



Interreg - IPA CBC 
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Study on endangered fish species and biodiversity condition in Montana region

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Abbreviations

Abbreviations	Description
BDA	The Biological Diversity Act Of Bulgaria
BDDR	Basin Directorate Of Danube Region
BDWMDR	Basin Directorate For Danube River Basin Management
BGBI	Bulgarian Biotic Index
Bio EP	Bio Energy Plant
BQE	Biological Quality Of Elements
EU	European Union
GEP	Good Ecological Potential
HMWB	Heavily Modified Water Bodies
HPP	Hydroelectric Power Plant
IUCN	International Union For Conservation Of Nature
MDP	Municipal Development Plan
MEP	Maximum Ecological Potential
MHPP	Mini Hydroelectric Power Plant
MoEW	Ministry Of Ecology And Water
NEN	National Ecological Network
PVPP	Photovoltaic Power Plant
RBMP	River Basin Management Plan
RSD	Regional Strategy for Development
SACs	Special Area Of Conservation
SCI	Site Of Community Importance
SPAs	Special Protection Areas
STP	Sewarage Treatment Plant
UN	United Nations
WFD	Water Framework Directive



- **Aim**

The aim of the study is:

- ✓ To identify the endangered, sensitive and vulnerable species of the ichthyofauna in the rivers of Montana district;
- ✓ to present basic information on habitats, geography, physical and ecological features, conservation status and value, threats and trends, economic value;
- ✓ to analyse the protected species, according to national and international red lists and the NATURA 2000 directive of habitats; to present national and international regulation on biodiversity and ichthyofauna preservation;
- ✓ to elaborate on the SWOT analysis;
- ✓ to define the threats over fish biodiversity, to investigate the launched measures and to identify the necessity of following and planning of next steps in biodiversity protection by measures for risk management;
- ✓ to study good practices in the EU and the perspectives for sustainable development

- **Scope**

The study includes: 11 Municipalities of Montana district; the three main rivers - Ogosta, Tzibritza and Lom, and their tributaries. The species of the ichthyofauna, found in the recent years in the rivers included in zones and areas of protection under Red Book of Bulgaria, Red List of IUNC and under Directive 92/43/EEC for Habitats under NATURA 2000. The ichthyofauna of Montana region Section was elaborated by adopting the original work of Trichkova et al who investigated the regions' ichthyofauna in details. The author was not part of any research work included in the present study. The threats and the measures for risk management are presented as overview of RBMP and the measures envisaged by RBMP and MDP of Montana region. The Section Future perspectives on biodiversity preservation is based on a paper of Gordon et al.(27), presented during the 50th Anniversary Symposium of The Fisheries Society of the British Isles at the University of Exeter, U.K. in July 2017, by a team of 30 biologists, who were challenged to consider the greatest threats, which fish populations are facing and how to ensure their sustainability in the future. The author did not co-authored this paper and only shares the vision of its authors as comparable and applicable to the topic of the current study.

- **Methods**

Collection of data for the purpose of the study was conducted by several main methods, which are interconnected. This means that the results obtained by applying one method serve as input



information when planning the implementation of the next method. The goal is to validate the results and resolve established contradictions and incompleteness.

The following methods are used:

- Study of documents and information;
- Content Analysis
- Interview with experts and stakeholders;

• **Results and discussion**

❖ **Montana district**

Montana District has a total area of 3635 square kilometers, which is 3.3% of the territory of the Republic of Bulgaria. The northern boundary of the district is the Danube River, which is also a state border with Romania. To the southwest, the district borders Serbia, to the south it is bounded by the northern slopes of the Balkan Mountains. Neighboring district in the western direction is Vidin, in the eastern - Vratza region and in the southern - Sofia region(1).

The district is one of the five areas of the Northwest region. Of all 11 municipalities in the area, 6 have a peripheral, borderline and have the potential to carry out cross-border cooperation with municipalities from neighboring countries - Serbia and Romania (1).

An important advantage of the area is its location.

Two European transport corridors - corridor № 4 (road E 79) Vidin-Montana-Vratza-Sofia-Kulata (FP I-1) and corridor № 7 the Danube River). Port Lom is the second largest Danube port in Bulgaria, and the infrastructure next to it provides the shortest direct land connection (via the second-class road II-81 through the Petrohan Stara Planina Pass), connecting the port of Lom with the port of Thessaloniki. (1)

Natural potential

The relief of the district is diverse - plain, mountainous and hollow. From north to the south in the Montana area fall parts of the Orsian Danube lowland, the Danube Plain, the Balkan Mountains, fore-Balkan and Stara Planina. In Stara Planina is located the highest point of the territory of the area - Kom peak (2 016 m). In the Stara Planina Mountain some of the lowland fields and valleys are formed, in which part of the settlements of the area are situated. Such are the Berkovska valley, the Varshets valley drop. (1)

Minerals.





Generally, the territory of the area is not rich in mineral raw materials. Mining deposits discovered by geological explorations in the past have largely lost their economic significance nowadays. Some of the deposits still exploited are of regional and local importance. They play a role primarily as raw materials for the construction industry. These are quarries for limestone, industrial mineral raw materials, granite, diabases. The availability of new deep-processing technologies is a prerequisite for mineral resource reintroduction. Of no industrial significance at this stage are lignite coal deposit in the Lom coal basin between the rivers Tzibritza and Lom, an area of about 300 square kilometers, which are not utilized because they have a low calorific value and are located below the aquifer. With certain economic significance are the deposits of quality clays and marls. There are deposits of refractory clay in the village of Klisuritza and in the village of Dolna Riksa (municipality of Montana). Quarries for open mining of building materials - limestone, sand, clay, ballast are in operation in the area. (1)

Climate

The climate in the region is diverse and influenced by the relief forms, which determine its microclimate features. The area is generally in the temperate-continental climatic area, with the mountainous climate having mountainous features. The wind regime (with a small exception to the Balkan ridge) is not suitable for wind energy generation. The sun power has indicators around the average for the country, on the southern slopes of the fore-Balkan Mountain and in the plain area there are suitable conditions for the production of solar energy. (1)

Soil

The soils have clear zoning in the north-south direction. The predominant soil type in the Danube Plain is the typical black forest with its varieties, and the gray forest soils are most common in the fore-Balkan. To the south - in the Stara Planina area, the soil cover is represented by the brown forest soils and mountain-meadow soils. (1)

Vegetation

The natural forest vegetation is better developed in the southern parts of the region - in the fore-Balkan and in the Stara Planina area. It is represented by deciduous species - hornbeam, oak, beech and others. In the area of Berkovitza there are natural plantations of chestnut forests. In the Stara Planina part there are artificial plantations of coniferous forests. (1)

Water

The river network includes the Ogosta, Tzibritza and Lom rivers and a number of their tributaries (Table 2). The mineral springs in the area of national importance are those in the balneological resort of Varshetz. The largest in catchment area and length, as well as in water quantities is the River Ogosta. In its upper course it is known as the Chiprovka River. The Lom River and the Tzibritza River are intersecting the whole Montana district. The hydropower potential of rivers in the area is a prerequisite for electricity generation - in existing medium and small hydropower plants (HPP). Surface river waters in the mountainous and hilly parts of the area are characterized by sufficient water quantities and poses the necessary slopes providing a natural conditions for the construction of small HPPs. (1)



Of economic importance are the thermal mineral waters. They are located mainly in Varshetz Municipality (Varshetz and Spanchevtzi) and are of national importance. Berkovitza municipality also has mineral water deposits (the villages of Borovtzi and Zamfirovo), which are virtually of no economic significance. A well of mineral water near the village of Dulgodeltzi, the Yakimovo municipality, was found but it was not exploited. The relatively high water temperature and flow rate have the potential for use of the geothermal energy of this drilling thermal mineral resource.

From renewable energy sources, Montana has high potential to use the energy of water and the sun, and low of wind and geothermal energy. (1)

Hydropower and hydro-meliorative potential of rivers.

The power of the water outflow of part of the rivers in the area is used for electricity generation - in the existing medium and small HPPs (Petrohan HPP Pilatevtzi, MHPP "Kosharnik", "Smirnenski" HPP, "Maktidi" HPP, "Milina" HPP, "Treshotka 1" HPP, "Orion" MHPP, etc.). In addition to producing electricity, river water is being used for water supply to settlements and for irrigation in agriculture. Three irrigation systems were built on the Lom River - Drenovetz, Lom-West and Smirnenski. The total area of the hydro-meliorative structure of the three irrigation systems is about 81 thousand decares. The irrigation system "Klisuritsa" with an area of 4.9 thousand decares is supplied with the waters of the Tzibritza river. The water from the Ogosta River feeds the Montana irrigation system with an area of about 52 thousand decares. (1)

Renewable Energy Sources and Energy Efficiency

For the production of alternative electricity in the country, mainly water, wind and solar energy are used. There are very good conditions in Montana region for the construction of HPPs that are almost fully utilized. Many HPPs have been built, such as Barzia hydroelectric power station, Klissura HPP and Petrohan HPP on the territory of Berkovitza municipality, and are included in the 110 kV system, and the others operate at 20 kV. Many of the municipalities trigger construction plans of renewable energy sources. The most serious are the applications in the municipality of Lom, where the construction of a power plant with a capacity of 2230 kW and Bioenergy - 3200 kW capacity is envisaged. The Municipality of Medkovetz also envisages the construction of a 3,700 kW bioenergy power plant as well as a power plant of 300 kW. The municipalities of Berkovitza, Valchedram and Montana are planning to build a PVPP with a capacity of 248 kW, 103 kW and 30 kW respectively. Optimal use of energy resources from renewable energy sources is a means of achieving sustainable energy development and minimizing the harmful environmental impacts of energy sector activities. (Table 1)(1)



Table 1

Renewable energy sources at Montana district (1)

Municipality	HPP kW	PVEP/ Bio EP kW	Total kW
Berkovitza	16800	PVPP – 3	16803
Boychinovtzi			
Brusartzi	600		600
Vulchedrum		PVPP - 6000	6000
Varshetz			
Georgi Damyanovo	2960		2960
Lom		PVPP - 9430	9430
Medkovetz		PVPP - 205	205
Montana	5000	PVPP - 3115	8115
Chiprovtsi	3030	PVPP - 150	3180
Yakimovo		Bio EP - 1000	1000
Montana District	28390	PVPP 18903/ Bio EP 1000	48293

❖ **Water bodies in Montana district**

By Order No. RD-272 / 03.05.2001 of MoEW, all the rivers in the area are categorized in their individual sections (1). The project category of the rivers in the area is:

- Danube River - III category;
- The Ogosta riverbed and the rivers west of the Ogosta River - the Lom River and the Tzibritza River, are I category up to the first settlement and II category - until their inflow into the Danube;
- The Ogosta River has different categories as follows: from the sources of all the tributaries to the first settlements - I category, II category up to the city of Montana and III category after the city of Montana, until the inflow of Botunya river. In the Ogosta River there are two of the complex and significant dams in the region - Srechenska Bara HPP, land of Yagodovo village, Berkovitza and HPP "Ogosta" - the second largest in Bulgaria after the Iskar Dam, a land of Montana. The first one is used for drinking water supply and is I category and the second is for irrigation - II category. Apart from irrigation (because a very small part of the irrigation system is built), the Ogosta HPP is also used for energy production, and three small HPP have been built directly under the dam wall and in the area of Kosharnik. Botunya River from the Ogosta riverbed is also categorized. From its springs to the village of Spanchevtzi is I category, from the village of Spanchevtzi to the town of Varshetz is II cat., and from the town of Varshetz to the village of Dolno Ozirovo - III category. After the influx of the Cherna River near the village of Dolno Ozirovo, the Botunya River passes again in the second category until its influx into the Ogosta River in the territory of Boichinovtzi. (1)



The conservation, rational use and management of water resources is of paramount importance for sustainable development, both for the region and for the whole country.

The riverbed to the west of the Ogosta River flowing through Montana district

Lom River¹

It is 92.5 km long, with a catchment area of 1 240 km². The Lom River starts from the main Stara Planina ridge in the village of Gorni Lom. It is formed by a number of smaller tributaries, starting from the sources of Burza (2,100 m above sea level) at the foot of Mount Midjur (2168 m) - the highest in the Chiprovka Mountains, Western Stara Planina. These rivers have mountainous character, very steep slopes of the riverbed and great flow rates. The river runs along a large slope next to Gorni Lom. Afforestation in this area is weak. Only a few parts of the catchment area are afforested mainly by deciduous forests. The riverbed is rocky and is covered with stones, gravel and sand, which are typical of the catchment areas of a similar nature. The longitudinal slope of the river to Gorni Lom is large - an average of 10%, and the cross profile of the valley is characterized by a deep cut and steep slopes. From Gorni Lom to Dolni Lom the river retains almost the same character. From there downwards, it enters an almost flat terrain (Lower and Mid-Range), where the river's slope is small and has the character of a flat river. The valley of the river is surrounded by high hills. The river banks are low, and the bottom is covered with sand. Thus, the river continues to Falkovetz neighborhood, where its main left tributary Stakevska River and its right tributary Chuprenska River are flowing. In this area the cross section of the valley becomes curved. From Falkovetz the river enters cornfields, where the valley and the bed of the river expand, with Drenovetz reaching 100-200 m. From Rujintzi to the northeast, the valley has asymmetric shores with well-developed terraces on the left of the riverbed and steep right slopes. The river banks in this area are very low and in heavy rains or intense snowfall its waters go out of the riverbed and cause flooding. The bottom of the river is for the most part, covered with gravel. When the water level lowers, the gravel moves to one or the other waterfront. Sometimes, after the flood, the river flows in the middle of the riverbed. The water catchment area of the river is deforested and is occupied by infields. The river retains this character until its inflow into the Danube at 742 km, in the town of Lom, at 28 m altitude. The mouth is known as "Limana". Characteristic of the river at its lowest point is the unleashing of its waters due to the higher levels of the Danube River.

Tzibritza River

The Tzibritza River springs north of Kostin Vrah (871 m) in the Shiroka mountain, part of the Balkan Mountains at 818 m above sea level, under the name Selska Bara. In the village Klisuritza the river Klisuritza infuses in Selska Bara and heading to the east under the name Tzibritza. Main tributaries: Levi - Tzibar, Turlovitza, Dushichnitza (Barata); right -Klisuritza,



Vinishka Bara, Selska Reka. It flows to the northeast through the fore-Balkan and the Danubian hilly plain in a wide asymmetric valley (with steep eastern slopes) (1).

The riverbed of Ogosta River flowing through Montana district

Ogosta River

Ogosta River is the largest river in Northwestern Bulgaria, characterised with well developed river system within the Pontic Province (Ecoregion 1) (4). For spring of Ogosta, Chiprovka River was adopted, which springs of the Chiprovtsi-Berkovska Mountains, West Stara Planina mountain. The length of the river is 144.1 km, with a catchment area of 3157.1 km². The boundaries of the catchment area are as follows:

- To the northwest and to the north - to the catchment areas of the Lom and Tzibritza Rivers;
- to the east, southeast and south - to the catchment area of the river Iskar;
- to the southwest - to the catchment area of the river Nishava(1).

The left tributaries of the Ogosta River are the Babichki Dol, the Prevalska River (Prevalska Ogosta) (19.3 km long), Ravnjanska Bara, Findo, Barata, Zlatitza, Turya Bara, Burzia (35.1 km), Shugavitza, Botunya, Virovska River, Marinska Bara, Barzina. The right tributaries are the Malki Bukovets river, Sabrin Dol, Binovrashki Dol, Parasinski Dol, Dulgodelska Ogosta(29.3 km), Buchka, Vurteshnitza (Leva Reka) (38.2 km), Ribine, Skat (2).

Ogosta Dam

The hydrotechnical facility is designed to irrigate large areas agriculture land stretching from Montana to the area of the Zlatiyata near Lom, but until 1989, only half of the necessary pipeline infrastructure was drained so it was never finished. At present, the water of the dam is practically not used for irrigation, but for the production of electricity in both HPP - Kosharnik and Ogosta located on the dam wall. In 1999 the dam is designated for industrial fishing. The variety of fish in the dam is big-carp, crucian carp, common rudd, bream, perch, common nase, barbel, catfish, northern pike, Danube bleak. The dam is also a place for recreation and tourism.(2)

Table 2

Type of rivers flowing through Montana district (3)

Nº	Type	Name of river type	Ogosta	Western of Ogosta
1	R2	Mountain Rivers in Pontian Province	3	9



№	Type	Name of river type	Ogosta	Western of Ogosta
2	R4	Semi-mountain rivers in the Pontian province	11	-
3	R6	Middle and Lower Danube	-	-
4	R7	Large rivers and tributaries of the Danube	5	-
5	RS	Small and medium Danube rivers	10	11
6	R9	Dobrudzha downsizing rivers	-	-
7	R15	Karst springs and other spring communities	-	-
Total water bodies along the riverbeds			29	20

Assesement of Ecological status of surface water

Intensive mining activities in the upper parts of the Ogosta River basin (Martinovo and Chiprovtsi regions) were undertaken between 1950 and 1999 (4). Until the building of the washeries and the sediment traps in the beginning of the 50's and in the middle of the 60's respectively, the discharges of mine wastewaters into the Ogosta River had led to a bad saprobiological status (4,5), and to the contamination of the river sediments with heavy metals (mainly lead, manganese, copper, zinc, cadmium and iron) and arsenic (4,6). After 1999 the mines were closed and at present the most of the spoil heaps are partially or completely remediated. Two reservoirs – Martinovo (located downstream the Martinovo village) and Ogosta (located upstream the town of Montana) serve as stilling basins for the river sediment load. The other pollutants in the Ogosta River are the wastewaters from farms, villages and towns in the river basin (4). Apart from the routine monitoring, a hydrobiological assessment of the river has not been carried out since 1991(4), until 2016.

Biological assessment of surface water status

According to NSI data and with regard to the biological indicators for surface waters of the rivers and lake categories in 2016, the majority of the monitored sites (over 50%) do not achieve the good status objectives (7). The assessment of the lakes and reservoirs is defined by the change in phytoplankton biomass (concentration of chlorophyll, $\mu\text{g} / \text{l}$). The indicator is sensitive to bio-pollution and eutrophication. The data represent the program for surface water approved by Order No. RD-167 / 31.03.2016 of the Minister of Environment and Water, which is part of the National Environmental Monitoring System. The biological assessment of the lake types has been performed on the basis of average annual values from sampling in 2016 according to the methodology approved by Ordinance № H-4 of 14.09.2012 for characterization of surface water, compared to the previous years. The evaluation is presented in 5 grades (excellent, good, moderate, bad, very poor) (Table 3). For the territory of the country 35% of the sites category



"lake" fall within the range of excellent - good condition, 10% are in moderate condition and 55% fall in the range bad - very poor condition, or 65% of the sites are not achieved targets for good condition (7). (Table 3)

In the Danube basin area, almost half (48%) of the monitored sites in 2016 are in the range bad - very poor condition. All observed reservoirs of Ogosta riverbed (Trikladentsi and Barzina) as well as riverbeds western of Ogosta (Poletkovtsi, Rasovo and Hr Smirnenski on the Lom River) are in the range bad - very bad condition which is a long-term tendency. (7) (Table 3)

A study of Stoyanova et al represents the results of a research on both the macrozoobenthos in Ogosta River, as a major biological quality element, and selected physical and chemical parameters of the river water (4). The research was conducted at seven sites along the river in August and October 2010, and in May and August 2011. During the study, 56 taxa belonging to 15 benthic groups have been found. The results were used to assess the ecological status of the river, represented by the lower of the values of the biological, physical and chemical quality elements. In the upper parts of the river, the status varied from very good to good. Downstream the influence of the city of Montana and many small farms in the river basin led to the deterioration of the river status to moderate. (4) These results correspond to the assessment according to the methodology approved by Ordinance № H-4 of 14.09.2012 for characterization of surface waters ordered by MoEW in 2016 (55a). The assessment of the river types was performed on the basis of one sampling during the optimal season (summer - autumn) The indicator is defined by changes in the number and diversity of macrozoobenthos indicator groups in rivers assessed by a biotic index [55a,8,9,10]. The index is sensitive to organic and toxic contamination and to hydromorphological changes. The evaluation is presented in 5 grades - excellent, good, moderate, bad, very poor. (Table 3) For the territory of the country, 43% of the river category falls in the excellent - good condition interval, 48% are in a moderate state and 9% fall in the bad - very poor state or 57% of the points have not achieved the goals for good condition. In 2016 the Danube basin district sites were in excellent condition (50%), 44 percent of the sites are moderate and the sites in the bad –very poor range are 6%. (Table 3) In the basin of the Ogosta River and the Rivers West of Ogosta, the sites are in good condition, and for these water bodies it is a long-standing trend.(2)

Assessed under the European Floods Directive and the Waters Act, the risk of flooding is significant in parts of the River Ogosta, but most places are outside the territory of the Municipality of Montana (11). In connection with the summer flood period in 2014 in Northern Bulgaria, according to the Danube Basin Directorate in Montana municipality there are no identified areas with potential risk of floods. A vulnerable zone, from floods on the territory of the municipality, is the area around Ogosta and Tzibritza, and the entire territory of the Municipality of Montana is defined assensitive area (Fig1). (11)



Table 3
Status of surface water bodies category of rivers (2)

<i>Index of water body</i>	<i>Name of the river</i>	<i>Index of the type</i>	<i>Description</i>	<i>Ecological status/potential</i>	<i>Chemical status</i>
<i>BG1OG307R013</i>	<i>Ogosta</i>	<i>BGTR4</i>	<i>Ogosta River, from Ogosta Dam to village of Saraevo, Botunya river, city of Krivodol until inflow into the river. Ogosta and the river Skat, from the village of Barkachevo until inflow into the Ogosta River</i>	<i>bad</i>	<i>bad</i>
<i>BG1OG700R005</i>	<i>Shugavitza</i>	<i>BGTR13</i>	<i>River Shugavitza, from the spring to the influx into the Ogosta River</i>	<i>good</i>	<i>good</i>
<i>BG1OG789R001</i>	<i>Ogosta</i>	<i>BGTR13</i>	<i>River Ogosta, from the spring to the influx into the Ogosta Dam the tributaries of Prevalska and Dulgodelska</i>	<i>moderate</i>	<i>good</i>
<i>BG1WO600R013</i>	<i>Nechinska Bara</i>	<i>BGTR13</i>	<i>River Nechinska Bara, from the spring until its infusion into the dam "Hristo Smirnenski "</i>	<i>good</i>	<i>good</i>
<i>BG1WO800R016</i>	<i>Tzibritza</i>	<i>BGTR13</i>	<i>the Tsibritsa River, from the spring to the village of Razgrad</i>	<i>good</i>	<i>good</i>

Fig.1 (11)



The control of the state of the rivers on the territory of the district is carried out according to an established schedule. The control of water quality in rivers is carried out at the following points, which are included in the National Environmental Monitoring System: 1 site at the Danube River, 5 at the Ogosta river, 2 sites at Botunya, 1 site at each of the rivers Burzia, Lom and Tzibritza and the Ogosta Dam and Srechenska Bara (1). In compliance with Ordinance No 12 / 18.06.2002, a monitoring of surface water intended for drinking and domestic water supply is carried out on the territory of Berkovitza Municipality - 7 sites, Varshetz Municipality - 10 sites, Chiprovtsi Municipality - 4 sites and Municipality of Belogradchik - 5 sites (1).

The results of the analysis of the state of the inland rivers in the region are as follows:

- The Ogosta (without the downstream and outfall) and the rivers west of it show stabilization of the results in the recent years with few exceptions on:

- ✓ Nitrate and undissolved substances at the Tzibritza River at Dolni Tzibar;
- ✓ undissolved substances at the sites of Botunya River near Ohrid village, before influx into the Ogosta River;
- ✓ nitrites at the site of the Tzibritza River near the village of Dolni Tzibar, Vulchedrum Municipality (1).

During the evaluation of the protected areas, Bulgarian biotic Index (BGBI) has been applied. In BGBI the indicator groups of organisms are selected using databases containing samples from the macrozoobenthos of the Bulgarian rivers. The method is based on so-called key groups of organisms whose designation does not require special taxonomic qualifications (12). The



indicator groups are divided into 5 classes corresponding to the gradient from the clear water to contaminated:

8-10 - I category (clean drinking water)

6-7 - Category II (conditional clean water)

3-5 - III category (polluted water)

<2 - out of the standard categories (highly polluted water)

0 - Antisaprophytic situation, when biological completeness trends to zero resulting from toxic or inert impact (12).

❖ IUCN Red List and Bulgarian Red Book of protected species

- ❖ *"rare species" is one whose populations are small, dispersed or dependent on specific factors and, if not, indirectly threatened or potentially threatened within the meaning of items (13);*
- ❖ *"globally threatened species" is a species included in the categories "extinct in nature", "critically endangered", "threatened" and "vulnerable" according to the current Red List of the International Union for the Protection of Nature (13)*
- ❖ *"extinct in nature", "critically endangered", "threatened" and "vulnerable" to the current Red List of the International Union for the Protection of Nature (13);*
- ❖ *"endemic species" is one that occurs only in a defined geographical area. (13);*
- ❖ *"endangered species" is one that is threatened with extinction throughout its area or in much of it (13).*

IUCN Red List

The status of freshwater fishes has been assessed at two regional levels: geographical Europe and the EU 27. According to the European freshwater fishes dataset published in November 2011 at the European level, at least 37% of the species were considered as threatened, 12% of them being Critically Endangered, 10% Endangered and 15% Vulnerable. A further 4% of species were classified as Near Threatened. Within the EU 27, 39% of freshwater fishes were threatened, of which 12% were Critically Endangered, 11% Endangered and 15% Vulnerable. In addition, 4% of species were considered as Near Threatened (Table4, Figure2) (14).

At the website of the European Commission² it is reported that Europe's freshwater fish species belong to a number of different families, which are varying both in species numbers and in the relative threat status of their species. The most threatened group are the sturgeons. All but one European sturgeon species depend on artificial reproduction and stocking for their survival. Another highly threatened group of species are the Mediterranean killifishes of the Cyprinodontidae family, victims of intensive development of Mediterranean coasts and threatened by invasive alien species; and the European Eel (now classified as Critically Endangered) which is the sole European representative of the Anguillidae (Table 5).

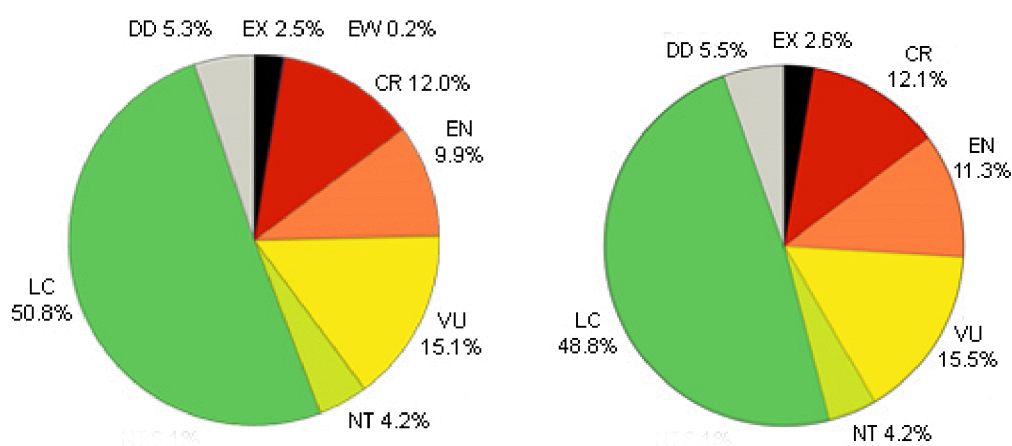
Table 4

Summary of number of freshwater fish species within each category of threat²

THREATENED CATEGORIES	IUCN Red List categories	No. species Europe (no. endemic species)	No. species EU 27 (no. endemic species)
	Extinct (EX)	13 (13)	10 (10)
	Extinct in the Wild (EW)	1 (1)	0
	Critically Endangered (CR)	63 (53)	48 (39)
	Endangered (EN)	52 (49)	43 (37)
	Vulnerable (VU)	79 (75)	59 (55)
	Near Threatened (NT)	22 (20)	16 (16)
	Least Concern (LC)	266 (188)	185 (88)
	Data Deficient (DD)	28 (26)	21 (18)
	Total	524 (425)	382 (263)

Fig.2

Red List status of freshwater fishes in Europe²



Red List status of freshwater fishes in Europe

Red List status of freshwater fishes in EU 27



Table 5

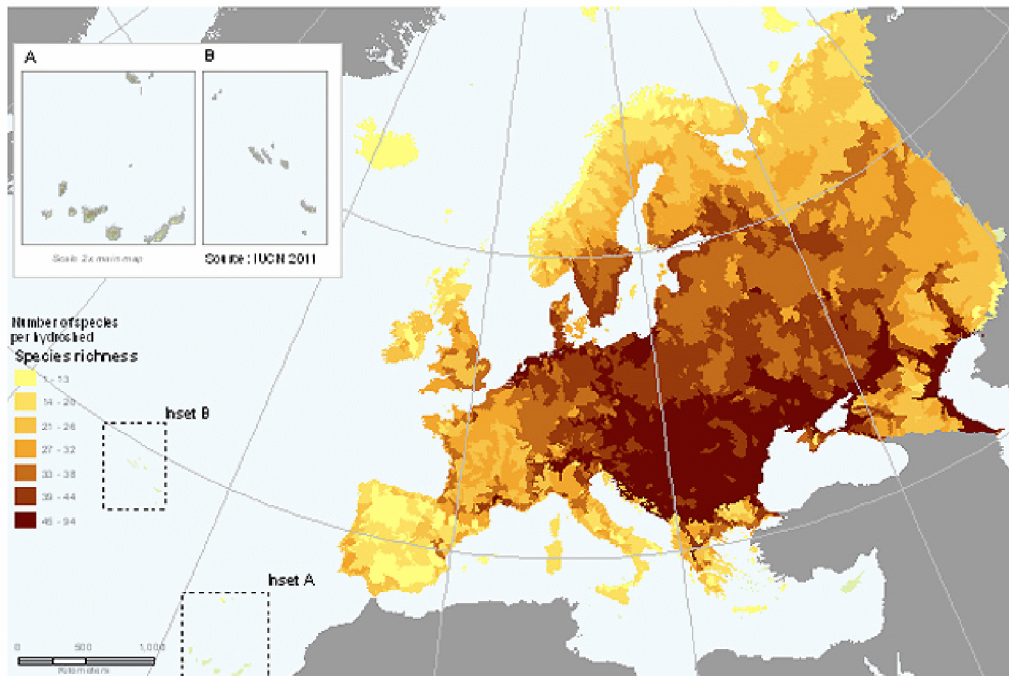
IUCN Red List status (at the European level) of freshwater fishes by taxonomic family²

Family	Total*	EX	EW	CR	EN	VU	NT	LC	DD	% Threatened*
ACIPENSERIDAE	8	0	0	7	0	1	0	0		100%
ANGUILLIDAE	1	0	0	1	0	0	0	0		100%
ATHERINIDAE	1	0	0	0	1	2	0	1		0%
BALITORIDAE	8	0	0	1	0	1	0	6		25%
BLENNIIDAE	2	0	0	1	0	0	1	1		50%
CLUPEIDAE	18	0	0	3	1	3	0	10	1	39%
COBITIDAE	35	0	0	5	5	6	3	16		46%
COTTIDAE	16	0	0	1	0	2	0	10	3	19%
CYPRINIDAE	236	3	0	23	35	38	14	119	4	41%
CYPRINODONTIDAE	6	0	0	3	2	0	0	1		83%
ESOCIDAE	1	0	0	0	0	0	0	1		0%
GASTEROSTEIDAE	8	1	0	1	0	0	0	6		13%
GOBIIDAE	43	0	0	4	2	3	1	30	3	21%
LOTIDAE	1	0	0	0	0	0	0	1		0%
MORONIDAE	1	0	0	0	0	0	0	1	0	0%
MUGILIDAE	5	0	0	0	0	0	0	5		0%
OSMERIDAE	2	0	0	0	0	0	0	2	0	0%
PERCIDAE	15	0	0	3	0	0	1	10	1	20%
PETROMYZONTIDAE	13	1	0	1	0	0	1	10	0	8%
PLEURONECTIDAE	3	0	0	0	0	0	0	3	0	0%
SALMONIDAE	98	8	1	9	7	24	2	32	15	41%
SILURIDAE	2	0	0	0	0	0	0	1	1	0%
SYNGNATHIDAE	1	0	0	0	0	0	0	1	0	0%
UMBRIDAE	1	0	0	0	0	1	0	0	0	100%
Total	525	13	1	63	52	79	22	267	28	37%

*Does not include species classed as Not Applicable (NA)

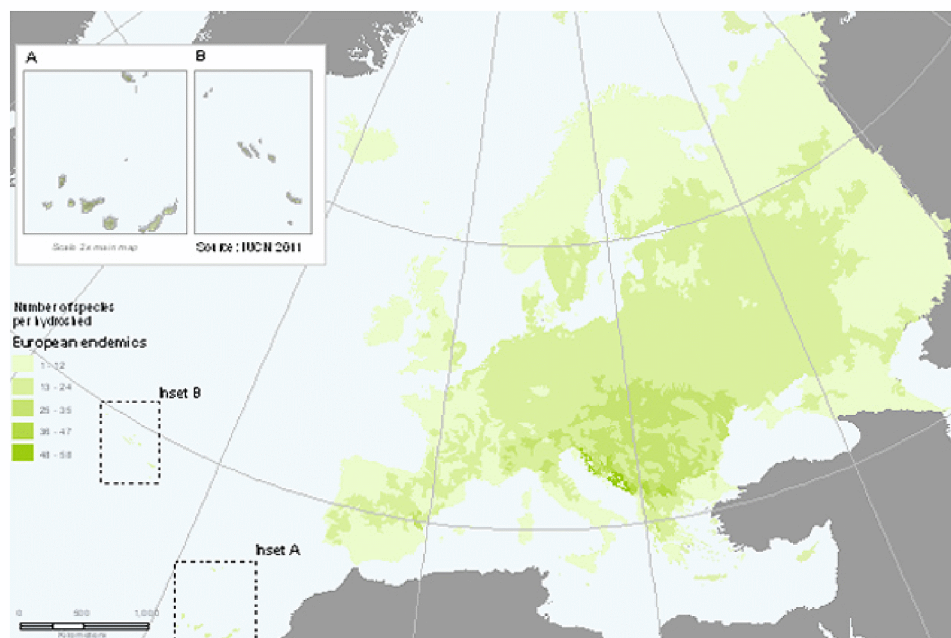
The areas of highest species richness clearly coincide with the lower parts of the large rivers flowing to the Black and Caspian seas, such as Danube, Bug, Dniestr, Dniepr, Don, Volga and Ural. Eastern and central Europe are also particularly rich, as is all of the Balkan Peninsula, and the catchments of the Elbe and the southern Baltic Sea basin(Fig.3). ²

Fig.3²
Species richness in Europe



At 80%, the level of freshwater fish endemism within Europe is very high, so the overall distribution of European endemic species is similar to that of overall species richness at the European level.² Many species are restricted to one, or very few, waterbodies. The most important hotspot of endemism in central Europe is the region of subalpine lakes in Austria, Germany, Switzerland and France (Fig.4).

Fig.4²
Endemic species in Europe



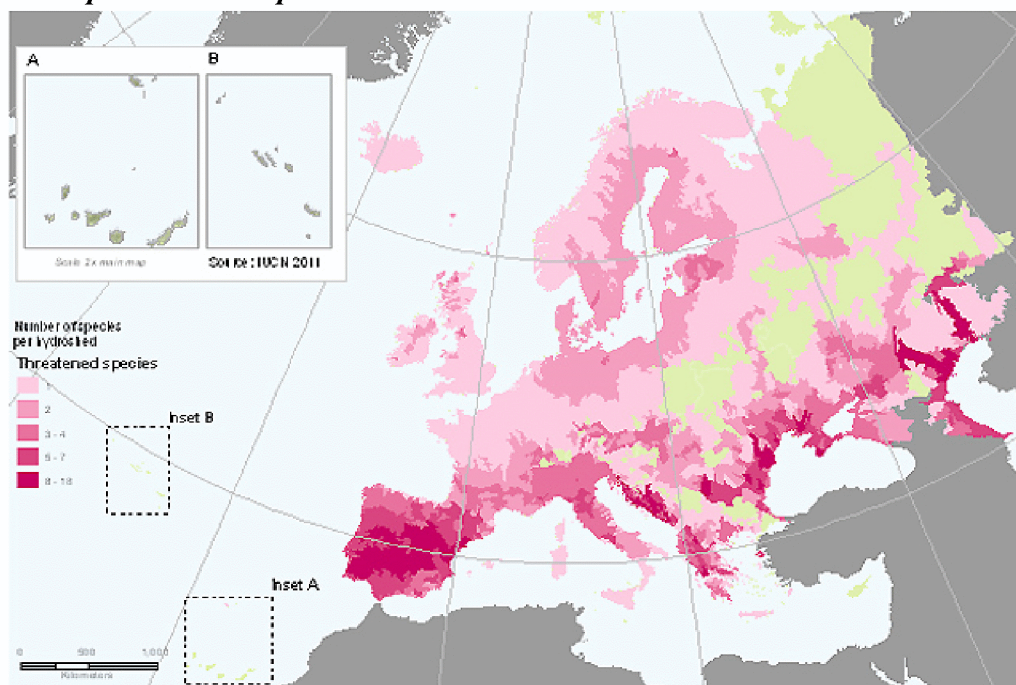
Another centre of freshwater fish endemism exists in northern Europe, in Iceland, Ireland, Scotland, Wales, Norway, Sweden, Finland and Russia.² In the tributaries of the Mediterranean and the western Black Sea coast and Crimea, the species diversity per water body is low, whereas the rate of endemism is high. Many species occur in just one catchment, in few springs or streams, and about 60% of all freshwater fishes assessed as Critically Endangered in Europe occur in this area (Fig.4).²

Threatened species in EU

The distribution of threatened freshwater fishes in Europe shows divergent patterns from the picture of the overall species diversity.

The highest concentrations of threatened freshwater fish species are found; (1) along the northern Mediterranean coast, (2) on the tip of the Crimean Peninsula, and (3) in coastal streams of Bulgaria and European Turkey.² All three regions have many locally endemic species, with natural ranges limited to one or few streams, springs or rivers. In certain areas within these regions, almost every river has its own unique freshwater fish fauna composed of local endemics (Fig.5).²

Fig.5²
Threatened species in Europe



Bulgarian Red Book of protected species

In the Red Book of Bulgaria are included 10 fish species from the Danube region (Table 6,7).(15)

Table 6
List of species of conservation significance of the categories "Nearly Endangered", "Poorly Affected", "Insufficient Data", Nearly Endangered (NT) .(15)

Bulgarian name	Latin name	Conventions and lists, including the species
Ray-finned fish	Actinopterygii	BQE-III
Order of ray-finned fish	Cypriniformes	BQE-III
Cyprinids family	Cyprinidae	IUCN [LR/lc]; BQE-III
Blue bream	Abramis ballerus, Linnaeus, 1758	IUCN [LC]; DX-V;
White-eye Bream	Abramis sapa, Pallas, 1814	BDA-IV
Schneider	Alburnoides bipunctatus, Bloch, 1782)	IUCN [LC]; BQE-III;
Western balkan barbel	Barbus cyclolepis, Heckel, 1837	DX-V; BQE-IV
Western balkan barbel	Barbus peloponnesius, Valenciennes, 1842	IUCN [LR/lc]; BQE-III
Vimba bream	Vimba vimba, Linnaeus, 1758	IUCN [DD];
True loachers	Cobitidae	



Bulgarian name	Latin name	Conventions and lists, including the species
Balkan loach	<i>Cobitis elongata</i> , Heckel & Kner, 1858	BQE-III
Seaweed pipefishes	Syngnathiformes	
Pipefishes family	Syngnathidae	
Schmidt's pipefish	<i>Syngnathus schmidtii</i> , Popov, 1927	
Perciformes	Perciformes Gobiidae	
Gobies family	<i>Neogobius cephalargoides</i> , Pinchuk, 1976	
Mushroom goby	<i>Neogobius ratan</i> , Nordmann, 1840	

Table 7

Faunistic diversity of ichthyofauna in Bulgaria (15,16).

Classes	Orders	Phylum	Genera	Species
Cyclostomata (Crustacea)	1	1	1	2
Chondrichthyes (Cartilaginous fish)	2	3	3	4
Osteichthyes (Bony fish)	17	56	137	213

❖ **Ichthyofauna of rivers and lakes protected by Biological Diversity Act of Bulgaria**

The catchment of the Danube River is characterized by the richest ichthyofauna species in Europe (17,18,19). According to Karapetkova et al. (17,19), this is due both to the fact that the river crosses most of Europe's territory and to the proximity of the Danube catchment with Siberia. In the Danube's ichthyofauna, the Pontico-Caspian species and the Boreal-Atlantik relicts predominate, followed by the Danube species and Mediterranean migrants. The Danube River Basin is a center of species formation and is of utmost importance for the conservation of Europe's ichthyofauna. (19)

Of the 78 native species of fish living on the Danube River, 66 are found in our aquatic environment (18,19). The number of species of the Danube river fauna is 70% of the freshwater fish in Bulgaria and 39% of Bulgarian ichthyofauna. The number of endemic species in the Danube catchment area is 7, of which 6 species are endemic to the Balkan peninsula - *Romanogobio kessleri*, *Barbus petenyi*, *Cobitis elongata*, *Cobitis strumicae*, *Sabanejewia balcanica*, *Sabanejewia bulgarica*, and *Cottus haemi*. In the watersheds of the Danube catchment area, 5 alien species have been introduced for enrichment of the base for commercial fishery and amateur fishing. The undesirable invasive species in the Danube catchment are 4 – pumpkinseed - *Lepomis gibbosus*, *Pseudorasbora parva*, *Gambusia holbrooki* and *Perccottus glenii*. At the fish farms in the Danube region another 6 species are used for breeding. (19)



The great species richness of the Danube tributaries is due to the variety of reliefs and climatic conditions (19). Along the rivers, three zones are distinguished alternating from mountain, foothill and plain. The mountain area is the habitat of the trout. At the border with the foothill area, miller's thumb (*Cottus gobio*, *C. haemus*) is found, also *Phoxinus phoxinus*, *Barbus petenyi*, *Romanogobio kessleri*, *R. uranoscopus*, *R. vladycovi* and *Squalius cephalus*), *Cobitis strumicae*, *Sabanejewia balcanica*, *Barbatula barbatula*. In this mixed zone attempts were made to introduce grayling (*Thymallus thymallus*) and American trout (*Oncorhynchus mykiss*)(19).

Compared to the Danube's ichthyofauna, its Bulgarian tributaries have a much more sophisticated species composition (17,19). The Bulgarian section of the Danube falls entirely in the lower zone of the river and is characterized by an exceptional richness of species, including industrial. In the ichthyofauna of the Danube catchment, there are common freshwater species from the whole country, but most of the species are occupying only this catchment, and differ significantly from the other water catchment areas (19). The Danube River is the only river in the country where the stocks allow commercial fishery. However, the number of many fish species in the Danube River has declined drastically in the past decades. Ichthyofauna of standing water basins in the Danube region is mostly formed as a result of restocking events. Their species composition is not significantly different from that of the standing water basins in the other catchment areas (19).

Bulgaria's special geological past and geographic location have determined the formation of a rich species diversity of aquatic organisms. There is a significant number of endemic species endemic for Bulgaria or for the Balkan Peninsula water basins. Therefore, nowadays, the conservation of genetic resources and the natural fish populations in our country are becoming more and more important in national, regional and even global scale (19).

Table 8
Species included in Annex 2 of BDA (13)

CLASSIFICATION OF FISHES	PISCES
<i>Lampreys ORDER</i>	<i>PETROMYZONIFORMES</i>
<i>Lampreys family</i>	<i>Petroinyzonidae</i>
<i>Lampreys</i>	<i>Eudontomvzon spp.</i>
<i>ORDER OF RAY-FINNED FISH – ESOCIFORMES</i>	<i>ESOCIFORMES</i>
<i>Family of ray-finned fish - umbridae</i>	<i>Umbridae</i>
<i>European mudminnow</i>	<i>Umbra krameri</i>



CLASSIFICATION OF FISHES		PISCES
ORDER OF RAY-FINNED FISH – CYPRINIFORMES		CYPRINIFORMES
Family of freshwater fishes - cyprinids		Cyprinidae
! Asp		<i>Aspius aspius</i>
Romanian barbell		<i>Barbus meridionalis petenyi</i>
Crimean barbell		<i>barbus tauricus (barbus plebejus tauricus)</i>
The round-scaled barbel		<i>Barbus cyclolepis (barbus cyclolepis tauricus)</i>
Danube bleaks		<i>Chalcalburnus chalcoides</i>
! White-finned gudgeon		<i>Romanogobio albipinatus (Gobio albipinatus)</i>
! Danubian longbarbel gudgeon		<i>Romanogobio uranoscopus (Gobio uranoscopus)</i>
! European bitterling		<i>Rhodeus amarus (Rhodeus sericeus amarus)</i>
Mountainous mullet		<i>Leuciscus souffia</i>
Sabrefish		<i>Pelecus cultratus</i>
True loaches		Cobitidae
Balkan loach		<i>Cobitis elongata</i>
Balkan loach		<i>Cobitis elongatoides (Cobitis taenia elongaroides)</i>
Struma spined loach		<i>Cobitis strumicae (cobitis taenia strumicae)</i>
! European weatherfish		<i>Misgurnus fossilis</i>
! Balcan spined loach		<i>Sabanejewia balcanica (Sabanejewia aurata balcanica)</i>
		<i>Sabanejewia bulgarica (Sabanejewia aurata bulgarica)</i>
Danube spined loach		<i>bulgarica)</i>
ORDER OF RAY-FINNED FISH – PERCIFORMES		PERCIFORMES
Perciform fish family		Percidae
Danube ruffe		<i>Gymnocephalus baloni</i>
! Striped ruffe		<i>Gymnocephalus schraetzer</i>
! Common zingel		<i>Zingel spp.</i>
ORDER OF RAY-FINNED FISH – CLUPEIFORMES		CLUPEIFORMES
Family of soft-finned teleost fishes		Clupeidae
Shad		<i>Alosa spp.</i>
ORDER OF RAY-FINNED FISH – SCORPAENIFORMES		SCORPAENIFORMES
Scorpaenoid family		Cottidae
! European bullhead		<i>Cottus gobio</i>



Using internationally accepted IUCN categories and criterion the list of endangered species in Bulgaria have been updated in the new edition of the Red Book of Bulgaria (15). With regards to the Council Directive 92/43 / EEC on the conservation of natural habitats and of wild fauna and flora habitats and of the wild flora and fauna in Annex 2 of BDA includes the following fish species, summarized in Table 8.

The protected species of fish included in Annex 3 of BDA are: German sturgeon (*Acipenser sturio*), Thorn sturgeon (*Acipenser nudiiventris*) and Danube ruffe (*Gymnocephalus baloni*).

❖ Ichthyofauna of Montana region

Ichthyofauna of Montana region is bound to the main stream - the Ogosta River, its tributaries and Ogosta Dam (20). Probable species included in Annex II of the Directive 92/43 / EEC are European bitterling (*Rhodeus sericeus amarus*), Romanian barbel (*Barbus meridionalis*), Danube spined loach (*Sabanejewia aurata*), Balkan loach (*Cobitis taenia*), European bullhead (*Cottus gobio*), Danubian longbarbel gudgeon (*Gobio uranoscopus*), Balkan Kessler's gudgeon (*Gobio kessleri*). Typical are European chub (*Leuciscus cephalus*), brown trout (*Salmo trutta*), river trout (*Salmo trutta fario*), Schneider (*Alburnoides bipunctatus*), stone loach (*Barbatula barbatula*), gudgeon (*Gobio gobio*), common barbel (*Barbus barbus*). According to local fishermen, in the Ogosta dam there are carp, gudgeon, bream, Prussian carp, Danube bleak, roach, rudds, redfin perch, catfish, northern pike, vimba bream, Balkan loach, Western Balkan barbel and common barbel, common nase, tench, pumpkinseed, grass carp, silver carp, bighead carp (20). Under conservation and regulated use status are the species, included in Annex 4 of BDA, and five of them are observed in Montana region - *Aspius aspius*, *Barbus meridionalis petenyi*, *Pelecus cultratus*, *Gymnocephalus schraetzer* and *Zingel zingel*.

In April-September 2005, the fish species diversity in five river basins: Voinishka, Vidbol, Archar, Tsibritsa and Ogosta (Table 9) have been monitored (21). Totally, 40 sites along the entire reaches of the rivers except the uppermost reaches and estuaries, as well as some tributaries were sampled. Sampling was made by electrofishing and beach seine (21). A total of 27 fish species belonging to seven families were recorded (21). This amounts to about 35% of the ichthyofauna currently occurring in the Bulgarian part of the Danube River and its tributaries (unpublished data of Trichkova et al.). In previous studies, the number of fish species reported in the same rivers ranged from 15 (21,22) to 43 (21,23). However, Michailova studied only the upper and middle reaches included in the mountain region (21,22), while Karapetkova included in her review the river estuaries as well (21,23). Totally, 24 species recorded are indigenous to the ichthyofauna of the Danube Basin and three species are exotic in Bulgaria - *C. gibelio*, *P. parva* and *L. gibbosus*. Most frequently were occurring are the species *L. cephalus* (at 100% of the sites), followed by *G. gobio* and *R. amarus* (both at 75% of the sites) (21). Frequent were also *B. petenyi*, *A. alburnus*, *Cobitis* sp. and *S. balcanica* occurring at over 50% of the sites. These results correspond to a great extent to the findings of Michailova, who reported as most frequent and abundant in the 1960's *B. petenyi*,



L. cephalus, *G. gobio* and *A. bipunctatus* (21,22). The species *L. cephalus* and *B. petenyi* inhabited the entire reaches of the rivers being most abundant in the rivers Lom and Vidbol. *G. gobio* and *A. alburnus* were occurring mainly in the middle and lower reaches and dominated in number in the Ogosta River (21). In this study, *A. bipunctatus* has been found at 30% of the sites, only in four of the rivers (21). However, it has been occurring along the entire reaches, as reported by Michailova as well (21,22), and it has been most abundant in the Lom River. *R. amarus* have been recorded in the middle and lower reaches, abundant at sites with slow water and vegetation. It was dominating in number in the Skat River, where most of the sites sampled have been characterized by muddy substrate. *S. balcanica* have been newly recorded in the rivers Vidbol and Voinishka and it has been abundant at three sites. The representatives of *Cobitis* sp. haven't been identified to species level (21). They have been occurring mainly in the lower reaches and have been newly found in the Archar River (21). *Cobitis* sp. has been most abundant in the Tzibritza River. *B. barbatula* was occurring at 40% of the sites and it has been first recorded in the Vidbol River (21). The exotic species (*C. gibelio*, *P. parva* and *L. gibbosus*) which were absent until the 1960s (21,22), and which occurred rarely in the subsequent periods (21,23; 24), have been found at over 30% of the sites. Most frequent of them have been *P. parva* (47.5%) (21). It was first reported in the rivers Lom and Archar, while *L. gibbosus* in the rivers Lom and Vidbol. The two species have been more common in the lower river reaches (21). Recently, a considerable increase in abundance of *Neogobius* species in the Bulgarian section of the Danube and their range expansion upstream the tributaries has been observed (21,25; data of Trichkova et al.). The results of Trichkova et al. inventory confirmed these observations and showed that gobies were found more frequently (21) than in the previous studies. Karapetkova reported *N. fluviatilis* and *P. marmoratus* only in the Ogosta River (21,23). Except in this river, *N. fluviatilis* has been newly recorded in the rivers Lom, Archar and Vidbol, and *P. marmoratus* – in the rivers Archar and Vidbol (21). The species *N. melanostomus* has been found for the first time in Ogosta and Archar rivers (21). The goby species was occurring mainly in the river lower reaches. Most rare during this survey have been *A. aspius*, *B. bjoerkna*, *C. nasus*, all *Romanogobiospecies* and *V. vimba* (21). In the past, the rheophilic Danube species *A. aspius*, *B. barbatus* and *C. nasus* run far upstream the river mouths reaching the upper parts of middle reaches, where they coexisted with *B. petenyi* (21,22). Trichkova et al. have found these species only in the biggest rivers Ogosta and Lom at single sites restricted to the lowest reaches (Tab. 9) (21). *V. vimba* has been found in the lower reaches, only in the Ogosta River, as in previous study (21,23). *R. albipinnatus* has been recorded in the Vidbol River near Dunavtzi, where it was previously reported (21,23). Other Danube species predominantly eurytopic, such as *B. bjoerkna*, *E. lucius*, *L. idus*, *R. rutilus* and *P. fluviatilis* have been also found comparatively rare predominantly in the river lowest reaches (21). *R. kessleri* and *R. uranoscopus* which were reported as common and frequent by Michailova (21,22) and Karapetkova (21,23), during this survey, were recorded only at single sites in the rivers Lom and Skat, respectively (21). 16 species reported in previous studies have not been found (21). Among them are the species from the uppermost reaches *P.*



phoxinus, *S. trutta fario* and the introduced *O. mykiss* in the rivers Ogosta and Lom (21,22,23). The other species absent from the present list, but reported by Karapetkova (23), are mainly limnophilic and eurytopic Danube species, found usually in the estuaries of the tributaries, such as: *A. brama*, *C. carpio*, *S. erythrophthalmus*, *T. tinca*, *M. fossilis*, *S. glanis*, *G. baloni*, *G. cernuus*, *G. schraetser*, *S. lucioperca* and *B. stellatus*. (21) These results did not confirm the finding of *P. platygaster* in the Vidbol River near Dunavtzi (21,23). However, this species is extremely rare and listed as critically endangered in the newly updated Red Book of Bulgaria (21,15). The greatest species diversity has been detected in the Ogosta River (24 species), followed by the rivers Lom (17 species), Vidbol (16 species), Archar (15 species), Tzibritza (12 species), and the lowest - in the Voinishka River (5 species) (21). The fish community in the biggest river Ogosta has been dominated by *A. alburnus* and *G. gobio* along the entire reaches, together with *B. barbus* - in the lower reaches (21). In the biggest Ogosta tributary Skat River, where 11 species have been recorded, dominant were *R. amarus* at all sites and *C. gibelio* near Altimir. In the Lom River, most abundant have been *A. bipunctatus*, *B. petenyi* and *L. cephalus*, while in the Vidbol River - *B. petenyi* and *L. cephalus* (21). (Table 9)



Species	Frequency of occurrence (%)	Conservation status
Cyprinidae		
<i>Alburnoides bipunctatus</i> (Bloch, 1782)	30	RB-DD
<i>Alburnus alburnus</i> (Linnaeus, 1758)	60	
<i>Aspius aspius</i> (Linnaeus, 1758)	2.5	BDA-2; RB-VU
<i>Barbus barbus</i> (Linnaeus, 1758)	10	BDA-4; RB-VU
<i>Barbus petenyi</i> (Heckel, 1847)	67.5	BDA-4; RB-DD
<i>Blicca bjoerkna</i> (Linnaeus, 1758)	2.5	
<i>Carassius gibelio</i> (Bloch, 1782)	40	
<i>Chondrostoma nasus</i> (Linnaeus, 1758)	2.5	
<i>Gobio gobio</i> (Linnaeus, 1758)	75	
<i>Leuciscus cephalus</i> (Linnaeus, 1758)	100	
<i>Leuciscus idus</i> (Linnaeus, 1758)	7.5	
<i>Pseudorasbora parva</i> (Temminck and Schlegel, 1842)	47.5	
<i>Rhodeus amarus</i> (Bloch, 1782)	75	BDA-2
<i>Romanogobio albipinnatus</i> (Lukasch, 1933)	2.5	BDA-2; RB-VU
<i>Romanogobio kesslerii</i> (Dybowski, 1862)	2.5	RB-EN
<i>Romanogobio uranoscopus</i> (Agassiz, 1828)	2.5	BDA-2; RB-EN
<i>Rutilus rutilus</i> (Linnaeus, 1758)	10	
<i>Vimba vimba</i> (Linnaeus, 1758)	5	RB-DD
Cobitidae		
<i>Cobitis</i> sp.	62.5	
<i>Sabanejewia balcanica</i> (Karaman, 1922)	55	BDA-2; RB-VU



Species	Frequency of occurrence (%)	Conservation status
Balitoridae		
<i>Barbatula barbatula</i> (Linnaeus, 1758)	40	RB-VU
Esocidae		
<i>Esox lucius</i> Linnaeus, 1758	5	
Centrarchidae		
<i>Lepomis gibbosus</i> (Linnaeus, 1758)	30	
Percidae		
<i>Perca fluviatilis</i> Linnaeus, 1758	12.5	
Gobiidae		
<i>Neogobius fluviatilis</i> (Pallas, 1811)	10	
<i>Neogobius melanostomus</i> (Pallas, 1814)	5	
<i>Proterorhinus marmoratus</i> (Pallas, 1814)	15	

Table 9

List of species recorded in the rivers of North-West Bulgaria, occurrence and conservation status in Bulgaria. BDA – Biological Diversity Act (2002); RB - Red Book of Republic of Bulgaria (in press); EN - Endangered, VU - Vulnerable, DD - Data Deficient. (21)

Some of the fishes recorded are of high conservation concern in Bulgaria. Seven species are under the protection of the BDA. *A. aspius*, *R. amarus*, *R. albipinnatus*, *R. uranoscopus* and *S. balcanica* are considered of high conservation priority and listed in Appendix 2 of BDA; while *B. barbus* and *B. petenyi* are considered under a special regime of conservation and regulated use in nature and listed in Appendix 4 (21,13). Ten species are listed in the newly updated, according to the IUCN criteria, Red Book of R. Bulgaria (21,15). Of them, two species are considered as endangered, five species as vulnerable, and three species as data deficient. The results of this study confirmed that most of these species, such as *A. aspius*, *B. barbus*, *R. kesslerii* and *R. uranoscopus*, are comparatively rarely found in the Danube tributaries (21).

Compared to previous studies, the non-indigenous species had become common, the goby species has expanded their range upstream, while other species had decreased their range and number considerably (*A. aspius*, *B. barbus*, *C. nasus* etc.), or had become very rare (*R. kesslerii*, *R. uranoscopus*) (21). In order to ensure the optimum protection and preservation of the indigenous ichthyofauna, especially in terms of the high conservation priority of the



studied region, the courses of the rivers Ogosta, Lom, Archar and Vidbol have been accepted as Natura 2000 sites and new protected areas in Bulgaria.

❖ **NATURA 2000 protected areas under the Directive for habitats in Montana district - overview and analysis**

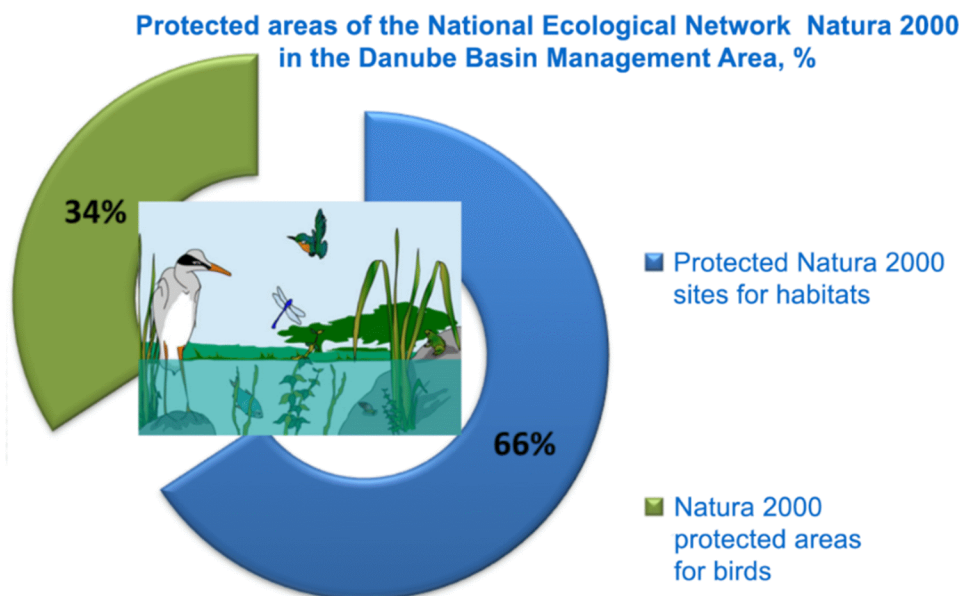
The presence of endemics is one of the important and basic criteria in international and national plan for defining the strategy and priorities for biodiversity conservation of a country or region (15).

The main threats to biodiversity in the world are overexploitation of natural resources by humans, progressive and accumulation of air, water and soil pollution, intensive industrialization, urbanization and related road construction and communications, progressive development of tourism and tourism industry, etc. Awareness of this global threat led to the UN Rio Conference in 1992, which adopted the Convention on the Protection of Biodiversity, ratified and signed today by more than 190 UN member states (15).

With the entry into force of BDA in 2002, conditions for the establishment of a national system of protected areas as part of the European ecological network NATURA 2000 were created. It aims to ensure the long-term conservation of types of natural habitats and populations of species that are of European significance. It includes special protection areas designated by the EU Member States, the Habitats Directive and the Birds Directive. Objects of protection under the two directives are about 140 natural habitats and more than 600 species of plants and animals of EU importance. Both Member States and acceding States are required to identify the distribution of these habitats and species within their territories, to place some of them under protection and to manage them for conservation and sustainable use (15).

The European Commission has taken the view that it is necessary for each EU country to retain about 20% of the national area by including it in NATURA 2000. As a contribution to the European Ecological Network NATURA 2000, Bulgaria should ensure the conservation of over 80 habitat types as well as the most important habitats of 100 species of plants and 226 species of animals defined by European directives. The process of exploration and establishment of NATURA 2000 sites in Bulgaria has been running for several years with the financial support of external donors and internal funding through the MoEW (15). Protected zones and areas were designated for the conservation of habitats and species in which the maintenance or improvement of water status is an important factor in their conservation (13).

Fig.6 (11)



These zones are defined / updated according to the zones included in the National Ecological Network (NEN), which was designed in accordance with the requirements of BDA. NEN includes:

- Protected zones, as part of the European Natura 2000 network, which include protected areas. Natura 2000 areas are listed under Directive 92/43 / EEC on the conservation of natural habitats and of wild fauna and flora - **Habitats Directive** and Directive 79/409 / EEC on the conservation of wild birds -**The Birds Directive** (Fig.6);
- Protected areas that do not fall within the protected zones. The protected area is designed to protect the biological diversity of ecosystems and the natural processes occurring therein as well as the characteristic or remarkable sites of the non-living nature and landscapes. These include predominantly forests, lands and water bodies. The protected areas are divided into several categories, regulated by the Protected Areas Act: National Park, Nature Park, Reserve, Reserved Nature Reserve, Nature Reserve and Protected area.(11)

Upon updating the register, a single national approach has been applied to these areas, according to which only protected areas and areas declared to be protected for waterborne habitats and species are identified. Following the update, the Habitats Protected Areas - out of 110 in the 2010 RBMP, 98 are made in the RBMP 2016, and the Birds Conservation Areas - from 47 RBMPs in 2010, become 50 in RBMP 2016 (11). In the RBMP 2016-2021, 190 protected zones - protected areas declared under the Protected Areas Act are identified, related to the conservation of water species and habitats.(11) The total area of protected sites covered by NEN is 1434.97 sq. km. This makes 39.52% of district territory. The share of NEN sites in the Montana region is higher than the average for the country - 34.24% and



much larger than the corresponding for the Northwest region - 31.39% (Table10). The high share of NEM sites is formed by the very large share of NATURA 2000 protected areas.(1)

Protected Areas

Montana District has a share of protected areas - 1.87% - much smaller than the average for the country (5.11%). The area is also much smaller than the average for the Northwest region - 4.47%. Among the protected areas, the natural parks predominate - 1.56% and the protected areas - 0.23%. The remaining categories are separately below 0.1%. The situation in municipalities is shown in Table 10. (1)

Table 10

NEN by municipalities / taking into account the overlap, according to the MoEW (1)

Municipalities	NEN %	Protected areas, %	Protected areas NATURA 2000, %
Berkovitza	68,06	0,62	67,91
Boychinovtzi	4,23	-	4,23
Brusartzi	2,61	-	2,61
Vulchedrum	54,13	0,15	54,13
Varshetz	64,61	23,53	64,61
G. Damyanovo	94,26	1,25	94,26
Lom	8,23	0,23	8,16
Medkovetz	0,58	0,52	0,06
Montana	18,26	0,19	18,24
Chiprovtsi	97,52	0,65	97,52
Yakimovo	2,47	-	2,47

With the largest share of protected areas, Varshetz municipality is definitely before the others. Of the remaining only the municipality of Georgi Damyanovo has more than 1% of protected areas. Three municipalities have no protected areas at all.

Of the municipalities a total of 5 have a share of protected areas above 50% - Chiprovtsi, Georgi Damyanovo, Berkovitza, Varshetz and Vulchedrum. Almost the entire municipal territory of municipalities Chiprovtsi and Georgi Damyanovo is occupied with protected areas (1). (Table10)

Four of the municipalities of the Montana District have no protected areas under the Habitats Directive - Boychinovtzi, Brusartzi, Medkovetz and Yakimovo.(1)



❖ **Protected fish species in Montana region occupying zones under NATURA2000 Directive for protected habitats³**

Balkan spined loach (*S. aurata*)³

S. aurata inhabits the average and upper currents of permanent rivers with sand and gravel bottom and rapid flow. It is benthic, radiophilic species. It inhabits the main basin of the Danube River. It enters into the Danube tributaries.

Altitude

Up to 800 m apart from the Palakaria river where it is found at up to 800 m above sea level.

Temperature

From 0 to 300°C

Inclination

Up to 15%.

Flow rate

Up to 1.5 m / s - medium to fast.

Bottom

It inhabits sandy bottoms, rarely with small gravel.

Oxygen

The species is tolerant to a relatively low oxygen content in the water, but no specialized studies have been conducted to determine its tolerance limit.

Depth

Shallow rivers up to 2 m.

In the Danube River, it is attached to sandy bottoms, which, in the case of low water, go into the shoal less than 1 m, and at high water remain at a depth of less than 10 m.

Of the identified threats, the highest number of points are: pollution (n = 42), longitudinal linear infrastructure (n = 13), change in outflow (n = 11) and recreation (urbanization).

According to the assessment of the species in the protected areas of Montana district, the species was in unfavorable condition with lower than referent values of biomass, population size and age structure in Zlatiya. The species was not detected in Portirovtzi-Vladimirovo, Orsoya and Pastrina, although there are no barriers and threads over the population. At Bilernitzite the number of juvenile fishes was 100% of the collected species. Only at two areas – Lom river and western Stara Planina the species was in favorable condition according to Criterion 1. In Pastrina and Orsoya BGBI showed a value of 3. The flow rate of Lom river was 0.2m/s and in Bilernitzite – 0.4 m/s, in Zlatiya less than 0.6 m/s for more than 50% of the river flow. In western Stara Planina 0.7% of the river's sections are contaminated. The river Lom has 4% corrected riverbed sections. Only at Vrachanski Balkan and Tzibritza the species was in favorable condition for all 4 Criterion evaluated.



Table 11

Assessment of *S. aurata* by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
Balkan spined loach (<i>S. aurata</i>)				
Vrachanski Balkan	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Bilernitzite	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Western Stara Planina and fore-Balkan	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Zlatiya	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Orsoya	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Portitovtsi - Vladimirovo	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Pastrina	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Lom River	favourable/ satisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Tzibritza	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Tzibar	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory

Results of overall assessment - Unfavorable – unsatisfactory

Favorable ("Green")

- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'
- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm
- The area of the habitats is large enough and the quality of the habitats is appropriate for the long-term survival of the species

Unfavorable – unsatisfactory ("Orange")

- River pollution, inert materials, correction, morphological changes in riverbeds have a negative impact on the species population.
- The creation of water catchment or mini-HPPs, as well as the extraction of inert materials, have a negative impact on the species population.



European bitterling (Rh. Sericeus) ³

A widespread small species of up to 7 cm, lives in a mutualism with the freshwater mussels of the genus *Unio* and *Anodonta*, in whose mantle the female lay caviar with a long egg-laying.

Altitude

The species inhabits only water reservoirs with an altitude of up to 500 m. Exceptionally it is registered at a height of more than 900 m above sea level, but in these cases it is an outcast population inhabited by dams and their adjacent large tributaries.

Temperature

It occurs in areas of water basins with moderate and hot water in the summer (above 20° C).

Inclination

The species is found only in rivers with a small slope below 15°.

Flow rate

It occurs mainly in areas with slow and medium currents - below 0.2 -0.6m / s.

Bottom

Exposed bottoms with a sandy and sandy slate or stony substrate.

Oxygen

The species is tolerant to a relatively low oxygen content in the water (over 50%)

Depth

The species adheres mainly to the deep riverside area, but in the standing ponds it prefers the warm shallow coastal areas overgrown with dense vegetation.

The species is widespread in Bulgaria. Missing basically in small, drying rivers and those with minimal runoff.

Of the identified threats, the highest number of points are: pollution(n = 263), longitudinal linear infrastructure (n = 414), change in outflow (n = 333) and recreation (urbanization) (n = 259)

According to the assessment of the species in the protected areas of Montana district, at Tzibritza, river Lom, Zlatiya, Portirovtzi-Vladimorovo and Tzibar the species was in favorable condition for all 4 Criterion evaluated. The species was in unfavorable condition with lower than referent values of biomass, population size and age structure in Zlatiya, Pastrina and Western Stara Planina The species was not detected in Vrachanski Balkan and Mominbrodsko blato, probably because of its small size as it is not sensitive to moderate pollution. In Orsoya, the species was found only in the drain with low biomass and number. In Pastrina and Orsoya BGBI showed a value of 3. The flow rate of Pastrina was 0.1m/s. In western Stara Planina 0.7% of the river's sections are contaminated. The river Lom has 4% corrected riverbed sections and in Orsoya all water bodies are with corrected waterbeds, and built channels and all natural water basins are turned into fishponds and abandoned.



Table 12

Assessment of Rh. sericeus by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
European bitterling (Rh. sericeus)				
Vrachanski Balkan	unfavourable/unsatisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Western Stara Planina and fore-Balkan	unfavourable/unsatisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Zlatiya	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Mominbrodsko blato	unfavourable/unsatisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Orsoya	unfavourable/unsatisfactory	favourable/satisfactory	unfavourable/unsatisfactory	unfavourable/unsatisfactory
Portitovtsi – Vladimirovo	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Pastrina	unfavourable/unsatisfactory	favourable/satisfactory	unfavourable/unsatisfactory	favourable/satisfactory
Lom River	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Tzibritza	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Tzibar	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory

Results of overall assessment – Favorable

Favorable ("Green")

- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'
- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm
- The species is widespread in Bulgaria, most of its populations are well preserved.
- In principle, the Alpin biogeographical region is not part of the natural distribution of the species. The populations found here are probably carried over by humans.
- The biggest threats to the species are pollution and the change of outflow, but they are somewhat compensated by the creation of artificial ponds, where the species adapt well and expands the spread.



Struma spined loach (*C. taenia*)³

S. taenia is a widespread species in most of the country. It occurs in the middle and lower currents of the Danube tributaries, in the Danube itself, in most of the rivers flowing into the Black Sea, as well as in the rivers of the Aegean catchment area. Its relevant species of *C. elongatoides* and *C. strumicae* have sympatric distribution. The *C. pontica* species inhabits Strandzha rivers flowing into the Black Sea south of the Fakijska River. The three species are mapped together due to their difficult differentiation and their similar biology. The species is tolerant to a wide range of environmental parameters. It inhabits running and standing water. It inhabits demersal zone. Feeds with demersal invertebrate animals and detritus. Three species are mapped under the name *Cobitis taenia*:

1 *Cobitis elongatoides* in the Danube catchment

2 *Cobitis strumicae* in the Aegean catchment

3 *Cobitis pontica* in the Black Sea catchment

Due to difficulties in macroscopic species determination and other peculiarities (interspecific hybridization, polyploidy, partenogenesis), the three species are mapped together.

Altitude

The species inhabits ponds up to 800 m above sea level with some exceptions.

Temperature

The species is found in ponds with moderate and warm water (above 16° C in the summer).

Inclination

The species is found in rivers with a small slope (up to 15 °) and lakes and dams.

Flow rate

The species is not found in rapid-flowing rivers. The substrate, which is suitable for its existence - sand and sludge, does not persist in the fast flowing sections.

Bottom

The species prefers a predominantly sandy substrate, but also occurs on a sandy-muddy, loamy and sandy-pebble / stony substrate. Avoids entirely stony and clayey substrate.

Oxygen

The species is tolerant to low oxygen content in the water, but specific quantitative data on its resistance to oxygen deficiency are unknown due to the lack of such studies.

Depth

The species sticks mainly to the shallow coastal zone to about 2 m, less often at greater depths if the conditions are appropriate.

The species is established in 92 zones. In 48 zones the species are newly established. The differences are due to the fact that the initial estimates were indicative due to lack of data.

Of the identified threats, the highest are: "other" (n = 1191), pollution (n = 903), transverse linear infrastructure (n = 830) and longitudinal linear infrastructure (n = 410)



Table 13

Assessment of *C. taenia* by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
Struma spined loach (<i>C. taenia</i>)				
Vrachanski Balkan	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Western Stara Planina and fore-Balkan	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Zlatiya	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Mominbrodsko blato	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Orsoya	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Portitovtzi – Vladimirovo	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Pastrina	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Lom River	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory
Tzibritza	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Tzibar	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory

According to the assessment of the species in the protected areas of Montana district, at Tzibritza, river Lom, western Stara Planina and Portirovtzi-Vladimorovo the species was in favorable condition for all 4 Criterion evaluated. The species was in unfavorable condition with lower than referent values of biomass, population size and age structure in Tzibar, Pastrina, Mominbrodsko blato, Vrachanski Balkan and Orsoya. The species was not detected in Zlatiya where the oxygen saturation was 50%. In Orsoya BGBI showed a value of 3.

Results of overall assessment – Favorable

Favorable ("Green")

- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'



- Population (s) no less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm
- Habitat size is large enough (both stable and increasing) The quality of the habitats is appropriate for the long-term survival of the species
- The species is very resistant to negative anthropogenic influences, except in extreme situations.

Romanian barbel (*B. meridionalis*)³

Barbus meridionalis occurs in the upper, middle and lower reaches of the Bulgarian Danube tributaries and the Kamchia river basin. The species inhabits extremely running waters. It inhabits demersal zone. Feeds with demersal invertebrate animals

Altitude

The species inhabits ponds with altitudes up to and over 1000 m.

Temperature

The species is most commonly found in water basins with moderate water (over 16° C in summer).

Inclination

The species occurs in rivers with a small slope (up to 15°).

Flow rate

The species is found in rivers with fast, moderate and slow currents.

Bottom

The species prefers a predominant gravel-sand substrate, but also occurs on a pebbly, pebble-gravelly. Avoids sludge and clay substrate.

Oxygen

The existence of the species requires a high oxygen content in the water (over 75%).

Depth

The species sticks mainly to the shallow coastal zone to about 2 m, less often at greater depths if the conditions are appropriate.

The species is found in 47 localities.

Of the identified threats, the highest is the number of points with transverse linear infrastructure (n = 292), others (n = 263), pollution (n = 171), change in outflow (n = 164), recreation (urbanization) = 70)

According to the assessment of the species in the protected areas of Montana district, at Vrachanski Balkan, Bilernitzite, Western Stara Planina and fore-Balkan and Tzibritza the species was in favorable condition for all 4 Criterion evaluated. The species was in unfavorable condition with lower than referent values of biomass, population size and age structure in Zlatiya. The species was not detected in Pastrina and Mominbrodsko blato. The oxygen saturation was 70.1% and BGBI was showing value of 3 in Pastrina. Mominbrodsko blato has standing waters and is not suitable habitat for the species. In Zlatiya, the oxygen saturation was 60.55% and the flow rate was 0.18 m/s. The flow rate of river Lom was also low – 0.2 m/s and the contamination in the area was 6.87%.



Table 14

Assessment of *B. meridionalis* by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
Romanian barbel (<i>B. meridionalis</i>)				
Vrachanski Balkan	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Bilernitzite	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Western Stara Planina and fore-Balkan	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Zlatiya	unfavourable/unsatisfactory	favourable/satisfactory	unfavourable/unsatisfactory	favourable/satisfactory
Mominbrodsko blato	unfavourable/unsatisfactory	favourable/satisfactory	unfavourable/unsatisfactory	favourable/satisfactory
Portitovtsi – Vladimirovo	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Pastrina	unfavourable/unsatisfactory	favourable/satisfactory	unfavourable/unsatisfactory	favourable/satisfactory
Lom River	favourable/satisfactory	favourable/satisfactory	unfavourable/unsatisfactory	unfavourable/unsatisfactory
Tzibritza	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Tzibar	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	unfavourable/unsatisfactory

Results of overall assessment – Favorable

Favorable ("Green")

- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'
- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm Habitat size is large enough (both stable and increasing) The quality of the habitats is appropriate for the long-term survival of the species
- The identified barriers and impacts do not affect the distribution of the species.

Kessler's gudgeon (*G. kessleri*)³

The species are located in the middle streams of most Danube tributaries - Lom, Ogosta, Iskar, Vit, Osam, Yantra and Rusenski Lom. In recent years, it has been a rare species with



decreasing numbers and distribution - found only in the basins of the rivers Lom, Iskar, Vit and Yantra. It is predominantly encountered in the medium streams with sand and gravel bottom. Benthic, radiophilic species. Feeds with bottom invertebrate animals, diatomaceous algae and detritus. It lives on passages of several dozen individuals. It reaches sexual maturity in the second year. The breeding season is from mid-May to September.

Altitude

The species inhabits ponds up to 1000 m above sea level.

Temperature

It is found in areas of water basins with moderate and cold water in the summer (up to 16° C, less often to 20° C).

Inclination

The species is found only in rivers with a small slope below 15°.

Flow rate

It occurs in rivers with moderate and rapid flow - over 0.8 m / s.

Bottom

The species inhabits riverbeds with a predominantly rocky and pebble bottom substrate, but rarely can be found in sandy stretches.

Oxygen

The species prefers areas of high oxygen content in the water (over 75%).

Depth

The species adheres mainly to the shallower river area with a depth of up to 2 m. There is no evidence of its presence in the deeper sections.

The species is found only in three localities along the Danube River. The reason for this is that the species is rare, with very low numbers in the country and with mapping of 30% of the territory of the zones, the probability to be established is very small.

Of the identified threats, the highest number of outflow points are of: change in outflow (n = 60), longitudinal linear infrastructure (n = 55), recreation (n = 38) and destruction of riparian vegetation (n = 30)

According to the assessment of the species in the protected areas of Montana district, at Western Stara Planina and fore-Balkan and Lom river the species was in favorable condition for all 4 Criterion evaluated. The species was in favorable condition with referent values of biomass and population size, but the age structure was not defined as no juveniles were collected in Tzibritza. The species was in unfavorable condition for Criterion 1 in Zlatiya and only 3 juvenile fishes were found. The absence of juveniles might be due to the small size of the species. The flow rate in both Zlatiya and Tzibritza was 0.6 m/s and less for 50% of the riverbeds' length.



Table 15

Assessment of *G. kessleri* by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
Kessler's gudgeon (<i>G. kessleri</i>)				
Western Stara Planina and fore-Balkan	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Zlatiya	unfavourable/unsatisfactory	favourable/satisfactory	unfavourable/unsatisfactory	favourable/satisfactory
Lom River	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Tzibritza	unfavourable/unsatisfactory	favourable/satisfactory	unfavourable/unsatisfactory	favourable/satisfactory

Results of overall assessment – Unfavorable – unsatisfactory

Favorable ("Green")

- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm

Unfavorable – unsatisfactory ("Orange")

- The area of distribution decreases compared to data published in the scientific literature.
- Loss of part of habitats due to pollution and other anthropogenic impacts.
- The identified impacts and threats have some influence on the species distribution. There is no evidence of the exact impact of the pollution on the species.

Danubian longbarbel gudgeon (*G. uranoscopus*)³

Altitude

The species inhabits ponds up to 1000 m above sea level.

Temperature

It is found in areas of water basins with moderate and cold water in the *Inclination*

The species is found only in rivers with a small slope below 15°.

Flow rate

It occurs in rivers with a moderate and rapid flow - over 0.6 m / s.

Bottom

The species inhabits river sections with predominantly rocky and pebble bottom substrate.

Oxygen

The species prefers areas of high oxygen content in the water (over 75%).

Depth



The species adheres mainly to the shallow river area with a depth of up to 2 m. There is no evidence of its presence in the deeper sections.

The species is found only in 13 localities along the banks of some Danube tributaries. The reason for this is that the species is rare, with very low numbers in the country and with mapping of 30% of the territory of the zones, the probability to be established is relatively small.

Of the identified threats, the highest number of points with other threats (n = 135), change in outflow (n = 67), longitudinal linear infrastructure (n = 58) and recreation (urbanization)

Table 16

Assessment of *G. uranoscopus* by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
Danubian longbarbel gudgeon (<i>G. uranoscopus</i>)				
Western Stara Planina and fore-Balkan	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory
Lom River	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory

According to the assessment of the species in the protected areas of Western Stara Planina and, as well as in Lom river, the species was in favorable condition with reference values of biomass, population size and age structure, although there is a thread of pollution of 14,2% in Lom river.

Results of overall assessment – Unfavorable – unsatisfactory

Favorable ("Green")

- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm

Unfavorable – unsatisfactory ("Orange")

- The area of distribution decreases compared to data published in the scientific literature.
- Loss of part of habitats due to pollution and other anthropogenic impacts.
- The identified impacts and threats have some influence on the species distribution. There is no evidence of the exact impact of the pollution on the species.

European bullhead (*C. gobio*)³

The upper reaches of the rivers have a sandy, gravel bottom and fast flowing, cold waters. Benthic type. Sexually matures in the second year. The breeding season is April to May. The fertility of females is very low - between 100-300 caviar. After fertilization the caviar is



deposited and attached to the underside of large stones and is guarded by the males. It feeds on various invertebrates and small fish.

Altitude

300 - 1500 m.

Temperature

1° to 16° C.

Inclination

It occurs in rivers with small and medium inclination.

Flow rate

It is found in rivers with medium and fast currents.

Bottom

Pebble and rocky bottom.

Oxygen

High oxygen content - over 75%.

Depth

Up to 2 m.

The species is newly established in three zones. The reason for this is that mountain rivers in Bulgaria are poorly studied.

Of the identified threats, the highest number of points are: pollution (n = 26), longitudinal linear infrastructure (n = 13), change in outflow (n = 7) and recreation (urbanization) (n = 4)

Table 17

Assessment of C. gobio by protected areas in Montana district

	<i>Criterion 1. Population within the area</i>	<i>Criterion 2. Area of habitats within the zone</i>	<i>Criterion 3. Structures and functions</i>	<i>Criterion 4. Future prospects (threats and influences)</i>
European bullhead (C. gobio)				
Western Stara Planina and fore-Balkan	unfavourable/unsatisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory

According to the assessment of the species in the protected area of Western Stara Planina and fore-Balkan, the species was in favorable condition with biomass 5.264 kg/ha and population size of 583.333 individuals/ha.

Results of overall assessment – Unfavorable – unsatisfactory

Favorable ("Green")

- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'
- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm



- The area of the habitats is large enough and the quality of the habitats is appropriate for the long-term survival of the species
Unfavorable – unsatisfactory ("Orange")
- River contamination, correction, morphological changes in river sections have a negative impact on the species population
- The creation of water catchment or mini-HPPs, as well as the extraction of inert materials, have a negative impact on the species population.

European weatherfish (*M. fossilis*)³

Misgurnus fossilis is a relatively rare species. Its distribution covers the Danube River with the coastal swamps, the lower and middle streams of some Danube tributaries and some water basins from the interior of the country. The species is tolerant to a wide range of environmental parameters. It inhabits mildly running and standing water. It inhabits demersal zone. Feeds with demersal invertebrate animals such as insect larvae and small mollusks.

Altitude

The species inhabits ponds with an altitude of up to 800 m.

Temperature

The species occurs in hot water basins (above 20 ° C in summer).

Inclination

The species is found in rivers with a small slope (up to 15°) as well as various standing water basins such as swamps, marshes, lakes, etc.

Flow rate

The species does not occur in rapid and medium-flow rivers. In the sections with a faster flow the substrate is not suitable for its existence

Bottom

The species prefers a predominantly silty substrate, but also occurs on a sandy-silt substrate. Avoids gravel, stony and clay substrates.

Oxygen

The species is tolerant to low oxygen content in the water, it has the ability to supply oxygen directly from the atmosphere.

Depth

The species sticks mainly to the shallow coastal zone to about 2 m, less often at greater depths if the conditions are appropriate.

The species is found only in 3 sites, in the rivers Orsoya, Kalimok-Brushlen, Lake Srebarna and Ovcharitsa River. The reason for this is that *M. fossilis* is a rare species with very low numbers in the country, and when mapping 30% of the territory of the zones, the probability of being established is very small.

Of the identified threats, the highest number of points are: pollution (n = 31), longitudinal linear infrastructure (n = 11), transverse linear infrastructure (n = 11), change in outflow (n = 8), and recreation (urbanization) (n = 5) and others



Table 18

Assessment of *M. fossilis* by protected areas in Montana district

According to the assessment of the species in the protected areas of Montana district, the species was in favorable condition in Orsoya area. In Mominblodsko blato the species was not found and the area of the habitat is very small.

Results of overall assessment – Unfavorable – unsatisfactory

Favorable ("Green")

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
European weatherfish (<i>M. fossilis</i>)				
Mominbrodsko blato	unfavourable/unsatisfactory	unfavourable/unsatisfactory	unfavourable/unsatisfactory	favourable/satisfactory
Orsoya	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory

- Not less than 'Favorable reference distribution'
 - Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm
- Unfavorable – unsatisfactory ("Orange")
- The potential distribution range of the species is large, but the data so far show that the area of the habitat does not allow long-term survival of the species.
 - The results do not confirm the preliminary data - the species is registered in only 3 zones.
 - The identified impacts and threats partly affect the distribution of the species.

Asp (*A. aspius*)³

A. aspius is not a widespread species in Bulgaria. It is encountered in the middle and lower streams of the Danube tributaries and Maritza, in the Danube river, in the lower course of the rivers Struma, Arda, Tundzha and Kamchia and in some big dams. The species is relative stenobiont - not very tolerant to changes in the environment parameters. It inhabits running and standing waters, leading pelagic life - sticking to open water spaces. Juveniles feed on aquatic invertebrates, and adults are typical predators - they eat only fish. The species is the only predator in Bulgaria from the carp family.

Altitude

The species inhabits ponds with an altitude of up to 100 m.

Temperature

The species is found in ponds with moderate and warm water (above 16° C in the summer).

Inclination

The species is found in rivers with nearly zero inclination, as well as some dams.



Flow rate

The species is found in fast and medium rivers. In slow-flowing and standing water bodies occurs when the oxygen content is very high.

Bottom

Substratum is not relevant to the species because it has pelagic life - in the middle and upper water layers.

Oxygen

The species is not tolerant to low oxygen content in the water but specific quantitative data on its resistance to oxygen deficiency are unknown due to the lack of such studies.

Depth

Juveniles adhere mainly to the shallow coastal area, while adults in larger depths away from the shores, if conditions are appropriate.

Table 19

Assessment of *A. aspius* by protected areas in Montana district

	<i>Criterion 1. Population within the area</i>	<i>Criterion 2. Area of habitats within the zone</i>	<i>Criterion 3. Structures and functions</i>	<i>Criterion 4. Future prospects (threats and influences)</i>
Asp (<i>A. aspius</i>)				
Mominbrodsko blato	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Orsoya	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Lom River	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory
Tzibar	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory

The species are found only in some deposits along the Danube, Maritza and Tundja. The reason for this is that it has a relatively low population in the country and the probability of being established is not very high when mapping 30% of the territory of the zones. On the other hand, the distribution of individuals in a population is dispersed.

Of the identified threats, the highest number of points are: pollution (n = 52), longitudinal linear infrastructure (n = 14), change in outflow (n = 13) and recreation (urbanization) (n = 9). According to the assessment of the species in the protected areas of Montana district, the species was not found in all investigated areas. In Lom river 7.09% of the area was contaminated and in Orsoya the BGBI showed the rate of 3.

Results of overall assessment – Unfavorable – unsatisfactory



Favorable ("Green")

- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'
- Population (s) no less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm
- Habitat size is large enough (both stable and increasing) The quality of the habitats is appropriate for the long-term survival of the species

Unfavorable – unsatisfactory ("Orange")

- The species are not found in the appropriate habitats of this biogeographic region. The area of its potential habitats is very limited (only in Kamchia river, according to the literature). For this reason, the species in this biogeographical region are very vulnerable.
- The identified impacts and threats are affecting the distribution of the species.
- Migration barriers affect its migration.
- Pollution also has an impact on the species because it is sensitive to it, but accurate literature on its endurance threshold is lacking.

White-finned gudgeon (G. albipinnatus) ³

The species is established for the first time in Bulgaria in the Ogosta River near the village of Lehchevo. It was subsequently found in the Yantra and Vit rivers. It is also found in the entire Bulgarian section of the Danube River. In the past, it swam relatively upstream the tributaries - in the river Yantra is located in Veliko Tarnovo. Nowadays, it inhabits only the main stream of the Danube River, as well as the areas near the estuary of the larger tributaries. Benthic, rheophilic species. It feeds on demersal invertebrate animals (chironomids and insect larvae), detritus and, to a lesser extent, algae. It reaches sexual maturity in the second year. The breeding season is from mid-May to early July. Its reproduction is in portions, with the female depositing the caviar in areas with a slow flow.

Altitude

The species inhabits only water reservoirs with an altitude of up to 500 m.

Temperature

It occurs in areas of water basins with moderate and warm water in the summer (above 16° C).

Inclination

The species is found only in rivers with a small inclination below 15°.

Flow rate

It occurs in rivers with moderate and rapid flow - over 0.2 m / s.

Bottom

The species inhabits river areas with a pebble and gravelly bottomed substrate, but very rarely can be encountered in those with predominantly sandy substrate.

Oxygen



The species prefers areas with relatively high oxygen content in the water (usually over 75%) but in general no specialized studies have been carried out to establish its tolerance threshold.

Depth

The species adheres mainly to the shallow coastal zone of the rivers, with a depth of up to about 2 m. There is no evidence of its occurrence in the deeper sections of the rivers, but it is possible for the Danube to inhabit the deeper areas.

The species is found only in three sites along the Danube. The reason for this is that the species is rare and of very low numbers in the country, and with the mapping of 30% of the territory of the zones the probability to be established is very small.

Of the identified threats, the highest number of points are: pollution (n = 30), longitudinal linear infrastructure (n = 14), change in outflow (n = 5), recreation (n = 4)

Table 20

Assessment of G. albipinnatus by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
White-finned gudgeon (G. albipinnatus)				
Orsoya	unfavourable/ unsatisfactory	unfavourable/ unsatisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Lom River	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory
Tzibar	unfavourable/ unsatisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory

According to the assessment of the species in the protected areas of Montana district, the species was not found in the areas of Orsoya and Tzibar, and in Lom river the collected individuals were very low number. A great area of the habitats of Orsoya and Tzibar are contaminated and unfavorable for the species existence, the flow rate was under 0,5m/sec in Orsoya area and 3.7% of the length of the Tzibar' riverbed was corrected.

Results of overall assessment – Unfavorable – unsatisfactory

Favorable ("Green")

- Population (s) not less than 'Favorable reference population' And multiplication, mortality and age structure not differing from normal

Unfavorable – unsatisfactory ("Orange")

- The area of distribution decreases compared to data published in the scientific literature.
- Loss of part of habitats due to pollution and other anthropogenic impacts.
- The identified impacts and threats have some influence on the species distribution. There is no evidence of the exact impact of the pollution on the species.



Danube ruffe (*G. baloni*)³

A relatively new type of species, described in 1974. It inhabits the whole Bulgarian section of the Danube River, and during breeding it enters its large tributaries. It prefers running water. It matures sexually in the second year. It breeds in April-June at a temperature of the water between 8 and 20° C. The fertility of the females is between 13 000 and 53 200 caviar. It is active at night. It feeds on benthic invertebrate animals, mostly insect larvae. It reaches a maximum body length of 132 mm and a mass of 84 g. The life span is up to 5-6 years.

Altitude

The species inhabits only water reservoirs with an altitude of up to 500 m.

Temperature

It occurs in areas of water basins with moderate and warm water in the summer (above 16° C).

Inclination

The species is found only in rivers with a small inclination below 15°.

Flow rate

It occurs mainly in areas with slow and medium currents - less than 2 m / s.

Bottom

Open bottoms with a sandy and sand-silty substrate.

Oxygen

The species is tolerant to a relatively low oxygen content in the water, but no specialized studies have been conducted to determine its tolerance threshold.

Depth

The species sticks mainly to the shallow coastal area of the rivers.

The species is found only in three localities along the Danube River. The reason for this is that the species is rare, with very low numbers in the country and with mapping of 30% of the territory of the zones, the probability to be established is very small.

Of the identified threats, the highest number of points are: pollution (n = 26), longitudinal linear infrastructure (n = 13), change in outflow (n = 7) and recreation (urbanization) (n = 4)

Table 21

Assessment of *G. baloni* by protected areas in Montana district

	<i>Criterion 1. Population within the area</i>	<i>Criterion 2. Area of habitats within the zone</i>	<i>Criterion 3. Structures and functions</i>	<i>Criterion 4. Future prospects (threats and influences)</i>
Danube ruffe (<i>G. baloni</i>)				
Orsoya	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Tzibar	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory



According to the assessment of the species in the protected areas of Montana district, the species was not found in both areas, although the habitats of Orsoya and Tzibar are suitable for the species existence without presence of barriers and other threats.

Results of overall assessment – Favorable – satisfactory

Favorable ("Green")

- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'
- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm
- The area of the habitats is large enough and the quality of the habitats is appropriate for the long-term survival of the species
- There are no significant threats to the species.

Balkan loach (*C. elongata*)³

The species inhabits shallow rivers with a rapid, and less often average current, with a sandy or rocky bottom with submerged aquatic vegetation. There is no evidence the species to be found in streams and small rivers, as well as in large rivers or in slow-flowing or no-flow river areas.

Altitude

The species is found in rivers with altitudes up to 250 m.

Temperature

The species is found in rivers whose temperature reaches 30⁰ C in the summer.

Inclination

The species is found only in rivers with a small inclination below 15°.

Flow rate

The species is found in areas with average and rapid flow - 0.5 - 1.5 m / s.

Bottom

Sandy to a rocky bottom.

Oxygen

Over 75% saturation.

Depth

Shallow stretches of rivers with maximum up to 2m.

The species is found in 5 new deposits on Danube tributaries. The reason for this is that the species is rare, inhabits a certain type of habitats that need to be studied very precisely. At the same time, as expected, *C. elongata* was not found in the Danube River and it was excluded as a potential habitat.

Of the identified threats, the highest number of points are: pollution (n = 13), longitudinal linear infrastructure (n = 8), change in outflow (n = 9) and recreation (urbanization) (n = 7)



Table 22

Assessment of *C. elongata* by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
Balkan loach (<i>C. elongata</i>)				
Orsoya	Unsuitable conditions for species habitat			
Lom River	unfavourable/unsatisfactory	favourable/satisfactory	unfavourable/unsatisfactory	unfavourable/unsatisfactory
Tzibar	Unsuitable conditions for species habitat			

According to the assessment of the species in the protected areas of Montana district, the habitats of Orsoya and Tzibar are not suitable for the species existence and the species detected in Lom river inhabits the area of rapid flow rate with 10 % contamination and the individuals collected there are 100% juvenile.

Results of overall assessment – Unfavorable – unsatisfactory

Favorable ("Green")

- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'
- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm
- The area of the habitats is large enough (both stable and increasing) and the quality of the habitats is appropriate for the long-term survival of the species

Unfavorable – unsatisfactory ("Orange")

- River pollution, inert materials, correction, morphological changes in riverbeds have a negative impact on the species population.

Common zingel (*Z. zingel*)³

In Bulgaria the species is located in the Danube River and some of its tributaries - Iskar, Vit, Osam, Yantra. In the past, it was quite common in the Danube River from Vidin to Silistra. Today it is a rare species and occurs only in the Danube River. Regarding the environmental parameters, this species is moderately sensitive. It inhabits areas with sandy bottoms. Adverse impacts on the population include large-scale dredging that destroys demersal habitats, severe chronic water pollution, overfishing.

Altitude

The species inhabits ponds with an altitude of up to 80 m.

Temperature

The species occurs in rivers with moderate water and warm water (16-20 and over 20° C in the summer).



Inclination

The species occurs in main rivers with a small inclination (up to 15 °), but not in standing water basins.

Flow rate

The species adheres to the rapid current of main rivers - over 0.5 m / s.

Bottom

The species prefers a predominantly grainy substrate, but also occurs on a sandy and sandy gravel substrate. Avoids entirely stony, slimy and loamy substrate.

Oxygen

The species is not tolerant to low oxygen content in the water but specific quantitative data on its resistance to oxygen deficiency are unknown due to the lack of such studies.

The species is found only in three sites along the Danube River. The reasons for this are several. On the one hand, the species is of relatively low number in the country, with a dispersive distribution of individuals in the populations and with the mapping of 30% of the territory of the zones, the probability of being established is not very high. On the other hand, the data collected by the survey method is based on selective catches - industrial catches in the Danube do not aim to catch juvenile specimens.

Of the identified threats, the highest number of points are: pollution (n = 24), longitudinal linear infrastructure (n = 14), change of outflow (n = 7) and recreation (urbanization) (n = 4)

Table 23

Assessment of Z. zingel by protected areas in Montana district

	Criterion Population within the area	1. within	Criterion 2. Area of habitats within the zone	Criterion Structures within the functions	3. and	Criterion Future prospects (threats and influences)	4.
Common zingel (Z. zingel)							
Orsoya	unfavourable/ unsatisfactory		favourable/ satisfactory	unfavourable/ unsatisfactory		favourable/ satisfactory	
Tzibar	unfavourable/ unsatisfactory		favourable/ satisfactory	favourable/ satisfactory		favourable/ satisfactory	

According to the assessment of the species in the protected areas of Montana district, the species was not detected in both investigated areas and BGBI in Orsoya showed III category of the river water quality.

Results of overall assessment – Favorable – satisfactory

Favorable ("Green")

- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'



- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm
- Habitat size is large enough (both stable and increasing)
- The quality of the habitats is appropriate for the long-term survival of the species
- The identified impacts and threats do not significantly affect the distribution of the species

Striped ruffe (G. schraetzer) ³

It inhabits the whole Bulgarian section of the Danube river, and during the breeding it enters the big tributaries. It prefers rivers with an average current. It matures sexually in the second to third year. It breeds in April-June at a water temperature between 8 and 14° C. The fertility of the females is between 18 000 and 45 200 caviar. It is active at night. It feeds on benthic invertebrate animals, mostly insect larvae. It achieves a maximum body length of 300 mm and a mass of 250 g. The life span is up to 7 years.

Altitude

The species inhabits only water reservoirs with an altitude of up to 500 m.

Temperature

It occurs in areas of water basins with moderate and warm water in the summer (above 16° C).

Inclination

The species is found only in rivers with a small inclination below 15°.

Flow rate

It occurs mainly in areas with slow and medium currents - less than 2 m / s.

Bottom

Open bottoms with a sandy and sand silt substrate.

Oxygen

The species is tolerant to a relatively low oxygen content in the water, but no specialized studies have been conducted to determine its tolerance threshold.

Depth

The species adheres mainly to the deep area of rivers

The species is found in only one deposit along the Danube River. The reason for this is that the species is rare, inhabits the deep parts of the Danube, with a very low number in the country and with a mapping of 30% of the territory of the zones, the probability to be established is very small.

Of the identified threats, the highest number of points are: pollution (n = 26), longitudinal linear infrastructure (n = 13), change in outflow (n = 7) and recreation (urbanization) (n = 4)



Table 24

Assessment of *G. schraetzer* by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
Striped ruffe (<i>G. schraetzer</i>)				
Orsoya	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Lom River	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Tzibar	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory

According to the assessment of the species in the protected areas of Montana district, the species was not detected in the three investigated areas and BGBI in showed III category of the river water quality in all of them.

Results of overall assessment – Favorable – satisfactory

Favorable ("Green")

- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'
- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm
- The habitat area is large enough and the quality of the habitats is appropriate for long-term survival of the species.
- There are no significant threats to the species.

Streber (*Z. streber*)³

In Bulgaria *Z. streber* is established in the Danube River and some of its tributaries - Iskar, Vit, Osam, Yantra. In the past, it was quite common in the Danube River from Vidin to Silistra, as it climbed up the tributaries - in the Iskar River reached Mezdra and Roman. Today it is a rare species and occurs only in the Danube River. Its habitats encompass large, plain rivers, rapid current and gravel bottom. The breeding season is in March-April. Fertility is relatively low - between 600 and 4200 caviar, which it lays under the stones. It feeds at night with benthic invertebrate animals. It reaches a length of up to 17 cm and mass up to 170 g approximately. The life span is about 5 years. Adverse impacts on the population include large-scale dredging that destroys bottom habitats, severe chronic water pollution, overfishing.

Altitude



The species inhabits ponds with an altitude of up to 80 m.

Temperature

The species occurs in rivers with moderate water and warm water (16-20 and over 20 ° C in the summer).

Inclination

The species occurs in main rivers with a small inclination (up to 15°), but not in standing water basins.

Flow rate

The species adheres to the rapid current of main rivers - over 0.5 m / s.

Bottom

The species prefers a predominantly grainy substrate, but also occurs on a sandy and sandy gravel substrate. Avoids entirely stony, slimy and loamy substrate.

Oxygen

The species is not tolerant to low oxygen content in the water, but specific quantitative data on its resistance to oxygen deficiency are unknown due to the lack of such studies.

The species is found only in three fields along the Danube. The reason for this is that the species with a very low number in the country and with the mapping of 30% of the territory of the zones the probability to be established is very small.

Of the identified threats, the highest number of pollution points (n = 28), longitudinal linear infrastructure (n = 14), change in outflow (n = 13) and recreation (urbanization) (n = 4)

Table 25

Assessment of Z. streber by protected areas in Montana district

	<i>Criterion 1. Population within the area</i>	<i>Criterion 2. Area of habitats within the zone</i>	<i>Criterion 3. Structures and functions</i>	<i>Criterion 4. Future prospects (threats and influences)</i>
Streber (Z. streber)				
Orsoya	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory
Tzibar	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory

According to the assessment of the species in the protected areas of Montana district, the species was not detected in both areas and BGBI in Orsoya showed III category of the river water quality.

Results of overall assessment – Favorable – satisfactory

Favorable ("Green")



- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'
- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm
- Habitat size is large enough (both stable and increasing) The quality of the habitats is appropriate for the long-term survival of the species
- The identified impacts and threats do not significantly affect the distribution of the species

Sabre carp (*P. cultratus*)³

In Bulgaria the species is reported mainly in the Danube River and the lower reaches of the large Danube tributaries. The sabre carp is a semi-passive, migratory passage species. It lives up to 9 years. It matures at the age of 3-5 years at 200-300 mm standard body length. Reproductive migration is in April-May. Propagation occurs in May at temperatures above 12 degrees. The eggs are half pelagic and are drifting along the stream, hatching after 3-4 days. Fledgling fish migrate to the delta during the first summer. They feed on zooplankton, invertebrates and small fish.

Altitude

The species inhabits only water reservoirs with an altitude of less than 500 m.

Temperature

It occurs in sections of warm water basins in the summer (above 20° C).

Inclination

The species is found only in rivers with a small inclination below 15°.

Flow rate

It occurs mainly in large rivers in areas with medium to rapid but laminar, no turbulent flow - 0,2 - 0,6 m / s.

Bottom

As a pelagic species, the sabre carp is not affected much by the bottom substrate, but as a rule avoids silty areas.

Oxygen

The species occurs in ponds with a relatively constant saturation of water with oxygen of not less than 50%, preferably above 75%.

Depth

The species sticks to the deep (thalweg) of the rivers, where it swims near the surface.

P. cultratus is established only in three sites along the Danube. The reason for this is that the species is rare and of very low numbers in the country, and with the mapping of 30% of the territory of the zones the probability to be established is very small.

Of the identified threats, the highest number of points are: pollution (n = 27), longitudinal linear infrastructure (n = 14), change in outflow (n = 7)



Table 26

Assessment of *P. cultratus* by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
Sabre carp (<i>P. cultratus</i>)				
Orsoya	unfavourable/ unsatisfactory	favourable/ satisfactory	unfavourable/ unsatisfactory	unfavourable/ unsatisfactory
Tzibar	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory	favourable/ satisfactory

According to the assessment of the species in Montana district's protected area, the species was not found in the area Orsoya, where the BGBI showed rate of 2.5-3.5, less than 25% of the length of the flows is with natural meandering and floating riverbanks. The situation in Tzibar was more favorable although the number of individuals collected is too low to determine their age structure.

Results of overall assessment – Unfavorable – Unsatisfactory

Favorable ("Green")

- Population (s) not less than 'Favorable reference population' and reproduction, mortality and age structure not differing from normal

Unfavorable – unsatisfactory ("Orange")

- Loss of part of the area compared to the historical data published in the scientific literature.
- Loss of part of habitats due to pollution and other anthropogenic impacts.
- The area of the habitat is not sufficient to ensure long-term survival of the species
- The identified impacts and threats have some influence on the species distribution.

Ukrainian brook lamprey (*E. mariae*)³

In Bulgaria during the first half of the last century the species is reported for some of the Danube tributaries - Vit, Osum, Iskar and Mendevska River (Yantra tributary), as well as in the Danube river at Lom, Oryahovo, Somovit and Rousse. In literature, the species has been named *E. danfordi* or *L. planeri*. It has been reported to inhabit the rivers Zlatna Panega and Roussenski Lom. After a long time considered extinct from the Bulgarian ichthyofauna, in recent years there have been reports of finding single specimens mainly in the larval stage in the Bulgarian sector of Danube- Ruse, Tutrakan as well as in Silistra and Belene. Non-parasitic species. In the larval stage, it spends 4-6 years and in this period, it feeds with detritus and phytoplankton (mainly diatomic seaweed). It inhabits mostly the silty regions. After the metamorphosis the adult specimens cease to feed and after their reproduction they die. The species reproduces in pure, fast-flowing waters rich in oxygen. There is no evidence of its breeding in the country for more than 50 years.

Altitude



The species inhabits only water reservoirs with an altitude of up to 500 m.

Temperature

It occurs in areas of water basins with moderate and warm water in the summer (above 16° C).

Inclination

The species is found only in rivers with a small inclination below 15°.

Flow rate

It occurs mainly in standing or slow-running areas of less than 0.2 m / sec.

Bottom

The species prefers areas with a muddy substrate, but it is also found in sandy and sand silty areas.

Oxygen

The species is tolerant to a relatively low oxygen content in the water, but no specialized studies have been conducted to determine its tolerance boundaries.

Depth

The species adheres mainly to the shallow coastal zone of the rivers, with a depth of about 2 m.

The species is found only in three fields along the Danube. The reason for this is that the species is rare and of very low numbers in the country, and with the mapping of 30% of the territory of the zones the probability to be established is very small.

Of the identified threats, the highest number of points are: pollution (n = 26), longitudinal linear infrastructure (n = 13), change in outflow (n = 7) and recreation (urbanization) (n = 4)

Table 27

Assessment of E. mariae by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
Ukrainian brook lamprey (E. mariae)				
Orsoya	unfavourable/ unsatisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory
Tzibar	unfavourable/ unsatisfactory	unfavourable/ unsatisfactory	favourable/ satisfactory	favourable/ satisfactory

According to the assessment of the species in protected areas of Montana district, it was not found to inhabit the areas, the area of Tzibar is appropriate as habitat for the larvae only and the potential habitats in Orsoya are decreasing.

Results of overall assessment – Unfavorable – Unsatisfactory

Favorable ("Green")



- Population (s) not less than 'Favorable reference population' and reproduction, mortality and age structure not differing from normal
Unfavorable – unsatisfactory ("Orange")
- Loss of part of the area compared to the historical data published in the scientific literature.
- The area of the habitat is not sufficient to ensure long-term survival of the species
- The identified impacts and threats have some influence on the species distribution. There is no evidence of the exact impact of the pollution on the species.

Pontic shad (*A. immaculata*)³

A. immaculata is a sea-like species. It is found in the Black and Azov Sea. For reproduction it enters the Danube River and other large rivers (Kamchia, Ropotamo, Karaagach and Veleka). During the breeding migrations in the Danube River reaches the "Iron Gates" dam. The marsupials are carried passively along the stream to the sea. Sexually matures at 3-4 years. Reaches 36-38 cm in length and 600-700 g in weight. Its overall age is 6-7 years. The gilly latch is with radial grooves. Behind it the body has 1 dark spot. Above the base of the abdominal fins there is a tapered triangular flake. It feeds mainly on crustaceans and fish. The little ones feed on rotifers and algae. A valuable commercial species subject to industrial fishing. In recent years in our country 40-50 tons are fished per annum.

Altitude

The species inhabits ponds up to 100 m above sea level.

Temperature

The species spawn in the spring at a water temperature of 15° C.

Inclination

The species occurs in rivers with a small inclination (up to 15°).

Flow rate

The species enters rivers with moderate flow.

Bottom

The nature of the bottom is not a determining criterion for this pelagic species.

Oxygen

The species lives at an oxygen content in the water above 6-8 mg/l, but specific quantitative data on its oxygen preference are not known due to lack of such research.

Depth

The species stays at depth of 2-3 m in the rivers, and inhabits the sea deep pelagial.

The species is established in nine zones along the Danube River and Kamchia River. The reasons for this are two:

- The total number of the species in the Bulgarian aquatory has decreased as a result of the economic fishery;
- in 9 zones, there are no rivers suitable for reproduction of the species and it should be dropped from mapping in their fresh water reservoirs.



Table 28

Assessment of *A.immaculata* by protected areas in Montana district

	Criterion 1. Population within the area	Criterion 2. Area of habitats within the zone	Criterion 3. Structures and functions	Criterion 4. Future prospects (threats and influences)
Pontic shad (<i>A. immaculata</i>)				
Tzibar	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory	favourable/satisfactory

The overall threats identified are: other (n = 12), pollution (n = 10), longitudinal linear infrastructure (n = 8), change in flow (n = 7), transverse linear infrastructure (n = 6)) and recreation (urbanization) (n = 2). However, a large number of them are in areas that are not suitable for habitat types and are proposed for exclusion (others (n = 8), pollution (n = 8), outflow change (n = 3), transverse linear infrastructure = 5).

According to the results of the assessment for the species in Montana district, 90% of its population and 99% of the habitats were in favorable condition, with referent distribution of the juvenile individuals in the area.

Results of overall assessment – Favorable – Satisfactory

Favorable ("Green")

- Stable (loss or expansion in balance) or increasing and Not less than 'Favorable reference distribution'
- Population (s) not less than 'Beneficial population of reference' and reproduction, mortality and age structure not deviating from the norm
- Habitat size is large enough (both stable and increasing). The quality of the habitats is appropriate for the long-term survival of the species
- There are no identified impacts and threats.

The presented information has been collected mainly during the project "Mapping and Determination of the Conservation Status of Natural Habitats and Species - Phase I". Also included are data from literature sources, unpublished observations of the investigators, etc.

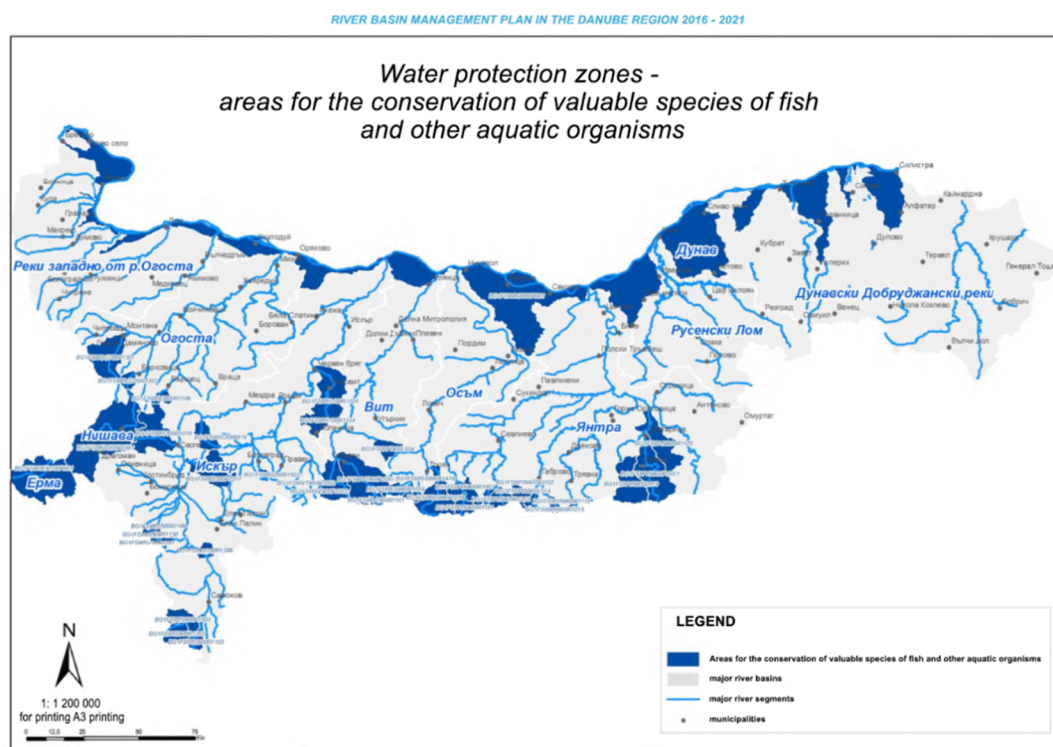
• **Ichthyofauna of economic value and aquaculture condition in montana district**

In relation to the designation of zones for conservation of economically valuable species of fish and other aquatic organisms, in 2012, the Minister of the Environment and Waters. has approved a list of economically valuable fish species and other aquatic organisms. There are 39 designated areas for conservation of economically valuable fish species and other aquatic organisms. In these zones, the species included in the list of economically valuable fish species and other aquatic organisms approved by the Minister of Environment and Waters are subject to conservation.

The trend of aquaculture production in the country is based on its considerable part of the production of non-native (introduced, foreign) species are permanent and marked its beginning ever since the emergence of organized fish farming in Bulgaria (20). The first one alien species, which has entered the local aquaculture permanently, is rainbow trout (*Oncorhynchus mykiss*), which remains a leader in the production of salmon fish in our country. Since the late 1970's, the acclimated carp species of the Far East (silver carp and bighead carp, black carp and grass carp). It must be noted that unlike a number of countries in Bulgaria all mentioned species are only successfully acclimated without naturalization, which means that they do not reproduce freely and do not form their own populations (20).

Fig.7 (11)

Water protection zones – areas for the conservation of valuable fish species under RBMP in Danube Region (2016-2021)



In the period 2007-2012 the introduction of two new species for aquaculture was carried out African catfish (*Clarias gariepinus*) and Barramundi (*Lates calcarifer*). Barramundi are grown in closed recirculating systems (Bourgas) and there is no real danger of falling into the environment and accordingly spreading in natural water ecosystems.



Table 29

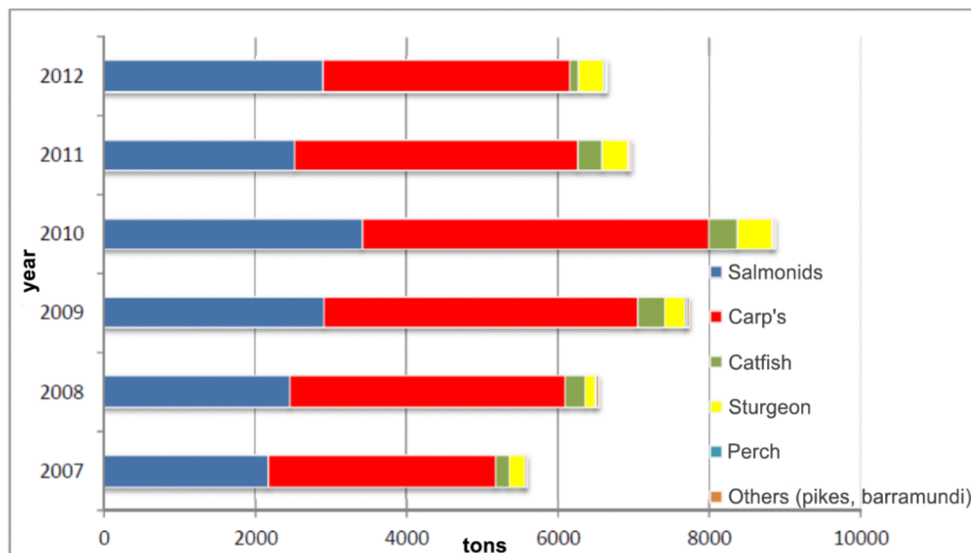
Commercially valuable species in Bulgarian catchment area (20).

Species	Danube River	Inland water basins
	Barbus barbus	Salmo trutta fario
	Silurus glanis	Exos Lucius
	Sander lucioperca	Sander lucioperca
	Cyprinus caprio	Cyprinus caprio
	Exos lucius	Silurus glanis
	Acipenser ruthenus	Ctenopharyngodon idella
	Alosa immaculata	Arysthychthys nobilis
	Acipenseridae	Hypophthalmichthys molltrix

The African catfish is the subject of a stockbreeding in the pond's coolers of thermal power plants and is also considered to be no danger of reproduction of individuals in natural ponds. Quite recently, it is also grown in recirculating systems. Production of these newly introduced species is small volume and they are not well known in the local market. In recent years, interest in the black carp as a means of combating the highly invasive species of zebra mussel (*Dreissena polymorpha*) (20). The breeding and cultivation of sturgeon fish in our country dates back from the beginning of this century. Two factors play the role of an incentive for the development of this share of our aquaculture production. On the one hand there are restrictive and prohibitive measures under the use of the natural resource of these fish species whose populations decrease sharply worldwide, and are endangered of extinction. On the other hand stands sustainable high prices and constant demand for Black Caviar on international markets (20).

Figure 8

Share of the representatives of individual fish families in the Aquaculture sub-sector for the period 2007-2012, Bulgaria (20)



* *Perch*: 2007 - 7.8 t; 2008 - 16.9 t; 2009 - 27.4 t; 2010 - 21.3 t; 2011 - 20.9 t; 2012 - 27.0 points

** *Other*: between 20 and 35 tonnes per year;

The sturgeon breeding in Bulgaria starts with the construction of a small a farm in the village of Bolyartzi (Plovdiv District) for production mainly of Russian sturgeon and European sturgeon. In 2012, the production of sturgeon species declared 15 of the registered farms keeping almost the entire range of species native inhabiting the Bulgarian aquatory on the Danube and the Black Sea (Sterlet, Russian sturgeon, and some introduced species. In the recent years the starry sturgeon and the sterlet appear in the statistics. This establishes tendency of species diversification in the field of sturgeon breeding. Two sturgeon species were introduced - Siberian sturgeon and American paddlefish. The American paddlefish *Polyodon spathula* is zooplankton phage with high quality meat. This spicies is a valuable alternative of the bighead carp, especially when growing in polyculture. However, in our country, there are no farms, that systematically engage in artificial breeding of *P. spathula* and the subsector rely on the supply of fertilizer material imported from neighboring countries (20). (Fig.8,9)

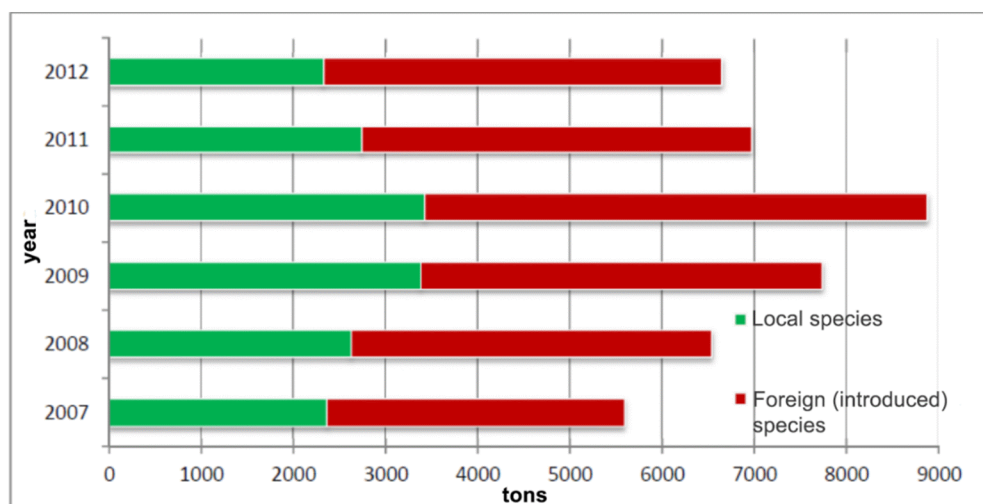
In the end of 2018 in Dolno Belotintzi village, new hatchery for restoration of endemic species populations was established. This activity was accomplished under the project “Joint cross border initiatives for creation of eco friendly region” of Interreg-IPA CBC Bulgaria-Serbia (26). The aim of the hatchery is to preserve the protected fishes according to Natura 2000 in the area by implementation of a complex of activities. The hatchery will ensure conditions for all the stage, necessary for the artificial reproduction of the fishes as follows: embrio (Eggs) of endangered fish species/ hatching (stage 1), fry /first larva/ (stage 2);



fingerlings (stage 3); transportation to rivers(stage 4) and release of endangered fish species in the water basin (stage 5). This is already possible through the specific equipment installed in the hatchery (26).

Figure 9

Share of local and non-native (introduced, foreign species) hydrobionites in the production of the Aquaculture subsector in Bulgaria, 2007-2013.(20)





• **SWOT analysis of the current condition concerning the ichthyofaunal biodiversity in Montana Region**

•

STRENGTHS	WEAKNESSES
✓ An important advantage of the area is its location. Two European transport corridors are built in the region ✓ Port Lom is the second largest Danube port in Bulgaria, and the infrastructure next to it provides the shortest direct land connection of the port of Lom with the port of Thessaloniki. ✓ The relief of the district is diverse - plain, mountainous and hollow ✓ In the basin of the Ogosta River and the Rivers West of Ogosta, with a few exceptions, the sites are in good condition ✓ The catchment of the Danube River is characterized by the richest ichthyofauna species in Europe (17,18). ✓ Montana District has a share of protected areas - 1.87% - much smaller than the average for the country (5.11%) ✓ Of the municipalities a total of 5 have a share of protected areas above 50% - Almost the entire municipal territory of municipalities Chiprovtsi and Georgi Damyanovo is occupied with protected areas. ✓ River water catchments for drinking water supply in the upper current of the Ogosta river. are not at risk of not achieving good status ✓ According to the national report on the state and the environment in the Republic of Bulgaria in 2010, the number of foreign species in Bulgaria has been increasing steadily since 1900.	✓ All observed reservoirs of Ogosta riverbed as well as riverbeds west of Ogosta are in the range bad - very bad condition, which is a long-term tendency. ✓ Four of the municipalities of the Montana District have no protected areas under the Habitats Directive ✓ Three municipalities have no protected areas at all. ✓ The transverse weirs disturb the continuity of the river and change its hydrological regime ✓ The rate of water flow in the damming area is greatly reduced ✓ There is a significant reduction in the oxygen content which leads to the destruction of aquatic organisms ✓ The migratory barriers prevent the natural transfer of sediments downstream, and as a result the bottom of the riverbed is dug up and the erosion becomes more intensive ✓ Many of the built drinking water facilities have no fish passages, and are emerging as migratory barriers. ✓ The fish passes, which are built according to the requirement of the law are not suited to all fish species ✓ Seasonal drought on some stretches is observed ✓ BQE monitoring is carried out only at the points according to the approved program, which is insufficient considering the number and location of the HPP. ✓ The assessment of the state of the water in a large part of the water bodies, in which HPPs are built, shows that there is a risk of failure to achieve good status for these bodies. ✓ There is a real threat of flooding in a significant part of the municipalities in the area
OPPORTUNITIES	TRENDS
✓ Integration of the legal framework under a common institution and the unification of the procedures to increase the effectiveness of all	✓ Restricted access to financial resources; ✓ Insufficient use of scientific achievements and new technologies



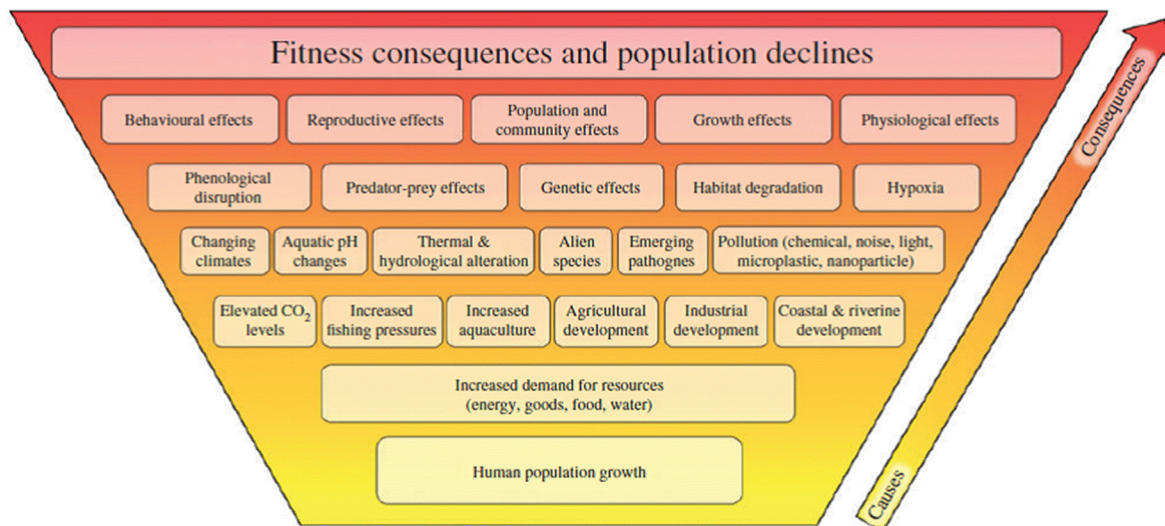
measures as well as shared obligations of neighboring regions concerning common protected areas

- ✓ Education of the European Green Belt initiative for Sustainable Development
- ✓ development and conservation of nature in the mountainous border regions;
- ✓ Recovery of disturbed areas, ecological equilibrium and biodiversity, adaptation to climate change and reduction the risk the of natural disasters
- ✓ Integration of spatial planning and setting clear obligations and responsibilities to support and application of spatial planning arrangements at all levels
- ✓ To create programs that support the link between science, education, civil society organizations and state institutions
- ✓ To better identify the obstacles to competitiveness leading to development of joint decisions on strategic policies and investments
- ✓ To get better results in the application of the procedures
- ✓ Scientific research related to technological development by allocation of significant amounts for projects to increase the competitiveness of the country.
- ✓ To improve competitiveness by investment in education, research, innovation and technological infrastructures.
- ✓ To stimulate research and innovation in the field of science as well as their transfer to the real ecological problems;
- ✓ To promote knowledge transfer, best practices and innovation, including the results of EU research projects;
- ✓ To elaborated measures to reduce the negative impact on the species for all protected areas as at present they are incomplete.

- ✓ The scattered legal framework, various responsible institutions, incomplete procedures
- ✓ Lack of unified and systematized information, which is currently available from a number of institutions (BDA, BDDR, NATURA 2000, Executive Agency for Fisheries and Aquaculture, MoEW, Regional Strategies and Plans for Development etc.).
- ✓ That does not allow the development of a sectoral one analysis with a sufficiently long time span to ensure development a reliable forecast and lessons for the development
- ✓ Ineffective state control and lack of traceability of the output of the sub-sector;
- ✓ Lack of qualified workforce, incentives for absorbing professional skills
- ✓ Lack of elaborated measures to reduce the negative impact on the species of Directive 92/43 / EEC
- ✓ There is currently no official methodology for assessing the significance of hydromorphological pressure on water bodies
- ✓ No adequate monitoring and data as to how far these passes fulfill their purpose.
- ✓ . At present, there is insufficient data from hydrobiological monitoring to assess the complex impact of HPPs. At this stage, there is no assessment of the extent to which the ecological status is influenced by the impact of HPP.
- ✓ The monitoring of invasive species in aquatic ecosystems is poorly developed in Bulgaria.

- **Major Threats on fish biodiversity in Montana region. Measures for risk management.**

Fig.10 (27)



WWF stated recently, that there is no “alive” river in Bulgaria⁴.

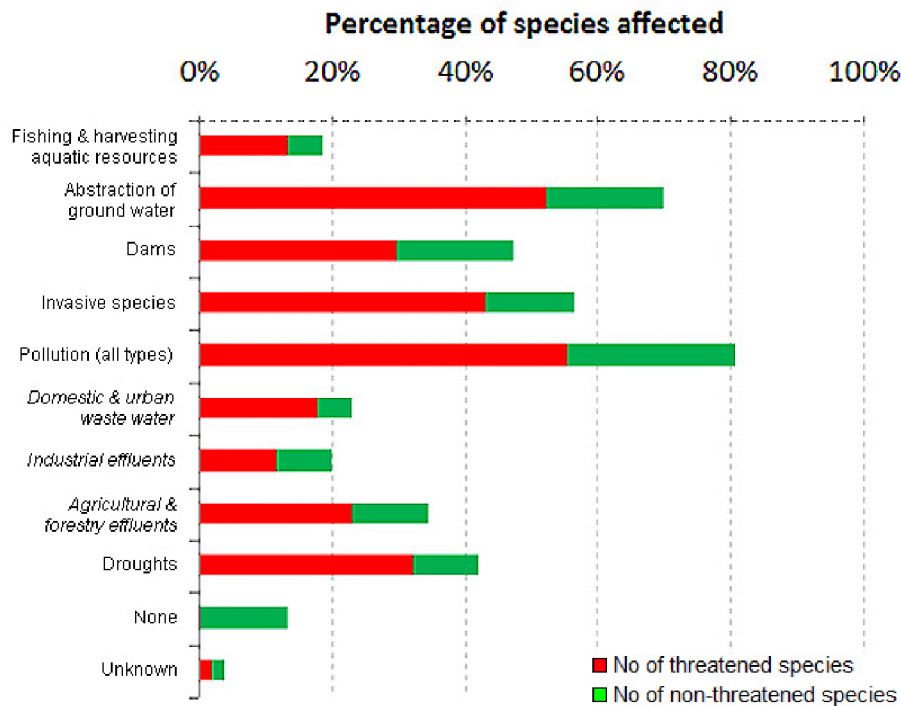
Although pollution is one of the most widespread threats, impacting the highest number of species, it is not the most serious threat. Other significant threats such as water abstraction and the introduction of alien species are causing much more rapid population declines for some freshwater species. The single most important threat to European freshwater fishes is the abstraction of water; from underground, or from the streams and rivers themselves. Water is abstracted for many reasons, for example, agriculture or drinking water. Many European fishes are highly susceptible to the impact of introduced alien species. These may be predators or competitors, especially under "insular" conditions of Mediterranean catchments, where rivers and streams may be naturally devoid of predatory fish, or where natural species poor communities exist with little inter-specific competition. Local populations are easily wiped out from such catchments if ecologically more competitive species, from species-rich central and eastern European fish communities, invade their habitats. Most freshwater fishes are very sensitive to alterations of their natural habitat. In addition, many require long distance migrations to fulfil their life cycle. There are few rivers in Europe, which have not been impacted by dams for hydropower or irrigation purposes. The first dam upriver of an estuary is now usually the end-point for the migration of anadromous species, especially in Eastern Europe. Dams are also a major threat for catadromous species, such as the European Eel, which forage in freshwater and spawn at sea. In most cases, dams block the migration route of fishes. Pollution was the major factor threatening fresh water fish species in Europe during the late 19th and in the 20th centuries, and is still a major driver of population decline and habitat loss for freshwater fishes in Europe. Pollution is caused by a number of



sources, including domestic waste, industrial and agricultural effluent, river transportation, and sedimentation.(Fig.11) ²

Fig.11²

Main threads affecting fish species across Europe

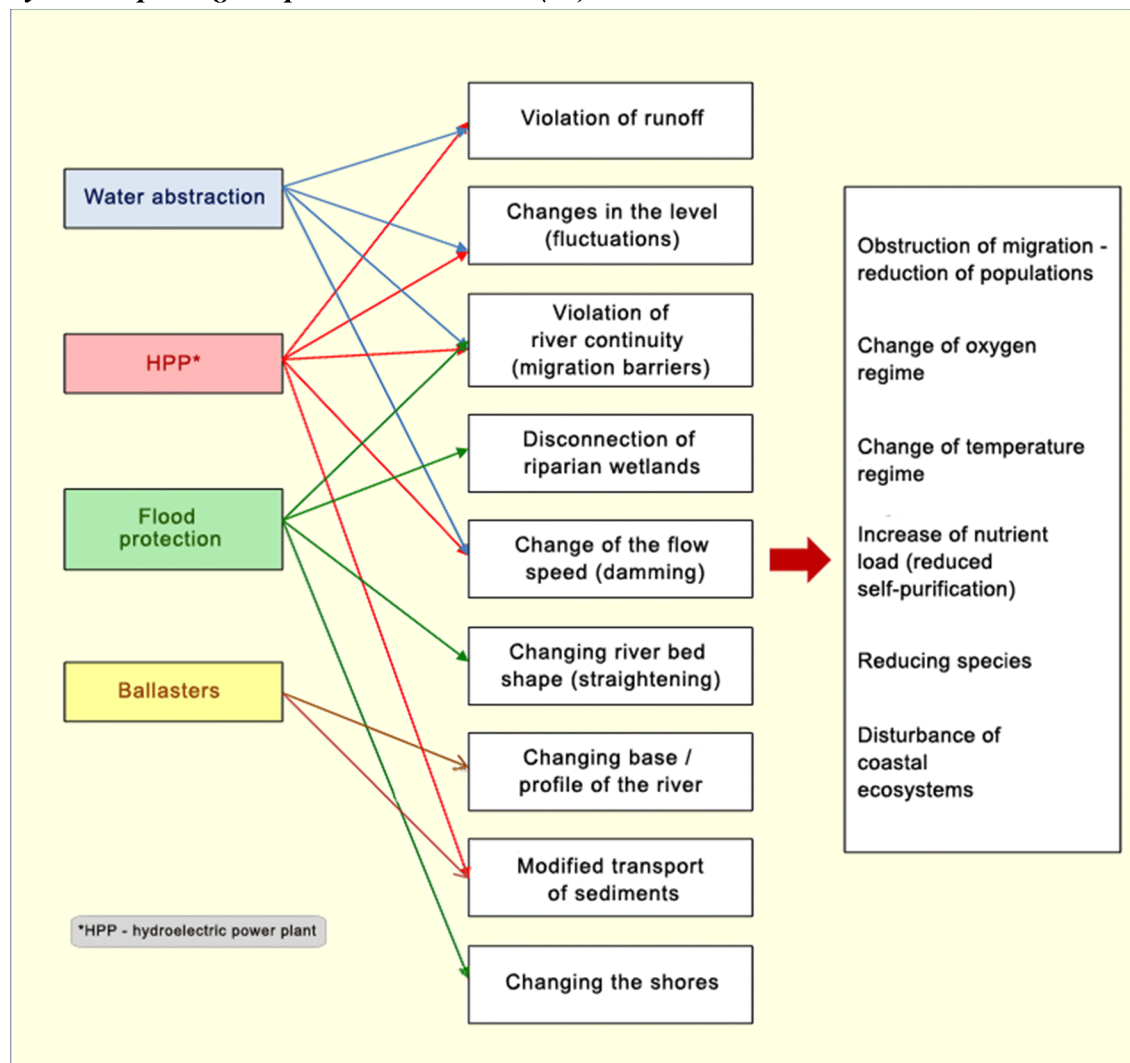


The accumulation of threats has resulted in unprecedented effects on ecosystems, with widespread population declines of fauna and extinctions across many taxa (27,28,29,30,31). These threats are manifested through multiple biological, chemical, physical and climatic mechanisms (Fig. 10). Threats occur across a wide range of spatial and temporal scales, and need to be understood in the context of a combination of local (spatially and temporally variable) and global (large scale, with little spatial and temporal variation) pressures (Gordon et al.). A combination of local and global mitigation strategies will therefore be required to restore and sustain the health of aquatic systems. (27).

WWF stated⁴, that due to the ecological impact by the combination of all factors, 60% of the fish populations in the Danube and its tributaries have disappeared over the last 20 years.⁴ And there are now 50 fish species in the Red Book of Bulgaria - 4 missing and 46 threatened. The fish are part of whole ecosystems, that is why the disappearance of a species is not a harmless event. It would lead to irreversible changes throughout the environment. ⁴

Fig.12

Main activities, which are sources of physical modifications, respectively of hydromorphological pressure in BDDR (11)



One of the main threats to fish populations in the Montana region is the river regulation by weirs and dikes in the lower reaches. This resulted in degradation or loss of suitable feeding and spawning habitats and caused the absence of Danube fish species upstream in some of the rivers (21). For instance, in a pool of a big weir, abundant populations of *N. fluviatilis*, *N. melanostomus* and *E. lucius* were found. However, the high weir wall stopped these and other species from migrating upstream the Archar River (21). Another threat to fish populations in the rivers is water pollution. Serious threat is also excessive fishing and poaching. Potential threat to fish populations is the construction of micro-HPPs along the river courses. The extensive development of this riverbased activity in the near future is expected to become a major concern in the region (Fig12)(21).



Migration barriers (3)

Migration barriers are transverse weirs of the river bed (dikes, thresholds, dams) that impede the natural passage of migratory aquatic organisms (migratory fish species). The fish are most affected, as most fish species carry seasonal, reproductive and other migrations upstream and downstream. The presence of migration barriers damages the populations of such species and may lead to their destruction. The transverse weirs disturb the continuity of the river and change its hydrological regime (3). A barrage pond is formed at the site behind the barrier, and the length of the damming section depends on the height of the barrier and the slope of the river. The rate of water flow in the damming area is greatly reduced, resulting in sludge deposition. The decomposition of the sludge results in a reduction in the oxygen content and the destruction of aquatic organisms. The barriers prevent the natural transfer of sediments downstream, and as a result the bottom of the riverbed is dug up and the erosion becomes more intensive. In connection with the assessment of the significance of hydromorphological pressure on water bodies, the Basin Directorates agreed initial quantitative criteria (3). There is a difficulty in applying these criteria due to large differences in the size and characteristics of water bodies. Another problem that impedes the application of these criteria is the lack of some of the necessary information. There is currently no official methodology for making this assessment (3).

Hydromorphological pressure and potential impact on water bodies

Physical changes generate hydromorphological pressure, which directly affects the state of surface water bodies by its negative impact on the biological species. As a result of the different physical modifications, the natural hydrological regime is changed, the species migration is prevented, the coastal wetlands are interrupted along the rivers (3). The main manifestations of hydromorphological impact resulting from physical modifications are summarized in Table 30. Each of these types of hydromorphological pressure has a negative impact on the water and coastal ecosystems, ie the ecological status of the water bodies. Typically, these pressure components work together, resulting in a cumulative effect of their negative influence and increase in their impact. The main activities, which are sources of physical modifications, respective of hydromorphological pressure in BDDR are:

- > Water abstraction (including construction of water abstraction facilities);
- > Construction of HPP;
- > Flood protection;
- > Sealing of alluvium deposits (ballast);(Fig.12)

The degree of hydromorphological pressure and impact of each activity depends in any case on the location, specific construction, realization and operation of the relevant activities and facilities. The analysis of the hydromorphological load in the Danube region shows that the most affected in this respect are the river valleys Iskar, Yantra, Ogosta, Osam and Vit (3).

Water abstraction

The hydromorphological pressure from water abstraction can be seen in two aspects:

- > Change of runoff due to the withdrawn water quantities;
- > Influence of water abstraction facilities.



Taking into account the ratio of the seized water quantities (excluding HPPs which are considered as returnable resources) and the estimated average annual quantity of surface water in the Danube area, water abstraction does not represent significant pressure (3). The impact of this activity is manifested by the hydromorphological pressure in the places of the water abstraction facilities. According to the seized quantities (excluding those for HPPs and for cooling nuclear power plants), the largest share has the water abstraction for drinking water supply.(3) River water catchments for drinking water supply are in the upper current of the Ogosta river. Analysis of the status of this water body indicates that it is not at risk of not achieving good status (3). Drinking water is seized from the Iskar, Beli Iskar, Bebreš, Srečenska Bara, Hristo Smirnenki, Yovkovtzi and Yastrebinovo reservoirs. These dams are defined as HMWB. Permits for water abstraction for irrigation have been issued for all the Danube river basins, both rivers and dams. It has been found, that many of the built facilities have no fish passages and are emerging as migratory barriers. The regulation and limitation of the pressure of water abstraction on surface water shall be carried out through the permits issued by the BDDR in accordance with the provisions of the Water Act. Redistribution of flow according to needs is called flow regulation. The various flow regulation measures are dependent on the natural mode of water source and the water demand. In BDDR there is no transfer of surface water between adjacent river basin districts as well as inland water transfers.(3)

Electricity production - HPPs

The production of electricity through HPPs is one of the activities that have the most negative hydromorphological impact. According to WWF data⁴, at present 325 rivers in our country have 270 HPPs built, and another 200 have been granted a building permit. HPPs are assumed as "green energy"⁴. In practice, however, they are barriers that change the watercourses, the speed and the flow of the rivers, thus blocking the possibility of migration of dozens of species of fish and invertebrates. The fish passes, which are built according to the requirement of the law, usually miss very few fish and do not allow them to follow their usual route.⁴ HPPs directly affect the hydrological regime by fluctuations at the water level after the water catchment, which is in a much wider range than the natural daily change in the water level in the area. Derivative HPPs greatly reduce drainage after the water catchment, and in some seasons in the section between the catchment and the discharge, this outflow falls to the required ecological minimum. The highest load with HPP is in the upper current of Ogosta river (3).

Currently, however, there is no adequate monitoring and data as to how far these passes fulfill their purpose (3). There have been cases of non-provision of minimal river outflow after derivative HPPs, including seasonal drought on some stretches is observed. At present, there is insufficient data from hydrobiological monitoring to assess the complex impact of HPPs. BQE monitoring is carried out only at the points according to the approved program, which is insufficient considering the number and the location of the HPP. The assessment of the state of the water in a large part of the water bodies, in which HPPs are built, shows that there is a risk of failure to achieve good status for these bodies. At this stage, there is no



assessment of the extent to which the ecological status is influenced by the impact of HPP. The BDDR has introduced restrictive measures for the construction of HPPs in accordance with the Opinion of Environmental Assessment Plan (3). These measures include restrictions and prohibitions for the construction of HPPs in NATURA 2000 sites for certain habitats, as well as requirements to ensure the continuity of the river (fish passes), and the required ecological runoff at permissible for construction and built HPPs. Prohibitions and restrictions on the construction of HPPs are introduced in the Water Act and in the Ordinance on the use of surface water. BDWMDR gives its opinion on eligibility to the RBMP and the current legislation on investment proposals for the construction and reconstruction of HPPs in the case of the Environmental Impact Assessment procedure, giving a negative opinion in cases of non-compliance.(3)

The anthropogenic impact

Point sources are:

- Sewerage of settlements discharging without necessary purification;
- Existing sewage treatment plant does not purify all wastewater because of lack of incoming collectors, insufficient capacity, necessity of reconstruction, modernization.
- Discharges of industrial waste water from industrial sites - there are no effective purification facilities, many of them are moral physically obsolete and not exploited and maintained as required;
- Discharges of untreated wastewater from agricultural farms. (2)

Diffusive sources are:

- Settlements with over 2000 residents, without built-up urban sewers;
- Landfills of settlements with more than 2000 residents;
- Diffuse sources of pollution from the industry - discharges of wastewater in wells and lagoons, unauthorized landfills for industrial waste;
- Agriculture - unauthorized accumulation of fertilizers, indiscriminate fertilization, etc.

(2)

Since there are no big industries in the region, this is mainly due to deposition of household wastes and cattle grazing around the towns and villages. (21)

Flood risk

There is a real threat of flooding in a significant part of the municipalities in the area - Berkovitz, Lom, Yakimovo, Valchedram, Boychinovtsi, Brusartzi and Montana. The risk to the affected population can be defined as low. Territories at risk of landslide processes are mainly on the Danube coast. According to Geozashtita - Pleven, the identified potential landslides in the Montana region are about 52. Territorially they are distributed mainly in the Danube coastal area (about 80%) and the remaining 20% in the other parts. (1) The number of potential landslides in the municipality of Lom is about 30, in the municipality of Valchedram - about 13, the potential landslides in the municipality of Yakimovo are 6. In the lands of some settlements the number of potential landslides is too large - Slivata - 15, Orsoya - 8., Gorni Tzibar - 7, Lom - 5 and Yakimovo - 6. Significant intra-area imbalances in the area are related to the existence of a preserved natural environment. (1) The construction



of dykes and river corrections are carried out with a view to ensuring flood protection of the population and businesses. This type of pressure also applies to the strengthening of coasts to protect against erosion.

The following 7 indicative areas with an increased flood risk are identified in the Montana region:

- In the Lom River there are identified 2 large stretches, which cover the middle and lower reaches to the mouth of the river and fall into the municipalities of Brusartzi and Lom;
- There is a large section in the valley of the Tzibritza River, covering the entire middle and lower reaches. This section occupies parts of the municipalities Medkovetz, Yakimovo, Valchedram and Montana;
- In the Ogosta River, the identified, large stretches are 4 and cover the upper and the middle stream without the springs. The affected municipalities are Boychinovtzi, Montana, Berkovitza and Varshetz.

The largest settlements in the area at risk of flooding are Berkovitza, Montana, Boychinovtzi, Medkovetz, Yakimovo, Brusartzi, Varshetz and Lom.(1)

WWF⁵ experts investigated the north-west Bulgarian rivers in September 2014 WWF experts have been visiting 69 potential locations to assess the condition of the rivers after the repeated severe floods that happened in the summer of 2014. The investigation was being related to the fieldwork under the LIFE + Free Fish project. The study covered the Tzibritza, Lom, Skomlya, Archar, Vidbol, Voinishka (a total of 62 points) and Rusenski Lom rivers (7 points) which were examined for potential locations for species restoration under the project. The specialists have found out that the water level in Tzibritza, Lom and Vidbol rivers is very high and they are very turbid. These rivers are basic locations for potential source populations for *Gobio kesslerii* and *Gobio uranoscopus*. The experts also have found out that the zoobenthos animals were significantly influenced/washed away by the high waters and at many places the waters carried away the bottom substrate. At those sites where it was possible to take ichthyological samplings using nets (ten-meter seine net), the experts found out a very big difference between the ichthyological communities in comparison to the preliminary studies that WWF conducted⁵. The water quality has been affected negatively, the bottom zoocenoses have been washed away or almost absent, especially in Lom and Tzibritza rivers, and the fish cenoses were heavily damaged. According to the WWF specialists⁵, the restoration of the normal state of the bottom zoocenoses, water quality and fish cenoses will probably take one year⁵. The experts found opportunistic and invasive fish species (Prussian carp, *Pseudorasbora*), which are characteristic of degraded ecosystems and usually inhabit dams. However, despite the high water and high turbidity, the WWF experts identified *Unio crassus* specimens⁵. This means that possibly their population was not completely destroyed.⁵



Table 30:

Comparable changes in biological quality elements influenced by hydromorphological changes associated with HMWB determination.(32)

BQE	Hydromorphological Pressure	Impact
Ichthyofauna	Transverse weirs, including large dams	✓ Interruption of the migration bio-corridors and impossibility of displacement of ichthyofauna. ✓ Delay in migratory movements. ✓ Extinction of species from the entire river, alteration of the genetic structure of the isolated parts of the populations, decrease in the number of species. ✓ Changes in the composition of the ichthyofauna as a result of the changed temperature regimen in which non-tolerant species drop out and / or create favorable conditions for the settlement of non-native species. ✓ Fish disorientation in over-riverside lakes, slowing migrations, decreasing population size
	Correction of riverbeds	✓ Broken side connection due to the cut-off of riparian wetlands and periodically flooded areas
	Creation of dikes on the riverbanks	✓ Reducing the diversity of river microhabitats and meso-habitats associated with feeding and breeding fish.
Macrophytes	Straightening and correction of riverbeds	✓ Extinction or reduction of damming and muddy areas that stimulate the development of macrophyte communities.
	Water abstraction	✓ Disruption of river flow and debit regime which results in a critical drop in water levels and even drought of river sections ✓ Disturbance of the seasonal flooding regime, especially in the plain rivers.
	Correction of riverbeds Damming	✓ Amendment, disturbance, complete destruction of the structure and characteristics of the river and riparian habitats. ✓ Broken side connectivity due to interruptions to riparian wetlands and periodically flooded areas representing spawning habitats for some macroinvertebrates (Odonata, Diptera, etc.).



BQE	Hydromorphological Pressure	Impact
	Migratory barriers, including large dams	✓ Breach of the natural migration of nutrients. ✓ Physical rinsing of macroinvertebrates, especially those that are not tightly attached to the bottom substrate by hydropeaking effect under large dams or HPPs.
Phytobentos	Water abstraction Transverse barriers	✓ Speed of river flow and mechanical impact on communities. ✓ Breakdown of river flow and flow regime resulting in a critical drop in water levels and even drifting of river sections. ✓ Changes in the speed of the river flow, including the total absence of such in the damming section.

Assessment made by MoEW under the European Floods Directive and the Waters Act, the risk of flooding is significant in parts of the River Ogosta, but most places are outside the territory of the Municipality of Montana. In connection with the summer floods a period in 2014 in Northern Bulgaria, according to the DBMA in Montana municipality there are no identified areas with potential risk from floods. A vulnerable zone, from floods on the territory of the municipality, is the area around Ogosta and Tzibritza, and the entire territory of the Municipality of Montana is defined as sensitive area(2).

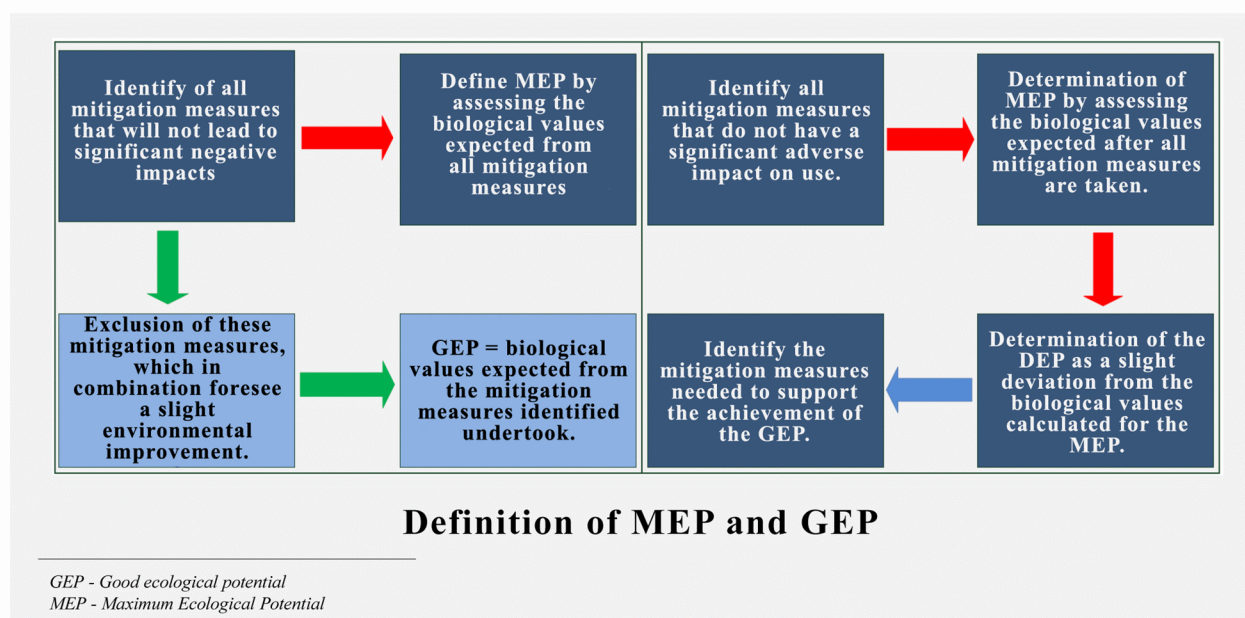
In the assessment of the ecological potential, appropriate, strictly indicative of the physical changes, BQE can be selected (Table 30):

- Invertebrate benthic fauna and fish are the most appropriate groups for assessing impacts of water power, changes in water levels, sudden fluctuations, change of the flow regime - Hydropeaking effect), flow rate;
- Migratory fish species are a criterion for assessing the disruption of river continuity (migration barriers) as well as changes in temperature, turbulence, speed and river flow rate;
- Macrophilic and phytobenthic organisms are good indicators of changes occurring in the downstream flow of water bodies as well as for the assessment of regulated lakes as they are sensitive to fluctuations in water level;
- Macroinvertebrate fauna and macrophytic communities are suitable indicators for linear physical changes.

Nevertheless, the use of BQE Fish is the most appropriate approach to the environmental assessment of heavily modified water bodies (HMWB).(32)

Fig.13

Identification all mitigation measures that do not have a significant negative impact on the use and would lead to an improvement in the environmental status (32)



Good Ecological Potential (GEP) means to maximize the environmental impact without significant negative impacts on the use of SWOT for that purpose. When defining the GEP and the Maximum Ecological Potential (MEP) it is important to consider the ecological link "There must be fish" - Fish (in particular migratory species) are perceived as a good indicator of ecological connectivity. It was agreed by ECOSTAT that the provision of fish migration through river continuity should be seen as a necessary component of the GEP. Good practice are to consider ecological connectivity at river basin level - but action should be taken locally. Lateral connectivity (eg with coastal zone, riparian area, etc.) and sediment transfer are also important for environmental connectivity. (Fig.13)(32)

Introduced species

More than 20 species of fish have been introduced into the freshwater basins in Bulgaria. The most numerous were the introductions made in the 70s of the 20th century (33). The quantity of aquaculture production from non-native species is about 70% of the total production for 2004, which makes some of the made introductions with undeniable economic importance. Another part of the introductions were done to increase biodiversity (mainly for recreational fishing purposes), to biocontrol various elements and parameters of aquatic ecosystems. A negative aspect is the unconscious introduction of invasive species, a phenomenon often accompanying the conscious introduction of new and exotic species of fish (33). This applies to the species *Pseudorasbora parva* and *Lepomis gibbosus*. (Uzunova et al.,2006). The pumpkinseed *Lepomis gibbosus* (L.) is one of the 23 introduced fish species in the Bulgarian



fresh water reservoirs (33). The fish breeding season is May-June when they are collected from freshwater pools (active and former quarry lakes, dams, adaptive oil refinery lakes). The demographic structure (age and size) and the number, defined as the number of fish per unit fishing load per hour (CPUE_N) from the different stations, were compared to obtain information on the ecological requirements of this species (34). The results showed that *Lepomis gibbosus* dominated in 24 stations and represented 87.6% of the total number of fish caught. The average number of pumpkinseed was 6.35 ± 7.2 CPUE_N. (34). The pumpkinseed is the most numerous in the littoral areas of the lakes that no longer function as active quarries, where their number reaches 20 CPUE_N. (34). The smallest number of the species was found in the lakes where there are active quarries for inert materials (34). The main habitat parameters that have an impact on the number are the type of bottom substrate and % of the aquatic vegetation. In the stations where predatory fish species occur, the age and length of pumpkinseed are the lowest (34). Human activity supports the establishment of pumpkinseed' populations, mainly by increasing the appropriate sections of the littoral for breeding and by eliminating competitors and predators, as a result of the fishing of local fish species. Parameters, such as sand and mud, as well as rich aquatic vegetation can serve as indicators of favorable conditions for the massive development of pumpkinseed (34). A number of desired economic species, such as Tilapia, Catostomidae and others, mainly due to incompatibility with local climatic conditions, fail to undergo the acclimatization and naturalization process and currently do not take a significant place in Bulgaria's aquaculture statistics. (33)

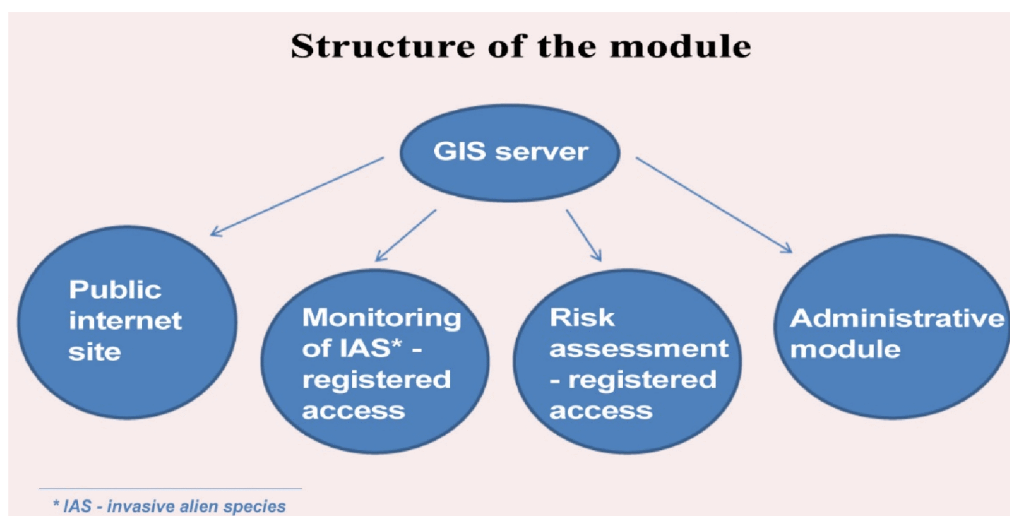
According to the National Report on the State and the Environment in the Republic of Bulgaria in 2010 (edition 2012), the number of foreign species for Bulgaria has been increasing steadily since 1900 (35). The most vulnerable to the penetration and the naturalization of foreign plant species are man-made habitats followed by riparian habitats. The monitoring of invasive species in aquatic ecosystems is poorly developed in Bulgaria. Much of the invasive species strongly alters local aquatic biotopes, significantly detracting from the ecological balance in them. "(36).

Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species, in force since 1 January 2015, has been transposed into Bulgarian law by the BDA. The regulation places stringent requirements on Member States regarding the prevention and control of invasive alien species, including risk assessment, monitoring, early detection and rapid destruction, development of action plans on distribution routes, management of established species, etc.

In this connection, a specialized module (Fig.14) (36). for the collection, analysis and mapping of data on foreign species and invasive alien species in Bulgaria has been developed by Water Monitoring Department of Executive Environment Agency together with IBER-BAS, which includes:

- Methods for monitoring and "data templates";
- methods for assessing the impact of alien species and "analysis templates"(36).

Fig.14"(36)



Climate change

The change in runoff in the water body's catchment area is a parameter inherent in direct and consequently indirect impacts of climate change. This is a prerequisite for the same parameter to be a criterion for the significance of the direct and indirect impacts of climate change (11). The study of water resources in the scope of climate change should be based on the most reliable methodological basis. The most reliably measured values are the statistical average of the runoff change and, more precisely, the results of the average multi-annual change in the flow in future periods. Even if greenhouse gas mitigation measures provide an optimal result due to the inertia of the climate system, global warming will continue over the next few decades, with all the resulting changes for the planet's waters: increased flood risk and drought, contamination of groundwater and surface water, drinking water shortages in certain areas and the need to adapt to their consequences. All types of pressure are sensitive to climate change (11). The direct effects of climate change affect the natural systems and processes (for example, the metabolism of organisms) and modify the effects of human impact, indirect effects are due to the adaptation of human activity to climate change (for example increasing retentate volumes leads to higher concentrations of pollutants in the lower currents). It is necessary to take into account the anticipated climate changes and their impacts, especially for the long-term measures requiring large investments, and to assess the extent to which these measures are effective in the expected climate change when drawing up the programs of measures to the RBMP (11). The preparation of the measures must be based on the pressure and impact assessment taking into account the expected climate change. When choosing climate change adaptation measures, it is necessary to consider measures that:

- are safe and flexible against uncertainties and expected changes in climate change conditions;



- have cross-sectoral benefits, and which, at least, have a positive environmental impact, including greenhouse gas emissions. (11)

List of environmental objectives defined in RBMP

The environmental objectives for water management are set out in Article 4 of Directive 2000/60 / EU (WFD) and include:

- avoiding deterioration of surface and underground water and areas for their protection
- improving and restoring all water bodies; achieve a good state of play by 2015; (or potentially) good ecological status as well as good chemical status of surface water and good chemical and quantitative status of groundwater;
- gradual reduction of pollution by certain substances and phase-out of the release of priority hazardous substances into surface water as well as prevention and limitation of the introduction of pollutants into groundwater;
- the cessation of any significant upward trends in groundwater pollution; the achievement of standards and targets for protected areas as defined in Community legislation

To achieve the objectives set out in the RBMP, measures are planned to address the anthropogenic pressure on water and the associated negative impacts. Taking into account the possibility of having specific conditions and with a view to maximally realistic approach to achieving the objectives, the WFD regulates specific cases in which failure to achieve environmental objectives is not considered a violation of the WFD if certain conditions are met - exceptions to the achievement of the objectives set out in Art. 4 (4) - Article 4 (7) of the WFD and Art. 156c - 156e of the Water Act. These exceptions include the possibility of:

- extending the deadlines for stepwise achievement of environmental objectives;
- setting less stringent goals;
- temporary deterioration of water bodies due to natural or Force majeure circumstances that could not be foreseen;
- failure to achieve good status due to newly appeared changes in the physical characteristics of the surface water body as a result of new activities for sustainable human development with socio-economic effect or failure to achieve good groundwater status due to changes in their level.

Programs of measures to achieve environmental objectives set in RBMP

The water conservation and rehabilitation programs of the RBMPs are developed taking into account (Article 156m of the Water Act):

- Analyzes in updating the characterization of the basin management area - a review of the impact of human activities on the status of surface and groundwater and identified significant water management problems (Section 2 of the plan);
- updated environmental objectives for surface and groundwater as well as protection zones (Section 5 of the plan).
- Each Measures Program includes basic and, if necessary, complementary measures (Article 156m of the Water Act). The update takes into account the requirements introduced in the Water Act during the period of application of the first RBMP 2010-



2015. The main measures ensure the fulfillment of the minimum mandatory requirements with regard to:

- the implementation of laws, regulations and other environmental legislation relevant to water;
- Ensure implementation of the principle of a more complete reimbursement of water services, including resources and environmental protection;
- supporting the efficient and sustainable use of water to achieve environmental objectives;
- water protection for drinking and domestic water supply;
- regulation of water catchment of fresh surface and underground waters, damming of surface waters;
- regulation of artificial groundwater supply;
- preventing and reducing other significant adverse effects on water status in order to ensure compatibility between the hydromorphological conditions of water bodies defined as artificial or highly modified and achieving the required ecological status or GEP;
- discontinuation of pollution of surface water with priority substances and gradual reduction of pollution by other substances which may obstruct the achievement of environmental objectives for surface water bodies;
- prevention of significant losses of pollutants from technical installations and prevention and reduction of the impact of accidental pollution resulting from floods;
- Achieving good chemical status of groundwater and protecting it from pollution and deterioration.

Complementary measures are designed and applied to the main measures to achieve environmental objectives and can be: legislative, administrative, economic and / or financial, environmental agreements, emission control, codes of good practice, restoration and creation of wetlands, control of water abstraction, management of consumption, efficiency and reuse of industrial waters, construction projects, desalination plants, reconstruction or reconstruction projects, artificial groundwater, educational projects, research, development and demonstration projects and other measures.

Additional measures are planned when the monitoring data or other data show that the environmental objectives for a given water body cannot be achieved by the measures envisaged and / or within the set deadline (Article 156 of the Water Act).

Some of the measures included in the list of measures for WFD are also applicable to the objectives of flood risk management, respectively. the objectives of the Floods Directive. These are measures aimed at reducing the adverse effects of floods on the environment, on water as one of the components of the environment by reducing and avoiding pollution and deterioration of water and water protection areas as a result of floods. These measures achieve mainly the objectives of the RBMP, but would contribute to mitigating the negative effects of floods. The measures included in the Measures Program of RBMP for the Danube region and having a positive effect on the achievement of the objectives of the two Directives - the WFD and the Floods Directive are as follows:

- Restoration and protection of the river banks and the river bed from erosion, including



the following actions :

- Protection of river and coastal shores from erosion and related landslides;
- Swarding and afforestation events;
- Afforestation of the banks and flooded terraces with appropriate tree species;
 - Restoration of the natural state of the lakes' bottom after barriers including:
- Cleaning the volume of sediment dams
 - Improving the hydromorphological status of the rivers - includes the following actions:
- No new negative changes in the hydromorphological regime (caused by HPP, seizure of alluvium of dams, new water abstractions, etc.) in water bodies designated as or falling into water protection areas;
- Removing river adjustments;
- Prohibition of new investment intentions related to the construction of hydro-technical facilities and sewerage deposition with the exception of flood protection facilities;
- Prohibition of disruption of the natural condition of river beds, river banks and coastal floodplains, except for activities to deepen the passes and correction of the riverbed to secure / improve safe navigation in the joint Bulgarian-Romanian section of the Danube and for flood protection activities.
 - Reducing erosion of the catchment - includes the following action:
- Prohibition of clear cuts in areas less than 500 m from water bodies.
 - Reduction of diffuse pollution from industrial activities – includes the following action:
- Closure and recultivation of old and already unusable industrial zones or individual enterprises.
 - Reduction of pollution from mining activities - includes action:
- Recultivation of contaminated sites from mining activities.
 - Rehabilitation of areas affected by inert materials extraction - includes action:
- Recultivation of plots affected by the extraction of aggregates.
 - Ensure the continuity of water currents and fish movements, including the following actions:
- Destruction of dams and thresholds to ensure fish migration;
- Reconstruction of dams / thresholds (by reducing their height or length) to ensure the migration of the fish.
 - Provision of collection, removal and treatment of urban waste water, including the following actions:
- Implementation of projects for construction, completion, reconstruction or modernization of sewerage system for agglomerations with less than 2000 residents, incl. completion of sewerage when there is a STP or adequate purification (through construction of STP or transfer to another STP) when there is a sewerage system.
- Construction, reconstruction or modernization of sewerage network for agglomerations with more than 2,000 residents.



- Construction, reconstruction or modernization of sewerage network for agglomerations with more than 2,000 residents.

Biodiversity, flora and fauna risks in Montana region (11)

Biodiversity is not only a natural resource, but also a potential for the future development of Montana region.

According to RDDRB, biodiversity, flora and fauna risks in Montana region include (11):

- Disturbances and fragmentation of habitats and habitats of plant and animal species, changes in the state of ecosystems and biosensors in the area due to the increased urbanization in the area;
- Pollution of water and seawater ecosystems and biodiversity change due to the destruction of part of the vegetation, habitat and habitat disturbances, destruction of nesting sites, introduction of non-native species due to contamination of water bodies with waste water discharged by obsolete and depreciated STPs and sewage systems without the necessary purification;
- Diffuse habitat pollution and biodiversity change in ecosystems, migration of food chain pollutants, and biodiversity change in ecosystems resulting from intensive farming in the areas and fertilization of agricultural fields with nitrogen and phosphorous fertilizers, organic fertilizers and plant protection products;
- Directly or indirectly damaging or destroying aquatic or riparian habitats and ecological niches of invertebrate, fish, amphibian, reptile or mammalian species due to changes in hydrobiocenosis parameters or erosion near hydrotechnical facilities;
- The change in key water parameters (flow rate, hydrochemical, physicochemical, biological indicators of water) can lead to changes in the food base, hiding and breeding sites, which is of great importance for the species composition and population size, and for preserving the structure of the populations.
- Soil pollution, vegetation, individual plant destruction or population density reduction, habitat threats to endangered and rare species, and species diversity reduction and migration of food chain contaminants, disturbance and banishment of animals and birds, places for breeding and habitats of different species as a result of the establishment and presence of unregulated landfills. The introduction of new animal species characteristic of these objects - rats, mice and others - creates conditions for danger for humans and for domestic animals and spreads of diseases and infections in the surrounding territories;
- Biodiversity change, habitat fragmentation, habitat disturbance of endangered and rare species, breeding sites and habitats of different species, destruction of individual animals as a result of mineral extraction activities in the river basin district;
- Changes in biodiversity, habitat destruction, habitat disturbances, feeding sites and spawning sites of rare species of ichthyofauna due to correction of river beds, cutting off



coastal vegetation, drainage of floodplains and ponds connected with the Danube river, diking on the Danube river basin and its tributaries;

- Destruction of habitats and habitat disturbance of ichthyofauna species due to coastline development, as well as changes in the living conditions of ichthyofauna species caused by water abstraction for drinking and household purposes.
- The change in biodiversity as a result of the targeted fishing of economically valuable species from the ichthyofauna, as well as the fishing of part of the parental fish passages;
- Direct impacts of the presence of site construction equipment. Direct impacts on fauna are related to habitat disturbance (destruction), disturbance and banishment of animal species, destruction of nesting sites and changing biodiversity;
- Change in biodiversity of riparian territories due to the destruction of part of the plant and animal populations, nesting sites and change in ecosystems during floods.
- With regard to ichthyofauna, the implementation of the measures provided for in the RBMP will not lead to significant negative consequences. Adverse impacts, such as causing mortality, escaping of fish, will only occur in the course of building activities, and these impacts will be of a temporary and local nature.
- Permits for water use of new HPPs and ballasters in protected areas whose subject are protection of riparian and river habitats, as well as species related to flowing water (rivers), should not be granted in the future.
- The construction of HPPs of all types (ruslic and derivatized), which takes more than 20 to 30% of water, has a very negative impact on protected areas and should not be allowed there (11).

Costs for environmental protection

A material expression of environmental efforts is the cost of environmental protection and restoration and the available fixed assets with ecological use. The protection from erosion of shores and soils along the Danube River and the consolidation of landslides are of particular importance for the prevention of disasters in the Montana region (1)..

The activities to be implemented are aimed at:

- Establishing and constant updating of a database of hazardous areas and contaminated sites, development of early warning systems for emerging flood hazards, fires, activation of landslides;
- Cleaning of riverbeds and construction of protective equipment;
- Construction of facilities to combat erosion, afforestation of deforested areas, sustainable land use;
- Carrying out anti-erosion measures, including the creation of forest massifs through afforestation and the enhancement of the quality of forest crops as factors to counteract floods and the harmful effects of climate change;
- the high waters of the Danube River (11).

Preservation and improvement of the environmental quality

The Montana District is characterized by a relatively well-preserved environment but also by the presence of certain medium-intensity problems. Maintaining the quality of the



environment and, above all, high biodiversity is an important task of the next generations to protect the natural values and the possibility of their environmentally friendly use. Addressing the more significant environmental pollution issues will also lead to an increase in the quality of life in the area - a requirement included in the formulated vision for development (11).

Measures envisaged for biodiversity protection include:

1. Limit the effects of industrial and household pollution

Certain problems exist in the quality of natural waters polluted by industrial and household pollutants, as well as in the soil cover, which is subject to erosion and pollution (1)..

2. Preservation and maintenance of biodiversity

Activities under this objective will include developing and updating NUTS 2000 and Natura 2000 sites. An important element of the overall activity is mapping of natural habitats and species subject to conservation in Natura 2000 sites, maintaining favorable conservation status of natural habitats, monitoring to establish changes, with a view to initiating conservation measures.

Another activity to be supported is the development of action plans for endangered animal and plant species as well as the conservation, maintenance and restoration of habitats and species in the area (1).

The protected species of flora and fauna have to be promoted as symbols of the area to enhance interest in it. Creating the right conditions for monitoring rare and endangered species and attracting a limited number of tourists would create a livelihood for the local population and build a positive attitude towards the conservation and good management of the protected area (1).

Conservation and restoration of biodiversity, prevention of natural hazards and recovery of disaster damage.

Highlighting environmental issues in the Strategic Framework is imperative both because of the new European requirements and requirements and because 39.5% of the district territory is currently under active conservation - included in the NEM. In individual municipalities this share exceeds even 90%. Before the implementation of this strategy and the MDP in the Montana region, the areas under active conservation status were below 2% (1).

Due to the specific geographical location of Montana, border municipalities can implement joint environmental cross-border projects with territorial communities from neighboring countries. Favorable opportunities in the field of ecology exist for cross-border cooperation in preserving and maintaining the quality of Danube waters and in realizing joint projects for the maintenance of biodiversity (under NATURA 2000) - with Romania and through the implementation of the initiative "European green belt "with Serbia (1).

Territorial ecological integration needs to be strengthened in the border regions with Serbia and Romania. Deepening cooperation in the field of protected natural areas and protected areas with these countries, and especially with Romania, is in line with the principles, objectives and tasks of both the European Ecological Network NATURA 2000 and the Danube Strategy, as well as the Romania-Bulgaria CBC Programs. An acknowledgment of



the uniqueness of these border areas (Western Stara Planina) is the joint initiative of the World Conservation Union IUCN and the NGO "European Green Belt". It will stimulate the preservation of the preserved nature at the borders (in particular, with Serbia) and the connection of these territories to an ecological network (1).

It is important to prioritize cross-border environmental cooperation in the development of MDP for those municipalities with an external border, especially in the area of protected areas and protected areas. These are the municipalities of Lom, Valchedram, Chiprovtsi, Georgi Damyanovo, Berkovitza and Varshetz. The latter municipality is included in this group of municipalities due to the fact that much of its territory falls within the protected area of Western Balkans, which has its natural extension on Serbian territory(1).

It is necessary to increase the pace of building the environmental infrastructure. Priority should be the construction and renewal of the water supply and sewerage network and the construction of water treatment plants in larger settlements. A modern solution to the problem of landfilling and the use of construction waste in the area should be sought (1).

Among the most important priorities of the area should be the prevention and fight against climate change as an area falling in the region at highest risk. It is necessary to create a modern system for monitoring and protection against floods and catastrophic landslides, carefully spent water supplies and improving the quality of surface and groundwater.

Account should be taken of the constraints naturally occurring in the current economic situation, realistically assessing the possibilities for obtaining external financing, by making the necessary prioritization of the projects that the municipality plans to implement to the plan's horizons. With a view to achieving greater efficiency in the provision of funds MDP must fully comply with the drafts of the individual Operational Programs, seeking maximum integration of projects and achieving a synergic effect in their planning, implementation and outcome planning.

It is expected that the necessary financial resources for the implementation of the environmental objectives of the MDP will be provided under the budget, the Structural and Cohesion Funds of the EU, the Enterprise for Management of Environmental Protection Activities and others (1).

Significant efforts are directed towards the construction of a water supply and sewerage network, which is a condition for improving the quality of natural waters. There is a tendency for discontinuation of surface water degradation, stabilization of the state and poor improvement in individual river sections. However, the area is lagging considerably in the construction of the sewerage network and the necessary STPs. The waste problem is not fully resolved, with no separate collection of waste. The region lacks significant regional sites - sources of environmental pollution. The Montana Vulnerability Index is estimated to be the sixth group with the highest vulnerability across the EU (1).

- **Good EU practices for protected areas management (37)**
FRANCE



The NATURA network in France covers 12.74% of the country's territory (1 758 protected areas). There are 1364 Site of Community Importance (SCI) zones and 392 Special Protection Areas (SPA) zones in the country. The management of protected areas in France is based on contractual relations with independent operators, controlled by local stakeholder committees. In 1998 the Ministry of the Environment introduced the contractual system for management of Natura 2000 sites. The target management document is equivalent to a management plan and is prepared by a protected area operator. The approval and formalization of the Document are the responsibility of the prefect of the respective area. In most cases, operators appoint a manager of the protected area as a paid expert position. The work done is regularly reported to the Steering Committee under the chairmanship of the Prefect, which includes the main stakeholders. This type of "local forum of nature" has a different composition (average for the country 27 members). In the last century, much of the wetlands in France have been destroyed, putting many plant and animal species under threat of extinction. Among the identified reasons for the negative trends are increased urbanization, drainage activities, extreme climatic events, invasive species and others. In 2010, the French Parliament adopted Law 2010-788 on National Engagement for the Environment. The law confirms, details and implements France's sustainable development goals. Chapter IV of the Biodiversity Act sets out measures to ensure better functioning of ecosystems and restoring ecological water quality. (37)

GERMANY (37)

There are 4557 SCI zones and 742 SPAs in the country, which is a very large number compared to other Member States. On the other hand, many of the proposed sites are small and the total percentage of NATURA network territories cover 15.45% of the territory of the country. In Germany, there is no unified national legislation for planning the management of protected areas, relying heavily on the direct application of European directives. Some of the provinces fully implement the management planning approach. In Saxony, for example, detailed management plans have been prepared for all SCI and SPA zones. Other provinces have adopted a different approach - management plans are only available for NATURA 2000 sites where conflicts may arise or environmental contracts can be introduced as a key tool for the management of protected areas. The competence to protect the wildlife and the environment in Germany is divided between the federal government and the provinces. Types of habitats are protected by rules established in the 1986 amendment to the Federal Nature Conservation Act (1976). It should be borne in mind that federal law allows the provinces to exclude protected habitats when the adverse effects on protected areas can be compensated or where the proposed activity is of greater public interest. Provinces have the right to add a new habitat to the federal list. Over the past 60 years, 57% of the peat soil and marshes in Germany have been destroyed due to drainage and agricultural activities, forestry and urbanization. (37)

GREECE (37)

There are 241 SCI zones and 202 SPA zones in Greece. As a whole, the Natura 2000 network in Greece covers 27.2% of the country's land territory and 6.1% of its territorial waters,



placing Greece on the sixth place in Europe as a percentage of the NATURA 2000 protected area. A National Biodiversity Strategy for the period 2014-2029 was adopted at the end of 2014, with a five-year action plan being developed and approved. In 2011, Law No. 3937 "Biodiversity Act" was adopted, replacing the old regulation of 1986. and provides the legal framework for the protection and management of NATURA 2000 sites. The law aims to modernize and simplify biodiversity conservation procedures. A five-year management plan is foreseen for each area, which is approved by an order of the Minister of the Environment. The management plan shall include a description of the necessary organizational and operational measures for the protection of the zones, specify the conditions and limits for carrying out activities, set out guidelines and priorities for the implementation of projects, activities and measures for the effective protection, management and restoration of the protected areas. An action plan is also being developed for each management plan. Apart from a presidential decree, SPAs can be designated, special environmental studies or reports being developed for their management and conservation. The existing legislation and the new legislation provide for different forms of management of protected areas:

- ✓ Establish management bodies for one or more zones that are registered as private legal entities and work under the supervision of the Ministry of Environment, Energy and Climate Change, which is part of the Ministry of Reconstruction of Production, Environment and Energy since January 2015
- ✓ Assigning responsibilities to existing sectoral public administration bodies;
- ✓ Establishment of special coordination offices within the centrally designated regional authorities.

The most prominent model is the assignment of governance bodies, which is accompanied by a number of problems - duplication of responsibilities with public administration structures, lack of a stable operational and financial framework. Towards the end of 2014 28 managing bodies have been set up to handle 55 Special Area of Conservation (SACs) and 55 SPAs. Of all protected areas, only two have developed and approved management plans.

The new legislation and strategic framework envisage the establishment of a National System of Protected Areas to replace the governing bodies and other forms of government that currently exist and which fail to prove their effectiveness. The structure and the way of functioning of the National System are still being discussed and, until a final decision is taken, the governing bodies will continue to perform their functions.

POLAND (37)

In Poland, 849 SCI zones and 145 SPA zones are registered, and the Natura 2000 network in Poland covers 20% of the country's territory.⁶ The main authorities responsible for the management of the NATURA 2000 network are the Directorate-General for Environmental Protection and the Regional Directorates for Environmental Protection. Other authorities with important powers are the Directors of the National Plans, the Maritime Administration and the District Forestry Directorates. The responsibilities and powers of individual institutions are defined in the Nature Conservation Act. The Directorate-General monitors the operation of the zones by keeping a record of the data required to ensure the protection of the zones.



Monitoring includes the issuing of recommendations and guidelines for the protection and operation of the NATURA 2000 sites, the requirement and definition of the scope of information on the protection and operation of the zones and the control of the implementation of the management plans and the NATURA 2000 conservation plans. Regional directors coordinate the operation of the areas in their area of responsibility and supervise most of the sites. The management of the protected areas, which totally or partially overlap with national parks, is carried out by the respective park administration. The main tools for the management of the NATURA 2000 areas are the Environmental Impact Assessment System and the planning of protection measures. Each NATURA 2000 site must have a planning document in the form of a plan of conservation measures or a management plan. They are developed by regional environmental protection directorates, national parks or maritime administrations. As a whole, negative attitudes to NATURA 2000 prevail in Polish society, which is still perceived as a barrier to the development of local communities (37,38). The reason for these moods is undoubtedly the originally adopted approach of "top" decision-making without effective public consultation and enabling stakeholders to participate actively in decision-making.⁷ (37)

SCOTLAND(37)

Scotland has 243 SCI zones and 153 SPA zones. As a whole, the Natura 2000 network in Scotland covers 15% of the country's territory. Scottish Natural Heritage is a government structure designed to ensure nature conservation and promote sustainable use and management of natural resources. The organization has seven regional structures across the country and provides advice and guidance on the management of protected areas, as well as organizing and supervising and monitoring the management of protected areas. Scotland's Natural Heritage implements programs to monitor the status of each area. They are monitored to determine if nature conservation interests achieve their intended objectives. Objectives are measurable and objectively verifiable, and if it is found not to be achieved, further studies are undertaken, corrective actions are prescribed, regulatory changes are recommended, All protected areas are included in the monitoring program. Different schemes to finance activities in protected areas are used, as well as compensation for owners, for example through small grants from the Scottish Natural Heritage, funding from the Scottish Rural Development Program, the LIFE Program of the European Union, In some cases, Scotland's Natural Heritage is authorized to conclude agreements with landowners and landholders and to compensate them for additional costs or lost revenue as a result of the agreed land management program. (37)

4.6. MALTA (37)

The Natura 2000 network in the country covers 12.97% (234.00 sq km) of the island's territory. 32 SCI zones and 13 SPA zones are registered in Malta. Typical for Malta are the leading role of the specialized administration and the structured process of working with stakeholders at local and national level. Management plans for protected areas are being prepared with extensive public consultations. Stakeholder workshops are held during the collection period separately for each protected area. National and local public events are



used: interactive public exhibitions, radio games and roundtables, facilitators to encourage citizens to give their opinions. Following the development of the management plans, a public discussion is taking place on the latest options, which is the official step towards completing the process (37).

- **Horizontal recommendations and perspectives for sustainable management**

□ To effectively implement several conservation regimes at the same time (e.g. The Biodiversity Act, the Habitats Directive, The Water Act and related rules for NATURA 2000, the Protected Areas Act, etc.) by a good institutional coordination, and coordination of objectives and approaches to achieve them.

The main tool for achieving this goal is the plans for the management of protected areas. Multi-disciplinary, ecosystem-based approaches have emerged as particularly promising novel frameworks, resulting in significant advances in both research and management

"Sustainable Management" is the management of the use, development and conservation of natural resources in a way and degree that enable current generations and communities to provide themselves with social, economic and cultural assets without:

- reduces the ability of future generations and communities to meet social, economic and cultural needs;
- disrupts the ability of ecosystems to carry out their soil and soil conservation climate-regulating functions;
- significantly reduces biodiversity.(13)

applications.(27) For instance, local societal and ecological changes have been linked to global climate change (27,39), biophysical modelling has been integrated with population genetics (27,40), ecosystem service ideas have been expanded to include relational values (27,41). Furthermore, recent ideas promote decision-making based upon expected future ecosystem states, as opposed to past baselines, to increase the efficacy of future management strategies (27,42). Calls for cooperative management of this nature has led to increased understanding of the subtle variations characterizing degraded environments as well as the novel fish assemblages that arise from warming-induced range shifts and abundance changes (27,43,44,45,46) and have the potential to prevent problems before they occur.

Ultimately, many of the most pervasive problems facing global fish populations can only be mitigated through collaborative efforts involving both scientists and wider society (27,47,48). Future efforts must, therefore, use both scientific and societal approaches in order to most effectively secure a future for fishes worldwide (27,49).

□ To initiate the development of zone management plans with the active involvement of all stakeholders. To prioritize specific avenues for research, management or regulation in the face of a rapidly changing global environment and limited resources.



Problem areas that may benefit from rapid intervention to address emergent threats should be given a higher priority compared with others where immediate action may not be necessary or effective.(27) Such prioritization should be based not only on scientific merit, but also inclusion of societal requirements, conservation and management strategies (27,50). For example, proposed habitat developments (*e.g.* hydropower) should increasingly weigh up the cost to biodiversity and fish productivity against societal requirements, to avoid negative consequences for aquatic conservation and ecosystem services (27,51,52). Alternatively, aquatic infrastructure can potentially be eco-engineered to minimize adverse impacts and provide benefits to a range of taxa (27,53). There is increasing concern regarding the rate of global change and the risk of overly cautious scientific conclusions limiting the onset, speed and potential benefits of effective management decisions.

□ To promote the principles of NATURA 2000, ecosystem services and benefits for the local community to conserve and maintain protected areas.

Development in the design and implementation of aquatic protected areas has focused on integrating and improving resilience to climate change and enhancing socio-ecological capacities (27,54). This can optimize the trade-off between conservation and fisheries production (27,55,56,57). In freshwater systems, improvements in management using protected areas have enhanced the connectivity of important sections of rivers, lakes and estuaries (27,58,59).

□ To integrate the analytical biotechnologies in understanding, monitoring and protecting fish populations. The cooperation of research and administration force in the development and improvement of the management of protected species and their habitats will provide better perspective corresponding and suited to the changing environment.

For example, microchemical analyses of both otoliths and other calcified structures in fishes are widely used as valuable tools for understanding the age structures, life histories, habitat use, migration routes and dietary patterns of many fish populations (27,60), and have contributed significantly to population management and conservation over time. The generating and interpreting sequence information for many fish species has increased our knowledge of their evolutionary biology and adaptive physiology, as well as our understanding of how these features change for populations under environmental stress (27,61,62). Further, DNA barcoding now allows global tracking of seafood fraud (27,63), and next-generation sequencing-based eDNA metabarcoding can be used to effectively detect non-native and endangered species when this was hitherto impractical (27,64). Use of eDNA is arguably on the verge of revolutionizing fish community monitoring (27,65) and is becoming an effective tool for monitoring the health of aquatic ecosystems (27,66,67). As technologies develop and their associated costs decrease, it is envisaged that sequencing will become progressively more powerful and widely used in managing fish populations worldwide. (27) Together, the development of new technologies and improvements in well-



established techniques are contributing significantly to better understand fish populations and improved management of fish and fisheries. (27)

□ To implement modelling techniques for better understanding of the effects of environmental change, to successfully predict potential consequences of management strategies (27,68). To improve environmental impact assessments by extrapolating the received knowledge into prediction the outcomes of development, and to engage effectively in post-scheme monitoring, and adaptive management based on models.

Advanced modelling techniques facilitate greater understanding of key features of population dynamics, including energy budgets, reproduction, larval dispersal, recruitment, genetic changes and productivity of fisheries (27,69,70,71,72), leading to improved utility for management and conservation. This potentially allows scientific advice to play a greater role in policy, as seen with successes such as the establishment of multi-disciplinary management indicators adopted by the E.U. Water Framework Directive (EC, 2016). Hydrological and ecological models have been used successfully in restoration of riverine habitats that have been affected by water extraction and associated altered flow regimes, which bodes well for future uses in similar systems (27,73). Such models, combined with empirical research, were used to inform management decisions on flow regulation to increase fish spawning and recruitment on a flood plain on the River Murray, Australia (27,74,75), demonstrating the potential of these approaches to improve the sustainability of fish populations.

□ To take advantage of the changing environment by creating modeling systems of the newly appeared as a consequence of climate change or anthropogenic modifications habitats and species.

Predicting the constituents of these altered habitats and the likely responses of existing fish communities to change represents a considerable current knowledge gap.(27) Understanding the mechanisms underpinning population responses and their variability and integrating this knowledge into predictive models (27,76) are important to appropriately manage fish populations and communities under stress.(27)

□ To promote the involvement of the non-scientific community in data collection and decision making for widening the knowledge of fish species and habitats, and improvement of ecosystem management strategies.

A number of citizen-science projects focussing on data collection for fishes already exist (27,77). Despite this, the absence of best practice regarding these processes is hindering progress and positive change through public engagement. Improving transparency and feedback within communication pathways between scientists and the public may enhance participation in management of fish populations (27,78). Improved stakeholder interaction and better use of citizen science also requires development of novel information technology tools and mobile applications that allow for the collection and use of data by the public (27,77)



- **Conclusion**

The region of Montana is one of the poorest in Bulgaria in regards to economical indicators. Nevertheless, the natural resources of Montana region have great advantage before the other Bulgarian districts by their diversity, quality and potential. The habitats of all aquatic fauna species are endangered by the uncontrolled anthropogenic activities for years and in the last decade, we are witnessing the gradual destructive consequences of these processes. The limiting of fish' free courses and changes in their natural habitats have led to the extinction of number of species and significant decline in the population of others. In recent years, the Ministries involved in the biological diversity and its conservation developed loads of plans, programs, strategies, ecological assessments and legal policies for recovering and preserving the natural richness in the rivers and lakes across the country. Many ambitious measures, recommendations and aims were laid down in these regulations but many of them are not followed and fulfilled, probably due to the dispersed and non-relative legal instruments and the lack of trained and concerned staff. The international organizations and local NGOs are trying to compensate for the gaps in government management of the biodiversity by taking decisive steps in preservation of the ichthyofauna. For example, inclusion of species and habitats in protected areas, mapping of habitats, assessment of the real condition of fish species, destruction of weirs and dykes to open their natural passes, restocking events etc.

The responsible stakeholders have created the legal basis for resolving most of the concerns related to fish and habitats preservation and sustainable management. First of all, integration of the legal framework under a common institution and the unification of the procedures to increase the effectiveness of all measures as well as shared obligations of neighboring regions concerning common protected areas should be envisaged. By effectively implementing several conservation regimes at the same time and by a good institutional coordination, and coordination of objectives and approaches to achieve them, this aim is feasible. Recovery of disturbed areas, ecological equilibrium and biodiversity, adaptation to climate change and reduction of the risk of natural disasters are in the spectrum of already applied actions and they must proceed in order to provide sustained development of the natural resources. Integration of analytical biotechnologies in understanding, monitoring and protecting fish populations by cooperation of research and administration force would develop and improve the management of protected species and their habitats, and will provide better perspective corresponding and suited to the changing environment. In relation to this, programs that support the link between science, education, civil society organizations and state institutions should be encouraged leading to development of joint decisions on strategic policies and investments, and better results in the application of the procedures. The stimulation of scientific research related to technological development by allocation of significant amounts for projects would increase the competitiveness of the country and would transfer knowledge, best practices and innovations into the real ecological problems. The implementation of model techniques for better understanding the effects of the environmental change and successfully predicting potential consequences of management strategies would improve environmental impact assessments by extrapolating the received knowledge into prediction of the outcomes of development, and by effective engagement in post-scheme monitoring, and



adaptive management based on models. Other important step in this direction would be to take advantage of the changing environment by creating modeling systems of the newly appeared as a consequence of climate change or anthropogenic modifications, habitats and species. Not least, would be the involvement of the non-scientific community in data collection and decision making for widening the knowledge of fish species and habitats, and improvement of ecosystem management strategies. This will contribute to elaboration of improved measures for reduction of the negative impact on the species for all protected areas, as at present these measures are incomplete.

Although the trends and ecological pressure over the fish environment are relatively high, there are a lot of critical actions and measures that could be implemented, which depend entirely on the good management and concerned organizations to be involved and to complete the led down measures.

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On-line resources:

¹ Rivers in Bulgaria, available at:

<http://rekitte.bg-schools.com/inforiv.php?id=38>

² European Red List, available at:

<http://ec.europa.eu/environment/nature/conservation/species/redlist/fishes/introduction.htm>

³ Protected areas of NATURA 2000, available at:

<http://natura2000.moew.government.bg/Home/Map>

⁴ There are no alive rivers in Bulgaria, WWF warns, 19 January 2019, available at:

<http://www.wwf.bg/?uNewsID=343232>

⁵ WWF experts investigated the north-western Bulgarian rivers. (October 15, 2014), available at:

http://www.wwf.bg/what_we_do/rivers/free_fish/novini/

⁶ The General Directorate for Environmental Protection of Poland, available at:

<http://www.gdos.gov.pl/history-of-establishing>



⁷ Scottish Government. POLICY: Landscape and outdoor access, available at: <http://www.gov.scot/Topics/Environment/Wildlife-Habitats/protectedareas/NATURA>

List of other regulations used in the study, not listed in References

- BDDR initial quantitative criteria
- Directive 79/409 / EEC on the conservation of wild birds
- Directive 92/43 / EEC on the conservation of natural habitats and of wild fauna and flora
- List of economically valuable fish species and other aquatic organisms. (2012), MoEW
- MDP in the Montana region
- No. RD-272 / 03.05.2001 of MoEW
- Order No. RD-167 / 31.03.2016 of MoEW
- Ordinance H-4 on characterization of surface water (23.09.2014)
- Regulation (EU) No 1143/2014 of the European Parliament and of the Council - October 2014 on the prevention and management of the introduction and spread of invasive alien species, in force since 1 January 2015
- The Biological Diversity Act of Bulgaria, 2013 and Annex 2,3,4 of BDA
- The Danube Strategy
- The European Floods Directive
- The Ordinance on the use of surface water Adopted by Council of Ministers Decree No 352 of 14.12.2016
- The Permits issued by the BDDR in accordance with the provisions of the Water Act for regulation and limitation of the pressure of water abstraction on surface water
- The Strategic Framework
- The Waters Act of Bulgaria and Art. 156 of the Waters Act
- The Water Framework Directive and Article 4 of Directive 2000/60 / EU (WFD)