Appendix 15.2 – Fisheries Assessment

KICEVO TO BUKOJCANI ESIA – FISHERIES ASSESSMENT

- TECHNICAL REPORT -

Skopje, 26 October 2020

Introduction

Field research: in order to obtain the baseline fisheries data required to inform an assessment of likely effects, electric fishing surveys were conducted at four locations of the watercourses that are to be crossed by the scheme, as follows:

- where Bridge No 1 crosses the Zajaska River,
- where Bridge No 2 crosses the Susica river,
- where Bridge No 3 crosses the Zajaska River, and
- where Viaduct No 3 crosses an unnamed watercourse.

The ichthyological survey was carried out on 22 October 2020, on two sites of the Zajaska River (Bridge No 1 and Bridge No 3). The other two sites (Bridge No 2 and Viaduct No 3) the riverbeds were dry.

Project Team

a)	Prof. Mitko Karadelev	Project Manager
b)	Prof. Vasil Kostov	Fish expert
c)	Irina Manevska, MSc	Fish expert

Work Methodology

The fisheries fund studies were undertaken by means of an electro-fisher (Samus 1000 and Susan 2020), by adhering to the standard and prescribed methods EN 14011 (CEN, 2003) and FAME – methodology 2004. Upon identification and quantification, the caught fish were restored to river waters alive, at the site where they had been caught. Taxonomic identification was done according to Kottelat and Freyhoff (2007).

The primary data related to the studied fishing profile were obtained for each sampling point.

Research Results

Bridge No 1 – the Zajaska River (Ch 08+315 km)

Profile Description:

- Riverbed width - 2.5 m;
- Average riverbed depth – 30 cm, with two puddles with over 50 cm in depth
- River bottom composition – 80 % stone, 20 % gravel.

Figure 1: The spot where Bridge No 1 crosses the Zajaska River.

Recorded Catch:

Within a 200-m stretch, eight (8) individuals of Macedonian trout (*Salmo macedonicus*) with 15-20 cm in length were caught. All individuals were male and ready for spawning.

Figure 2: Portion of recorded catch of Macedonian trout.

Population Density:

The population density of Macedonian trout in this profile totals 1.6 individuals per 100 m^2.

Estimation

Adult male individuals of Macedonian trout ready to spawn occur in the fishing profile. This indicates that this river stretch could be defined as a potential spawning locality of Macedonian trout.

Bridge No 2 – the Susica River (Ch 11+949 km)

The riverbed of the Susica River was dried up at this time of the year. Water flow occurs only during wintertime or early spring contingent on precipitation.

Viaduct No 3 – Dry Stiborani Ravine (Ch 12+460 km)

The stream bed is dry. Water flow is short-lived and occurring solely during torrential rain.

Fig. 3: The arid riverbed of the Susica River (left) and the stream of Stiborani ravine (right).

Bridge No 3 – the Zajaska River (Ch 01+093 km)

Profile Description:

- Riverbed width: 4 – 8 m;
- Average riverbed depth – 20 cm, with three pools with over 100 cm in depth;
- River bottom composition – 80 % stone, 15 % gravel, 5 % sand.

Figure 4: The site where Bridge No 3 crosses the Zajaska River.

Recorded Catch:

Within a 280-m-long stretch, the following fish were caught:

- Twenty-five (25) individuals of one-year and two-year old offspring of Macedonian trout (*Salmo macedonicus*) with 3 - 8 cm in length, and one 20-cm-long male specimen ready to spawn;
- Forty-five (45) individuals of the common minnow (*Phoxinus phoxinus*) from all age groups. The fish were captured in a puddle where the water was still and at a sandy bottom.
- Twenty (20) individuals of spirlin (*Alburnoides bipunctatus*). The fish were captured in the pools.
- Eleven (11) units of the Danube barbel (*Barbus balcanicus*) from various age groups and length categories; and
- One specimen of the Aegean gudgeon (*Gobio bulgaricus*) caught in the deepest puddle.

Figure 5: A portion of the registered fish catch.

Population Density:

The population density of fish in the current profile totals 36.4 individuals per 100 m^2. *P. phoxinus* population boasts the highest density i.e. 16.1 ind./100м^2, then *S. macedonicus* - 8.9 ind./100 m^2 while the population density of the remaining species is lesser, as follows: 7.1 ind./100 m^2 of *A. bipunctatus*; 3.9 ind./100 m^2 of *B. balcanicus* and 0.35 ind./100 m^2 of *G.bulgaricus*.

Estimation

Individuals of one-year and two-year old offspring of Macedonian trout, accompanied by offspring of the Danube barbel, the common minnow and spirlin were found. This implies that the present river stretch constitutes a habitat for the offspring of a variety of species, and it may well be a spawning site for them.

Valorisation

Fish were evaluated pursuant to Habitat Directive (Directive 92/43/EEC); the Global Red List (IUCN); the European Red List of Freshwater Species compiled by Freyhof and Brooks (2011); the Mediterranean Red List; Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention); Convention on the Conservation of Migratory Species (Bonn Convention); Convention on International Trade in Endangered Species (CITES). The evaluation of biodiversity on a national level was performed in compliance with the national lists of strictly

protected (I) and protected (II) wild species in the Republic of Macedonia (Official Gazette No 139 (7.10.2011) (Table 4).

Table 1. Valorisation of native fish species.

Species	Habitat Directive	Bern Convention	Bonn Convention	Emerald network	IUCN Global Red List	Endemism
*Salmo macedonicus**	Annex II				DD	Endemic to the river Vardar watershed.
*Barbus balcanicus**	Annex II*-V				LC	Balkan endemite
*Gobio bulgaricus**					LC*	Balkan endemite
Alburnoides bipunctatus		III			LC	
Phoxinus phoxinus					LC	

Most of the species in the table have been marked by a symbol '*' given that they are cited in some of the lists under a different name (according to earlier nomenclature). This is a problem affecting a large number of species nowadays, which is the reason why Freyhof and Brooks (2011) propose that all newly-described species previously included in some of the lists ought to be listed under the taxonomic name used for them at the present time.

***Salmo macedonicus* (Karaman, 1924) – Macedonian trout.** The river Vardar watershed is the natural area of distribution of the Macedonian trout (*Salmo macedonicus*). In view of the fact that scores of trout species in Europe are contained by the umbrella name *Salmo macrostigma*, a taxonomic name which, as maintained by Kottelat and Freyhof (2007), is not a valid name for the European populations of trout, Freyhof и Brooks (2011) have advised that the Macedonian trout be quoted in Annex II as *Salmo macedonicus*. Pursuant to the Global and the European Red List, *Salmo macedonicus* has a DD (Data Deficient) status. According to the national lists, the taxon is also on List II (protected wild species).

***Barbus balcanicus* Kotlik, Tsigenopoulos, Rab & Berrebi, 2002 – the Danube barbel**. *Barbus meridionalis* is in Annex II to the Habitat Directive and in Appendix III to Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). In the past in the Republic of Macedonia, a few subspecies of the present species used to be defined, including the Danube barbel – an inhabitant of the river Vardar watershed. The taxonomic status of the Danube barbel from the river Vardar watershed underwent various changes in the past: *Barbus meridionalis meridionalis* according to Karaman (1924); *Barbus meridionalis petenyi* according to Vukovic and Ivanovic (1971); *Barbus meridionalis* according to Димовски и Групче (1987); *Barbus peloponesius* according to Georgiev (1998). These days, it has been raised and granted the status of a separate species under the name *Barbus balcanicus* Kotlik,

Tsigenopoulos, Rab & Berrebi, 2002. On the one hand, Freyhof and Brooks (2011) suggest that *Barbus balcanicus* should be registered in Annex V to the Habitat Directive (Directive 92/43/EEC). On the other hand, in line with the recommendations from Article 17 Checklist, *Barbus balcanicus* ought to retain the status held by *Barbus meridionalis*.
Due to the aforementioned reasons, *Barbus balcanicus* is both categorised in Annex II and Annex V. In the Global Red List (IUCN) as well as in the European and the Mediterranean Red List, the Danube barbel is categorised as a Least Concern species (LC).

Gobio bulgaricus **Drensky, 1926 – the Aegean gudgeon.** Kottelat and Freyhoff (2007) do not exclude the likelihood that two species - *Gobio bulgaricus* and *Gobio balcanicus* – occur in the Aegean basin in the Balkans. Presently, molecular data signify that *Gobio bulgaricus* and *Gobio balcanicus* are virtually two different species necessitating morphological revision and re-description (Geiger et al, 2014).

Alburnoides bipunctatus **(Bloch, 1782) – the spirlin**. Stierandova *et al* (2016) have identified an Aegean fish group within the framework of the genus *Alburnoides,* distinct from the Midwest European group, to which the species *Alburnoides bipunctatus* s. stricto is affiliated. Judging from the latest findings, the Vardar river basin is inhabited by *Alburnoides thessalicus* (Barbieri *et al*. 2017). *Alburnoides bipunctatus* is cited in Annex III to Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). It has been granted a Least Concern (LC) status only in the European Red List.

Phoxinus phoxinus **(Linnaeus, 1758) – the common minnow.** The genus is widely distributed in the basins of the Atlantic Ocean, the North and the Baltic Sea, the Pacific and the Arctic Oceans, from the Ebro river basin in Spain to the Amur river basin in Russia and China. Since the early 20th century, the minnows have spread outside their natural area of distribution, in particular in the Scandinavian alpine regions, where they are used as live bait (Museth *et al.*, 2007), and in the Pyrenean Peninsula, where they are stocked as a natural food for trout (Miró and Ventura, 2015). Nowadays, the Eurasian minnow from the genus *Phoxinus* comprises no less than 15 species (Eschmeyer *et al.*, 2017) adapted to cold and well-aerated alpine watercourses and to wide lowland rivers and lakes (Kottelat and Freyhof, 2007).

Phoxinus phoxinus is categorised in Annexes II and IV to the Habitat Directive. According to the Global Red List (IUCN) and the European and the Mediterranean Red List, the common minnow is categorised as a Least Concern (LC) species.

Summary and Conclusion

Ichthyological studies into the Zajaska River have demonstrated presence of five autochthonous fish as follows: *Salmo macedonicus, Barbus balcanicus, Alburnoides bipunctatus, Gobio bulgaricus* and *Phoxinus phoxinus.*

The five autochthonous species of fish sighted during the field research have been valorised accordingly. The trout (*Salmo macedonicus*) and the Danube barbel (*Barbus balcanicus*) are among the more important fish species with a priority for protection. They are part of Annex II of the Habitat Directive (Directive 92/43/EEC).