THE FAUNA OF THE VJOSA RIVER AND THE ADJACENT FLOODPLAIN AT POÇEM

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The Vjosa in the area of the projected Poçem hydropower plant. Photo: Gregor Subic

1. SUMMARY

This report lists aquatic and terrestrial species recently documented at the Vjosa River within the project area of the planned hydropower plant at Poçem in Albania. It evaluates the ecological value of this river section based on occurrence of rare and endangered organisms in order to document its uniqueness and conservation status.

The fauna of the Vjosa contains typical faunal elements characteristic for highly dynamic, large rivers, which have lost large areas of their former distribution in Europe. These species are highly sensitive to hydromorphological disturbances such as changes in discharge, flow regime and sediment budget. Any impacts on these parameters may lead to a decrease or extinction of this highly vulnerable taxa.

Within this study 101 aquatic invertebrate species were found, at least 41 species of which have been documented for the first time in Albania. They were hitherto exclusively found at the Vjosa.

2. RESULTS

2.1 OVERALL RESULTS

132 taxa of terrestrial fauna were found during a recent survey.

One Plecoptera species, *Isoperla vjosae* sp. n., is new to science and is exclusively known from the Vjosa River.

Some preliminary genetic results indicate a new species of the genus *Pelasgus* (*Pelasgus* sp. nov.), which was recorded in the Vjosa near the village of Kut.

The following five species documented in the project area are listed in Appendix II – STRICTLY PROTECTED FAUNA SPECIES – of the Convention on the Conservation of European Wildlife and Natural Habitats

Emys orbicularis

Saga pedo

Bufo viridis

Ophisaurus apodus

Testudo hermanni

The following six species are listed in Appendix III - PROTECTED FAUNA SPECIES - of the Convention on the Conservation of European Wildlife and Natural Habitats of the Bern Convention

Rana graeca

Pelophylax shqipericus

Petromyzon marinus

Alosa fallax

Alburnoides bipunctatus

Pachychilon pictum

2.2. AQUATIC INVERTEBRATE FAUNA OF THE VJOSA

Information on both aquatic and terrestrial invertebrate fauna of the Vjosa valley is scarce. Beqiraj et al. (2008) and Chatzinikolaou et al. (2008) analysed the benthic invertebrate fauna of the Vjosa under assessment aspects of ecological status, howerver, the taxonomic resolution remained at genus and family level. Therefore, three short-term expeditions were conducted in order to investigate the community on species level and check whether rare and endangered species within an European context occur within the project-area: to Poçem and Tepelenan in June 2014 (M. Hess, U. Heckes & W. Graf), to Poçem and Kut in October 2016 (W. Graf & S. Beqiray) and to Kut April 2017 (U. Heckes, S. Vitecek, S. Beqiray & W. Graf). In total, 89 species were identified (tab. 1). Even though this study reflects only a snapshot of the existing diversity, 45% (41 species) of the recorded species are new to the fauna of Albania (tab. 2). Conservation issues and ecology of some specific species typical for unimpaired and highly dynamic, large rivers will be discussed below.

Table 1: Species list (Odonata, Trichoptera, Ephemeroptera, Plecoptera, Heteroptera, Coleoptera and Decapoda) documented in the project-area

Trichoptera
Rhyacophila diaftokensis
Rhyacophila nubila
Allotrichia vilnensis
Hydroptila angulata
Hydroptila angustata
Hydroptila brissaga
Hydroptila occulta
Hydroptila sparsa
Hydroptila simulans
Hydroptila tineoides
Hydroptila vectis
Oxyethira falcata
Agapetus laniger
Cyrnus trimaculatus
Polycentropus ieraptera dirfis
Cheumatopsyche lepida
Hydropsyche bulbifera
Hydropsyche incognita
Hydropsyche modesta
Hydropsyche mostarensis
Lype reducta
Psychomyia pusilla
Limnephilus graecus
Stenophylax mitis
Leptocerus interruptus
Leptocerus tineiformis
Mystacides azurea
Lepidostoma hirtum
Beraeamyia schmidi

Plecoptera
Eoperla ochracea
Marthamea vitripennis
Xanthoperla apicalis (Kula e Lumes, bei Kukesi (Rauser, 1963)
Leuctra fusca
Chloroperla tripunctata
Perla marginata
Isoperla vjosae sp. n.
Perlodes floridus

Ephemeroptera
Neoephemera maxima
Ephemerella maculocaudata
Prosopistoma pennigerum
Oligoneura rhenana

Ephemerella major
Serratella mesoleuca
Baetis beskidensis
Baetis meridionalis
Baetis cf. mirkae
Baetis muticus
Baetis rhodani
Baetis vernus
Procleon romanicum
Procloeon pennulatum
Ecdyonurus puma
Heptagenia longicauda
Heptagenia sulphurea
Caenis macrura
Caenis pusilla
Caenis rivulorum
Siphlonurus lacustris

Blephariceridae
Blepharicera fasciata

Sialidae
Sialis nigripes

Heteroptera
Aphelocheirus aestivalis
Micronecta griseola

Odonata
Gomphus vulgatissimus
Onychogomphus forcipatus
Calopteryx virgo
Coenagrion hastulatum

Aquatic Coleoptera
Laccophilus hyalinus (DE GEER 1774)
Laccophilus minutus (LINNAEUS 1758)
Hydaticus leander (ROSSI, 1790)
Helophorus brevipalpis BEDEL 1881
Georissus costatus Laporte de Castelnau, 1840
Georissus crenulatus (ROSSI 1794)
Georissus laesicollis GERMAR 1831
Laccobius alternus MOTSCHULSKY 1855
Laccobius gracilis MOTSCHULSKY 1855
Laccobius obscuratus ROTTENBERG 1874
Laccobius cf. *striatulus* (FABRICIUS 1801)
Laccobius simulatrix D'ORCHYMONT 1932
Helochares lividus (FORSTER 1771)

Enochrus sp.
Berosus affinis BRULLÉ 1835
Berosus jaechi SCHÖDL, 1991
Coelostoma hispanicum (KÜSTER, 1848)
Ochthebius foveolatus-group
Ochthebius striatus (CASTELNAU, 1840)
Ochthebius uskubensis HEBAUER, 1986
Hydraena bicolorata JÄCH 1997
Hydraena simonidea D'ORCHYMONT
Hydraena subjuncta D'ORCHYMONT 1929
Hydraena vedrasi D'ORCHYMONT, 1931
Limnebius perparvulus REY, 1884
Dryops subincanus (KUWERT 1890)
Potamophilus acuminatus (FABRICIUS 1792)
Elmis rioloides KUWERT 1890
Limnius cf. *intermedius* FAIMAIRE
Limnichus incanus KIESENWETTER 1851
Byrrhidae Gen. sp.
Heterocerus fenestratus (THUNBERG 1784)
Heterocerus flexuosus STEPHENS 1828
Augyles pruinosus (KIESENWETTER 1851)
Augyles flavidus (ROSSI, 1794)

Decapoda
Atyaephyra desmaresti
Palaemonetes antennarius

New to Albania according to Fauna Europaea http://www.faunaeur.org
In total, 41 new species for the Fauna of Albania were documented.

Table 2: list of species newly documented for Albania

Decapoda
Atyaephyra desmaresti
Palaemonetes antennarius

Heteroptera
Aphelocheirus aestivalis
Micronecta griseola

Plecoptera
Marthamea vitripennis (cited in Zwick (1984) from Kula Ljums collected in 1918)
Eoperla ochracea

Ephemeroptera
Prosospistoma pennigerum (the genus is already listed in Beqiraj et al. 2008)
Neoephemera maxima

Serratella mesoleuca
Baetis muticus
Baetis vernus
Heptagenia longicauda
Caenis pusilla
Caenis rivulorum

Odonata
Coenagrion hastulatum

Trichoptera
Rhyacophila diakoftensis
Allotrichia vilnensis
Hydroptila brissaga
Hydroptila occulta
Hydroptila simulans
Polycentropus ieraptera dirfis
Stenophylax mitis
Lepidostoma hirtum
Leptocerus interruptus

Aquatic Coleoptera
Scarodytes savinensis
Laccophilus hyalinus
Hydaticus leander
Helophorus brevipalpis
Georissus costatus
Georissus crenulatus
Georissus laesicollis
Laccobius simulatrix
Helochares lividus
Berosus jaechi
Coelostoma hispanicum
Hydraena bicolorata
Dryops subincanus
Potamophilus acuminatus
Limnichus incanus
Augyles pruinosus

Sialidae
Sialis nigripes

Large European rivers have undergone anthropogenic modifications and have lost a high share of their indigenous fauna, especially sensitive insects such as Ephemeroptera, Plecoptera and Trichoptera. Den Hartog et al. (1992) documented a 85% disappearance rate of these species in the Lower Rhine. Mey (2006) describes a similar phenomenon regarding Trichoptera and Fittkau, while Reiss (1983) highlighted this fact in general.

Some potamal invertebrates belong to the most endangered aquatic species on a European scale due to manifold and complex habitat degradation including factors of organic and toxic pollution, straightening and damming of the river channel as well as other hydromorphological impacts (pulse releases, residual flow), loss of habitats such as wetlands as well as population pressures by invasive species.

Several rare and endangered species exist among the highly diverse benthic community found at the Vjosa. In general, the faunal assemblage is typical for large rivers which had once a wide distribution across Europe.

Two species exemplarily illustrate this fact.

***Marthamea vitripennis* (Plecoptera: Perlidae) and *Xanthoperla apicalis* (Plecoptera: Chloroperlidae)**

Regarding *Marthamea vitripennis,* Zwick (1984) had already registered "a dramatic decline of the species practically everywhere in central Europe". The same is true for *Xanthoperla apicalis,* which has lost considerable parts of its range due to anthropogenic effects (Fig. 1 & 2).

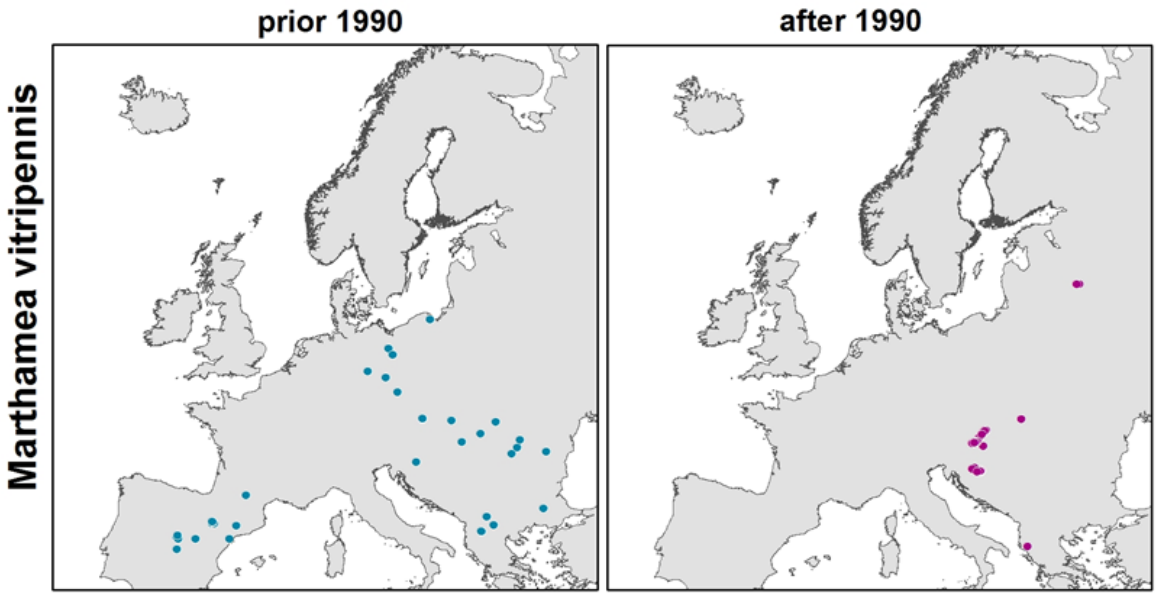

Figure 1: Location of records of *Marthamea vitripennis* before 1990 (left) and after 1990 (right)(Graf et al. 2016)

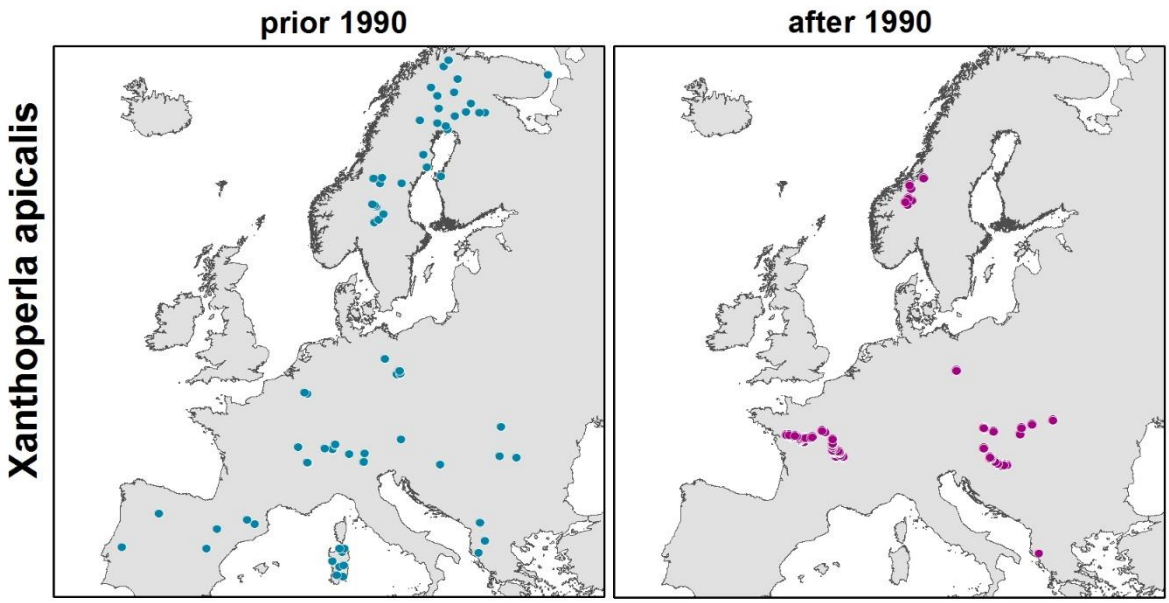

Figure 2: Location of records of *Xanthoperla apicalis* before 1990 (left) and after 1990 (right) (Graf et al. 2016)

Isoperla vjosae sp. n.

This species new to science has been detected on April 24, 2017, during the Vjosa Science Week initiated by Riverwatch, EuroNatur and private funds. *Isoperla vjosae* sp. n. is currently under description and will be published this year. As it is known worldwide exclusively from the Vjosa at Kut and all other morphologically related species are known from montane to submontane headwaters, the species is most likely perfectly adapted to this highly dynamic conditions presently occurring there. Any environmental changes may seriously endanger this population and would lead to the extinction of this particular Albanian Plecoptera.

Photo 1: *Isoperla vjosae* sp. n.

***Prosopistoma pennigerum* (Ephemeroptera: Prosopistomatidae)**

Schletterer & Füreder (2009) summarize the ecological situation of this Ephemeroptera species as follows: “The records are scattered and some species were only found once and not rediscovered after their description. Obviously Prosopistomatidae are a very rare and sensitive family, which underlines the need of a special protection of all species i.e. the inclusion to the IUCN list (Schletterer & Füreder, in prep.). For example, the species *Prosopistoma pennigerum* became rare throughout Europe due to an increase of anthropogenic activities, i.e. habitat alternation and/or eutrophication, within the 20th century (Schletterer & Füreder, 2008)”. In Russia, for example, the species disappeared in the Daugava River after the building of a hydroelectric dam (Schletterer & Kuzovlev, 2007).

Photo 2: *Prosopistoma pennigerum*

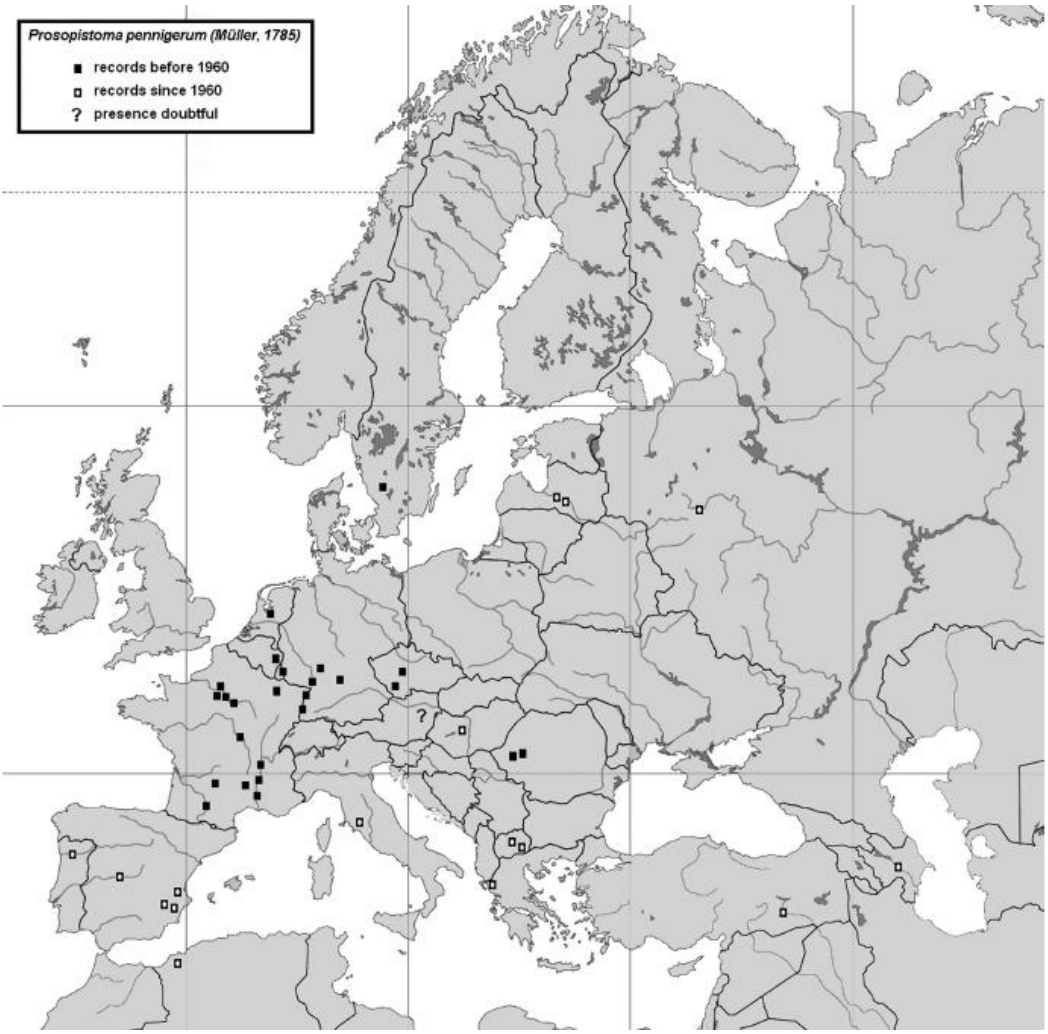

Fig. 3: Distribution of *Prosopistoma pennigerum* Müller, 1785 (Schletterer & Füreder, 2009)

***Potamophilus acuminatus* (Coleoptera: Elmidae)**

Buczyński et al. (2011) state that "[i]n many countries *Potamophilus acuminatus* is regarded as a species strongly endangered by extinction. In Austria, Czech Republic, Germany and Slovakia it has CR category (critically endangered) (Boukal 2005, Geiser 1998, Holecová & Franc 2001, Jäch et al. 2005). This makes sense in a very strong regression of national populations in relation to historical data, including regional extinction of the species (Klausnitzer 1996) or its long-term absence in the whole country (Boukal 2005). The regress of *Potamophilus acuminatus* in Europe has many reasons, like: water pollution and degradation, development of banks (Klausnitzer 1996). Braasch (1995), in the scale of sensitivity on environment degradation with the range from 1 (the most sensitive) to 5 (the least sensitive), placed this species in the group 1. Jäch et al. (2005) show, among others, high requirements towards water quality, especially low resistance to organic and toxic pollution. Adverse changes of the environment result in the increase of numbers and quality of habitats of *P. acuminatus* as well as their fragmentation (Ribera 2000)". "A specific threat is associated with trophic requirements of larvae: very dangerous activity connected with water "care" like seemingly harmless removal of decaying wood can result in the total vanishing of the species (Jäch et al. 2005). For the reasons described above, the authors postulate the including of *Potamophilus acuminatus* to the Red List of IUCN in VU category (vulnerable species) (Jäch et al. 2005, Ribera 2000)".

2.3. VERTEBRATE

Emys orbicularis

The species was found in a small macrophyte-rich pond at the margin of the floodplain. Its habitat would be destoyed by the HPP Poçem.

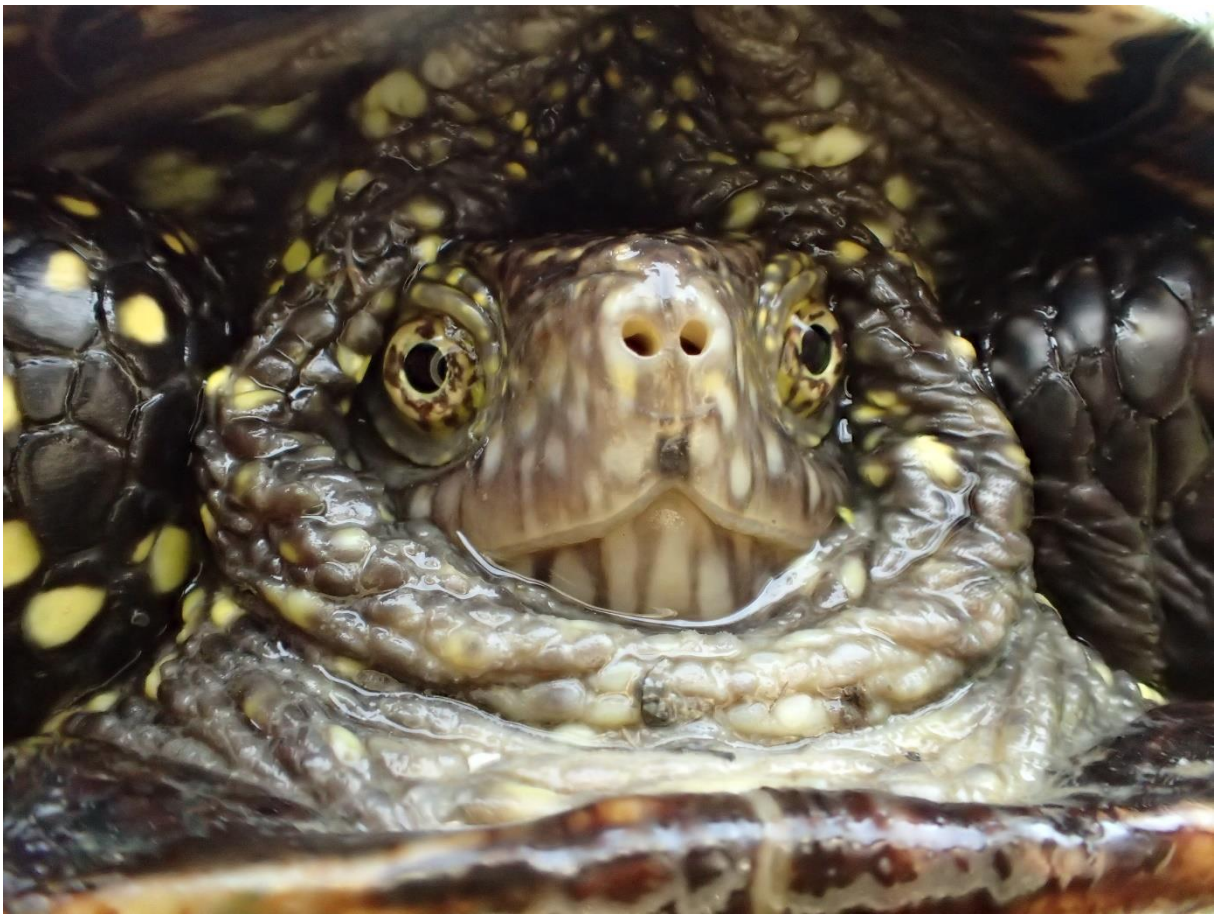

Photo 4: *Emys orbicularis*

This species is listed in Appendix II – STRICTLY PROTECTED FAUNA SPECIES - of the Convention on the Conservation of European Wildlife and Natural Habitats.

FISH FAUNA OF THE VJOSA

Whereas the understanding of the diversity and distribution patterns of freshwater fishes in most of the European Mediterranean has increased (Mrakovčić et al., 2006; Economou et al., 2007), the freshwater fish fauna in Albania is still poorly known. Apart from that on loaches (Cobitidae and Nemacheilidae) (Šanda et al., 2008), salmonids (Snoj et al., 2009) and barbels (genus Barbus; Cyprinidae) (Marková et al., 2010) such data on Albanian species are non-existant. The only available sources of information are the general works of Poljakov et al. (1958) which includes 36 freshwater species and that of Rakaj (1995), including 77 species. The difference between the coverage of these two publications is probably due in part to inclusion of newly introduced species, but more so due to changes in the taxonomic status of many species.

Moreover, both Poljakov et al. (1958) and Rakaj (1995) include many doubtful taxa. The deficiency in knowledge about the diversity of freshwater fishes in Albania has been confirmed by recent

descriptions of many new species from the area (Bianco & Kottelat, 2005; Economidis, 2005; Kovačić & Šanda, 2007; Miller & Šanda, 2008; Zupančič et al., 2010; Bogutskaya et al., 2010). Yet, most of the new species are described from transboundary water systems in neighbouring countries (Montenegro, and Greece) and not from Albania, though some of the new taxa are reported to occur here as well (Šanda et al., 2008; Šanda & Kovačić, 2009), a fact that is most probably also true for other species. Apart from the insufficient data on the diversity of freshwater fishes in Albania, the lack of knowledge about distribution of most of the species is striking. Recent investigation of Albanian Barbus phylogeography included samples from all hydrological systems in the country (Marková et al., 2010). Rather than just two species that were believed to inhabit Albania (Economidis & Daoulas, 2003; Kottelat & Freyhof, 2007) this study revealed the presence of five different lineages of Barbus.
Some preliminary genetic results indicate a new species of the genus *Pelasgus* (*Pelasgus* sp. nov.) which was caught in the Vjosa near the village of Kut. There are currently seven described species in this genus (Kottelat and Freyhof, 2007).

The following three species are listed in Appendix III - PROTECTED FAUNA SPECIES – of the Convention on the Conservation of European Wildlife and Natural Habitats of the Bern Convention.

Petromyzon marinus

The sea lamprey is an anadromous species, which migrates into rivers to spawn. A very rare species in the costal parts of Albania, its presence within country is poorly documented. Ichthyological surveys very seldom target this species. It was recorded by Shumka & Sanda in 2008 and 2014.

Alosa fallax

Formerly widespread at sea and in larger rivers, this anadromous fish has declined in numbers and distribution. It was recorded in the lower course of the Vjosa (close to confluence with Narta). This strongly migratory fish swims from the sea up to rivers to spawn during spring.

Pachychilon pictum

It is endemic to the Balkan and found in large numbers in the Vjosa and its tributaries. It inhabits slow-flowing rivers, canals and backwaters and reaches 18 cm TL.

Furthermore, the fish fauna of the Vjosa is characterized by high shares of species endemic to the Balkans: *Alburnus scoranza, Barbus prespensis, Chondrostoma vardarense, Gobio skadarensis, Luciobarbus albanicus, Pachychilon pictum, Cobitis ohridana* and *Oxynoemacheilus pindus.*

Additionally the river potentially provides habitat and spawning sides for anadromous sturgeons (*Acipenseridae*) such as *Acipenser sturio* or *Acipenser naccarii. T*he latter is listed **in Appendix II – STRICTLY PROTECTED FAUNA SPECIES.**

Expected impact of a hydropower plant on the fish fauna in the Vjosa

The construction of impoundments changes river systems ecologically by disrupting the connection between the river and the lateral backwaters, changing the shore line, stabilizing previously dynamic water levels as well as by other impacts (Schiemer & Waidbacher, 1992). Once dominant riverine fish species can almost exclusively be found in free-flowing sections, except for a few individuals in the

uppermost part of the impoundments (Waidbacher, 1989). Heavy morphological alterations for navigation, flood protection and hydroelectric power generation as well as the disconnection of tributaries resulted in riverine habitat degradation and fragmentation, especially in large rivers all over Europe (Dudgeon and others 2006; Morley and Karr 2002; Schiemer 2000). These habitat modifications affect the integrity and diversity of freshwater biota (Allan and Flecker 1993; Karr and others 1985; Richter and others 1996). Therefore, we expect a massive decline in abundances of typical riverine fish community as well as the disappearance of several species in the area. Additionally, the rest of the upstream Vjosa will be cut off for anadromous species migrating upstream from the sea.

Table 3. Records of fish species in the Vjosa; species listed in Appendix III – PROTECTED FAUNA SPECIES - of the Bern Convention are highlighted in orange

Species name	Author	Last record in Vjosa
Petromyzon marinus	Linnaeus, 1758	Shumka & Sanda, 2014
Anguilla Anguilla	Linnaeus, 1758	Meulenbroek, 2017
Alosa fallax	La Cepède, 1803	Shumka
Alburnoides prespenses	Bloch, 1782	Meulenbroek, 2017
Alburnus scoranza	Bonaparte, 1845	Meulenbroek, 2017
Barbus prespensis	Karaman, 1924	Meulenbroek, 2017
Carassius gibelio	Bloch, 1782	Shumka, 2015
Chondrostoma vardarense	Karaman, 1928	Meulenbroek, 2017
Gobio skadarensis	Karaman, 1937	Meulenbroek, 2017
Luciobarbus albanicus	Steindachner, 1870	Shumka, 2017
Pachychilon pictum	Heckel & Kner, 1858	Meulenbroek, 2017
Pelasgus thesproticus	Stephanidis, 1939	Shumka, 2017
Pelasgus sp.nov.		Meulenbroek, 2017
Pseudorasbora parva	Temminck & Schlegel, 1846	Meulenbroek, 2017
Squalius sp.		Meulenbroek, 2017
Cobitis ohridana	Karaman, 1928	Meulenbroek, 2017
Oxynoemacheilus pindus	Economidis, 2005	Meulenbroek, 2017
Oncorhynchus mykiss	Walbaum, 1792	Shumka, 2010
Salmo farioides	Karaman, 1938	Shumka, 2016
Chelon labrosus	Risso, 1827	Shumka
Chelon ramada	Risso, 1827	Meulenbroek, 2017
Chelon saliens	Risso, 1810	Meulenbroek, 2017

Mugil cephalus	Linnaeus, 1758	Shumka
Atherina boyeri	Risso, 1810	Shumka, 2015
Gambusia holbrooki	Girard, 1859	Meulenbroek, 2017
Aphanius fasciatus	Valenciennes, 1821	Shumka, 2014
Gasterosteus aculeatus	Linnaeus, 1758	Shumka, 2014
Dicentrarchus labrax	Linnaeus, 1758	Meulenbroek, 2017
Platichthys flesus	Linnaeus, 1758	Shumka, 2014

2.4. TERRESTRIC INVERTEBRATES, AMPHIBIANS AND REPTILES

Data on terrestric invertebrates, (semi)-terrestric amphibians and reptiles exist only from one short-term expedition conducted in April 2017 in Kut (W. Paill, G. Kunz, J. Gunczy, M. Duda, W. Rabitsch & T. Frank). Therefore, species listed below can only be seen as a small selection of species expected to occur in this region of the Vjosa river (Table 4). Albeit these preliminary data give already a good insight into the uniqueness of the fauna of the project area.

Table 4: Species list (Carabidae, Scarabaeidae, Orthoptera, Mantodea, Odonata, Isoptera, Dermaptera, Heteroptera, Auchenorrhyncha, Opiliones, Gastropoda, Amphibia, Reptilia) documented in the project area.

Carabidae
Asaphidion flavipes
Bembidion (Microserrullula) quadricolle
Bembidion (Peryphus) cruciatum
Bembidion cf. aspericolle
Bembidion cf. combustum
Bembidion striatum
Calomera fischeri
Calomera littoralis nemoralis
Chlaenius (Chlaeniellus) vestitus
Chlaenius spoliatus
Cicindela campestris
Cicindela maculata
Cicindela monticola
Cylindera arenaria viennensis
Cylindera germanica
Demetrias imperialis
Dyschirius (Dyschiriodes) aeneus
Dyschirius (Dyschiriodes) agnatus
Dyschirius (Paradyschirius) parallelus ruficornis
Dyschirius substriatus
Elaphropus (Sphaerotachys) hoemorroidalis
Elaphropus (Tachyura) diabrachys
Harpalus cf. pygmaeus

Omophron (s.str.) limbatum
Paradromius linearis
Poecilus striatopunctatus
Stenolophus (s.str.) discophorus
Tachys cf. parvulus
Thalasophilus longicornis

Scarabaeidae
Eulasia pareyssei
Oryctes nasicornis
Pleurophorus cf. caesus

Orthoptera
Acrotylus insubricus
Eumodicogryllus bordigalensis
Gryllus bimaculatus
Locusta migratoria
Saga pedo
Tetrix tuerki
Xya variegata

Mantodea
Empusa cf. *fasciata*
Mantis religiosa

Isoptera
Reticulitermes cf. lucifugus

Dermaptera
Labidura riparia

Heteroptera
Aelia acuminata
Agramma atricapillum
Aquarius paludum
Belonochilus numenius
Beosus quadripunctatus
Brachycarenus tigrinus
Camptopus lateralis
Carpocoris purpureipennis
Catoplatus carthusianus
Codophila varia
Conostethus venustus
Copium teucrii
Coranus griseus
Corizus hyoscyami
Cremnorrhinus basalis
Cymus melanocephalus
Dictyla echii

Dictyla humuli
Dolycoris baccarum
Emblethis verbasci
Eurydema ornata
Eysarcoris ventralis
Geocoris erythrocephalus
Geocoris megacephalus
Gerris maculatus
Heterogaster urticae
Holcocranum saturejae
Hydrometra stagnorum
Kalama tricornis
Lygus pratensis
Monosteira unicostata
Neides aduncus
Orthocephalus proserpinae
Peribalus strictus
Pilemostoma fastuosa
Platyplax inermis
Rhopalus parumpunctatus
Rhopalus subrufus
Saldula cf. melanoscela
Saldula cf. xanthochila
Stenodema calcarata
Stictopleurus cf. pictus
Strobilotoma typhaecornis
Tingis cardui

Auchenorrhyncha
Ditrophis pteridis
Malenia bosnica
Tropidocephala tuberipennis

Opiliones
Nelima sempronii
Opilio cf. parietinus
Paranemastoma longipes

Gastropoda
Albinaria scopulosa
Allaegopis skanderbegianus
Cecilioides tumulorum
Cernuella virgata
Charpentiera stigmatica
Chondrina arcadica
Chondrula cf. microtragus
Cochlicella acuta
Cornu aspersa
Eobania vermiculata

Granopupa granum
Helix lucorum
Helix secernenda
Josephinella byshekensis
Lindholmiola girva
Mastus grandis
Monacha cf. claustralis
Monacha frequens
Morlina glabra
Poiretia delesserti
Pomatias elegans
Strigilodelima conspersa
Succinella oblonga
Trochoidea pyramidata
Vallonia cf. enniensis
Vertigo pygmaea
Vitrea sp.
Xeromunda vulgarissima

Amphibia
Bufo viridis
Pelophylax shqipericus
Rana graeca

Reptilia
Ophisaurus apodus
Testudo hermanni

In the following sections, some faunal highlights of terrestric invertebrates and Herpetofauna are exemplified, strengthening the uniqueness of the fauna in the project area.

Carabidae - Carabid beetles
Dyschirius agnatus, D. parallelus ruficornis, D. substriatus: these species exclusively populate natural floodplains where they dig in fine sand substrate near the river bank. All these species have almost entirely gone extinct in Central Europe.
Bembidion striatum (Photo 5) is highly endangered in the entire project area. The survival of this species strongly depends on highly dynamic riparian zones with fine sand on bare ground. These preconditions are fulfilled at the Vjosa river.
Thalassophilus longicornis represents a species which requires coarsely granular gravel that is abundantly rearranged near the river bank. Due to its extremely specific demands, it exclusively lives along natural rivers like the Vjosa. Outside the study area, this species has only been reported once before for Albania.
Though extremely endangered in the project region, ***Poecilus striatopunctatus*** (Photo 6) and ***Stenolophus discophorus*** are typical species of the Vjosa floodplains. They live on humid fine sand free of vegetation and urgently require highly dynamic habitats. They could not survive in the project area if dams are constructed.
Demetrias imperialis was observed in older, silt up floodplains alongside the Vjosa. It was the first discovery for Albania.

Photo 5: The carabid beetle *Bembidion striatum*. Photo: W. Paill

Photo 6: The carabid beetle *Poecilus striatopunctatus*. Photo: W. Paill

Orthoptera - Grasshoppers

Saga pedo inhabits dry and wet meadows, shrubby hills and further habitats provided in the project area. As this species, whose population is generally spread thinly, is threatened by insecticide use and habitat destruction, it is considered endangered at a global scale. **In the Convention on the Conservation of European Wildlife and Natural Habitats this species is listed in Appendix II - STRICTLY PROTECTED FAUNA SPECIES.**

Tetrix tuerki is a specialist of highly dynamic river systems only surviving under very specific site conditions, i.e. sparsely vegetated sand and gravel banks that are abundantly relocated by the river. In many European countries, this species has already gone extinct or is threatened with extinction. The construction of hydropower dams constitutes one of the most important threats.

The survival of many rare and highly endangered invertebrates strongly depends on a mosaic of various site conditions within a highly dynamic natural river system. Today, such preconditions can only be found at the Vjosa and nowhere else in a comparable spatial extent in Europe outside Russia. **This fact makes the Vjosa a particularly important river for the conservation of a highly endangered invertebrate community thus emphasizing the remarkable uniqueness of this river.**

Amphibians and reptiles

The species recorded are listed either in Appendix II - STRICTLY PROTECTED FAUNA SPECIES (*Bufo viridis, Ophisaurus = Pseudopus apodus, Testudo hermanni*) or Appendix III - PROTECTED FAUNA SPECIES (*Rana graeca, Pelophylax shqipericus*) of the Bern Convention. They were found in different (semi)-terrestric habitat types that are connected with the river Vjosa.

Conclusion - terrestrial fauna

The Vjosa river and its surrounding habitats is most definitely of a remarkably high conservation status because i) it comprises a mosaic of various habitat types which forms a highly dynamic natural river ecosystem of a spatial extent which is absolutely unique in Europe outside Russia; ii) it harbours viable communities of animals that have largely or completely disappeared from other European rivers; iii) the majority of these viable communities are expected to irrecoverably go extinct as a result of the projected hydropower dams, because they are well adapted and strictly dependent on a highly dynamic river system. The construction of dams would disconnect the river from its surrounding (semi)-terrestric habitats and thus preventing the natural river dynamic which is essential for the survival of most rare and endangered species inhabiting the project area. Therefore, the protection of the Vjosa river system in its present form is of pan-European importance.

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