



Vjosa Basin-the first free flow river protected area in the Balkans (Albania) from fish diversity richness prospective

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Abstract

Vjosa River, an ecologically important area and the last Europe free-flowing river, is an essential aquatic ecosystem for the Albanian ecological, social, and cultural aspects. The Vjosa river is home of at least 34 species of fishes inhabiting the river and delta system, of which 29 are native, including eight species endemic to the Balkans. With 12 species, Cyprinidae are by far the most specious family, followed by Mugilidae (five). Salmonidae and Acipenseridae are represented by 2 species each. The remaining ten families are represented by a single species. At least four species (*Pseudorasbora parva*, *Oncorhynchus mykiss*, *Carassius* sp., *Gambusia holbrooki*) were introduced into the Vjosa basin. The lower river reach is populated by other species as: European eel (*Anguilla anguilla*), species of Family Mugilidae (*Mugil cephalus*, *Liza ramada*, *Liza salienes* and *Chelon labrosus*), Seabream (*Sparus aurata*), Seabass (*Dincentrarchus labrax*), Flatfish (*Platichthys flesus*, Common sole (*Solea* spp.) etc, while the resident species associated with saline water include, are numerically prevalent with the two species *Atherina boyeri* and *Aphanius fasciatus* showing presence and significance.

Introduction

Albanian watersheds are defined as distinct river basins or isolated sub-basins, usually defined naturally by watershed boundaries. In Albania, there are several large, temporally independent river and lake systems. From north to south, they are arranged as follows: Drini (Ohrid-Drin-Skadar system including the Buna River), Mat, Ishëm, Erzen, Shkumbin, Seman (consisting of two major tributaries - Devoll and Osum), Vjosë (Aos in Greece) river systems, several short rivers flowing from the Cika Mountains to the southernmost part of the Adriatic Sea and to the northernmost part of the Ionian Sea, the area around the Butrint lagoon (rivers Bistrica and Pavllo) and Lake Prespa (Figure 1). Most of the above lakes and rivers belong to the catchment area of the Adriatic Sea and the southernmost areas to the slope of the Ionian Sea. Only a very small area in the northernmost part of Albania, in the Albanian Alps, is part of the Danube River basin. The area covered by this study corresponds to Vjosa basin and as stated above it lies at the Adriatic Basin.

The differences in geological settings and structures, physico-chemical characters of water in the different drainage basins enables different conditions for the development of fish communities, within Adriatic watercourses. That has also enabled speciation processes. It is worth to mention fact that the waters belonging to different basins have been under the influence of different conditions and events.

With a catchment of 6700 km² the Vjosa has a mean annual discharge of 204 m³/s. While the discharge during dry periods (Summer) drops down to levels of 40-50 m³/s, annual flood events show a magnitude of >1000 m³/s. This river shows a very active sediment regime with an estimated transport at the Pocem bridge of 5 million tons per year. The sediments mainly consisted of the substrate classes psammal, akal and mikrolithal [1, 2]. The native ichthyofauna of the River Vjosa reflects the rich geological past and geographic position of the basin, given the large number of *Near Endemic* species (Species almost entirely found within Vjosa territory and most of them are found in two lake systems shared with neighboring countries i.e., Albania and Greece) and *Endemics Balkans* (Species restricted to the southern Balkans, specifically, to the Southeast Adriatic). There are species in the genera *Oxynoemacheilus*, *Cobitis* and *Pelagusus*.



Figure 1. Albanian River basins

Material and Methods

A systematic review of the literature has been conducted following the guidelines of [3]. The work was focused on peer-reviewed studies, PhD and Master's theses, and scientific reports regarding Vjosa basin that were written in English and published online. The data search was conducted in three comprehensive databases of scholarly publications- Web of Science, Google Scholar and Scopus between January 2000 and December 2022. The preliminary assessment has been conducted of a subset of articles prior to the main search to determine the search-string combination to utilize. All results were evaluated for relevancy and to avoid papers that were not related to our focus for each search-string. Examples of the search-strings include: water quality parameters, fish diversity, decline factors, management, conservation, livelihood profile, etc. Then, I found 59, 11, 8 peer reviewed papers from Google scholar, web of science and Scopus, respectively. Finally, I was reviewed 33 papers.

Results and Discussions

The very recent research and literature data focused to the freshwater of Albania and River Vjosa have confirmed that the current fish fauna consists of 34 species from 10 orders and 14 families [4-12]. Among them 29 species are native to the River Vjosa basin: with 12 species, *Cyprinidae* are by far the most specious family, followed by *Mugilidae* (five). *Salmonidae* and *Acipenseridae* are represented by 2 species each. The remaining ten families are represented by a single species. At least five species (*Pseudorasbora parva*, *Oncorhynchus mykiss*, *Carassius gibelio*, *Chtenopharyngodon idella* and *Gambusia holbrooki*) were introduced into the Vjosa basin. The lower river reach is populated by other species as: European eel (*Anguilla anguilla*), species of Family *Mugilidae* (*Mugil cephalus*, *Chelon ramada*, *Chelon salienes* and *Chelon labrosus*), Seabream (*Sparus aurata*), Seabass (*Dicentrarchus labrax*), Flatfish (*Platichthys flesus*, Common sole (*Solea* spp.) etc, while the resident species associated with saline water include, are numerically prevalent with the two species *Atherina boyeri* and *Aphanius fasciatus* showing presence and significance. The remaining four alien species, all introduced over the past 100 years as a consequence of human activity or unintentional one. According to the Albanian red list (MoE, 2013), three species are endangered (*Acipenser naccarii*, *Acipenser sturio*, and *Aphanius fasciatus*) and two vulnerable (*Petromyzon marinus* and *Platichthys flesus*). IUCN considers three species to be critically endangered (*Acipenser naccarii*, *Acipenser sturio* and *Anguilla Anguilla*) and additionally *Gobio skadarensis* is categorized as endangered. The Bern convention lists three species in Annex II (strictly protected fauna species) (*Acipenser naccarii*, *Acipenser sturio* and *Aphanius fasciatus*) and two as in Annex III (*Alburnoides aff. Prespensis*, *Chondrostoma vardarensis*, *Pachychlion pictum* and *Petromyzon marinus*) [13-16]. There is a severe lack of knowledge concerning these systems compared to other systems in Europe, resulting in limited available data information about these species and their population status. This means that more species than previously thought could be severely threatened.

Conclusion

Given to the fact that nowadays, the aquatic and riparian fauna and particularly fish species in many river basins in Albania are at risk, the conservation approaches are of vital importance. Lowland section and deltaic system of Vjosa is at greatest risk due to changes in agricultural practices, current development large sale of infrastructure, tourism and large-scale modifications in headwaters. Following this, the WFD demands a reduction of human impacts to establish a 'good' water status, however, at present the Directive is only being implemented in EU country, but Albania as a candidate one has to consider the conservation and monitoring aspects.

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