



Research Article

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Some information on the species composition of the native freshwater ichthyofauna in Albania and their conservation status according to the IUCN National Red List and the IUCN Red List of European Freshwater Fishes

Dritan Arapi

Research Centre of Flora and Fauna, Faculty of Natural Sciences, University of Tirana, Albania

Rigerta Sadikaj

Department of Biotechnology, Faculty of Natural Sciences, University of Tirana, Albania

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Abstract

A review of scientific studies on Albanian fish shows that there are 76 native freshwater species and subspecies, including 20 that are endemic. According to the IUCN National Red List, 38 species (50%) are in high-risk categories—Vulnerable (VU), Endangered (EN), and Critically Endangered (CR). Among these, 14 species (70%) are endemic. There are also differences between the IUCN National Red List and the IUCN Red List of European Freshwater Fishes in how species are classified across five categories: Least Threatened (LT), Not Evaluated (NE), Vulnerable (VU), Endangered (EN), and Critically Endangered (CR).

Keywords: Conservation status, IUCN Red List, native species, taxonomy, Albania.

1. Introduction

The history of ichthyological research in Albania, focused on identifying fish species in freshwater ecosystems, is relatively long. Most information comes from faunal studies that identified species and subspecies. In the early stages, research also included data on the commercial importance and biology of fish, such as reproduction, feeding, and distribution (Kola, 1942; Filipi, 1959). The study by Filipi (1959) on the ichthyofauna of Lake Ohrid is a good example of this approach. Most studies have identified species based on comparisons of physical traits (metric and meristic characteristics). In some cases, however, detailed biometric analyses of numerical data were not

used to support these identifications. Still, there are examples where such methods were applied, such as studies on species of the genus *Alburnoides* in the Vjosa River basin (Bogutskaya and Ahnelt, 2019). Since the early 2000s, genetic methods have increasingly been included in taxonomic studies of Albanian fish (Sell and Spirkovski, 2004; Sušnik et al., 2006; Snoj et al., 2009; and others). Taxonomic research in Albania has also led to the publication of two important books (Poljakov et al., 1958; Rakaj and Flloko, 1995). These works describe fish species found in freshwaters, lagoons, and coastal areas, including their morphology, distribution, and biology. Over the last 30 years, around 20 scientific studies by Albanian and international researchers have contributed further to the taxonomy of freshwater fish. Taxonomic information has also been included in studies related to fisheries, ecogeography, and human environmental impacts.

Research on the conservation status of fish in Albania is still limited. There is little data on marine fish species, while information on fish in lagoons and river deltas mainly focuses on commercially important species such as the European eel and mullets. More data are available for fish species in lakes and rivers, including studies from neighboring regions. The aim of this paper is to summarize the native and endemic fish species and subspecies found in Albanian freshwaters. It also provides an overview of their conservation status, with a focus on identifying species that are at high risk and need urgent protection.

2. Material and Methods

This paper summarizes published research in the field of ichthyology, carried out mainly by Albanian authors, as well as by foreign researchers who have studied fish in Albania and in transboundary waters. The focus is on native and endemic fish species. Fish were classified taxonomically, and their habitats were identified as lake species (lentic), river species (lotic), or species found in both environments. The study is based on different types of sources, including 28 scientific articles, two books on Albanian ichthyofauna, reports from international organizations such as the European Union and International Union for Conservation of Nature, final study reports, conservation guidelines, conference presentations, and other informative publications. The main topics addressed in this paper are:

- a) Taxonomy: Identification of fish species and subspecies in Albanian freshwaters, including their scientific names and names in English and Albanian.
- b) Spatial distribution: The habitats of each species are indicated using abbreviations for different water bodies (e.g., O – Ohrid, S – Skadar, V – Vjosa). Species are also classified by origin: native (n) or endemic (e), while introduced species (i) are excluded. This distinction is important for understanding ecological relationships and setting conservation priorities.
- c) Conservation status: The conservation status of native and endemic freshwater fish was evaluated using the IUCN Red Lists for Albania and Europe. According to IUCN criteria, species are classified into categories such as Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN), and Critically Endangered

(CR), as well as Extinct (EX), Regionally Extinct (RE), and Extinct in the Wild (EW). Two additional categories are also used: Not Evaluated (NE) and Data Deficient (DD). The results of these assessments are presented in tables and graphs.

3. Results

1. Taxonomy of native and endemic fish fauna in the freshwaters of Albania

The data presented in Table 1 and summarized in Figure 1 show the number of taxa (species and subspecies) within each taxonomic family. Based on the reviewed studies, especially scientific articles and research reports, a total of 13 taxonomic families were identified, including 70 species and 6 subspecies. These subspecies belong to the *Salmo letnica* complex (3), *Salmo trutta* complex (1), *Rutilus ohridanus* complex (1), and *Gobio gobio* complex (1). Compared to earlier (“classical”) assessments of Albanian freshwater fish, the number of identified taxa—particularly species—is higher. It is not yet clear whether this increase is due to the discovery of new species, the reclassification of subspecies as full species, or improvements in research methods, including the use of genetic analyses alongside traditional morphological methods. This issue will be discussed further in the results discussion.

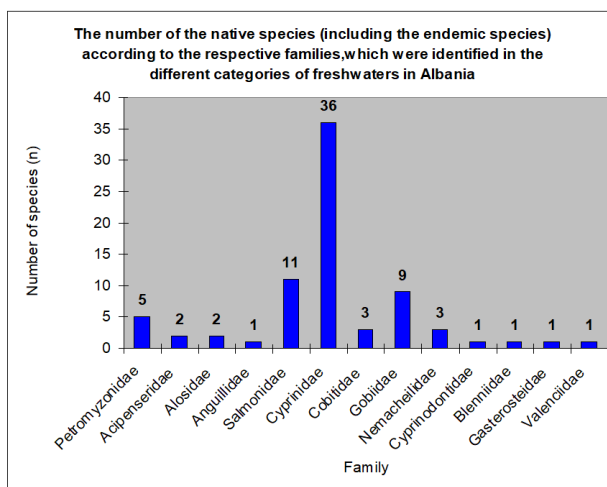


Figure 1. Taxonomic families of the native freshwater ichthyofauna of Albania and the number of species (including subspecies) in each family.

As expected, the largest number of taxa belongs to the Cyprinidae family, with a total of 36 species and subspecies (Figure 1). The Salmonidae (trout) family includes 11 species and subspecies. The Gobiidae family includes 8 species and one subspecies (*albanicus* of *Gobio gobio*). Researchers have identified 5 species from the Petromyzonidae family. The Cobitidae and Nemacheilidae families each include 3 species. The Acipenseridae and Alosidae families each have 2 species. Finally, the families Anguillidae, Blenniidae, Valenciidae, Cyprinodontidae, and Gasterosteidae are each represented by only one species in Albania’s freshwater fish fauna.

2. The distribution of fish species in the freshwaters of Albania

All five species of the Petromyzonidae family were found only in rivers. In the Buna River, three species were identified (*L. fluviatilis*, *L. soljani*, and *P. marinus*). The last two species, along with *E. stankokaramani*, were also recorded in the Black Drin River. The Vjosa River is another location where *P. marinus* has been found, while *C. graecus* is limited to the Pavlo River in Albania. The two sturgeon species are mainly found in the Buna River–Shkodra Lake system, according to most researchers. However, there are also reports of *A. naccarii* in the Vjosa River. A similar distribution pattern appears to apply to the two species of the genus *Alosa*. The distribution of the European eel (*Anguilla anguilla*) is relatively well known, as it occurs in rivers, lagoons, and other freshwater habitats across Albania.

Table 1/1. Native (including endemic) fish species in the different freshwater basins of Albania.

Scientific (latin) name	Albanian (local) name	English name	Lake	River
Petromyzonidae				
<i>Lampetra fluviatilis</i> Linnaeus, 1758	Kavall lumi	River lamprey	-	B
<i>Lampetra soljani</i> Tutman et al., 2017	-	Soljani lamprey	-	BD/B
<i>Petromyzon marinus</i> Linnaeus, 1758	Kavall deti	Sea lamprey	-	BD/B/V
<i>Eudontomyzon stankokaramani</i> Karaman, 1974	Kavall Drini	Drin brook lamprey	-	BD
<i>Caspionomyzon graecus</i> Renaud and Economidis, 2010	Kavall përroi	Epirus brook lamprey	-	P
Acipenseridae				
<i>Acipenser naccarii</i> Bonaparte, 1836	Blin i bardhë	Adriat. sturgeon	S	B/V/
<i>Acipenser sturio</i> Linnaeus, 1758	Blin	Europ. sea sturgeon	S	B
Alosidae				
<i>Alosa fallax</i> La Cepede, 1803	Kubël migratore	Twaite shad	S	B
<i>Alosa agone</i> Scopoli, 1786	Kubël liqenore	Agone	S	-
Anguillidae				
<i>Anguilla anguilla</i> Linnaeus, 1758	Ngjalë	Europ. eel	S/O/ P	BD/V/S
Salmonidae				
<i>Salmo fario</i> Linnaeus, 1758	Troftë Drini	Balkan brook trout	S	BD/V/M/B
<i>Salmo marmoratus</i> Cuvier, 1829	Troftë e mermertë	Marble trout	S	BD/Va
<i>Salmo aphelios</i> Kotelat, 1997	Koran i Verës	Summer trout	O	-
<i>Salmo letnica balcanicus</i> Karaman, S., 1928	Koran i Strugës	Struga trout	O	-
<i>Salmo letnica typicus</i> Karaman, S., 1924	Koran tipik	Ohrid trout	O	-
<i>Salmo letnica lumi</i> Poljakov et al., 1958	Koran lumi	Lumi trout	O	-
<i>Salmo ohridanus</i> Steindachner, 1892	Belushkë	Ohrid belyica	O	-
<i>Salmo peristericus</i> Karaman, S., 1938	Trofta e Prespës	Prespa trout	P	-
<i>Salmo montenegrinus</i> Karaman, S., 1933	Trofta e Cemit	Montenegro trout	S	BD
<i>Salmo trutta macrostigma</i> Dumeril, 1858	Troftë mali	Mountain trout	-	Sh
<i>Salmo obtustirostris</i> Heckel, 1851	Troftë gojë-butë	Softmouth trout	-	BD
Cyprinidae				
<i>Alburnoides ohridanus</i> Karaman, S., 1928	Barkgjëra e Ohrit	Ohrid spirlin	O/S	-
<i>Alburnoides prespensis</i> Karaman, S., 1924	Barkgjëra e Prespës	Prespa spirlin	P	V
<i>Alburnoides devolli</i> Bogutskaya et al., 2010	Barkgjëra e Devollit	Devolli spirlin	-	V/S
<i>Alburnoides fangfangae</i> Bogutskaya	Barkgjëra e Osumit	Osumi spirlin	-	V/S

Table 1/2

et al., 2010				
<i>Alburnoides bipunctatus</i> Bloch 1782	Barkgjëra e përroit	Spirlin	-	Sh/V
<i>Alburnus scoranza</i> Bonaparte, 1845	Pilashica	Ohrid bleak	O/S	V/B/
<i>Alburnus belvica</i> Karaman, 1924	Cironka	Prespa bleak	P	-
<i>Barbus rebeli</i> Koller 1926	Mustaku	Western Balcan barbel	O/S	-
<i>Barbus prespensis</i> Karaman, S., 1924	Mërena	Briana	B	V
<i>Barbus peloponnesius</i> Valenciennes, 1842	-	Peloponese barbel	-	Is
<i>Barbus balcanicus</i> Kotlik et al., 2002	-	Danube barbel	S	BD
<i>Luciobarbus albanicus</i> Steindachner, 1870	Millonai	Albanian barbel	-	V
<i>Luciobarbus (Barbus) graecus</i> Steindachner, 1895	Millona deti	Skarouni	-	Sh
<i>Chondrostoma ohridanum</i> Karaman, S., 1924	Skobusi	Ohrid nase	O	BD
<i>Chondrostoma prespense</i> Karaman, S., 1924	Skobus buzak	Prespa nase	P	-
<i>Chondrostoma scodrense</i> Elvira, 1987	Niilë	Skadar nase	S	B
<i>Chondrostoma vardarensis</i> Karaman, S., 1928	Niilë Vardari	Vardar nase	-	V
<i>Cyprinus carpio</i> Linnaeus, 1758	Krapi	Common carp	S/O/ P	V/B/BD
<i>Pachychilon pictum</i> Heckel and Kner 1858	Skort i Zi	Black roach	O	V/B
<i>Phoxinus karsticus</i> Binco and De Bonis, 2015	Grunc karsti	Karst minnow	-	B
<i>Phoxinus lumaireul</i> Schinz, 1840	Pior cigan italian	Italian minnow	O	-
<i>Pelagius minutus</i> Karaman, S., 1924	Grunci i Ohrit	Ohrid minnow	O/S	BD
<i>Pelagius prespensis</i> Karaman, S., 1924	Grunci i Prespës	Prepa minnow	P	S
<i>Pelagius thesproticus</i> Stephanidis, 1939	Grunci i Viosës	Epiros minnow	-	P/Is
<i>Rutilus (Leucos) albus</i> Maric, 2010	Skort i bardhë	White roach	O	B
<i>Rutilus (Leucos) prespensis</i> Karaman, S., 1924	Pilotica	Yellow roach	P	-
<i>Rutilus (Leucos) ohridanum</i> Karaman, S., 1924	Gurnecka	Ohrid roach	O/S	BD
<i>Rutilus basac ohridanum</i> Maric, 1989	Shytëza	Albanian roach	S	-
<i>Scardinius knjezovici</i> Bianco and Kottelat, 2005	Lloska Drenga	Skadar rudd	S/O	-
<i>Squalius platiceps</i> Zupancic et al., 2010	Mëlysh	Skadar chub	S	BD/E/V
<i>Squalius prespensis</i> Fowler, 1977	Klen	Prespa chub	P	-
<i>Squalius cephalus</i> Linnaeus, 1758	Klen	European chub	S	BD/V
<i>Squalius squalus</i> Bonaparte, 1837	Klen italian	Cavedano chub	O	BD
<i>Squalius pamvoticus</i> Stephanidis, 1939	Mëlysh i Pavlos	Pamvotis chub	-	P
<i>Telestes montenegrinus</i> Vukovic, 1963	Skort me vizë	Montenegro riffle dace	S	B
<i>Telestes pleurobipunctatus</i>	Skort përroi	Greek riffle	-	Is/P

Table 1/3

Stephanidis, 1939		dace		
Cobitidae				
<i>Cobitis ohridana</i> Karaman, S., 1928	Mërenka gjëmbace	Spined loach	O/S	BD/V
<i>Cobitis meridionalis</i> Karaman, S., 1924	Mërenë e egër	Prespa spined loach	P	-
<i>Sabanejewia balcanica</i> Karaman, S., 1922	Mërenka e artë	Balkan golden loach	-	BD/B
Gobiidae				
<i>Gobio skadarensis</i> Karaman, S., 1936	Njëmstakor Shkodre	Skadar gudgeon	S	B/M/E/S
<i>Gobio ohridanus</i> Karaman, S., 1924	Njëmstakor Ohri	Ohrid gudgeon	O	BD
<i>Gobio gobio albanicus</i> Oliva, 1961	Njëmstakori	Albanian gudgeon	-	Sh
<i>Knipowitschia montenegrina</i> Kovacic and Sanda, 2007	Burdullaku i vogël	Moraca river goby	-	B/BD
<i>Knipowitschia goerneri</i> Anheld, 1991	Burdullaku i Korfuzit	Corfu dwarf goby	-	P
<i>Nimigobius (Pomatoschistus) canestrinii</i> Ninni, 1883	Burdullak Kanestrini	Canestrini's goby	-	C/B
<i>Nimigobius montenegrinus</i> Miller and Sanda, 2008	Burdullak Shkodre	Skadar lake goby	S	B/BD/C
<i>Pomatoschistus marmoratus</i> Risso, 1810	Burdullak i mermertë	Marbled goby	-	BD
<i>Economidichthys pygmaeus</i> Holly, 1929	-	Western Greece goby		P
Nemacheilidae				
<i>Barbatula zetensis</i> Soric, 2001	Tufëza e Zetës	Zeta stone loach	-	C/B
<i>Barbatula sturanyi</i> Steindachner, 1892	Tufëza e Ohrit	Ohrid stone loach	O	BD
<i>Oxymacheilus pinus</i> Economidis, 2005	Tufëza e Vjosës	Pinus stone loach	-	V/Sh/S/
Cyprinodontidae				
<i>Aphanius fasciatus</i> Valenciennes, 1821	Celiku	Mediterranean killifish	-	BD/S/V
Blenniidae				
<i>Salariaopsis fluviatilis</i> Asso y del Rio 1801	Barburig lumi	Freshwater blenny	S	B/V/S/Is
Gasterosteidae				
<i>Gasterosteus gymnotus</i> Cuvier, 1829	Tri-gjilpërëza	Three-spined stickleback	S	BD/P/B
Valenciidae				
<i>Valencia letourneuxi</i> Sauvage, 1880	Verdhosh bari	Corfu toothcarp	Bt	Is

The eleven trout taxa (genus *Salmo*) included in this study can be divided into three ecological groups based on habitat. The first group includes lake-dwelling

(limnophilic) species, found in Lake Ohrid (*S. letnica typicus*, *S. letnica lumi*, *S. letnica balcanicus*, *S. aphelios*, *S. ohridanus*) and in Lake Prespa (*S. peristericus*).

The second group includes river-dwelling (potamophilic) trout. The most widespread species is *S. farioides*, found in the Black Drin, Buna, Mat, and Vjosa rivers, as well as in smaller streams. Other river species have a more limited distribution: *S. marmoratus* occurs only in the Black Drin and Valbona rivers, *S. obtusirostris* only in the Black Drin, and *S. trutta macrostigma* in the Shkumbin River. The third group includes species that live in both rivers and lakes. Only one species fits this category, *S. montenegrinus*. In addition, the so-called "Cemi trout" has been found in the Cem and Black Drin rivers, as well as in Lake Shkodra. Cyprinid fishes (family Cyprinidae) are the most widespread and occur in all types of freshwater habitats. Unlike trout, they are less specialized and can live in both rivers and lakes, although some differences in habitat preference exist.

Some cyprinid species were found only in lakes:

- In Lakes Shkodra and Ohrid: *A. ohridanus*, *B. rebeli*, *S. knezevici*;
- In Lake Prespa: *Ch. prespense*, *R. prespensis*, *Sq. prespensis*, *A. belvica*;
- In Lake Ohrid only: *Ph. lumaireul*, *R. ohridanus basac*;

Other cyprinid species were found only in rivers:

- In the Vjosa River: *A. devolli*, *A. fangfangae*, *Luciobarbus albanicus*, *Ch. Vardarensis*;
- In the Vjosa and Shkumbin rivers: *A. bipunctatus*;
- In the Shkumbin River: *L. graecus*;
- In the Buna River: *Ph. Karsticus*;
- In the Pavllo River and nearby Ionian streams: *B. peloponnesius*, *P. thesproticus*, *Sq. pamvoticus*, *T. pleurobipunctatus*;

All other cyprinid species listed in Table 1 were found in both lakes and rivers.

4. Conservation status of the Albanian freshwater ichthyofauna according to IUCN Red List

The National Red List of Albania shows important differences compared to the Red List of European Freshwater Fishes when assessing the conservation status of native fish species (Figures 2 and 3). This is expected because environmental conditions and human impacts vary across regions, affecting fish populations differently in different parts of Europe, including Albania. This pattern is also shown by the data in Table 2, which were used to create Figures 2 and 3. The greatest similarity between the two Red Lists is for species that were not evaluated or lacked sufficient data (NE and DD). In Albania's Red List, 18 species (23.68%) fall into these categories, while in the European Red List, the number is 20 species (26.32%). The largest difference between the two assessments is seen in the number and percentage of species classified as Least Concern (LC).

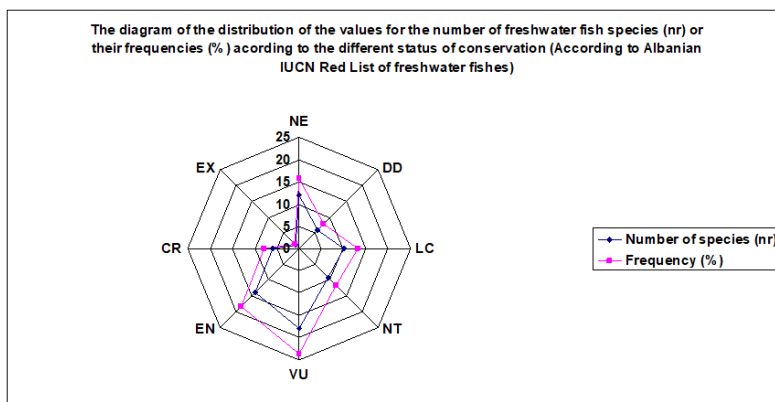


Figura 2. Statistical data on the distribution of Albanian freshwater fish fauna according to conservation status, evaluated using the IUCN Red List of Albanian ichthyofauna

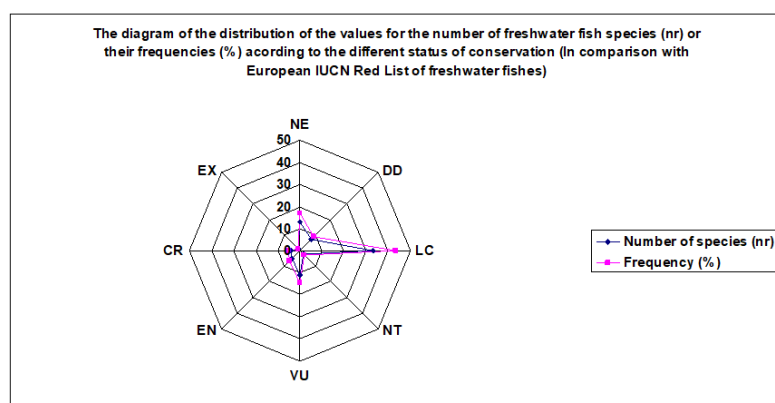


Figura 3. Statistical data on the distribution of Albanian freshwater fish fauna according to conservation status, evaluated using the IUCN Red List of European freshwater ichthyofauna

According to the Albanian Red List, 10 species (13.16%) are classified as Least Concern (LC), while the European Red List classifies 33 species (43.42%) in this category. Some species are considered less threatened at the European level but more at risk in Albania. For example, *Lampetra fluviatilis*, *Salmo marmoratus*, *Squalius prespensis*, and *Aphanius fasciatus* are listed as LC in Europe but as Endangered (EN) in Albania. Similarly, seven species classified as Vulnerable (VU) in Albania are considered LC in the European Red List. In contrast, two species (*Luciobarbus graecus* and *Gobio scadarensis*) show the opposite pattern: they are classified as Endangered (EN) in Europe but as Least Concern (LC) in Albania. Overall, differences between the two assessments are clear across several risk categories. The biggest difference is in the number of species considered at high risk (VU, EN, CR, and EX). According to the

Albanian Red List, 39 species (51.32%) fall into these categories, compared to only 21 species (27.63%) in the European Red List. This shows that the national assessment indicates a more critical conservation situation for freshwater fish in Albania than the broader European assessment.

Table 2/1. The conservation status of the native freshwater Albanian ichthofauna according to the IUCN Red List Categories (Albanian Red List and European Red List for Freshwater Fishes)

Scientific (latin) name	Native (n)/Endemic (e)	Conservation status (according to Albanian Red List)	Conservation status (according to European Red List)
Petromyzonidae			
<i>Lampetra fluviatilis</i> Linnaeus, 1758	n	EN	LC
<i>Lampetra soljani</i> Tutman et al., 2017	n	DD	NE
<i>Petromyzon marinus</i> Linnaeus, 1758	n	VU	LC
<i>Eudontomyzon stankokaramani</i> Karaman, 1974	n	VU	LC
<i>Eudontomyzon (Caspionymzon) graecus</i> Renaud and Economidis, 2010	n	CR	NE
Acipenseridae			
<i>Acipenser naccarii</i> Bonaparte, 1836	n	CR	CR
<i>Acipenser sturio</i> Linnaeus, 1758	n	EN	CR
Alosidae			
<i>Alosa fallax</i> La Cèpe, 1803	n	VU	NT
<i>Alosa agone</i> Scopoli, 1786	e	VU	LC
Anguillidae			
<i>Anguilla anguilla</i> Linnaeus, 1758	n	CR	CR
Salmonidae			
<i>Salmo fario</i> Karaman, S., 1937	n	VU	NE
<i>Salmo marmoratus</i> Cuvier, 1829	n	EN	LC
<i>Salmo aphelios</i> Kotelat, 1997	e	NE	DD
<i>Salmo letnica balcanicus</i> Karaman, S., 1928	e	EN	DD
<i>Salmo letnica typicus</i> Karaman, S., 1924	e	VU	DD
<i>Salmo letnica lumi</i> Poljakov et al., 1958	e	CR	DD
<i>Salmo ohridanus</i> Steindachner, 1892	e	EN	VU
<i>Salmo peristericus</i> Karaman, S., 1938	e	CR	EN
<i>Salmo montenegrinus</i> Karaman, S., 1933	n	VU	NE
<i>Salmo trutta macrostigma</i> Dumeril, 1858	n	EN	NE
<i>Salmo obtusirostris</i> Heckel, 1851	n	NE	EN
Cyprinidae			
<i>Alburnoides ohridanus</i> Karaman, S., 1928	n	NT	VU
<i>Alburnoides prespensis</i> Karaman, S., 1924	e	VU	VU
<i>Alburnoides devolli</i> Bogutskaya et al., 2010	e	EN	NE
<i>Alburnoides fangfagae</i> Bogutskaya et al., 2010	e	NT	NE
<i>Alburnoides bipunctatus</i> Bloch, 1782	n	NE	LC
<i>Alburnus scoranza</i> Bonaparte, 1845	n	NT	LC
<i>Alburnus belvica</i> Karaman, 1924	e	EN	VU
<i>Barbus rebeli</i> Koller, 1926	n	LC	LC
<i>Barbus prespensis</i> Karaman, S., 1924	n	NT	VU
<i>Barbus peloponnesius</i> Valenciennes, 1842	e	NT	LC

Table 2/2

<i>Barbus balcanicus</i> Kotlik et al., 2002	n	DD	LC
<i>Luciobarbus albanicus</i> Steindachner, 1870	e	LC	LC
<i>Luciobarbus graecus</i> Steindachner, 1895	e	LC	EN
<i>Chondrostoma ohridanum</i> Karaman, S., 1924	n	NE	NE
<i>Chondrostoma prespense</i> Karaman, S., 1924	e	EN	VU
<i>Chondrostoma scodrense</i> Elvira, 1987	n	EX	EX
<i>Chondrostoma vardarensis</i> Karaman, S., 1928	n	LC	NE
<i>Cyprinus carpio</i> Linnaeus, 1758	n	VU	VU
<i>Pachychilon pictum</i> Heckel and Kner 1858	n	LC	LC
<i>Phoxinus karsticus</i> Binco and De Bonis, 2015	n	NE	NE
<i>Phoxinus phoxinus</i> Schinz, 1840	n	NE	LC
<i>Pelagus minutus</i> Karaman, S., 1924	n	VU	DD
<i>Pelagus prespensis</i> Karaman, S., 1924	e	VU	EN
<i>Pelagus theproticus</i> Stephanidis, 1939	n	VU	NT
<i>Rutilus (Leucos) albus</i> Maric, 2010	n	EN	NE
<i>Rutilus (Leucos) prespensis</i> Karaman, S., 1924	n	NE	VU
<i>Rutilus (Leucos) ohridanum</i> Karaman, S., 1924	n	NE	LC
<i>Rutilus (Leucos) basac</i> Heckel, 1843	n	VU	LC
<i>Scardinius kriezevici</i> Bianco and Kottelat, 2005	n	VU	LC
<i>Squalius platiceps</i> Zupancic et al., 2010	n	LC	LC
<i>Squalius prespensis</i> Fowler, 1977	e	EN	LC
<i>Squalius cephalus</i> Linnaeus, 1758	n	LC	LC
<i>Squalius squalus</i> Bonaparte, 1837	n	NE	LC
<i>Squalius pannonicus</i> Stephanidis, 1939	n	NT	LC
<i>Telestes montenegrinus</i> , Vukovic, 1963	n	NT	LC
<i>Telestes pleurobipunctatus</i> Stephanidis, 1939	n	VU	LC
Cobitidae			
<i>Cobitis ohridana</i> Karaman, S., 1928	n	NT	LC
<i>Cobitis meridionalis</i> Karaman, S., 1924	e	EN	VU
<i>Sabanejewia balcanica</i> Karaman, S., 1922	n	DD	LC
Gobiidae			
<i>Gobio skadarensis</i> Karaman, S., 1936	n	LC	EN
<i>Gobio ohridanum</i> Karaman, S., 1924	e	EN	VU
<i>Gobio gobio albanicus</i> Oliva, 1961	n	LC	LC
<i>Knipowitschia montenegrina</i> Kovacic and Sanda, 2007	n	VU	DD
<i>Knipowitschia goerneri</i> Anhalt, 1991	n	DD	DD
<i>Pomatoschistus canestrinii</i> Ninni, 1883	n	NE	LC
<i>Pomatoschistus montenegrensis</i> Miller and Sanda, 2008	n	DD	LC
<i>Pomatoschistus marmoratus</i> Risso, 1810	n	NE	NE

Table 2/3

<i>Economidichthys pygmaeus</i> Holly,1929	e	NE	LC
Nemacheilidae			
<i>Barbatula zetensis</i> Soric,2001	n	DD	LC
<i>Barbatula sturanyi</i> Steindachner,1892	e	VU	LC
<i>Oxymemacheilus pinchus</i> Economidis,2005	n	VU	VU
Cyprinodontidae			
<i>Aphanius fasciatus</i> Valenciennes,1821	n	EN	LC
Blenniidae			
<i>Salariopsis fluviatilis</i> Asso y del Rio 1801	n	NT	LC
Gasterosteidae			
<i>Gasterosteus gymmurus</i> Cuvier,1829	n	LC	LC
Valenciidae			
<i>Valencia letourmeuxi</i> Sauvage,1880	n	CR	CR

If we focus only on the endemic fish species found in Albanian freshwaters (20 species in total, according to our review of Albanian and foreign studies) (Table 3), clear differences appear between the two Red Lists. The number of species not evaluated or with insufficient data (NE and DD) is three times higher in the European Red List (6 species) than in the Albanian Red List (2 species). A similar pattern is seen in the Least Concern (LC) category. Only 2 endemic species are classified as LC in the Albanian Red List, compared to 6 species in the European Red List.

Table 3. The number of endemic fish species in the freshwaters of Albania and their status of conservation evaluated according to two IUCN Red Lists

Conservation status (according to IUCN Red List criteria)	Number of endemic species (according to IUCN Albanian Red List)	Number of endemic species (according to IUCN European Red List of Freshwater fishes)
NE	2	2
DD	0	4
LC	2	6
NT	2	0
VU	5	5
EN	7	3
CR	2	0
EX	0	0

During the assessment of the conservation status of native freshwater fish in Albania, we found that out of 76 species, 39 species (51%) were placed in the four highest risk categories when using the Albanian Red List, compared to 21 species (28%) when using the European Red List of Freshwater Fishes. When focusing only on endemic species, the results show a similar pattern. Using the Albanian Red List, 14 species (70%) were classified in the highest risk categories, while using the European Red List, 8 species (40%) were included in these categories. It is also important to note that the ratio between the two assessments is similar for both native and endemic fish. For native species, the ratio is $51/28 = 1.82$, while for endemic species it is $70/40 = 1.75$, showing a consistent difference between the two Red Lists.

5. Discussion

Since this study is a synthesis of published research based on three main themes, including taxonomy, it is important to note that published information on limnophilic and potamophilic fish species in Albanian basins shows several inconsistencies. These include differences in the number of taxa (species and subspecies), variation in binomial nomenclature (where the same taxon is sometimes treated as a species and sometimes as a subspecies), and inconsistencies in the definition of species complexes in different habitats. To illustrate this, we refer to studies on the ichthyofauna of the Prespa Lakes. Different authors report different numbers of species and different classifications. For example, 23 fish taxa were identified, of which 11 are introduced and 7 of the remaining 12 are endemic (Crivelli et al., 1997). Another study reports 11 native and 12 introduced species, with 9 endemic species (Talevski et al., 2009). Shumka and Apostolou (2018) report 10 native species, 9 of which are endemic. Pietrock et al. (2022) recorded 15 of 26 previously reported species using new sampling methods. Although some values are similar, overall results vary between studies. Biodiversity naturally changes over time, especially due to factors such as species introductions. However, basic records of native and endemic fauna should not vary significantly, particularly in stable lake ecosystems. A second taxonomic issue concerns changes in classification, where some taxa previously described as subspecies are now elevated to species level. In some cases, sympatric populations are given different species names based mainly on morphological and meristic differences. This reflects different interpretations of the species concept, particularly in foreign taxonomic literature. For example, the genus *Squalius* includes 54 species in European freshwater systems. It is not necessary to fully discuss species concepts here, but two main ideas are relevant: the morphological (taxonomic) species concept and the biological species concept. The biological species concept defines species as groups of populations that can interbreed but are reproductively isolated from others (Mayr, 1970; de Queiroz, 2005). If these concepts are distinguished, it becomes important to ask whether recently defined “taxonomic species” in Albanian freshwater ichthyofauna also represent true biological species. In other words, are morphologically distinct populations also reproductively isolated? Reproductive isolation—through anatomical, genetic, or

behavioral barriers—is a key step in evolution and speciation. A clear example is the trout species in Lake Ohrid. Morphological differences between *Salmo aphelios* and *Salmo letnica* are less important than differences in spawning time, which act as reproductive barriers and support their status as separate biological species. This discussion does not question the results of taxonomic research, which are valuable and important. However, theoretical interpretation is also essential. Since reproduction is the key feature that distinguishes living organisms, greater caution is needed when defining species based only on morphological or biometric traits. Ernst Mayr (1904–2005), who introduced the biological species concept, emphasized that reproductive isolation defines species. Populations become separate species when they can no longer interbreed successfully or produce fertile offspring (Mayr, 1970). Modern systematics increasingly integrates evolutionary biology, where species remain a central concept (de Queiroz, 2005). According to our assessment, out of 76 native freshwater fish species in Albania, 38 (50%) are listed in the threatened categories (VU, EN, CR), and one species is considered extinct (EX). Given that half of the native ichthyofauna is under pressure from environmental and human impacts, there is a need to strengthen research on fish population dynamics, especially reproductive capacity. This is particularly important for Salmonidae species and economically important trout, which have low fecundity and limited tolerance to environmental change.

6. Conclusion

A review of scientific literature on the taxonomy, distribution, and conservation status of native fish in Albanian freshwaters identified 76 species and subspecies, of which 20 are endemic. According to the IUCN Red List of Albanian fish fauna, 38 native species (50%) are classified in the highest risk categories (VU, EN, and CR). Among these, 14 species (70% of all endemic species) are endemic. These results show the need to strengthen research in order to identify the main pressures and develop effective conservation measures to support the recovery of affected populations.

References

- Bogutskaya, N. G., & Ahnelt, H. (2019). New data on the western Balkan leuciscids *Alburnoides* and *Alburnus* (Teleostei; Leuciscidae) from the Vjosa River, Albania. *ZooKeys*, 870, 101–115.
- Cake, A., & Miho, A. (2005). Fishes from Shkumbini River (Central Albania): An ecological view. *Journal of Ecological Protection and Ecology*, 2, 260–265.
- Crivelli, A., Catsadorakis, G., Malakou, M., & Rosecchi, E. (1997). Fish and fisheries of Prespa lakes. *Hydrobiologia*, 351(1), 107–125.
- de Queiroz, K. (2005). Ernst Mayr and the modern concept of species. *Systematics and the Origin of Species*, 3(102), 6600–6607.
- Dhora, Dh. (2003). *Peshqit e Liqenit të Shkodrës, Lumit Buna dhe ujërave pranë saj*. Botim i Sektorit Bio-Eko të Liqenit të Shkodrës. Universiteti i Shkodrës “Luigj Gurakuqi”, Nr. 5: 14–18.
- Dhora, Dh. (2009). Vleresime ekogjeografike per peshqit e ujrave te embel te Shqiperise. *Bul.*

- Shk. Ser. Shk. Nat, Univ. i Shkodres, 59, 160–188.
- Dhora, L. (2024). Comments about the genetic diversity phenomenon in the fish community of Lake Shkodra. *International Journal of Ecosystems and Ecology Science*, 14(4), 87–92.
- Dhora, L. (2025). Report on the species diversity of fish in Albania's major lakes. *European Journal of Environmental Sciences*, 15(2), 67–71.
- European Union. (1992). Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Document 31992L0043; Current consolidated version: 14/07/2025. <http://data.europa.eu/eli/dir/1992/43/oj>
- Filipi, N. (1959). Iktiofauna e Liqenit te Pogradecit dhe e afluenteve te tij. *Buletin i Stacionit te Kerkimeve te Ekonomise se Peshkimit*, 1, 140–173.
- Freyhof, J. (2012). *Threatened freshwater fishes and mollusks of the Balkan: Potential impact of hydropower projects* [Unpublished report]. ECA Watch Austria and EuroNatur.
- Freyhof, J., & Brooks, E. (2011). *European Red List of Freshwater Fishes*. Publications Office of the European Union.
- Hasanllari, R., & Xherri, Xh. (2025). *Peshqit e Bunes dhe Deltes se saj*. Bot. PPNEA. M&B Botime dhe Studio Grafike.
- Hoda, A., Locci, Ch., Azzena, I., et al. (2025). Exploring mitochondrial evolutionary pathways: Insights into the origin of the endemic Ohrid trout. *Life*, 15(1), 150–152.
- International Union for Conservation of Nature (IUCN). (2001). *IUCN Red List categories and criteria, version 3.1*. IUCN Species Survival Commission (SSC).
- International Union for Conservation of Nature (IUCN). (2012a). *Guidelines for application of IUCN Red List criteria at regional and national levels: Version 4.0*. IUCN.
- International Union for Conservation of Nature (IUCN). (2012b). *IUCN Red List categories and criteria: Version 3.1* (2nd ed.). IUCN.
- Kola, Gj. (1942). Gjuetia e peshkut ne Liqenit te Shkodres e lumenjte Buna, Kir e Drin. *Hylli i Drites*, 1–2, 72–78.
- Kovacic, M., & Sanda, R. (2007). A new species of *Knipowitschia* (Perciformes: Gobiidae) from southern Montenegro. *Journal of the National Museum (Prague), Natural History Series*, 176(5), 81–89.
- Marić, D. (2018). The ichthyofauna of Lake Skadar/Shkodra: Diversity, economic significance, condition and conservation. In V. Pesic, G. Karaman, & A. G. Kostianoy (Eds.), *The Skadar/Shkodra Lake Environment* (pp. 363–381). Springer.
- Mayr, E. (1970). *Populations, species, and evolution*. Harvard University Press.
- Meulenbroek, P., Shumka, S., & Schiemer, F. (2018). First reconnaissance of habitat partitioning and fish diversity in the alluvial zone of the river Vjosa, Albania. *Acta ZooBot Austria*, 155, 177–186.
- Milosevic, D., & Talevski, T. (2015). Conservation status of native species in natural lakes of Drim system (Prespa, Ohrid and Skadar Lake) and dangers of commercial fishing. *Bulgarian Journal of Agricultural Science*, 21(1), 61–67.
- Ministry of the Environment. (2013). Order Nr.1280, date 20.11.2013: For the approval of the updated Red List of Wild Flora and Fauna of Albania.
- Mrdak, D. (2009). *Environmental risk assessment of the Morača dams: Fish fauna of Morača river canyon and Skadar Lake*. WWF MedPO and Green Home.
- Ndoka, G. (2017). Dy specie te reja ne listen e peshqeve te Shqiperise. *Balkan Journal of Interdisciplinary Research*, 3(1), 70–87.
- Pietroock, M., Ritterbusch, D., Lewin, W. Ch., et al. (2022). The fish community of the ancient Prespa Lake (Southeast Europe): Non-indigenous species take over. *Fisheries and Aquatic Life*, 30, 112–124.
- Poljakov, G. D., Filipi, N., Basho, K., & Hysenaj, A. (1958). *Peshqit e Shqiperise*. Universiteti

Shtetëror i Tiranës.

- Radek, S., Vukic, J., Choleva, L., Krizek, J., Sediva, A., et al. (2008). Distribution of loach fishes (Cobitidae, Nemacheilidae) in Albania, with genetic analysis of populations of *Cobitis ohridana*. *Folia Zoologica*, 57(1-2), 42–50.
- Rakaj, N., & Crivelli, A. J. (2001). Occurrence of agone (*Alosa agone*) in Lake Shkodra, Albania in sympatry with twaite shad (*Alosa fallax nilotica*). *Bull. Fr. Peche. Piscic.*, 362/363, 1067–1073.
- Rakaj, N., & Flloko, A. (1995a). Conservation status of freshwater fish of Albania. *Biological Conservation*, 72(2), 195–199.
- Rakaj, N., & Flloko, A. (1995b). *Iktiofauna e Shqiperise*. Bot. i Lib. Universitar.
- Sanda, R., Vukic, J., Shumka, S., et al. (2008). Distribution of loach fishes (Nemacheilidae) in Albania, with genetic analysis of populations of *Cobitis ohridana*. *Folia Zoologica*, 57(1-2), 42–50.
- Schoffmann, J., Susnik, S., Snoj, A., Maric, S., & Rozman, R. (2022). Genetic and morphological diversity in brown trout (*Salmo* spp.) in the Aoos/Vjosa River drainage in Greece and Albania. *Österreichs Fischerei*, 75, 299–320.
- Sell, J., & Spirkovski, Z. (2004). Mitochondrial DNA differentiation between two forms of trout *Salmo letnica*, endemic to the Balkan Lake Ohrid, reflects their reproductive isolation. *Molecular Ecology*, 13, 3633–3644.
- Shumka, S. (2019). *NATURA 2000. Potential sites in Albania. A contribution of fish species of community interest*. Proceeding Book of ISESER. International Symposium for Environmental Science and Engineering Research, Konya, Turkey.
- Shumka, S., & Apostolou, A. (2018). Current knowledge on the status of the most common non-indigenous fish species in the transboundary Greater Prespa Lake (Albanian side). *Acta Zoologica Bulgarica*, 70(2), 203–209.
- Shumka, S., Kalogianni, E., Sanda, R., Vukic, J., Shumka, L., & Zimmerman, B. (2020b). Ecological particularities of the critically endangered killifish *Valencia letourneuxi* and its spring-fed habitats: A long-lost endemic species of South Albania. *Knowledge & Management of Aquatic Ecosystems*, 421, 45.
- Shumka, S., Lalaj, S., Sanda, R., et al. (2023). Recent data on the distribution of freshwater ichthyofauna in Albania. *Croatian Journal of Fisheries*, 81, 33–44.
- Shumka, S., Meulenbroek, P., Schiemer, F., & Sanda, R. (2018). Fishes of the River Vjosa—An annotated Checklist. *Acta ZooBot Austria*, 155, 163–176.
- Shumka, S., & Muçollari, N. (2023a). A review of fish diversity and management of the Vjosa basin: The first free flow river protected area in the Balkans. *Innovare Journal of Agri. Sci.*, 11(6), 32–36.
- Shumka, S., Sanda, R., Dhora, Dh., & Grapci-Kotori, L. (2023b). Fish resources of inland waters and fisheries in Albania, management, sustainability and conservation. In V. Simić et al. (Eds.), *Ecological Sustainability of Fish Resources of Inland Waters of the Western Balkans, Fish and Fisheries Series 43* (pp. 303–337). Springer.
- Shumka, S., Shumka, L., Trajce, K., & Ceci, S. (2020a). First record of the Western Greece goby—*Economidichthys pygmaeus* (Holly, 1929), in Greater Prespa Lake (Albania). *Ecologica Montenegrina*, 35, 78–81.
- Snoj, A., Maric, S., Berrebi, P., Crivelli, A. J., Shumka, S., & Susnik, S. (2009). Genetic architecture of trout from Albania as revealed by mtDNA control region variation. *Genetics Selection Evolution*, 41(1), 22.
- Sušnik, S., Knizhin, I., Snoj, A., & Weiss, S. (2006). Genetic and morphological characterization of a Lake Ohrid endemic, *Salmo (Acantholingua) ohridanus* with a comparison to sympatric *Salmo trutta*. *Journal of Fish Biology*, 67, 2–23.
- Talevski, T., Milosevic, D., Maric, D., Petrovic, D., Talevska, M., & Talevska, A. (2009). Biodiversity of ichthyofauna from Lake Prespa, Lake Ohrid and Lake Skadar. *Biotechnol and*

Biotechnol Equip, 23, 400–403.

Talevski, T., Milosevic, D., & Talevska, A. (2010). *Anthropogenic influence and conservation status of autochthonous fish fauna from Lake Ohrid*. BALWOIS 2010 - Ohrid, Republic of Macedonia.

Vukić, J., Ulqini, D., & Sanda, R. (2017). Occurrence of *Knipowitschia goerneri* Ahnelt, 1991 (Gobiidae) in Southern Albania confirmed with molecular tools. *Journal of Applied Ichthyology*, 13297.

Wilson, I. (2004). Low genetic variability in the summer Koran (*Salmo letnica aestivalis* Stefanovic) of Lake Ohrid. *Albanian Journal of Natural and Technical Sciences*, 16, 3–13.