

Balkan Rivers – Endangered Fish Species

Distributions and threats from hydropower development



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eurONATUR

RiverWatch



Wild Rivers - International - 8thOctober 2019 – Tirana, Albania

OUTLINE

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- 2) Goals and Scope of the Study
- 3) Species-Specific Examples
- 4) Biodiversity Hot Spots
- 5) Global Results
- 6) Hydropower Impacts
- 7) The Case for Wild Rivers

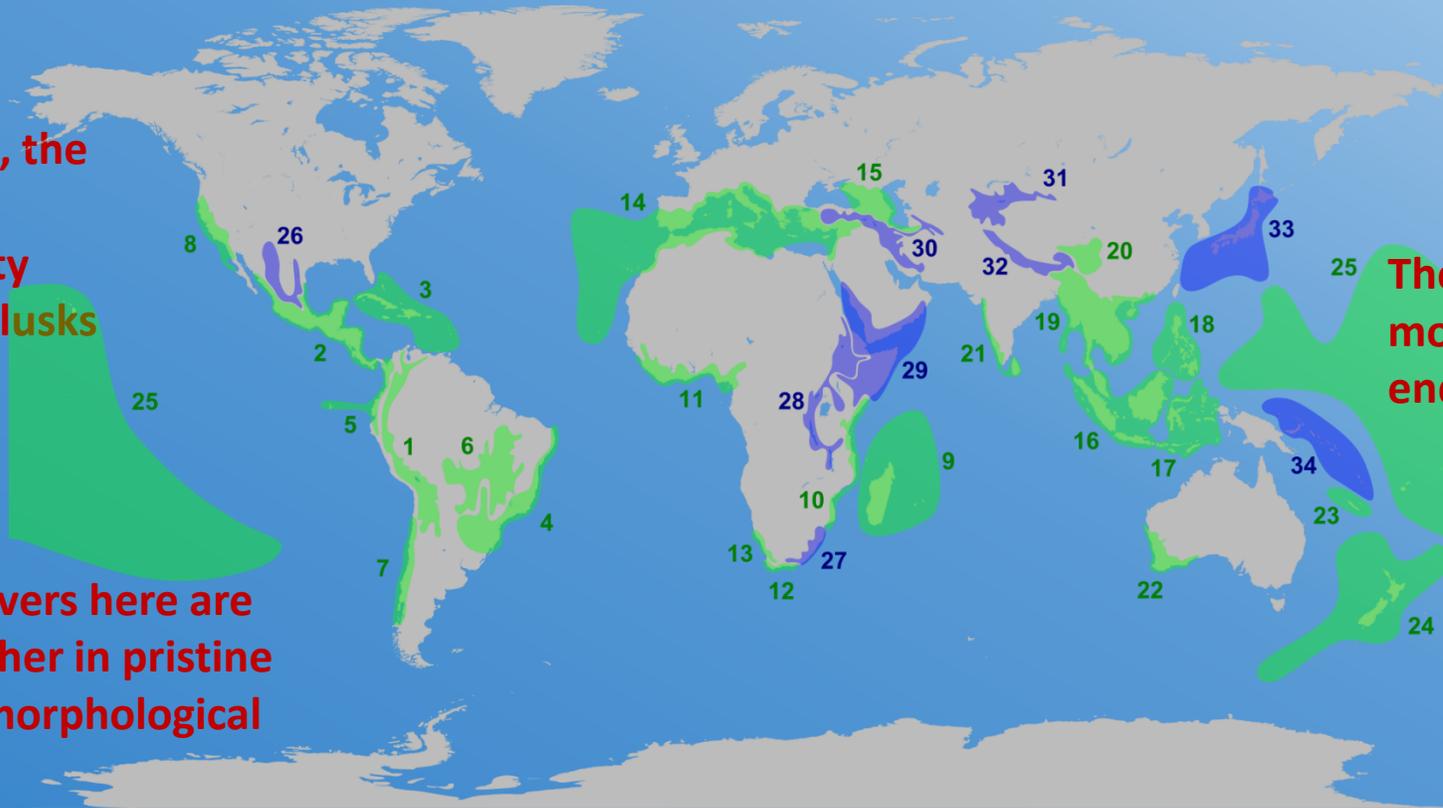
BACKGROUND

The Balkan Peninsula is at the center of one of the world's original 25 designated biodiversity hotspots

For freshwater fauna, the Balkans is the most important biodiversity hotspot for both mollusks and fishes in Europe.

35,000 km of rivers here are classified as either in pristine or good hydromorphological condition

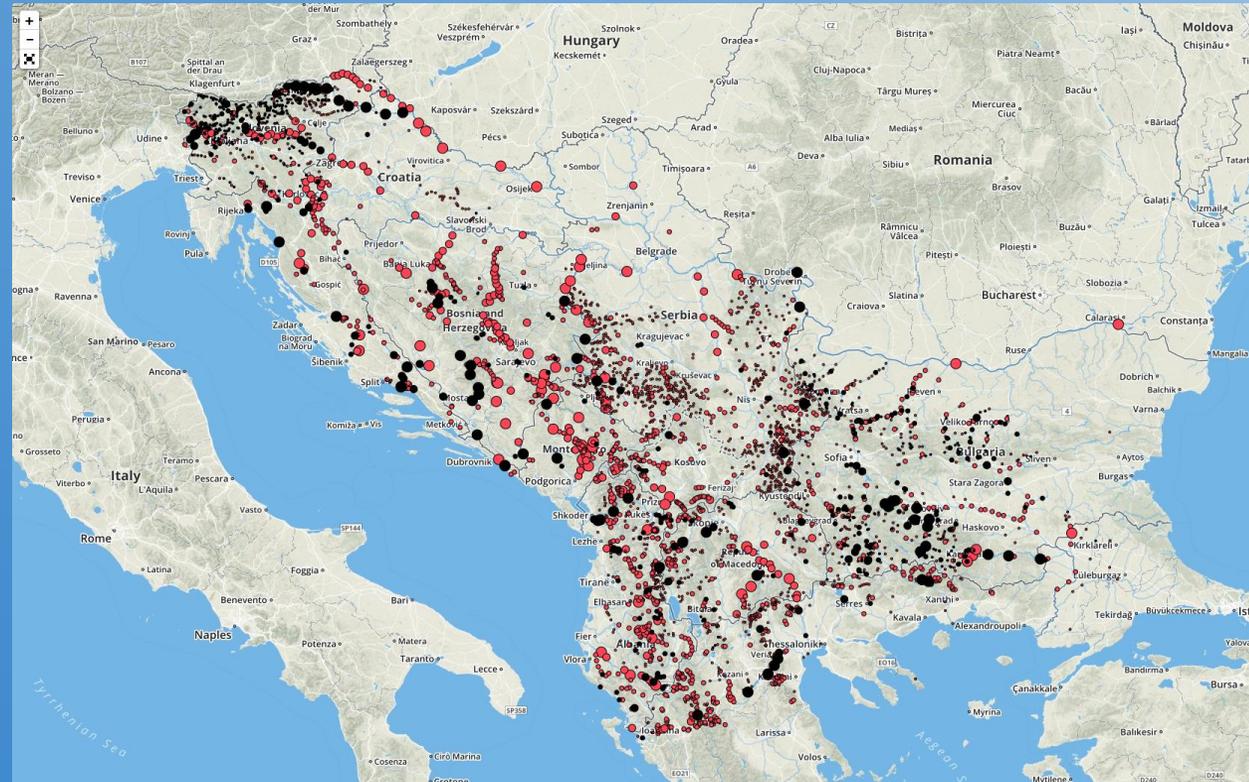
The Balkans harbours Europe's most dense concentration of endemic fish species.



BACKGROUND

Hydropower Distribution in the Balkan Region

- Planned
- Planned



68	> 50MW
178	10-50 MW
867	1-10 MW
1570	0,1-1 MW

Shown in red, there are 2,800 projects in planning (Schwarz 2017).

STUDY AREA

About 450,000 km² from Slovenia to northern Greece



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TARGET SPECIES

Freshwater Species – including anadromous & catadromous

emphasis on riverine fishes, including lacustrine species that either require rivers to spawn, or whose habitats could be threatened by changes in water level (***N* = 113**)

Listed in an **IUCN Red List - (Critically Endangered, Endangered, Vulnerable)** and/or appear in Annexes of the **European Habitat Directives (i.e. II, IV, V)**, or the Bern Convention (**Annexes II, II**)

Of this list, 101 species (90%), were considered **at least moderately sensitive to hydropower development**

Of these species and based on available information and taxonomic clarity , **82 were mapped**, based on available data, literature, and local expert contributions from scientists

SUMMARY TABLE

2) Goals & Study Area

Species	IUCN Red List Category	published in IUCN	Bern Convention Annexes	EUR-HAB-DIR Annexes	Hydropower sensitivity	Balkan dam threat	page
Acipenseridae							
<i>Acipenser gueldenstaedtii</i>	CR	2010		V	Very High	High	27
<i>Acipenser naccarii</i>	CR	2011	II	II, IV	Very High	High	28
<i>Acipenser nudiventris</i>	CR	2010		V	Very High	High	-
<i>Acipenser ruthenus</i>	VU	2010	III	V	High	High	29
<i>Acipenser stellatus</i>	CR	2010	III	V	Very High	High	30
<i>Huso</i>	CR	2010	II,III	V	Very High	High	31
Anguillidae							
<i>Anguilla</i>	CR	2014			Very High	Moderate	32
Baltoridae							
<i>Oxynoemacheilus pindus</i>	VU	2016			Very High	High	33
Clupeidae							
<i>Alosa fallax</i>	LC	2008	III	II, V	Very High	High	34
<i>Alosa immaculata</i>	VU	2008	III	II, V	Very High	High	35
<i>Alosa macedonica</i>	VU	2006*		II, V	Low	Low-to-Mod.	36
<i>Alosa maeotica</i>	LC	2008		II, V	Low	Low	-
<i>Alosa sp. nov. 'Skadar'</i>	VU	2008		II, V	Low	Mod.-to-High	37
<i>Alosa vistonica</i>	CR	2006*		II, V	Low	Low	-
Cobitidae							
<i>Cobitis arachthosensis</i>	EN	2006*	III	II	Moderate	Mod.-to-High	38
<i>Cobitis dalmatina</i>	VU	2006*	III	II	Moderate	High-to-Very High	39
<i>Cobitis elongata</i>	LC	2008	III	II	Moderate	Mod.-to-High	40
<i>Cobitis hellenica</i>	EN	2006*	III	II	Moderate	Very High	41
<i>Cobitis herzegoviniensis</i>	NE		III	II	Moderate	Low-to-Mod.	42
<i>Cobitis illyrica</i>	CR	2008	III	II	Moderate	Mod.-to-High	43

MAPPING RESULTS

Species-specific examples

Cobitis arachthosensis

Arachthos spined loach (eng.), Arachthos Steinbeisser (ger.), Arachthovelonitsa (gr.)



© Perica Mustavić

IUCN:

Endangered

EUR-HAB-DIR:

Annex II

Bern Convention:

Annex III

Hydropower Sensitivity:

Moderate

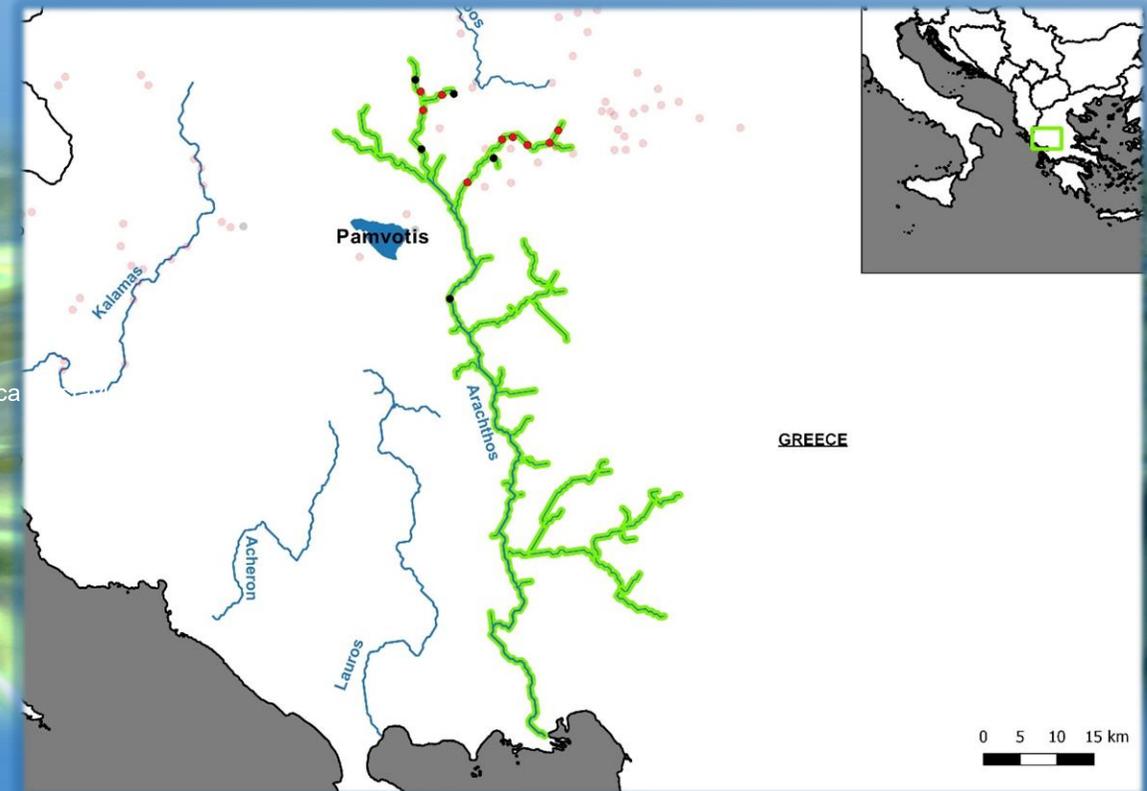
Balkan Dam Threat:

Moderate-to-High

Distribution and Habitat - Greece

The **Arachthos spined loach** is a small benthic loach endemic to the Arachthos drainage of which the upper third is in our study area (Zogaris et al 2009). Similar habitat preferences as *C. hellenica* – it prefers still to moderate flowing water with sand or silt substrates with vegetation. Canals between the Arachthos and Louros River are bringing *C. arachthosensis* and *C. hellenica* into contact (Crivelli 2006a). The IUCN Red List entry states that the status requires updating. Freyhof (2012) list the species as moderately sensitive to dam construction, as they can colonize reservoirs; they are however sensitive to the introduction of invasive species. If reservoirs are flushed or hydropeaking is part of the operation regime of a hydropower facility, loaches can be extirpated.

Up to nine hydropower schemes are planned in the upper Arachthos drainage, threatening to eliminate or drastically reduce this species in the study area.



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- Planned Hydropower Plants
- Existing Hydropower Plants

MAPPING RESULTS

Species-specific examples

Cobitis elongata

Balkan spined loach (eng.), Balkan Steinbeisser (ger.), Veliki vijun (hr.)



IUCN:
Least Concern
EUR-HAB-DIR:
Annex II

Bern Convention:
Annex III

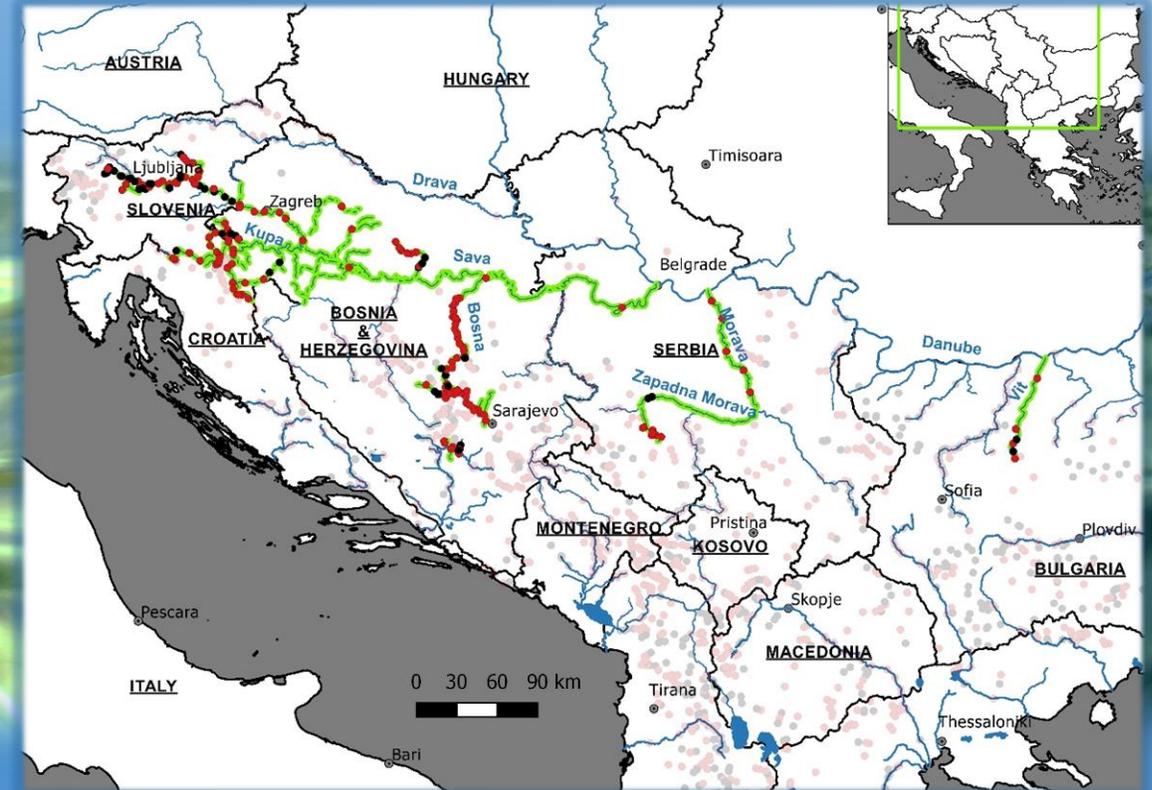
Hydropower Sensitivity:
Moderate

Balkan Dam Threat:
Moderate-to-High

Distribution and Habitat - Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Bulgaria

The **Balkan spined loach** is one of the more widely distributed loaches in the region. Reported from the Kolpa, Una, Sava, Morava and Zapadna Morava systems as well as the Vit River in Bulgaria (Mustafić et al 2003; Pehlivanov et al 2009; Čaleta et al 2015). Mičetić et al (2008) reported the species from the Petrinjčica River in Croatia. More of a large river specialist found on sandy shores and banks, occasionally over rocks with vegetation (Kottelat & Freyhof 2007). Kottelat & Freyhof (2007) also report that the species is not known to enter small streams or larger rivers without at least moderate current. While widespread, and moderately tolerant of pollution (Kopjar et al 2008) most of its habitat, especially in Slovenia and Bosnia-Herzegovina is targeted for large-scale hydropower development.

A loss of at least a third and up to 50% of this species habitat in the Balkans is threatened by more than 50 planned hydropower schemes.



- Planned Hydropower Plants
- Existing Hydropower Plants

MAPPING RESULTS

Species specific examples

Barbus rebeli

Western Balkan barbel (eng.), Westbalkan Barbe (ger.), Mrena e Fanit (al.)

© Spase Shumka



IUCN:

least Concern

EUR-HAB-DIR:

Annex V

Bern Convention:

Hydropower Sensitivity:

High

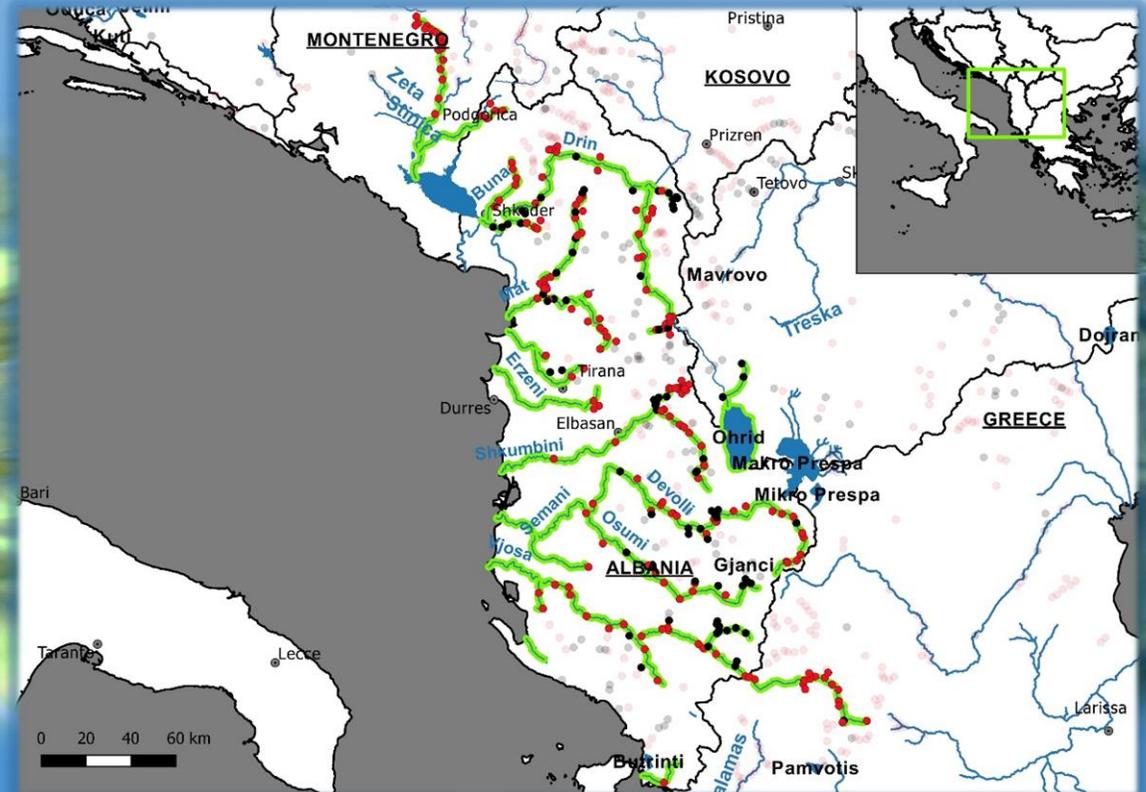
Balkan Dam Threat:

High

Distribution and Habitat – Greece, Macedonia, Montenegro, Albania

The **Western Balkan barbel** is found in the Adriatic basin from Drin to upper Vjosa River (Aaos) in Greece (Kottelat & Freyhof 2007). Found extensively in Albanian rivers, Marková et al (2010) reported three distinct mtDNA lineages of *B. rebeli* found in the following basins; a) Drin drainage from Zeta River to Lake Ohrid; b) northern Albanian rivers from Mati to Erzeni; c) Albanian rivers Shkumbini to Dukati but including Lake Prespa. But for the purposes of this report, we treat *B. prespa* as a distinct species. Also reported from both lakes Ohrid and Skadar (Talevski et al 2009), and the Cijevna River in Montenegro (Marić et al 2012). The species occurs both in lakes and streams, with overfishing potentially a problem in Albania (Kottelat & Freyhof 2007).

Several hundred hydropower plants are being planned throughout the entire range of the species. Their construction would lead to the elimination of at least 75% of the species habitat.



- Planned Hydropower Plants
- Existing Hydropower Plants

MAPPING RESULTS

Species specific examples

Hucho hucho

Huchen or Danube salmon (eng.), Huchen (ger.), mladica (hr.)

© Clemens Ratschan

IUCN:
Endangered

EUR-HAB-DIR:
Annex II, V

Bern Convention:
Annex III
Hydropower Sensitivity:
High

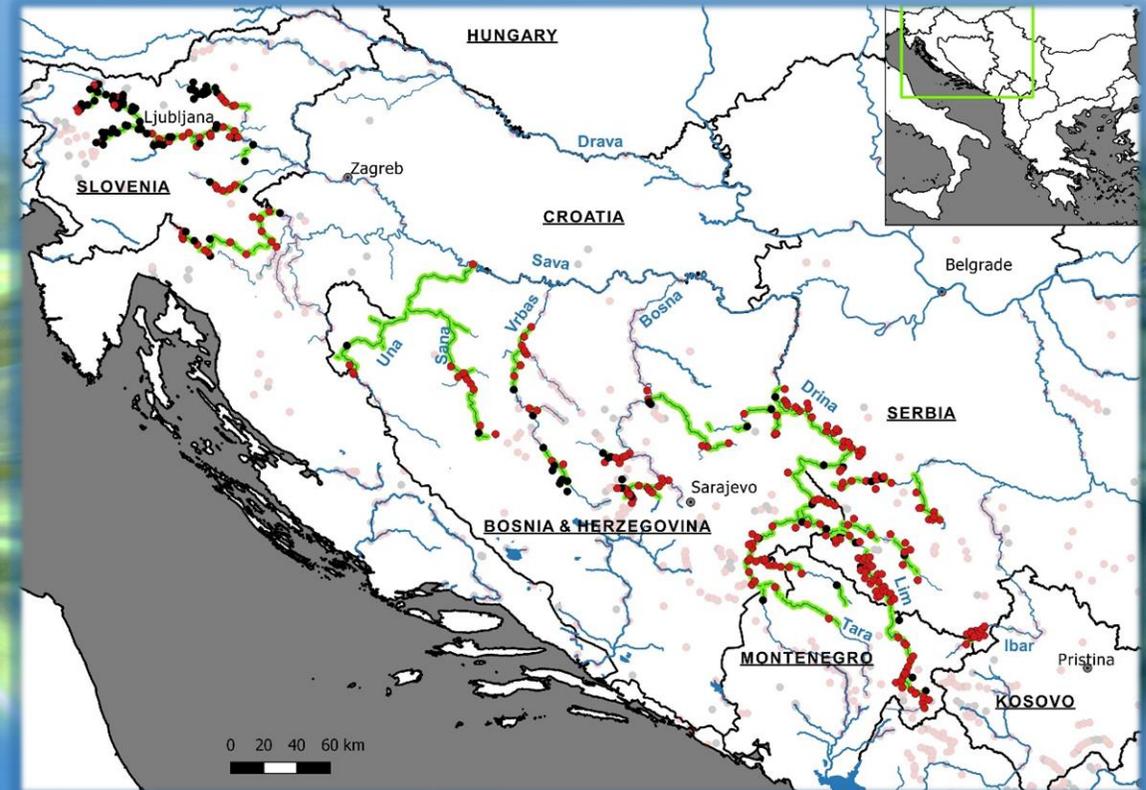
Balkan Dam Threat:
High



Distribution and Habitat – Slovenia, Bosnia-Herzegovina, Serbia, Montenegro

Huchen historically reached sizes up to 60 kg (Holčík et al. 1988). They exhibit a freshwater resident life history, are endemic to the Danube basin and are among the largest of all salmonid fishes. Huchen are also an excellent ecosystem indicator as a top predator, and are extremely attractive for sport fisheries. Approximately 65% of their range is on the Balkan Peninsula, where 5 of the 6 longest remaining free-flowing habitats are found (i.e. Kolpa, Una, Sana, Drina, and Lim rivers)(Freyhof et al 2015). Hydropower development is the most serious threat to the remaining healthy populations. They occur in medium to large-sized rivers, but also migrate into small tributaries to spawn. Loss of spawning and rearing habitat are the biggest impacts of hydropower development on their population sustainability.

A total of 93 hydropower facilities are planned (the first already in construction) directly in river reaches supporting populations of Huchen with a potential loss of up to 70% of their populations in the region (Freyhof et al 2015).



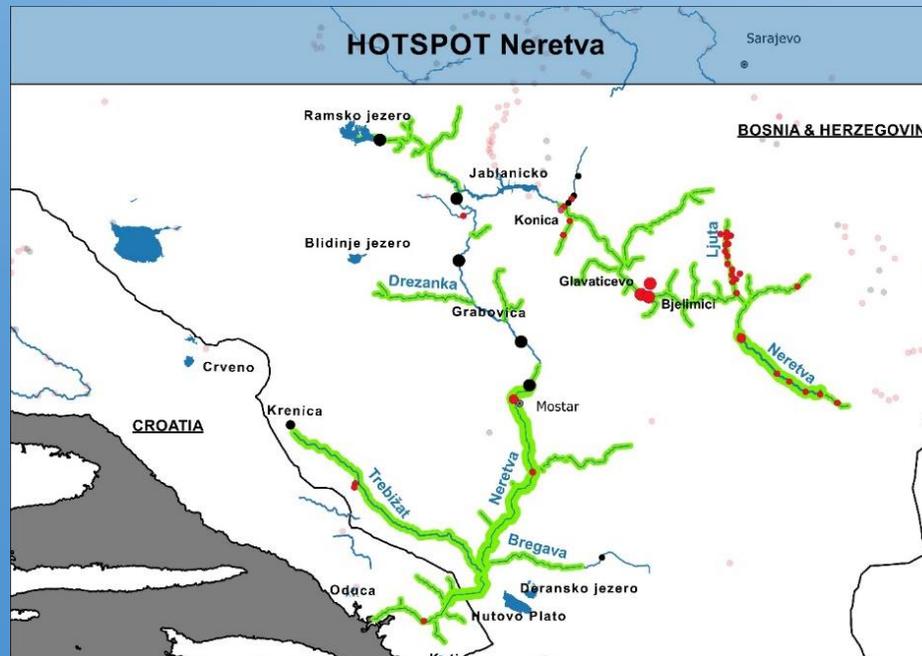
- Planned Hydropower Plants
- Existing Hydropower Plants

Neretva Basin

ENDANGERED FISH HOTSPOTS



Squalius squalizza
Neretva chub (eng.), Neretva Döbel (ger.),
Svalić (hr.)



Native fish species	IUCN	Native fish species	IUCN
<i>Alosa fallax</i>	LC	<i>Knipowitschia panizzae</i>	LC
<i>Anguilla anguilla</i>	CR	<i>Lampetra soljani</i>	LC
<i>Chondrostoma knerii</i>	VU	<i>Pomatoschistus canestrinii</i>	LC
<i>Cobitis narentana</i>	VU	<i>Salmo marmoratus</i>	LC
<i>Cottus gobio</i>	LC	<i>Salmo obtusirostris</i>	EN
<i>Delminichthys adspersus</i>	VU	<i>Squalius microlepis</i>	EN
<i>Delminichthys ghetaldii</i>	VU	<i>Squalius squalizza</i>	VU
<i>Knipowitschia croatica</i>	VU	<i>Thymallus thymallus</i>	LC
<i>Knipowitschia radovici</i>	VU		



Salmo obtusirostris
Softmouth trout (eng.), Weichmaulforelle (ger.),
Mekousna (hr.)

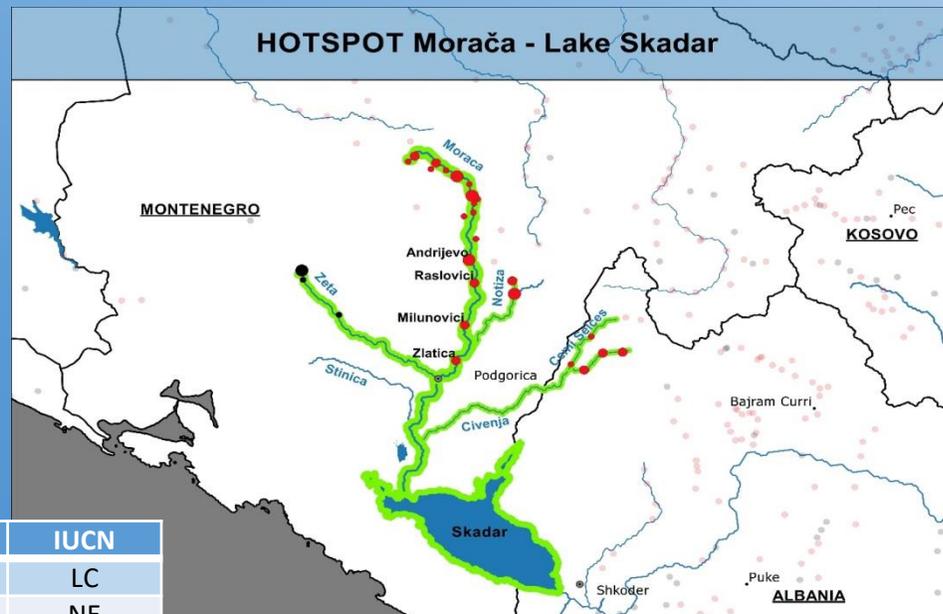


Anguilla anguilla
European eel (eng.), Europäischer Aal (ger.), Jegulja
(bh.)



Moraca – Lake Skadar System

ENDANGERED FISH HOTSPOTS



Gobio skadarensis
Skadar gudgeon (eng.), Skadar Gründling (ger.),
Mrena njëmustakore e Shkodrës (alb.)



Acipenser naccarii
Adriatic sturgeon (eng.), Adriatischer Stör (ger.),
Jadranska jesetra (hr.)



Anguilla anguilla
European eel (eng.), Europäischer Aal (ger.), Jegulja (bh.)



Salmo obtusirostris zetensis
softmouth trout (eng.), Weichmaulforelle (ger.),
Mekousna (hr.)

Native fish species	IUCN	Native fish species	IUCN
<i>Acipenser naccarii</i>	CR	<i>Salaria fluviatilis</i>	LC
<i>Acipenser sturio</i>	CR	<i>Salmo farioides</i>	NE
<i>Alburnoides ohridanus</i>	VU	<i>Salmo marmoratus</i>	LC
<i>Alburnus scoranza</i>	LC	<i>Salmo obtusirostris</i>	EN
<i>Alosa fallax</i>	LC	<i>Scardinius knezevici</i>	LC
<i>Alosa sp. nov. 'Skadar'</i>	VU	<i>Squalius squalus</i>	LC
<i>Anguilla anguilla</i>	CR	<i>Telestes montenigrinus</i>	LC
<i>Barbatula zetensis</i>	LC	<i>Thymallus thymallus</i>	LC
<i>Barbus rebeli</i>	LC	<i>Perca fluviatilis</i>	LC
<i>Barbus strumicae</i>	LC	<i>Phoxinus limaireul</i>	LC
<i>Carassius gibelio</i>	LC	<i>Rhodeus amarus</i>	LC
<i>Chondrostoma scodrensis</i>	EX	<i>Pomatoschistus montenegrensis</i>	LC
<i>Chondrostoma phoxinus</i>	EN	<i>Pachychilon pictum</i>	LC
<i>Cobitis ohridana</i>	LC	<i>Rutilus albus</i>	NE
<i>Gobio skadarensis</i>	EN	<i>Rutilus ohridanus</i>	LC
<i>Gasterosteus gymnurus</i>	LC		
<i>Pelagius minutus</i>	DD		
<i>Salaria fluviatilis</i>	LC		

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Krka Softmouth (likely extinct)

Salmo obtusirostris
Softmouth trout (eng.), Weichmaulforelle (ger.), Mekoušna (hr.)



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IUCN:
Endangered
EUR-HAB-DIR:
Annex II
Bern Convention:

Hydropower Sensitivity:
High
Balkan Dam Threat:
Very High



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Zeta Softmouth



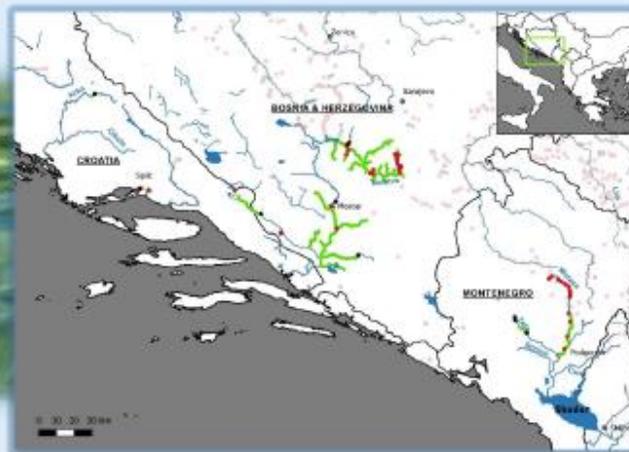
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Jadro Softmouth

Distribution and Habitat – Croatia, Bosnia-Herzegovina, Montenegro

Softmouth trout are the most intriguing member of the genus *Salmo*; previously known as *Salmothymus* (Stearly & Smith 1993). Five distinct populations exist; in the Jadro (Sušnik et al 2007), Vrljika (Snoj et al 2008) and Krka rivers of Croatia, the Neretva Basin in Bosnia-Herzegovina (Snoj et al 2002), and the Zeta and Morača rivers in Montenegro (Mrdak et al 2012, Mrdak, pers. Comm). The taxonomic status of these populations remains controversial, so each deserves protection. The population in the Krka River is on the brink of extinction. Several small fragmented sub-populations have been recently found in the Trebižat and Bregava systems of the lower Neretva basin (Glamuzina pers. comm.). Jadro River softmouth have also been transplanted into the Žrnovnica River (not shown).

Planned dams on the upper Neretva River between Konjic and Glavatičevo threatened to exterminate 50% or more of Neretva River populations. Planned dams on the Morača River would most likely eliminate the species in that system.



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Neretva Softmouth



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Vrljika Softmouth

ENDANGERED FISH HOTSPOTS



The Morača River is the hydrological life-line of the Skadar Lake Ecosystem



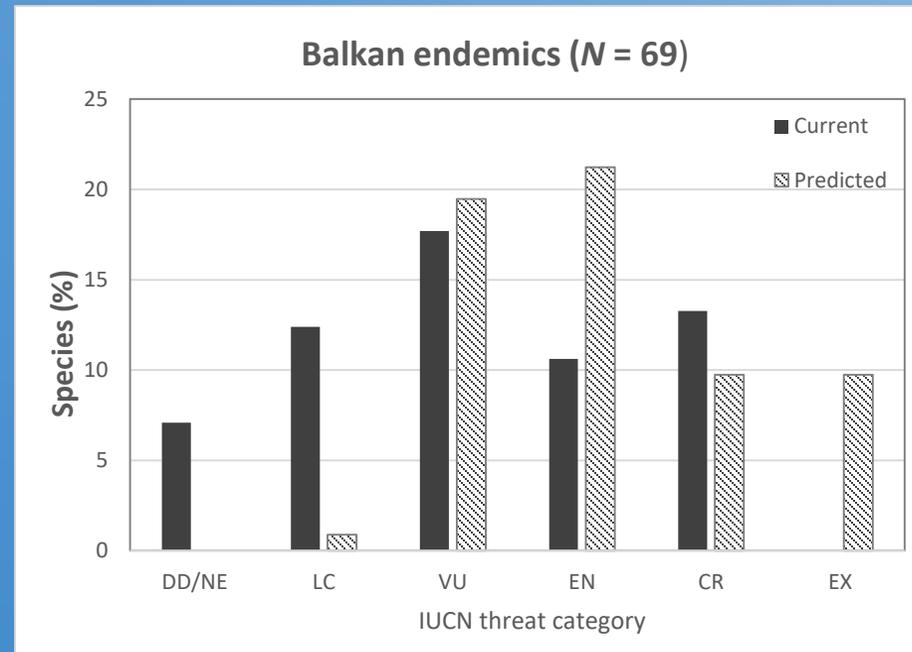
The fluctuating flows of the river lead to seasonal water-level changes of six meters, involving over 12,000 ha of wetland habitats

- 39 snails (12 endemics)**
- 282 birds (140 aquatic species)**
- 34 native aquatic plants**



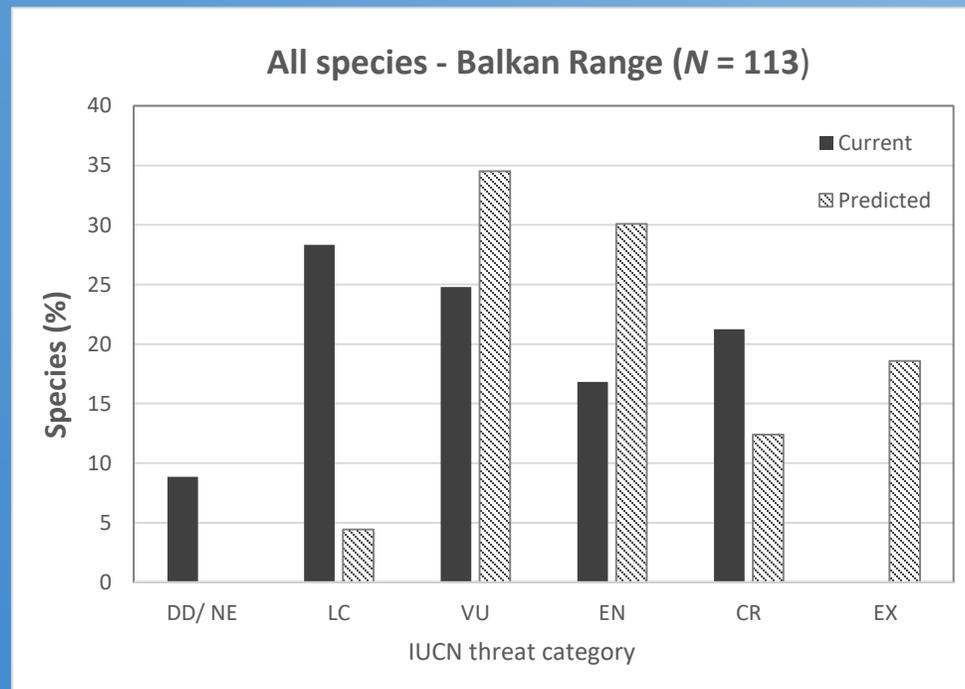
Global Results

A total of 69 of the reviewed 113 species are endemic to the study area. **Carrying out most or all of the planned hydropower projects in the range of these 69 species will potentially lead to 11 global extinctions (Fig 49).**

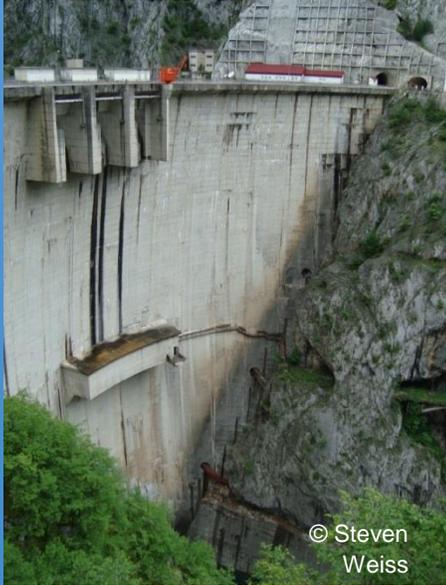


Global Results

Considering all 113 evaluated species, the same prediction can be made but limited to the Balkan range. That is, **with this analysis, the number of species that could permanently disappear from the Balkan region (including global extinction) rises to 21**



Hydropower Impacts



The 228 meter high Mratinje Dam on the Piva River, Montenegro; and on the right, the 113.5 meter high Krichim Dam on the Vacha River, Bulgaria.

© Steven Weiss



© hdesislava



© Franz Keppel



© Damir Mišura

Jablaničko Reservoir on the Neretva River



© Franz Keppel

Hydropower Impacts



Ugar River, Bosnia-Herzegovina



Rapuni River, Albania



**TECHNICAL CHALLENGES
WATER AVAILABILITY & CONFLICT
MAINTENANCE**



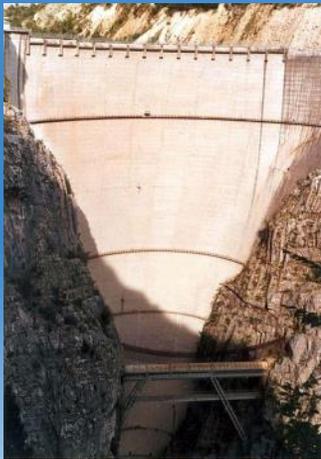
Hydropower Impacts



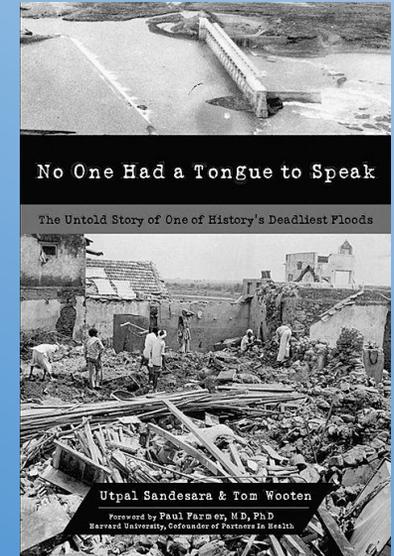
In May of 2008, 80,000 people were killed from an earthquake that measured 7.9 on the Richter scale. This event was brought into connection with the construction of the **Zipingpu hydropower dam in China**

Methane Issue

Accidents, Dam Failures, Turbine Explosions



Vaiont Dam Italy
1963: 2043 people died
- a mud slide emptied the reservoir



1979 Machchhu dam failure

There is presently no immediate threat as great to the health and biodiversity of Balkan rivers as hydropower expansion

There are multiple sources of legal conflict considering the European Habitats Directive, the European Water Framework Directive, the Bern Convention as well as potential loss of IUCN National Park status for various protected areas

There are also long-term costs to infrastructure that will take decades to materialize, which most countries are not ready to accommodate

Climate change will heighten current conflicts over water availability – projected precipitation decreases of 40% in the southern Balkans

The Case for Wild Rivers



Lim River, Montenegro



Sana River, Bosnia-Herzegovina



Tara River, Montenegro



Una River, Bosnia-Herzegovina

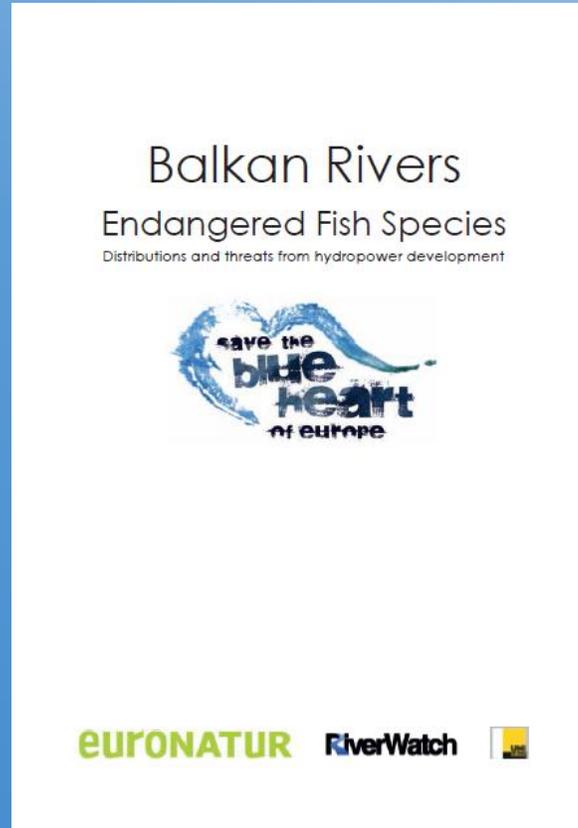
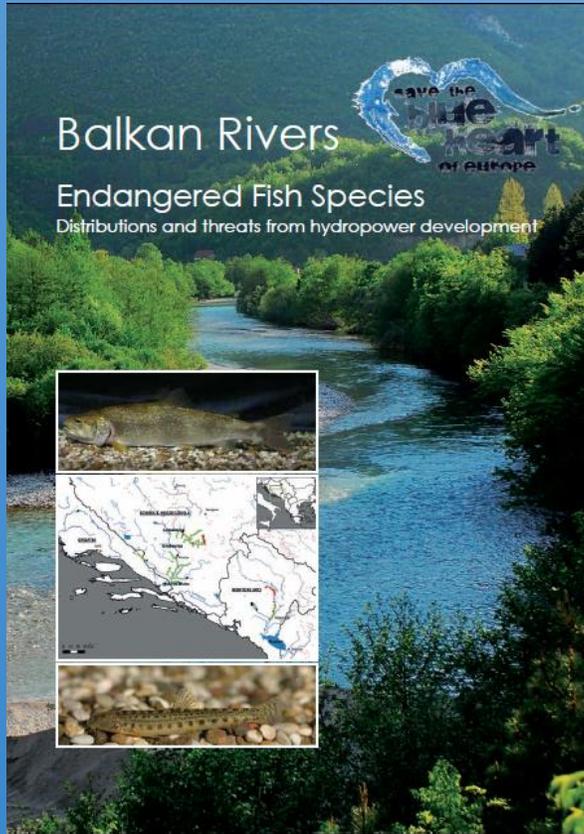


Kupa River, Croatia



Kalama River, Greece

<https://riverwatch.eu/en/balkanrivers/studies>



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