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LULEZIM SHUKA[2], ALEKO MIHO[2], SOTIR MALI[3]

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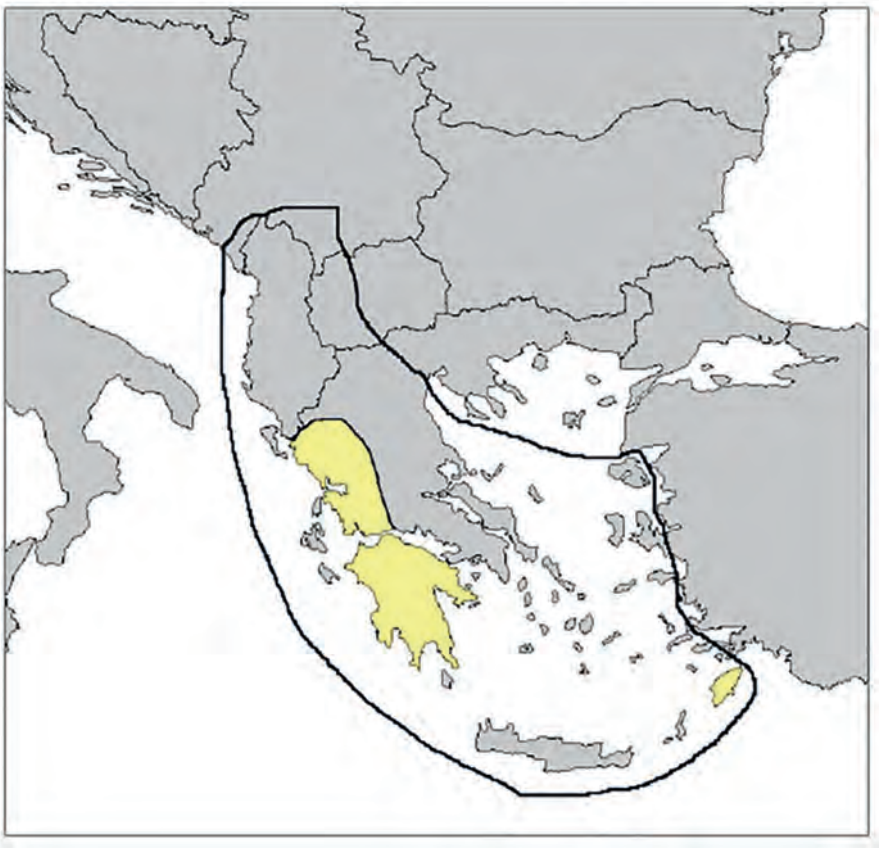
# CURRENT KNOWLEDGE OF BIODIVERSITY IN VJOSA RIVER SYSTEMCOUNTING THREATS THAT JEOPARDIZE SPECIES AND ECOSYSTEMS SURVIVAL

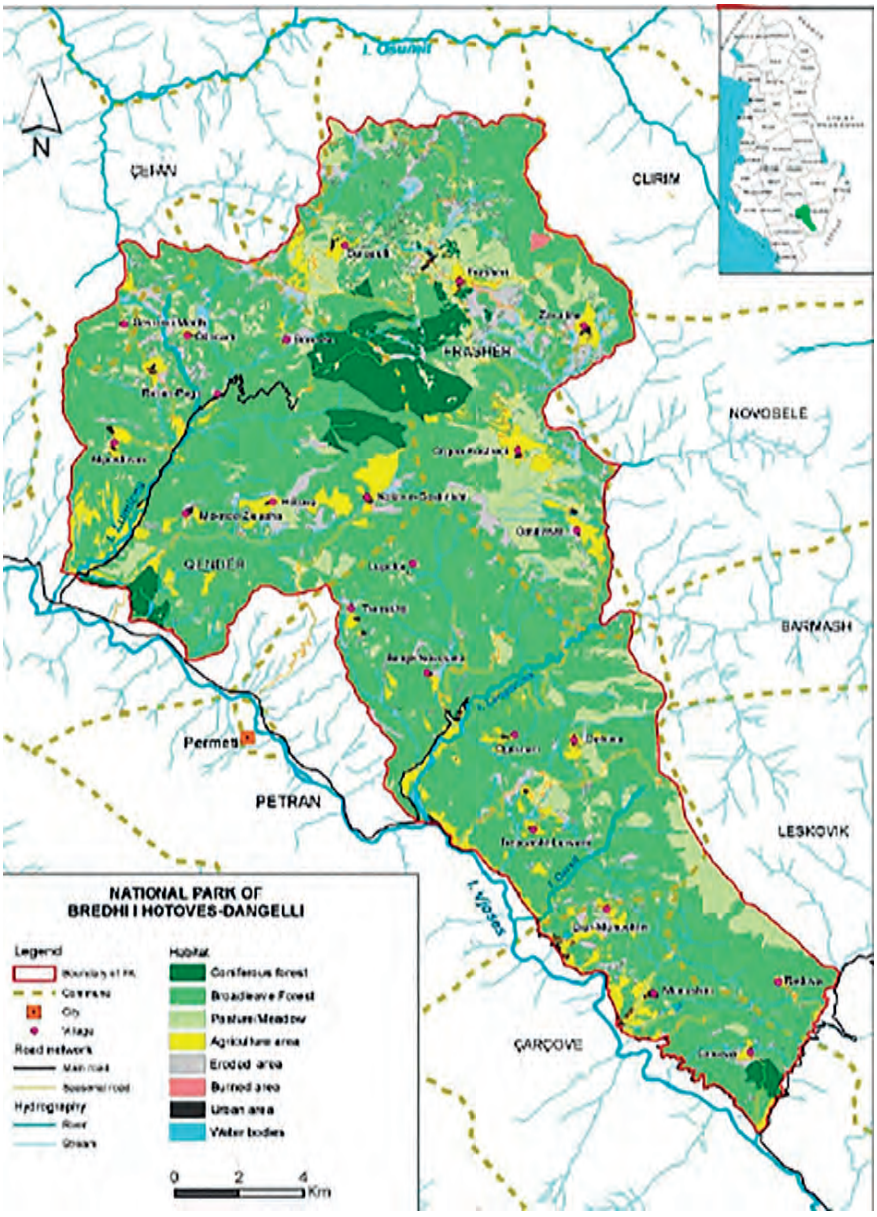
**How much we know about Vjosa Biodiversity?**
A search of, any time‘ type via Google Scholar:40 (35 time less than Ohrid)
(33 time less than Shkodra)
(25 time less than Prespa)
( 4 time less than Drini)
**Why this presentation and**
**Where it is based?**
The risk from HPPs, High biodiversity values, &
Intensive field works in last two years, Interdisciplinary approach, Other sources of primary and secondary type

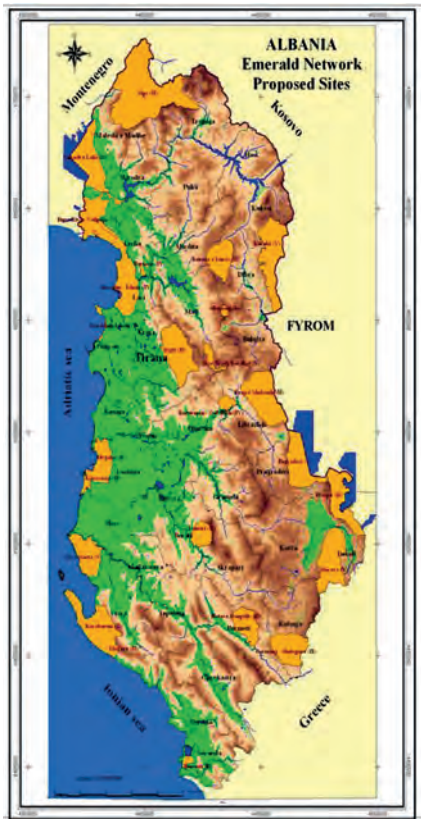
**Fig. 4.** Scheme of biogeographical and faunistic territories of the Balkan Peninsula and adjacent countries. Distribution of faunistic elements. A. Plains: 1. Pannonian; 2. Dacian (Vallachian); 3. Pontian; 4. Lombardian; 5. Thracian; 25. Thessalian. B. Coasts of the following Mediterranean seas: 6. Adriatic; 7. Ionian; 8. Aegean; 9. Pontian; 10. Ancient Pannonian. C. Characteristic hill and sub-montane elements: 11. sub-Pannonian; 12. sub-Dacian; 13. sub-Pontian; 14. Moesian; 15. Strandjanian; 16. Macedonian; 17. Liburnian. D. Elements characteristic of mountain systems: 18. Eastern Alps; 19 Northern Dinarids; 20. Southern Dinarids; 21. Carpathian; 22. Balkan Range (Stara Planina); 23. Rilo-Rhodopes; 24. Mountains of Southern Greece and Peloponese; 25. Thessalian plain (Matvejev, 1980).

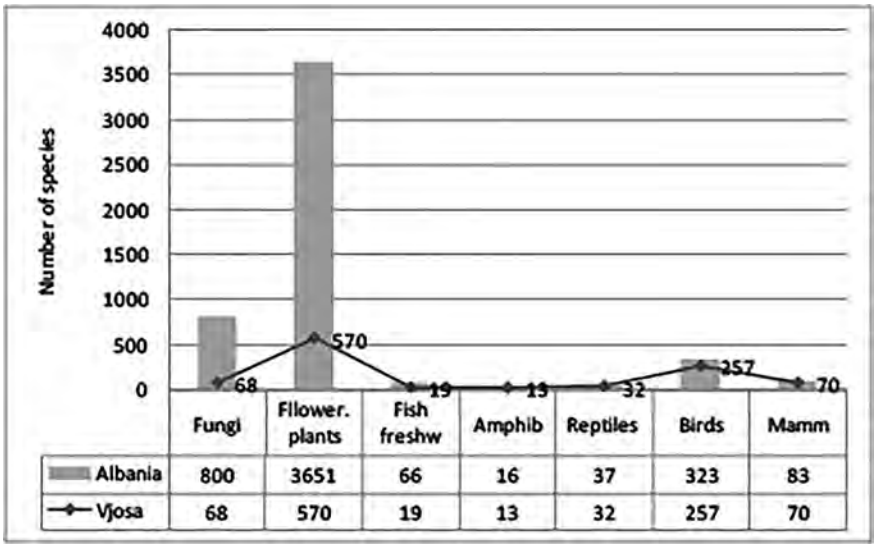


Ecoregion (WFD documents): Hellenic Western Ballkan.

European Green belts and Albania 12, 500 km North to South Importance of Albanian PAs.

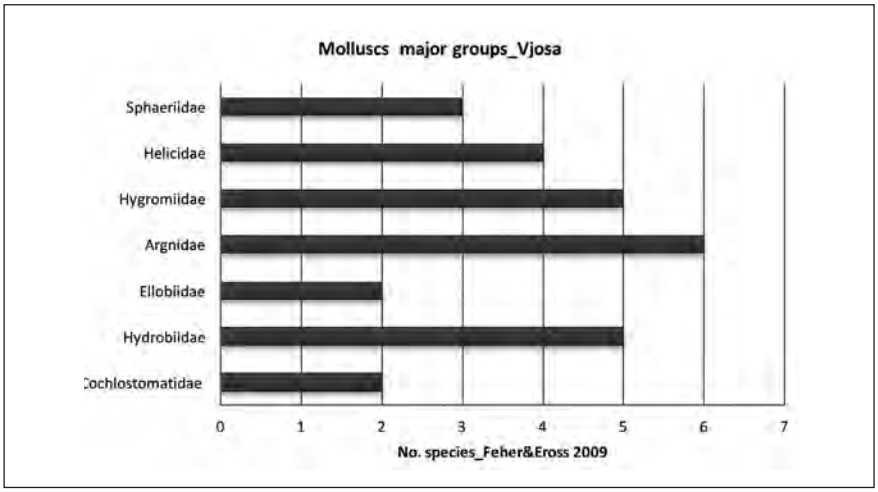

N
I. Osumit
ÇLIRIM
KRASHER
NOVOSELE
QENDER
BARMASH
Permet
PETRAN
LESKOVIK
ÇARDOVE
NATIONAL PARK OF
BREDHI I HOTOVES-DANGELLI
Legend
Boundary of PK
Commune
City
Village
Road network
Main road
Secondary road
Hydrography
River
Stream
Habitat
Coniferous forest
Broadleave Forest
Pasture/Meadow
Agricultural area
Eroded area
Burned area
Urban area
Water bodies
0
2
4
Km




| | Fungi | Fflower. plants | Fish freshw | Amphib | Reptiles | Birds | Mamm |
|---|---|---|---|---|---|---|---|
| Albania | 800 | 3651 | 66 | 16 | 37 | 323 | 83 |
| Vjosa | 68 | 570 | 19 | 13 | 32 | 257 | 70 |

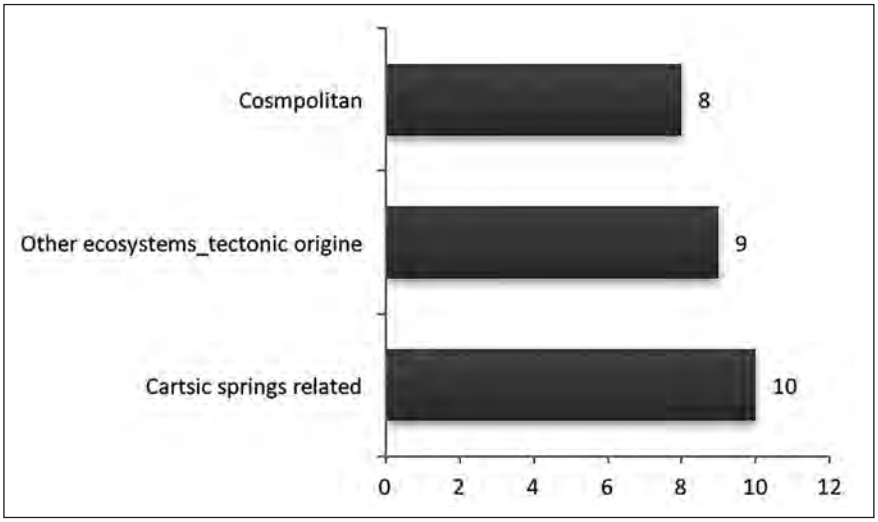
More than 95 taxa were present in the phytoplankton of the lagoon; besides a high proportion of diatoms, dinoflagellates, cryptophyceae and some filamentous cyanobacteria have been detected.
The scarce exchange with the sea and a potential high input of nutrients from Vlora town and the surrounding watershed may be the cause for the dominance of the filamentous cyanobacteria *Oscillatoria* spp., as well as for the increase of dinoflagellates of the genera *Prorocentrum* and *Dinophysis*; some of the latter, *Prorocentrum minimum* and *P. lima*, are highly toxic.
For the marine zone with a sandy substratum submersed meadows of *Posidonia oceanica* are characteristic at depths from 2 to 20 m.
In shallow and protected zones *Posidonia* is substituted by *Cymodocea nodosa* or rarely by *Zostera noltii* as seen near the Treporti cape.
These habitats are often complemented by the green algae *Caulerpa prolifera* and *Flabella petiolata*.
On rocky substrates near the Treporti cape the brown algae *Cystoseira* is more frequent, mainly *C. barbata*. Members of the genera *Acetabularia, Flabella, Anadiomene, Dasycladus, Hypnea* and *Sargassum* indicate the tropical affinity of the site.
Some Atlantic influence is represented by the species *Taonia atomaria* and *Sphaerococcus coronopifolius*, while *Fucus virsoides* is an Adriatic endemic species.
A total of **49 taxa** of benthic macro-invertebrates. The highest quantitative variation has been recorded for the net spinners Hydropsyche (Tricoptera), while the variation of species number had the highest value for coleopters.
**75 different taxa.** Ephemeroptera appeared to be the most abundant order in almost all sites during the high flow season. Trichoptera constituted the second most abundant order, and during the low flow period their family, Hydropsychidae, became dominant.

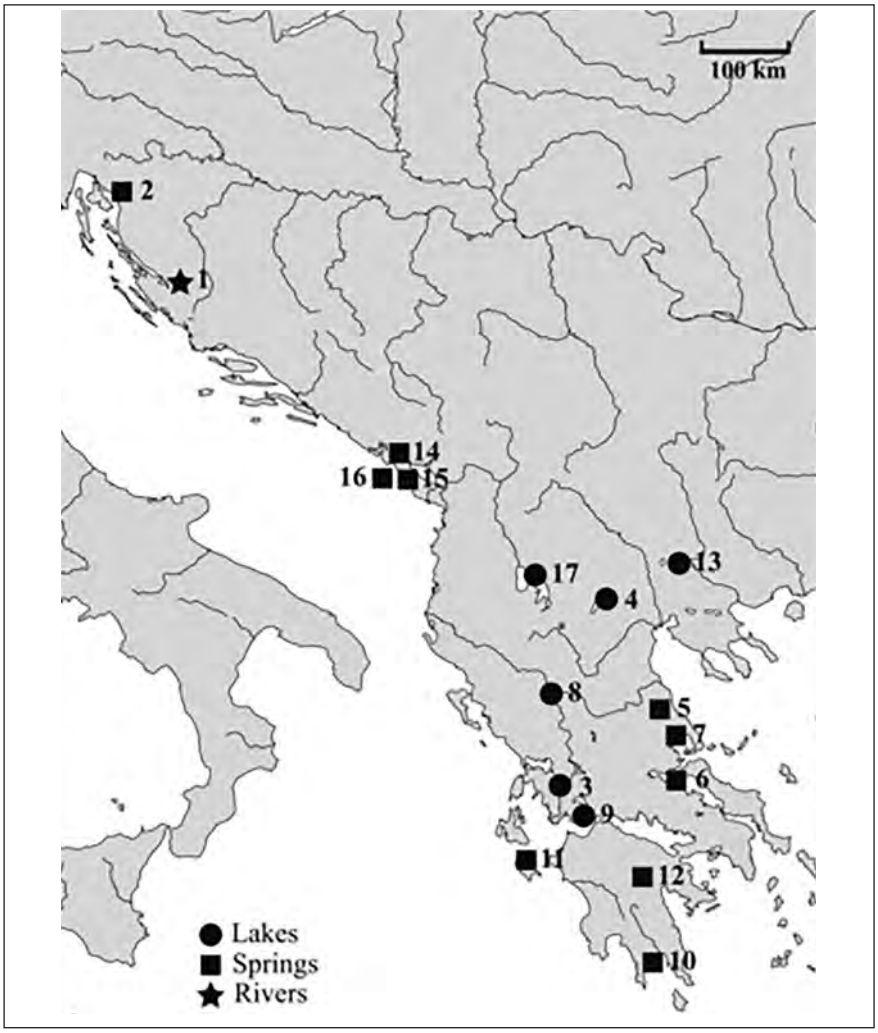


**Cochlostomatidae**
*Cochlostoma tessellatum tepelenum*
**Hydrobiidae**
*Orientalina albanica* (Radoman,
*Radomaniola albanica* Radoman, 1973
(**carstic springs**)
*Grossuana euxina* (A. J. Wagner, 1828)
**Ellobiidae**
*Myosotella myosotis* (Draparnaud, 1801)
**Argnidae**
*Agardhiella truncatella* (L. Pfeiffer, 1841)
*Albinaria senilis inconstans* (Mousson, 1859)
*Oxychilus inopinatus* (Ulicný, 1887)
Periferi Përmet, Petran, at the confluence of Vjosa and Lengarica, 300 m a.s.l.

**Hygromiidae**
*Monacha emigrata senitshika* Hausdorf, 1996
*Hiltrudia kusmici* (Clessin, 1887)
*Metafruticicola occidentalis* Subai, 1999
**Helicidae**
*Liburnica albanograeca* (Subai, 1995) .
**Sphaeriidae**
*Pisidium personatum* Malm, 1855

**New species to Albania**, this is the second *Pisidium* species found in Albania (apart from the fauna of the great tectonic lakes-Prespa).






Locations of the extinct mollusks of the Balkan region: 1, *Belgrandiella zermanica, Dalmatinella fluviatilis, Islamia zermanica, Tanousia zrmanjae*; 2, *Graziana lacheineri adriolitoralis, Vinodolia fiumana*; 3, *Dianella schlickumi*; 4, *Graecoanatolica vegorriticola*; 5, *Graecorientalia vrissiana*; 6, *Grossuana serbica vurliana*; 7, *Heleobia achaja sorella, Turcorientalia hohenackeri hohenackeri*; 8, *H. steindachneri, I. epirana, Orientalina curta albanica, Paladilhiopsis janinensis*; 9, *I. graeca, Pseudoislamia balcanica, Trichonia trichonica, Valvata klemmi;* 10, *I. hadei; 11, Pseudamnicola macrostoma*; 12, *T. kephalovrissonia*; 13, *G. macedonica;* 14, *Antibaria notata, V. gluhodolica;* 15, *Bracenica spiridoni*; 16, *V. matjasici*; 17, *Ohridohauffenia drimica*

**INVERTEBRATES - Arthropods**

**Un-expectable rich zooplankton composition**

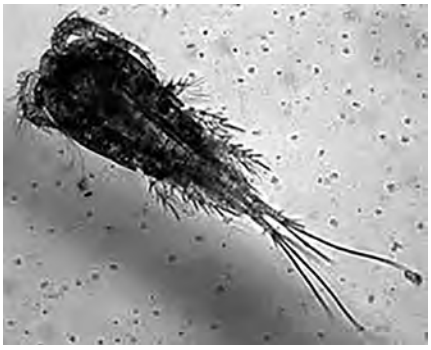
(Kelcyra Gorge Glide-May, June 2015)

*Ascomorpha ecaudis* (Perty), *Brachionus angularis* Gosse, *B. calyciflorus* Pallas, *Epiphanes* sp., *Lepadella ovalis* (o.f.m.), *Kellicottia longispina* (Kell.), *Keratella cochlearis* (Gosse), *K. quandrata* (Muller), *Lecane luna* (o.f.m.), *L. lunaris* (Ehrb.), *Mytilina mucronata* (Muller), *Polyarthra major* (Burck.), *P. vulgaris* Carl., *Ploesoma sp., Trichocerca elongata* (Gosse), *Bosmina longirostris* (o.f.m.), *Simocephalus exspinosus* (Koch), *Chydorus sphaericus* (o.f.m.), *Cyclops* sp., *Eudiaptomus gracilis* Sars, *Thermocyclops crassus* (Fischer).

More than 150 species of winged insects (Pterygota):

Lepidoptera (63 species), Coleoptera (43), Odonata (8) and Orthoptera (7).

The biological equilibrium becomes occasionally displaced by the development of massive blooms, even of endangered species with multi annual dynamics, like night butterflies with *Thaumetopoea pityocampa, Hyphantria cunea* and *Malcosoma neustria*.



**VERTEBRATES – Fishes**

17 species in the up Kalivachi section, 11 marine origin (catodromic and anadromic)

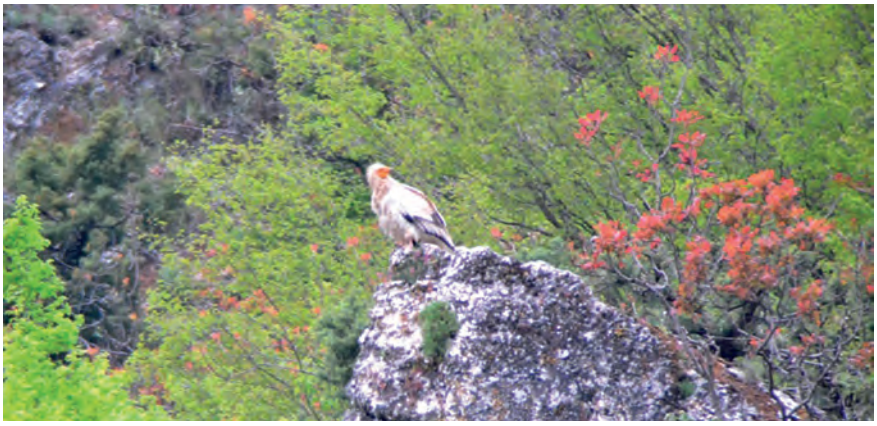
| Site.name | Site code | Long E | Lat N | Obs. dens. H IN TOL. inf.150 | Obs. dens. O2 IN TOL | Obs. ric. RH. PAR | Obs. dens. LITH | Exp. dens. H IN TOL. inf150 | Exp. dens. O2 IN TOL | Exp. ric. RH. PAR | Exp. dens. LITH | Ids. dens. H IN TOL. inf.150 | Ids. dens. O2 IN TOL | Ids. ric. RH. PAR | Ids. dens. LITH | Method | Rich ness | Capt ures | Eco reg | ST-Species | Riv-er zone | Aggr. Score Cypr. zone | FishIn-dex | Fish-In-dex. class |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BorderAl-Gr | AL001 | 20.59 | 40.071 | 28.181 | 29.090 | 4 | 140.909 | 55.783 | 73.048 | 3.9943 | 134.72 | NA | NA | 0.871 | 0.922 | Wading | 6 | 312 | Est | 0.2051 | Cyp | 0.897 | 0.8972 | 2 |
| Border 5 | AL002 | 20.575 | 40.081 | 17.368 | 17.368 | 3 | 136.315 | 55.099 | 72.280 | 3.3313 | 134.07 | NA | NA | 0.828 | 0.912 | Wading | 5 | 268 | Est | 0.1231 | Cyp | 0.870 | 0.8708 | 2 |
| Biovizhde | AL003 | 20.460 | 40.165 | 16.4 | 15.2 | 4 | 90 | 35.823 | 47.085 | 4.6680 | 87.879 | NA | NA | 0.804 | 0.915 | Wading | 7 | 231 | Est | 0.1645 | Cyp | 0.860 | 0.8600 | 2 |
| Br. Stermbec | AL004 | 20.460 | 40.165 | 16.086 | 11.739 | 5 | 98.2608 | 43.448 | 57.291 | 6.0106 | 108.03 | NA | NA | 0.788 | 0.873 | Wading | 9 | 261 | Est | 0.1034 | Cyp | 0.830 | 0.8309 | 2 |
| Petran | AL005 | 20.448 | 40.177 | 12.727 | 10.454 | 5 | 83.6363 | 35.867 | 47.525 | 6.0239 | 91.010 | NA | NA | 0.787 | 0.876 | Wading | 9 | 210 | Est | 0.1095 | Cyp | 0.832 | 0.8323 | 2 |
| Permet | AL006 | 20.41 | 40.207 | NA | 16.5 | 5 | 88.5 | 35.918 | 47.710 | 5.3607 | 92.077 | NA | NA | 0.840 | 0.892 | Wading | 8 | 193 | Est | 0.1709 | Cyp | 0.866 | 0.8665 | 2 |
| Grabove | AL007 | 20.241 | 40.285 | 20.434 | 12.608 | 5 | 75.6521 | 28.380 | 37.844 | 4.6989 | 73.932 | NA | NA | 0.898 | 0.915 | Wading | 7 | 178 | Est | 0.1629 | Cyp | 0.906 | 0.9066 | 2 |
| Exit Kelcyra | AL008 | 20.174 | 40.302 | 4.1176 | 1.1764 | 4 | 41.1764 | 16.492 | 22.031 | 4.7028 | 43.294 | NA | NA | 0.801 | 0.889 | Wading | 7 | 77 | Est | 0.0259 | Cyp | 0.845 | 0.8453 | 2 |
| G1 Kelcyra | AL009 | 20.131 | 40.298 | 1.2631 | 0.4210 | 5 | 12.842 | 5.2334 | 6.9972 | 5.3768 | 13.787 | NA | NA | 0.838 | 0.881 | Mixed | 8 | 137 | Est | 0.0291 | Cyp | 0.860 | 0.8603 | 2 |
| G2 Kelcyra | AL010 | 20.128 | 40.298 | NA | 0.7 | 6 | 9.5 | 3.9789 | 5.3243 | 6.0512 | 10.519 | NA | NA | 0.867 | 0.870 | Mixed | 9 | 110 | Est | 0.0545 | Cyp | 0.869 | 0.8690 | 2 |
| Dragoti Bridge | AL011 | 20.078 | 40.292 | 29.629 | 22.222 | 4 | 65.185 | 27.773 | 37.242 | 6.0570 | 74.075 | NA | NA | 0.688 | 0.861 | Wading | 9 | 209 | Est | 0.2870 | Cyp | 0.775 | 0.7751 | 2 |
| En. Memaliaj | AL012 | 20.060 | 40.279 | 23.2 | 20.4 | 5 | 94 | 34.981 | 47.070 | 5.3926 | 94.648 | NA | NA | 0.837 | 0.904 | Wading | 8 | 247 | Est | 0.2064 | Cyp | 0.870 | 0.8709 | 2 |
| Af. Memaliaj | AL013 | 20.013 | 40.281 | 27.5 | 25 | 4 | 104.5 | 37.004 | 49.913 | 4.0489 | 101.14 | NA | NA | 0.865 | 0.918 | Wading | 6 | 211 | Est | 0.2369 | Cyp | 0.892 | 0.8921 | 2 |
| Iliras | AL014 | 19.882 | 40.375 | 15.4545 | 15.454 | 3 | 74.090 | 29.059 | 39.346 | 4.7319 | 80.710 | NA | NA | 0.680 | 0.876 | Wading | 7 | 185 | Est | 0.1837 | Cyp | 0.778 | 0.7786 | 2 |
| Pocem | AL015 | 19.740 | 40.496 | 22.333 | 21.666 | 4 | 76.333 | 29.886 | 40.607 | 6.7706 | 84.232 | NA | NA | 0.637 | 0.871 | Wading | 10 | 263 | Est | 0.2471 | Cyp | 0.754 | 0.7548 | 2 |
| Pocem West | AL016 | 19.723 | 40.491 | 11.666 | 12.333 | 5 | 54 | 23.004 | 31.279 | 7.4501 | 65.030 | NA | NA | 0.689 | 0.841 | Wading | 11 | 203 | Est | 0.1674 | Cyp | 0.765 | 0.7654 | 2 |

EFI+ Fish based index 2-Good (1-5)

The amphibians (**13 species out of 16 at national level**) are a taxonomic group usually connected with different habitats during their lifecycle, both water and terrestrial. The most popular amphibians encountered are the Yellow-Bellied Toad (*Bombina variegata)* andthe Common Toad *(Bufo bufo).* Present as well *Rana graeca, Rana balcanica, Triturus cristatus.*

Reptiles (**32 of 37 species**) are represented by Balkan Whip Snake (*Coluber gemonensis),* Leopard Snake *(Elaphe situla),* four-lined snake *(Elaphe quatuorlineata),* Hermann's tortoise *(Testudo hermanni),* European pond turtle *(Emys orbicularis)* and the European green lizard *(Lacerta viridis).*

There is a wide variety of bird (**257 out 323 species**) species present within the valley in connection to the different ecosystems and habitats. Species, such as Eagle Owl (*Bubo bubo),* Long-legged Buzzard *(Buteo rufinus),* Levant Sparrow hawk *(Accipiter brevipes),* Lanner Falcon *(Falco biarmicus ),* Sparrow hawk *(Accipiter nisus),* Golden Eagle *(Aquila chrysaetos),* European Honey Buzzard *(Pernis apivorus),* Gosshawk *(Accipiter gentilis),* Short-toed Eagle *(Circaetus gallicus),* Egyptian Vulture*(Neophron percnopterus),*Grey-headed Woodpecker *(Picus canus),* Barn Owl *(Tyto alba)* and Kestrel *(Falco tinnunculus)* are present and good indicators of the areas ecosystems condition.

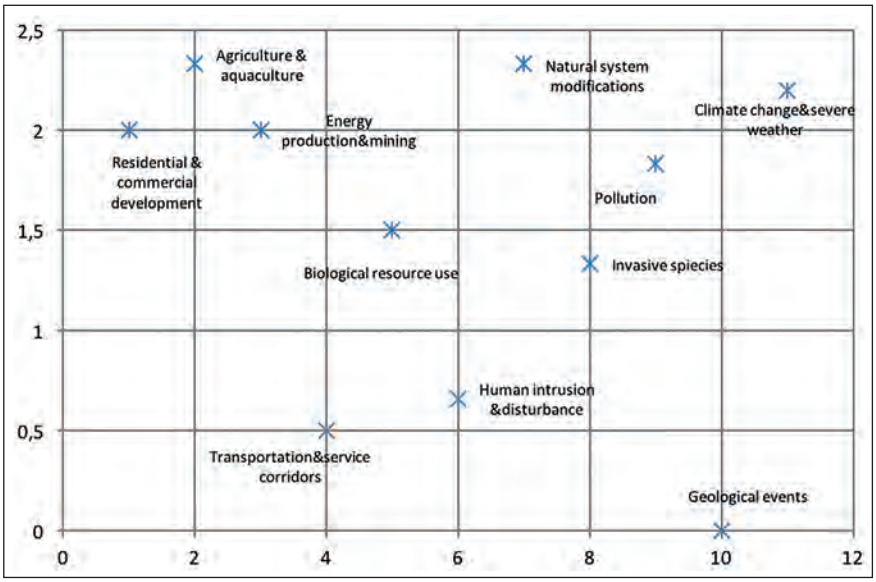


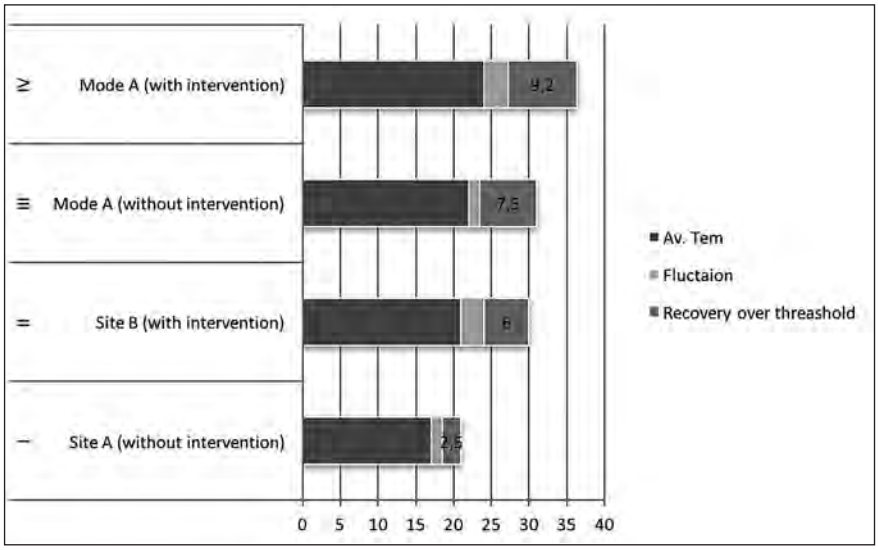
**70 mammalians out of 83 at national level**

Large carnivores are also common such as the **brown bear** (*Ursus arctos)* and the wolf *(Canis lupus).* Large mammals in the wider area also comprise the roe deer *(Capreolus capreolus)* and wild boar *(Sus scrofa).* Furthermore the mammals are also presented by bats *(Rhinolophus euryale), Rhinolophus blasii and Myotis cappaccinii),* red squirrel *(Sciurus vulgaris),* fat dormouse *(Glis glis),* hazel dormouse *(Muscardinus vellanarius),* beech marten *(Martes foina),* badger *(Meles meles),* red fox *(Vulpes vulpes)* and wild cat *(Felis sylvestris).*

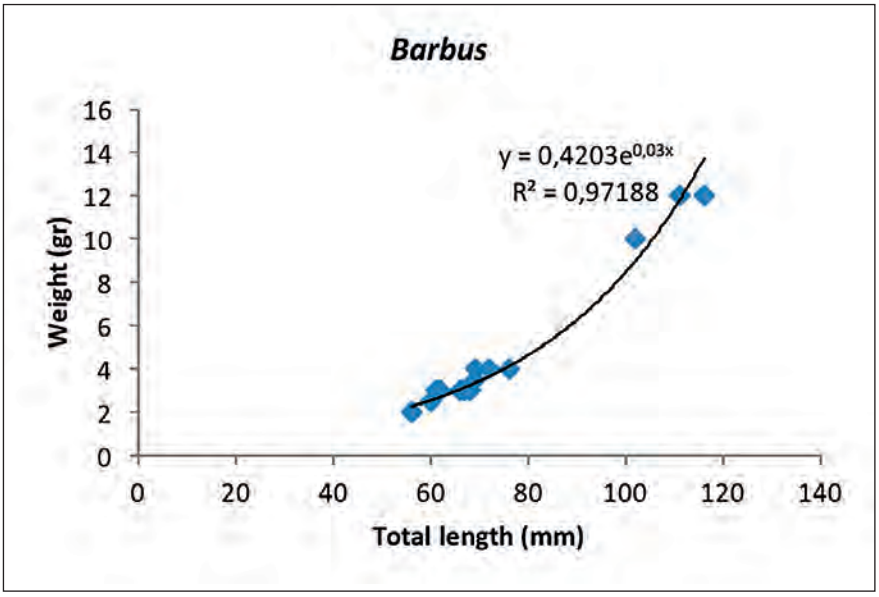
| Threat class | Major threat | Level of knowledge | Impact | Average impact | Maximum impact |
|---|---|---|---|---|---|
| 1. Residential & commercial development | 1.1. Housing & urban areas | well - known | 3 | 2 | 3 |
| | 1.2. Commercial & industrial areas | moderately known | 1 | | |
| | 1.3. Tourism & recreation areas | well - known | 2 | | |
| 2. Agriculture & aquaculture | 2.1 Annual & perennial non-timber crops | less-known | 2 | 2 (2.33) | 3 |
| | 2.2 Wood & pulp plantations | less-known | 1 | | |
| | 2.3 Livestock farming & ranching | well - known | 2 | | |
| | 2.4 Marine & freshwater aquaculture | less-known | 2 | | |
| 3. Energy production & mining | 3.1. Oil & gas drilling | well - known | 1 | 2 | 3 |
| | 3.2. Mining & Quarrying | well - known | 2 | | |
| | 3.3. River mining | well - known | 3 | | |
| | 3.4. Renewable energy | well - known | 2 | | |
| 4. Transportation & service corridors | 4.1. Road & railroads | well - known | 2 | 1(0.5) | 2 |
| | 4.2. Utility & service lines | – | 0 | | |
| | 4.3. Shipping lanes | – | 0 | | |
| | 4.4. Flight paths | – | 0 | | |
| 5. Biological resource use | 5.1. Hunting & Trapping animals | moderately known | 2 | 2 (1.5) | 3 |
| | 5.2. Gathering terrestrial plants | moderately known | 1 | | |
| | 5.3. Logging & wood harvesting | well - known | 3 | | |
| | 5.4. Fishing & harvesting aquatic resources | moderately known | 1 | | |
| 6. Human intrusion & disturbance | 6.1. Recreational activities | less-known | 1 | 1 (0.66) | 1 |
| | 6.2. War, civil unrest & military exercises | – | 0 | | |
| | 6.3. Work & other activities | less-known | 1 | | |
| 7. Natural system modifications | 7.1. Fire & fire suppression | less-known | 2 | 2 (2.33) | 3 |
| | 7.2. Dams & water management/ use | moderately known | 2 | | |
| | 7.3. Other ecosystem modifications | less-known | 3 | | |

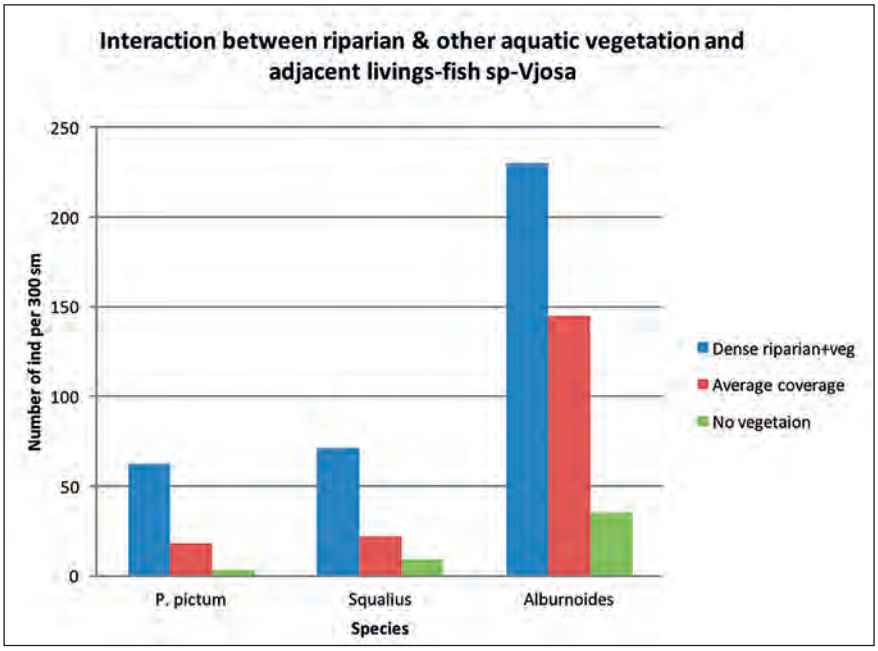
| | | | | | |
|---|---|---|---|---|---|
| 8. Invasive species | 8.1. Invasive non-native/alien species | moderately known | 2 | 1 (1.33) | 2 |
| | 8.2. Problematic native species | less-known | 0 | | |
| | 8.3. Introduced genetic material | less-known | 2 | | |
| 9. Pollution | 9.1. Domestic & urban waste water | well - known | 3 | 2 (1.83) | 3 |
| | 9.2. Industrial & military effluents | moderately known | 2 | | |
| | 9.3. Agricultural & forestry effluents | moderately known | 2 | | |
| | 9.4. Garbage & solid waste | well - known | 3 | | |
| | 9.5. Air-borne pollutants | less-known | 1 | | |
| | 9.6. Excess energy | – | 0 | | |
| 10. Geological events | 10.1. Volcanoes | – | 0 | 0 | 0 |
| | 10.2. Earthquakes/tsunamis | – | 0 | | |
| | 10.3. Avalanches/landslides | – | 0 | | |
| 11. Climate change & severe weather | 11.1. Habitat shifting & alteration | well - known | 3 | 2(2.2) | 3 |
| | 11.2. Droughts | less-known | 3 | | |
| | 11.3. Temperature extremes | less-known | 2 | | |
| | 11.4. Storms & floodings | less-known | 3 | | |
| | 11.5. Other impacts | – | 0 | | |

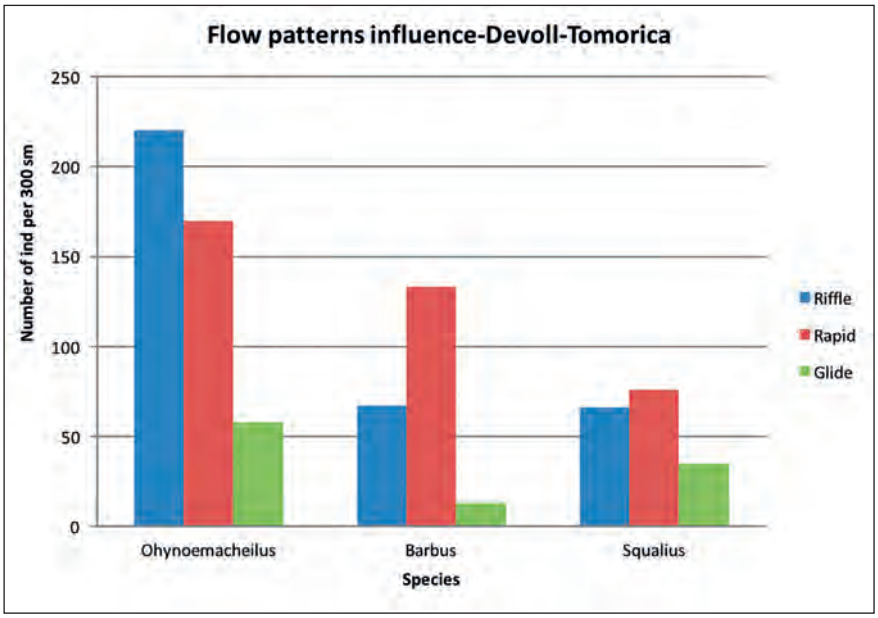


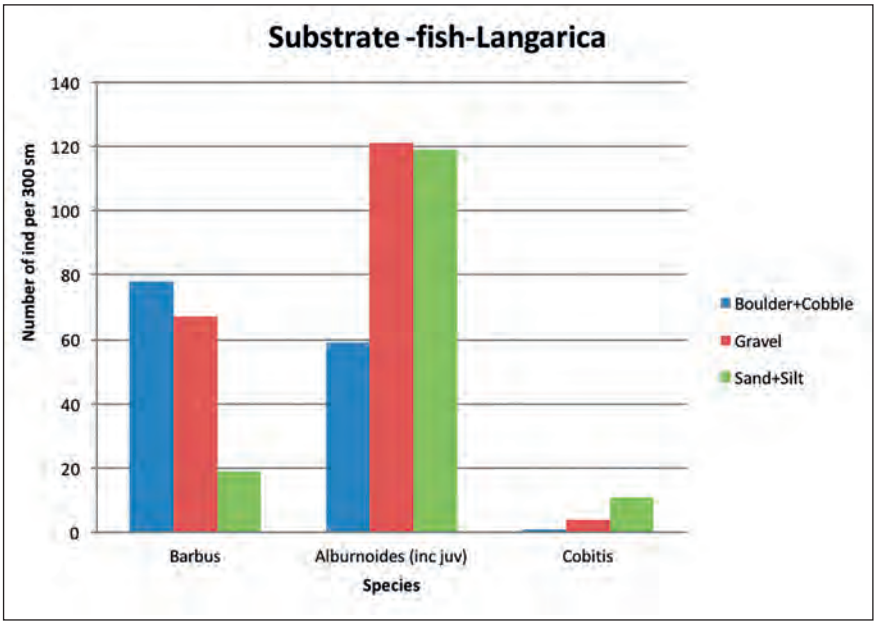



The effects of fluctuating temperature regimes on temperature tolerance, thermal stress accumulation and recovery, and growth is still largely a mystery.




Interaction between riparian & other aquatic vegetation and adjacent livings-fish sp-Vjosa
Number of ind per 300 sm
250
200
150
100
50
0
P. pictum
Squalius
Alburnoides
Species
Dense riparian+veg
Average coverage
No vegetaion


Flow patterns influence-Devoll-Tomorica
Number of ind per 300 sm
250
200
150
100
50
0
Ohynoemacheilus
Barbus
Squalius
Species
Riffle
Rapid
Glide


Substrate -fish-Langarica
Number of ind per 300 sm
140
120
100
80
60
40
20
0
Barbus
Alburnoides (inc juv)
Cobitis
Species
Boulder+Cobble
Gravel
Sand+Silt

## CONCLUSIONS

Protecting river and stream life in entire Vjosa catchment seems to be a complicated challenge. Due to a large watershed and water flows downhill, freshwater species are affected by activities taking place anywhere upstream or uphill in the watershed, even many kilometers away. Conservation actions must therefore address threats to water quantity and quality over the wider areas that are upstream from risked species and habitats. Further to that it is wise to consider that all type of human activities in watersheds can pose a host of threats to freshwater species. Yet, it is often difficult to address the stresses on streams species, and habitats (Lengarica, Benja, etc). Even when these impacts are correctly recorded, the sources of water quality and quantity problems can be difficult to control. In general in case of Vjosa from the Pindos sources to the river delta, the human activities within the watershed are incompatible with conservation objectives for freshwater species and habitats lined in various protected areas management plans.