CEPF FINAL PROJECT COMPLETION REPORT

Organization Legal Name:	Hrvatska Ekološka Udruga "Buna" – HEU Buna
Project Title:	Education of the public on sustainable water use and the protection of endemic fish in the Neretva River Valley
Date of Report:	7th of August 2014
Report Author and Contact Information:	Damir Brljevic; Buna bb, 88202 Mostar, BiH; heu.buna@gmail.com

CEPF Region: Mediterranean (Europe & Central Asia)

Strategic Direction: Strategic Direction 3 - "Improve the conservation and protection status of 44 priority key biodiversity areas"

Grant Amount: $18,750

Project Dates: 5th of August 2013 – 30th of July 2014

Implementation Partners for this Project (please explain the level of involvement for each partner):

The project's partners were local environmental non-governmental organizations: EkoMost, Anguilla, Viridis, Neretva Delta Forum, Dinarica, Neretva 1933, Mocvara. The NGOs signed the Declaration on the need to protect left Neretva tributaries of the negative impacts of Upper Horizons project. The NGOs also participated in the dissemination of the project's promotional materials (leaflets and posters) as well as they have been promoting the project's objectives in the local media.

Conservation Impacts

Please explain/describe how your project has contributed to the implementation of the CEPF ecosystem profile.

The project has researched the status of endemic fish species in rivers of Buna, Bunica and Bregava in lower Neretva valley. In Buna and Bunica rivers salmonid species dominated, while in Bregava endemic cyprinids species are abundant. These rivers are important habitats for endemic salmonids, as they use rivers for spawning and juvenile feeding grounds. The dominant salmonid species is softmouth trout, Salmo obtusirostris. It was very abundant in Neretva River watershed, but after building of five dams in major river flow, the present population is restricted to major flow between towns of Mostar and Čapljina, where all three rivers also flow in. It is questionable is this habitat is sufficient to sustain species survival, especially in the years of water flow changes and observed climatic and precipitation changes. Fish fauna in three investigated karst rivers is significantly threatened by different reasons. The most important is impact of recent water management changes, due to building of new dams and reservoirs for production of energy. As a main impact, the water quantity and natural

seasonality is significantly changed threatening most of the life cycles of important endemic species. Furthermore, the planned dams and water diverting to another watershed will make the situation worse. The main issue of future fish management is how to secure natural water conditions for endangered fish species and critical periods of life cycles, such as spawning and juvenile recruitment.

Please summarize the overall results/impact of your project.

The first project's milestone was the Conference on Upper Horizons and its possible negative influences on rivers Buna, Bunica and Bregava that took place on 26th of November. Hydrology and hydrogeology of Eastern Herzegovina were presented by the experts from the Agency for water management of Neretva watershed. Upper horizons project and the current developments of that project were explained by Mr. Mateljak from WWF. Potential impacts of such water allocations and diversions to endemic fish in Buna, Bunica and Bregava were analysed by Dr. Glamuzina from the University of Dubrovnik. The conclusion of the Conference was that if the investors and implementers of the Upper Horizons project continue to ignore all mitigations measures requests from the environmentalists. If the Upper Horizons project would meet only the requests of the energy sector (as it is the current situation), endemic salmon fish (Salmo marmoratus, Salmothymus obtusirostris oxyrhynchus and Salmo dentex) would be extincted in the rivers of Buna, Bunica and Bregava.

Based on such conclusions of the Conference, HEU Buna organised drafting of the Declaration for protection of endemic fish in rivers of Buna, Bunica and Bregava. The Declaration was signed by six local NGOs at the press conference that was organised on 31st of January. The press conference attracted almost all media in Federation of Bosnia and Herzegovina and the articles with the messages of urgency to save Buna, Bunica and Bregava were published in all major daily newspapers. Reports were broadcasted at Federal TV and BHT1. Members of HEU Buna together with experts participated in radio programs on local radio Capljina, Federal radio and BH radio 1. Numerous of web sites published articles on the press conference.

All three rivers were investigated with electrofishing and nets during April-June period in order to investigate fish composition for each river. The sampling was executed during spring season and do not represent complete picture of ichthyofauna of these rivers. It is evident that during spring period none of introduced species was sampled, which is result of their spawning migrations to lower shallow areas (Hutovo Blato wetlands) of Neretva watershed. Only rainbow trout was sampled and all of them were result of recent stock enhancement with hatchery fish. The dominance of salmonids in Buna River is result of good water quality and stable flow. Their lower number in close Bunica River is result of different river properties (smaller, stones). The dominance of endemic cyprinids in Bregava River is result of higher water temperatures and lower oxygen levels, the conditions not suitable to sensitive trout species. Furthermore, Bregava River is closer to most spawning grounds of these species, and closest river to recruit.

The problem lies in drying of river during summer, when significant number of these fished died in water remnants, if not migrated to main Neretva flow. The sampling campaign were organized with major stakeholders dealing with this river, including fishery societies which have concessions for organized recreational and sport fishery on those rivers. The other people who take part in sampling, fish analysis and educational sessions were from NGO-s, primary school in Buna village and local fishermen.

The promotional campaign with the title “Endemic fish are our legacy – save them!” started in June.

HEU Buna throught the project implementation has reached all main national TV channels, all main newspapers published articles on the project, our team gave numerous of radio interviews. Special billboard was constructed and placed in Buna municipality, next to the river Buna, as a part of the promotional campaign. The billboard will stay for many months after the project would be official finished. Also leaflet and poster with the same message were printed and disseminated to the project’s partners, media and all interested stakeholders including governmental and non-governmental bodies and organisations. In the project’s framework HEU Buna come up with the declaration supported by the most active local NGOs as well as contraceted the best local expert. The Campgain was consisted of:

- 3,000 leaflets have been printed and disseminated to the public and partner NGOs;
- 1,000 posters have been printed and disseminated with the help of our NGO partners as well as placed at the public areas;
- Billboard has been set up;
- All main national TV channels broadcasted the information about the project;
- All main newspapers published articles about the project;
- The project team gave at least ten interviews to the radio stations;
- Other five local NGOs used their communication networks to promote the project’s goals;
- All events organised by other environmental NGOs and local authorities were used to spread information about the project goals.

About 200 leaflets have been already disseminated at the events and meetings that members of our organization regularly participate in Mostar, Sarajevo, Metkovic and Dubrovnik. The leaftels were disseminated to different environmental stakeholders such as governmental and non-governmental representatives, business, media, universities, different governmental agencies, etc. About 600 has been disseminated to the visitors of the restaurant Cuprija at the river Buna, where our NGO has regular stand. 200 copies has been given to each our partners NGOs (ones that signed the Declaration), in total 1,000 copies for them. Our partner NGOs will use their own communications channels for the dissemination. About 800 have been disseminated by our volunteers to the public at the main squares in Mostar and Capljina. There are still 400 copies to be disseminated.

With the posters is similar. We have given 100 copies to the each partner NGO. Our volunteers have posted in Mostar and Capljina as well as to some smaller towns in surroundings about

300 posters in total and still we have some 200 to deal with in following period depending on the actual situation regarding the protection of rivers Buna, Bunica and Bregava.

Please provide the following information where relevant:

Hectares Protected: The project has not been envisaged to enlarge the protected areas in Bosnia and Herzegovina

Species Conserved: Conservation and protection of the endemic species of fish in rivers of Buna, Bunica and Bregava is ultimate goal of the project but the project itself does not have objective to conserve any new species.

Corridors Created: The project promotes importance of these three rivers to be undisturbed by future and/or potential water allocations and diversion for hydropower but no new corridors were created.

Describe the success or challenges of the project toward achieving its short-term and long-term impact objectives.

The short term objective of the project was to raise awareness for the need for protection of endemic fish species in the rivers of Buna, Bunica and Bregava. The main project activities serve to that purpose:

1. The Conference on Upper Horizons and its possible negative influences on rivers Buna, Bunica and Bregava,
2. The Declaration for protection of endemic fish in the rivers,
3. The field research and monitoring on the endemic fish,
4. The promotional campaign “Endemic fish are our legacy – save them!”

Local NGOs, media and other stakeholders expressed a great interest for endemic fish protection. Local population is aware of the importance to take actions to conserve the endemic fish. The great disappointment is ignorance of the energy sector. The endemic fish in the rivers would be in the great danger if water from these rivers would be diverted for hydropower and still hydropower sector, and especially Elektroprivreda Republike Srpske refuse to participate in debates and discussions on potential impacts of their operations on the flora and fauna, or in this specific case endemic fish in these three rivers.

Were there any unexpected impacts (positive or negative)?

HEU Buna invested a lot of efforts to media work still the interest of media was over expectations. Two types of campaigns were envisaged by the project. In the first phase this was direct work with the media in Federation of BiH that proved to be full success. In the second project phase, the campaign was consisted of design and print of leaflets, posters and construction and set up of billboard. Since HEU Buna has established a good cooperation with local media and all educational and promotional materials have been disseminated to media as

well as to wide range of stakeholders. The project team tried to reach media and NGOs in Republic of Srpska and to involve them more in the project. Unfortunately, this was difficult and only Centre for Environment from Banja Luka expressed the support to the project as well as NGO Vrelo from Trebinje offered their technical support. No other NGO wanted to be involved. Similar is with media in Republic of Srpska. This gives to Upper Horizons project political dimension that HEU Buna wanted to avoid. The Upper Horizons project is politically sensitive project and HEU Buna has become fully aware of this. The construction and hydropower development is to take place in Republic of Srpska, where people see opportunity for economic development. But the main negative impacts will be in Federation of BiH and Croatia, where are the main opponents of the Upper Horizons project. Therefore HEU Buna as a priority in the project implementation has identified political neutrality and will focus only on environmental issues no matter of political borders.

Project Components

Project Components: *Please report on results by project component. Reporting should reference specific products/deliverables from the approved project design and other relevant information.*

Component 1 Planned:

1.1 Gathering data and updating information on Upper Horizons;
1.2 Kick off meeting with the local NGOs and other partners to present the project and agree on the ways of cooperation
1.3 Conference on Upper Horizons and the EIA Study of the Dabar plant;
1.4 Drafting the Declaration and signing it by local NGOs;
1.5 Press conference on the threats of Upper Horizons and to present the Declaration;
1.6 Media work (TV, radio, newspapers).

Component 1 Actual at Completion:

The project initial meeting was organised together with the partner NGOs EkoMost, Viridis and Anguilla and the project team in order to agree on the ways of cooperation, collect data and updating information on Upper Horizons project. The Agency for water management in the Adriatic basin technically supported data gathering, processing the data and analysis of the project team. The Conference on Upper Horizons and its possible negative influences on rivers Buna, Bunica and Bregava took place on 26th of November.The conclusion of the Conference is that if the investors and implementers of the Upper Horizons project continue to ignore all mitigations measures requests from the environmentalists. If the Upper Horizons project would meet only the requests of the energy sector (as it is the current situation), endemic salmon fish (Salmo marmoratus, Salmothymus obtusirostris oxyrhynchus and Salmo dentex) would be extincted in the rivers of Buna, Bunica and Bregava. As the following up of the Conference, HEU Buna organised drafting of the Declaration for protection of endemic fish in rivers of Buna, Bunica and Bregava. The Declaration was signed by six local NGOs at the press conference that was organised on 31st of January. The press conference attracted almost all media in Federation of Bosnia and Herzegovina and the articles with the messages of urgency to save Buna, Bunica and Bregava were published in all major daily newspapers. Reports were broadcasted at Federal TV and BHT1. Members

of HEU Buna together with experts participated in radio programs on local radio Capljina, Federal radio and BH radio 1. Numerous of web sites published articles on the press conference.

Component 2 Planned:

2.1 Establishing the Component 2 team and contracting ichthyofauna expert;
2.2 Survey on status of ichthyofauna in all three rivers with main target on native and endemic species status;
2.3 Survey on status of flora and fauna which are important for life cycle of endemic species;
2.4 Define physical condition in the rivers targeting mainly flow, temperature and oxygen levels that would secure stable population of endemic fish species;
2.5 Mapping of spawning grounds of endemic species in the rivers;
2.6 Identification and description of spawning grounds for each species with a focus of type of bottom and habitat, flow regime and temperature, which are needed for successful spawning result and recruitment of juveniles;
2.7 Writing the Action Plan for efficient protection of spawning grounds and endemic fish stocks.

Component 2 Actual at Completion:

The lead expert on Neretva endemic fish, prof.dr. Branko Glamuzina from University of Dubrovnik, has been contracted to lead on this project component. All three rivers were investigated with electrofishing and nets during April-June period in order to investigate fish composition for each river. It was concluded that the most important fish species in these rivers is softmouth trout, due to endemic status and importance for sport fishery.

The softmouth trout spawn during winter, from late December to early March, at specific locations along Neretva River and tributaries of Buna, Bunica and Bregava. This indicates that for successful spawning and recruitment of juveniles winter water regime is crucial. Most of the spawning ground of endemic fish species are scattered in Neretva River watershed. The majority of endemic species belong to family Cyprinidae and their spawning grounds are located in the shallow and slower waters. All investigated cyprinid species spawn in wetlands of Hutovo Blato, which are protected as Park of Nature and under serious protection activity. The only species for which these three rivers are important spawning ground is softmouth trout. The most important parts are several locations along Buna River, where spawning grounds where identified during spawning season, based on
whiter color of bottom. Based on these finding, the follow up activities to be conducted have been defined as follows:

1. Detailed survey of present status of softmouth trout in Neretva River, Buna and Bunica rivers and other smaller tributaries;
2. Description of reproduction cycle and characteristics;
3. Detailed mapping of spawning grounds in all watershed;
4. Development of sustainable plan for recreational and sport fishery;
5. Research on flow regime of Buna and Bunica rivers during several years and its impact on spawning and recruitment of softmout trout.

Component 3 Planned:

3.1 Preparations and print of publication on endemic fish in the rivers;
3.2 Design, print and set up of promotional billboards;
3.3 Publishing information on web sites, newsletters and magazines;
3.4 Preparations and printing of leaflet and poster on endemic fish in the rivers;
3.5 Overall project reporting.

Component 3 Actual at Completion:
The educational and promotional campaign of the Component 3 was based on the researches and conclusion of the Component 2. Leaflet and poster on endemic fish of the three rivers were prepared, designed, printed and disseminated to the project partners, media and all interested stakeholders including governmental institutions and non-governmental organisations. A special billboard with message “Endemic fish are our legacy – save them!” was constructed and set up next to the river Buna.

Were any components unrealized? If so, how has this affected the overall impact of the project?

All project components have been realized.

Please describe and submit (electronically if possible) any tools, products, or methodologies that resulted from this project or contributed to the results.

Please find in the Annex the following:

- Declaration on the need to protect left Neretva tributaries of the negative impacts of Upper Horizons project;
- The most interesting articles on the project published in newspapers and internet together with link for video broadcasted at TV and internet;
- The report on the research and monitoring on the endemic fish in Buna, Bunica and Bregava conducted in April, May and June 2014;
- Final design of the leaflet and poster/billboard

Lessons Learned

Describe any lessons learned during the design and implementation of the project, as well as any related to organizational development and capacity building. Consider lessons that would inform projects designed or implemented by your organization or others, as well as lessons that might be considered by the global conservation community.

Project Design Process: (aspects of the project design that contributed to its success/shortcomings)

The project was designed not to be standing alone project. The project itself served the purpose to strengthen arguments for implementation of sustainable hydropower development in Neretva and Trebisnjica river basin. WWF with its project “Dinaric Arc Sustainable Hydropower Initiative” is focused on Hutovo Blato and delta of river Neretva but the same as the project “Education of the public on sustainable water use and the protection of endemic fish in the Neretva River Valley”, it is addressing the biggest threat to the biodiversity in the area which is the Upper Horizons project. HEU Buna has already (together with several other local NGOs) joined to the initiative of WWF and all together have sent official comments on EIA study for the Dabar hydropower plant of Upper Horizons project. The project design is result of a great need to intensify campaign and promote the strong arguments for sustainable hydropower development in the Upper Horizons. Also during the project preparation and implementation of the most consideration was development of the “Neretva and Trebisnjica Management Plan”. This is defiantly the most important project but unfortunately the least transparent and vague progress in implementation. Actually the management plan for Neretva and Trebisnjica is being developed thanks to

the World Bank/GEF grant. There was only one public consultation held, in May 2012 and since then no progress has been reported. Nevertheless, HEU Buna with the project makes its contribution to the development of the management plan for Neretva and Trebisnjica.

Project Implementation: (aspects of the project execution that contributed to its success/ shortcomings)

The very passive reactions from the Energy Company of Republic of Srpska (ERS) on the project implementation are the biggest disappointed of HEU Buna. Also media in Republic of Srpska, even though were always informed and invited to the project's events, was not willing to participate. Even environmental NGOs from Republic of Srpska, apart from Centre for Environment from Banja Luka were not supported to the project. Obviously there is a strong lobby for Upper Horizons project in Republic of Srpska and very few organisations and individuals are ready to speak up about the shortcomings of the Upper Horizons project. On the contrary, in Federation of BiH and Croatia, all media, environmental NGOs and governmental institutions are willing to participate in the campaigns that address potential negative impacts of the Upper Horizons project. It is of crucial importance that in nearest future build network of allies in Republic of Srpska that would insist on implementation of EU Water Framework Directive and sustainable hydropower good practice in water management strategies in Republic of Srpska.

Other lessons learned relevant to conservation community:

The small scale projects such as "Education of the public on sustainable water use and the protection of endemic fish in the Neretva River Valley" need to be in line with the larger scale programmes of Conservation Community. Therefore this project has contributed to a much wider initiative to mitigate negative impacts of unsustainable hydropower development to freshwater ecosystems.

Additional Funding

Provide details of any additional donors who supported this project and any funding secured for the project as a result of the CEPF grant or success of the project.

Donor	Type of Funding*	Amount	Notes

Additional funding should be reported using the following categories:
A) Project co-financing (Other donors contribute to the direct costs of this CEPF project)
B) Grantee and Partner leveraging (Other donors contribute to your organization or a partner organization as a direct result of successes with this CEPF project.)
C) Regional/Portfolio leveraging (Other donors make large investments in a region because of CEPF investment or successes related to this project.)

No direct additional funding was secured to the project, but as it is explained above, the project was not standing alone project and was coordinated with the other initiatives for protection of freshwater ecosystems.

Sustainability/Replicability

Summarize the success or challenge in achieving planned sustainability or replicability of project components or results.

The project aimed to encourage similar campaigns in other areas with important freshwater biodiversity threatened by unsustainable hydropower projects hydropower plant Ulog in upper Neretva part, hydropower plant Buk Bijela on Drina, small hydropower plants in National park Sutjeska, Unac in National park Una as well as hydropower plant Ombla near Dubrovnik in Croatia and series of planned hydropower stations on river Moraca in Montenegro.

Summarize any unplanned sustainability or replicability achieved.

Youth Centar Livno in cooperation with WWF is applying similar approach in the case of hydropower plant Vrilo in Livanjsko polje. This approach means that the first step is to gather local NGOs and other potential allies, on addressing the issue. Second step is to conduct research and monitoring coordinated by the respectful scientists. The third step is to, based on the research results, conduct public campaign for protection of the most valued species. These three steps are actually three components of the project. Project “Education of the public on sustainable water use and the protection of endemic fish in the Neretva River Valley”.

Safeguard Policy Assessment

Provide a summary of the implementation of any required action toward the environmental and social safeguard policies within the project.

No action was needed to be taken to anticipate environmental or social safeguard issues since there were no such issues occurred during the project implementation.

Additional Comments/Recommendations

The follow up of the project should be detailed survey of present status of softmouth trout in Neretva River, Buna, Bunica, Bregava rivers and other smaller tributaries. The target of this action is to describe abundance, population and age structure, growth rate, food and feeding and other important biological aspects of populations in all parts where it lives. It is important to conduced further and more detailed research on flow regime of Buna and Bunica rivers during several years and its impact on spawning and recruitment of softmout trout, in order to propose optimal water flow regime for successful spawning and recruitment of juveniles.

Information Sharing and CEPF Policy

CEPF is committed to transparent operations and to helping civil society groups share experiences, lessons learned, and results. Final project completion reports are made available on our Web site, www.cepf.net, and publicized in our newsletter and other communications.

Please include your full contact details below:

Name:
Damir Brljevic
Organization name:
HEU Buna
Mailing address:
Buna bb, 88202 Mostar, BiH
Tel:
+387 63 894 895
Fax:
+387 36 480 038
E-mail:
heu.buna@gmail.com

ANNEX

B U N A
Hrvatska Ekološka Udruga
Buna bb, 88202 Mostar, BiH
Tel./Fax: + 387 36 480 380
Email: heu.buna@gmail.com

Project: „Education of the public on sustainable water use and the protection of endemic fish in the Neretva River Valley" is funded by

CRITICAL ECOSYSTEM PARTNERSHIP FUND

DEKLARACIJA ZA ZAŠTITU RIJEKA BUNA, BUNICA I BREGAVA

Pozivajući se na temeljna ljudska prava, zakone i međunarodne konvencije, predstavnici civilnog društva iz Hercegovačko-nerevanske županije/kantona apeliramo na odgovorne institucije da zatraže od odgovornih pojedinaca i tvrtki prestanak aktivnosti koje degradiraju prirodu i život lokalnog stanovništva na slivnom području rijeke Neretve a osobito izražavamo zabrinutost za očuvanje naših rijeka Bune, Bunice i Bregave.

Povodom nastavka provođenja projekta „Gornji Horizonti" unatoč službenom protivljenju od strane vlade Federacije BiH i zabrinutosti Vlade Republike Hrvatske, dolje potpisani želimo izraziti ozbiljnu zabrinutost, da će se projekt nastaviti bez uvažavanja preporuka i mišljenja drugog entiteta u BiH te civilnog društva i neovisnih stručnjaka.

Manjak vode, koji može nastati zbog preusmjeravanja za potrebe proizvodnje električne energije u hidro-energetskom sustavu na Trebišnjici, najviše bi pogodio zaštićena područja kao što je Park prirode Hutovo Blato ali i ponajviše rijeke Bunu, Bunicu i Bregavu koji su dom endemskim i zaštićenim vrstama riba.

Problematično je da se projekt „Gornji Horizonti" pokušava izvesti prije prihvaćanja Plana upravljanja slivovima Neretve i Trebišnjice, u čiju izradu su uključene Bosna i Hercegovina i Republika Hrvatska i oba entiteta u BiH. Izradu Plana upravljanja Neretvom i Trebišnjicom financira Svjetska banka kroz GEF (*Global Environment Facility)*, i trebao bi postaviti temelje za upravljanje ovog prekograničnog vodnog resursa.

Hidero-energetski sustav na rijeci Trebišnjici u trenutnom obliku predstavlja ozbiljnu opasnost za ljude i prirodu jer će omogućiti da se iz sliva Neretve i Trebišnjice preusmjeri ogromna količina voda prema hidroelektrani Dubrovnik 1 i planiranoj hidroelektrani Dubrovnik 2, ukupno čak veća nego što je cijeli protok Neretve u Mostaru. Ovaj zahvat može imati drastičan utjecaj na hidrološke, hidrogeološke i ekološke prilike u cijeloj istočnoj Hercegovini, sve do delte Neretve i Malostonskog zaljeva.

Podsjećamo da se BiH članstvom u Energetskoj zajednici obvezala na provedbu pravne stečevine EU na područjima energije i zaštite okoliša, a potpisnica je i Espoo konvencije, po kojoj je dužna usuglasiti se sa susjednim državama u slučaju projekata sa prekograničnim utjecajima. Razvoj hidroenergije potrebno je sagledati u svjetlu cjelokupne održivosti i socio-ekonomskih koristi, zato pozivamo mjerodavne vlasti da:

1. usvoje Plan upravljanja slivovima Neretve i Trebišnjice u kojem će se posebna pažnja posvetiti osiguranju zaštite najvažnijih ekosustavima;
2. poduzmu sve potrebne mjere za postizanje i održavanje dobrog stanja površinskih i podzemnih voda u slivu Neretve i Trebišnjice;
3. osnuju zajedničko prekogranično savjetodavno tijelo, koje bi omogućilo pronalaženje najboljih rješenja za očuvanje sliva Neretve i zaštićenih područja u regiji.

VIRIDIS, MOSTAR
Anita V. Mustapić

VIRIDIS
udruga za zaštitu okoliša i promicanja kulture življenja

Eko - Most
Mostar

Ekološka udruga "EKO - MOST" MOSTAR

Ivo Božić - predsjednik
USR „NERETVA 1533" MOSTAR

NERETVA 1533 UDRUGA SPORTSKIH RIBOLOVACA MOSTAR 1933

Dinarica 1

UDRUGA DINARICA

Marijan Ćorko

EKOLOŠKA UDRUGA "ANGUILLA" ČAPLJINA

EKOLOŠKA UDRUGA - MOSTAR

Mostar, 31.01.2014. godine

Video:

http://www.federalna.ba/bhs/vijest/88183/buna-bunica-i-bregava-bi-mogle-ostati-bez-autohtonih-vrsta-ribe

pisani:

http://www.bljesak.info/rubrika/business/clanak/projekt-gornji-horizonti-ugrozava-endemske-vrste-riba-u-buni-bunici-i-bregavi/75251

U rijeci Neretvi i njenim pritokama živi 75 vrsta riba, od kojih je 30 autohtonih. Od najveće vrijednosti, no nažalost i najugroženije, je 1*2 endemskih vrsta riba*. Potrebu za očuvanjem i zaštitom endemskih vrsta riba, a osobito u pritokama Buna, Bunica i Bregava je prepoznala međunarodna fondacija **Critical Ecosystem Partership Fund (CEPF)**, koja je omogućila HEU Buna iz Mostara provedbu projekta '*Edukacija javnosti o održivom korištenju voda i zaštiti endemskih riba u dolini Neretve*'.

"*Izgrađeni hidroenergetski objekti u slivu rijeke Neretve su nanijeli i nanose veliku štetu ribljem fondu. Prije svega brane sprječavaju neophodne migracije riba, te također iste uzrokuju potpunu promjenu staništa. Naglim i velikim promjenama temperatura i razina voda, dodatno se ugrožava opstanak endemskih vrsta riba. Pored već postojećih problema, situacija bi s mogla dodatno i dramatično pogoršati novim hidrotehničkim zahvatima, prije svega izgradnjom projekta Gornji horizonti*", navedeno je iz **Hrvatske Ekološke Udruge Buna**.

HEU Buna zajedno sa stručnjacima organizira i konferenciju za javnost u petak **31.1.2014 u 11:00 u Hotelu Ero u Mostaru**, kojom želi ukazati na prijetnje s kojima će se suočavati endemske vrste riba u Buni, Bunici i Bergavi daljnjom provedbom projekta Gornji horizonti.

Hidroenergetski sustav u slivu Trebišnjice

Godine 1965. započela je izgradnja hidroenergetskog sustava u slivu Trebišnjice, izgrađena je brana Gorica u Trebinju, čime je dio voda rijeke Trebišnjice preusmjeren tunelom prema Jadranskom moru, odnosno hidroelektrani Plat kod Dubrovnika. Od tada se računa s umjetnim režimom voda u slivu Trebišnjice. Nastavkom izgradnje prve etape sustava hidroelektrana na Trebišnjici godine 1979. puštena je u pogon crpna hidroelektrana Čapljina. U sustavu ove hidroelektrane izvršena je i regulacija korita Trebišnjice kroz Popovo polje, odnosno oblaganje korita prskanim betonom u duljini od 65 km. Regulacijom korita izdvojeni su ponori i ponorske zone u Popovom polju, a preostala voda nakon odvajanja za hidroelektranu Plat, usmjerena je u gornji kompenzacijski bazen crpne hidroelektrane Čapljina. Nakon puštanja u pogon CHE Čapljina, uz prethodnu izgradnju brane Gorica i HE Plat, došlo je do smanjenja prihranjivanja podzemlja putem ponora i ponorskih zona na glavnim pravcima podzemnih tokova, koji vode dreniraju prema delti Neretve.

Danas se nastavlja s provedbom hidroenergetskih planova starih preko 60 godina. Vode Gatačkog, Nevesinjskog, Dabarskog i Fatničkog polja će se preusmjeriti u već postojeći sustav, tj. u Bilećko jezero, te potom odvoditi s dva tunela kapaciteta 210 m3/s prema Jadranskom moru. Dio voda ovih krških polja istočne Hercegovine zapravo pripada slivovima rijeka Buna, Bunica i Bregava. *Znači dio voda koji prirodnim putem prihranjuje izvore ovih rijeka, biti će im oduzet radi korištenja tih istih voda za pokretanje turbina hidroelektrane Plat kod Dubrovnika*.

Projekt Gornji horizonti

Elektroprivreda Republike Srpske, kao glavni investitor projekta **Gornji horizonti** predviđa određene mjere ublažavanja negativnih utjecaja projekta, kao što su sanacija korita rijeke Bregave i kontrolirano upuštanje voda u ponor Ponikva u Dabarskom polju, sve u cilju povećanje minimalnih proticaja Bregave kroz Stolac.

"*Sanacijom tj. betoniranjem korita Bregave, opet bi se narušile prirodne podzemne veze, pa se postavlja pitanje kome se te vode oduzimaju? Da li bi se sanacijom korita Bregave spriječio dotok vode u Hutovo blato? Ne spominje se gdje bi zapravo te vode išle jer je sigurno da eventualnim povećanjem protoka voda kroz Stolac, bi moralo doći negdje do smanjenja*", rekao je **Damir Brljević**, predsjednik **HEU Buna**.

"*Vrlo je upitno hoće li uopće biti moguće puštanjem vode u ponor Ponikva u ljetnim mjesecima povećati minimalne proticaje rijeke Bregave kroz Stolac. Naime, postoji istraživanje koje dokazuje da voda iz Ponikve u ljetnim mjesecima uopće ne dolazi na izvore Bregave*", dodaje **Zoran Mateljak iz Svjetskog fonda za prirodu (WWF)**.

Tvrdnju planera i investitora projekta Gornji horizonti, da će se preusmjerenjima voda oduzimati samo velike vode a potom osiguravati male vode, profesor s Dubrovačkog sveučilišta, **Branko Glamuzina**smatra prilično nesigurnom. "*Zapravo površinske vode u karstu Istočne Hrecegovine ovise o nivou podzemnih voda, stoga ako se ne omogući punjenje podzemlja zimi velikim vodama, postoji opravdana sumnja da bi osiguranje voda u ljetnim mjesecima bili uzaludno tj. da bi podzemlje jednostavno upilo ove vode te se one ne bi pojavile na površini*."

Velika većina ekologa i ekoloških udruga koje djeluju u slivovima Neretve i Trebišnjice smatra da su ovo jako ozbiljni problemi kojima je potrebno ozbiljno pristupiti, te nikako ne bi trebalo ići u investicije bez značajno detaljnijih istraživanja.

http://bljesak.info/rubrika/business/clanak/hidroenergetski-objekti-u-slivu-rijeke-neretve-su-nanijeli-i-nanose-veliku-stetu-ribljem-fondu/75633

Hidroenergetski objekti u slivu rijeke Neretve su nanijeli i nanose veliku štetu ribljem fondu

GORNJI HORIZONTI

OBJAVA: Petak, 31. siječnja 2014. 18:02

IZVOR: Bljesak.info

AUTOR: Sa.M.

HEU Buna je zajedno sa stručnjacima organizirala konferenciju na kojoj je ukazala na prijetnje s kojima će se suočavati endemske vrste riba u Buni, Bunici i Bergavi daljnjom provedbom projekta Gornji horizonti.

Na rijeci Neretvi i njenim pritokama živi 75 vrsta riba, od kojih je 30 autohtonih. Od najveće vrijednosti, no nažalost i najugroženije, je 12 endemskih vrsta riba. Potrebu za očuvanjem i zaštitom endemskih vrsta riba, a osobito u pritokama Buna, Bunica i Bregava je prepoznala međunarodna fondacija Critical Ecosystem Partership Fund (CEPF), koja je omogućila HEU Buna iz Mostara provedbu projekta 'Edukacija javnosti o održivom korištenju voda i zaštiti endemskih riba u dolini Neretve'.

"Izgrađeni hidroenergetski objekti u slivu rijeke Neretve su nanijeli i nanose veliku štetu ribljem fondu. Prije svega brane sprječavaju neophodne migracije riba, te također iste uzrokuju potpunu promjenu staništa. Naglim i velikim promjenama temperatura i razina voda, dodatno se ugrožava opstanak endemskih vrsta riba. Pored već postojećih problema, situacija bi s mogla dodatno i dramatično pogoršati novim hidrotehničkim zahvatima, prije svega izgradnjom projekta Gornji horizonti", navedeno je nedavno iz Hrvatske Ekološke Udruge Buna.

Elektroprivreda Republike Srpske, kao glavni investitor projekta Gornji horizonti predviđa određene mjere ublažavanja negativnih utjecaja projekta, kao što su sanacija korita rijeke Bregave i kontrolirano upuštanje voda u ponor Ponikva u Dabarskom polju, sve u cilju povećanje minimalnih proticaja Bregave kroz Stolac.

Velika većina ekologa i ekoloških udruga koje djeluju u slivovima Neretve i Trebišnjice smatra da su ovo jako ozbiljni problemi kojima je potrebno ozbiljno pristupiti, te nikako ne bi trebalo ići u investicije bez značajno detaljnijih istraživanja.

http://novovrijeme.ba/projekt-gornji-horizonti-ugrozava-endemske-vrste-riba-u-buni-bunici-i-bregavi/

Projekt "Gornji horizonti" ugrožava endemske vrste riba u Buni, Bunici i Bregavi

U rijeci Neretvi i njenim pritokama živi 75 vrsta riba, od kojih je 30 autohtonih. Od najveće vrijednosti, no nažalost i najugroženije, je 12 endemskih vrsta riba. Potrebu za očuvanjem i zaštitom endemskih vrsta riba, a osobito u pritokama Buna, Bunica i Bregava je prepoznala međunarodna fondacija Critical Ecosystem Partership Fund (CEPF), koja je omogućila HEU Buna iz Mostara provedbu projekta "Edukacija javnosti o održivom korištenju voda i zaštiti endemskih riba u dolini Neretve“

Piše: Almir Kasupović. Objavljeno : 28-01-2014 11:51h Tagovi: **Bregava**, **Buna**, **Bunica**, **endemske vrste riba**, **Mostar**, **Neretva**

Izgrađeni hidroenergetski objekti u slivu rijeke Neretve su nanijeli i nanose veliku štetu ribljem fondu. Prije svega brane spriječavaju neophodne migracije riba, te također iste uzrokuju potpunu promjenu staništa. Naglim i velikim promjenama temperatura i razina voda, dodatno se ugrožava opstanak endemskih vrsta riba. Pored već postojećih problema, situacija bi s mogla dodatno i dramatično pogoršati novim hidrotehničkim zahvatima, prije svega izgradnjom projekta "Gornji horizonti".

Godine 1965. započela je izgradnja hidroenergetskog sustava u slivu Trebišnjice, izgrađena je brana Gorica u Trebinju, čime je dio voda rijeke Trebišnjice preusmjeren tunelom prema Jadranskom moru, odnosno hidroelektrani Plat kod Dubrovnika. Od tada se računa s umjetnim režimom voda u slivu Trebišnjice. Nastavkom izgradnje prve etape sustava hidroelektrana na Trebišnjici godine 1979. puštena je u pogon crpna hidroelektrana Čapljina. U sustavu ove hidroelektrane izvršena je i regulacija korita Trebišnjice kroz Popovo polje, odnosno oblaganje korita prskanim betonom u duljini od 65 km. Regulacijom korita izdvojeni su ponori i ponorske zone u Popovom polju, a preostala voda nakon odvajanja za hidroelektranu Plat, usmjerena je u gornji kompenzacijski bazen crpne hidroelektrane Čapljina. Nakon puštanja u pogon CHE Čapljina, uz prethodnu izgradnju brane Gorica i HE Plat, došlo je do smanjenja prihranjivanja podzemlja putem ponora i ponorskih zona na glavnim pravcima podzemnih tokova, koji vode dreniraju prema delti Neretve.

Danas se nastavlja s provedbom hidroenergetskih planova starih preko 60 godina. Vode Gatačkog, Nevesinjskog, Dabarskog i Fatničkog polja će se preusmjeriti u već postojeći sustav, tj. u Bilećko jezero, te potom odvoditi s dva tunela kapaciteta 210 m3/s prema Jadranskom moru. Dio voda ovih krških polja istočne Hercegovine zapravo pripada slivovima rijeka Buna, Bunica i Bregava. Znači dio voda koji prirodnim putem prihranjuje izvore ovih rijeka, biti će im oduzet radi korištenja tih istih voda za pokretanje turbina hidroelektrane Plat kod Dubrovnika.

Elektroprivreda Republike Srpske, kao glavni investitor projekta "Gornji horizonti" predviđa određene mjere ublažavanja negativnih utjecaja projekta, kao što su sanacija korita rijeke Bregave i kontrolirano upuštanje voda u ponor Ponikva u Dabarskom polju, sve u cilju povećanje minimalnih proticaja Bregave kroz Stolac.

"Sanacijom tj. betoniranjem korita Bregave, opet bi se narušile prirodne podzemne veze, pa se postavlja pitanje kome se te vode oduzimaju? Da li bi se sanacijom korita Bregave spriječio dotok vode u Hutovo blato? Ne spominje se gdje bi zapravo te vode išle jer je sigurno da eventualnim povećanjem protoka voda kroz Stolac, bi moralo doći negdje do smanjenja“, rekao je Damir Brljević, predsjednik HEU Buna.

"Vrlo je upitno da li je uopće moguće upuštanjem vode u ponor Ponikva u ljetnim mjesecima povećati minimalne proticaje rijeke Bregave kroz Stolac. Naime, postoji istraživanje koje dokazuje da voda iz Ponikve u ljetnim mjesecima uopće ne dolazi na izvore Bregave“, dodaje Zoran Mateljak iz Svjetskog fonda za prirodu (WWF).

Tvrdnju planera i investitora projekta Gornji horizonti, da će se preusmjerenjima voda oduzimati samo velike vode a potom osiguravati male vode, profesor s Dubrovačkog sveučilišta, Branko Glamuzina smatra prilično nesigurnom. "Zapravo površinske vode u karstu Istočne Hrecegovine ovise o nivou podzemnih voda, stoga ako se ne omogući punjenje podzemlja zimi velikim vodama, postoji opradana sumnja da bi osiguranje voda u ljetnim mjesecima bili uzaludno tj. da bi podzemlje jednostavno upilo ove vode te se one ne bi pojavile na površini.“

Velika većina ekologa i ekoloških udruga koje djeluju u slivovima Neretve i Trebišnjice smatra da su ovo jako ozbiljni problemi kojima je potrebno ozbiljno pristupiti, te nikako ne bi trebalo ići u investicije bez značajno detaljnijih istraživanja.

(Fena)

http://dnevni-list.ba/web1/2014/01/31/borba-za-ocuvanje-endemskih-vrsta-u-rijekama-bune/

Borba za očuvanje endemskih vrsta u rijekama Bune

MOSTAR – Zbog izgrađeni hidroenergetski objekti u slivu Neretve nanose veliku štetu ribljem fondu, posebice populacijama endemskih vrsta, a zabrinjava i projekt “Gornji horizonti” kojeg planira realizirati Elektroprivreda Republike Srpske.
Ovo je istaknuto na današnjoj konferenciji u Mostaru u hotelu Eri, koju je organizirala Hrvatska ekološka udruge (HEU) Buna.
- Umjesto da se poduzimaju žurni koraci u cilju zaštite ključnih prirodnih vrijednosti, svjedoci smo da se pokreću projekti koji zauvijek mogu uništiti i ono što nam je preostalo od naših prirodnih ljepota i vrijednosti, poručio je predsjednik ove udruge, Damir Brljević. Stoga su, dodaje, pokrenuli projekt “Edukacija javnosti o održivom korištenju voda i zaštiti endemskih vrsta riba u dolini Neretve”, kojeg financira fondacija Critical Ecosystem Partership Fund (CEPF). Iz HEU Buna upozoravaju kako bi se situacija mogla dramatično pogoršati novim hidrotehničkim zahvatima, posebice izgradnjom navedenog projekta EPRS-a.
Po riječima Zorana Mateljaka iz Svjetskog fonda za prirodu (WWF) radovi na izgradnji hidroenergetskog sustava na Trebišnjici u Istočnoj Hercegovini može imati velike posljedice na Neretvu, ali i na njezine pritoke: Bunu, Bunicu i Bregavu, te na Park prirode “Hutovo blato” i deltu Neretve u Hrvatskoj.
Branko Glamuzina, profesor s Dubrovačkog sveučilišta rekao je kako jedina vrsta koju su izabrali kao indikatorsku vrstu u Buni i Bunici je mekousna neretvanska pastrva koja jedina ostaje kao riba koja ima održivu populaciju dok je većini ostalih riba značajno smanjena brojnost. Te vrste pastrve nema nigdje u svijetu, iako imaju njezine podvrste. Objašnjava kako se ta pastrva upravo sada mrijesti u Buni i Bunici i djelu Neretve oko Mostara i prema Žitomislićima.
- Upravo sada vidimo direktan učinak smanjivanja tih voda jer je tek neki dio populacije ušao u Bunu i Bunicu kada su digle i spojile. Ako se ne spoje ta riba ne može više ulaziti u Bunu i Bunicu i propadaju sva ta prirodna mrjestilišta, rekao je Glamuzina. Poručio je da, ako se spriječi ulazak nema više prirodnog mrjestilišta, ako nema mrijesta populacija dramatično pada, ostat će samo poribljavanje kao krajnji izlaz očuvanja vrste.
Sudionici konferencije napomenuli su da u Neretvi i njezinim pritokama živi 75 vrsta riba, od kojih je 30 autohtonih, a od najveće vrijednosti je 12 vrsta endemskih riba, koje su i najugroženije.
M. Marić
http://www.starmo.ba/mostars/item/24648-video-ugro%C5%BEene-pritoke-rijeke-neretve.html

Mostar -- Projekat pod nazivom "Gornji horizonti", koji se provodi u istočnoj Hercegovini i podrazumijeva preusmjeravanje voda sliva rijeke Trebišnjice, već ima negativne efekte na prirodnu okolinu u dolini

Neretve. Ako se taj projekat provede do kraja, rijeke iz sliva Neretve, poput Bune, Bunice i Bregave, potpuno će ostati bez autohtonih vrsta.

To je upozoreno na današnjoj press-konferenciji koju je u Mostaru održala Hrvatska ekološka udruga "Buna". Oni kažu da se ne protive projektu "Gornji horizonti" kao takvom, ali da bi Elektroprivreda RS trebala u projekt ugraditi ekološke komponente.

Kako je rečeno na press-konferenciji HEU "Buna", projektom "Gornji horizonti" direktno su ugroženi Buna i Bunica, Bregava, Park prirode Hutovo Blato i delta Neretve u Hrvatskoj.

Prof. dr. Branko Glamuzina, sa Sveučilišta u Dubrovniku, izjavio je da je učinak projekta "Gornji horizonti" na Hutovo blato već vidljiv, a rijeka Bregava je u dramatičnom stanju, dok Buna i Bunica još koliko-toliko imaju tradicionalni izgled.

Situacija se odražava na neke autohtone vrste, koje su uzete kao indikatori stanja.

Zoran Mateljak, iz Svjetskog fonda za prirodu, kaže da je više od pola navedenog HE sistema već završeno. Tunelima se vode skupljaju i preusmjeravaju ka vještačkoj akumulaciji Bileća, najvećoj takvoj na Balkanu, te je stoga Popovo polje, prirodno srce sistema, danas suho, a bez vode ostaju izvori rijekâ Buna, Bunica i Bregava, koje su pritoke Neretve.

Projektom bi se, kaže Mateljak, skupile vode, koje bi bile veće od rijeke Neretve u Mostaru. Do sada se tim sistemom nije upravljalo na ekološki prihvatljiv način, tvrdi Mateljak.

A šta će se dogoditi ako se ne vodi računa o ekologiji - već postoji primjer projekta „Donji horizonti“ iz 70-tih godina prošlog stoljeća. Prof. Branko Glamuzina kaže da tada nisu ostvarena obećanja o dotoku vode do hidrocentrale Svitava, te o navodnjavanju donje Neretve.

sa današnje press-konferencije HEU Buna

HEU "Buna" saopćila je da već godinama nastoji spriječiti propadanje eko-sistemâ i smanjenje bio-raznolikosti u slivu rijeke Neretve. Zato su pokrenuli inicijativu o edukaciji javnosti o održivom korištenju voda i zaštiti endemskih vrsta riba, što je podržala američka fondacija Critical Ecosystem Partnership Fund.

(StarMo)

http://www.studio88.ba/clanak/brljevic-zabrinuti-smo-odlukom-ep-rsa-da-se-krene-u-realizaciju-projekta-gornji-horizonti

HEU 'BUNA'

Brljević: Zabrinuti smo odlukom EP RS-a da se krene u realizaciju projekta 'Gornji horizonti'

Fena
petak, 31.01.2014 15:20
0

Izgrađeni hidroenergetski objekti u slivu Neretve nanose veliku štetu ribljem fondu, a posebice smo zabrinuti stanjem populacija endemskih vrta riba, kao i odlukom Elektroprivrede Republike Srpske da krene u realizaciju projekta "Gornji horizonti", istaknuto je na današnjoj konferenciji za novinare u Mostaru.

Kako je istaknuo predsjednik Hrvatske ekološke udruge (HEU) "Buna" Damir Brljević, umjesto da se poduzimaju žurni koraci u cilju zaštite ključnih prirodnih vrijednosti, danas smo svjedoci da se pokreću projekti koji zauvijek mogu uništiti i ono što nam je preostalo od naših prirodnih ljepota i vrijednosti.

Iz tog razloga, navodi Brljević, pokrenuli su projekt pod nazivom *"Edukacija javnosti o održivom korištenju voda i zaštiti endemskih vrsta riba u dolini Neretve",* kojeg financira fondacija Critical Ecosystem Partership Fund (CEPF).

Iz HEU "Buna" upozoravaju kako bi se situacija mogla dramatično pogoršati novim hidrotehničkim zahvatima, posebice izgradnjom projekta "Gornji horizonti".

Zoran Mateljak iz Svjetskog fonda za prirodu (WWF) na današjoj konferenciji govorio je o hidrotehničkim zahvatima u slivu Trebišnjice odnosno u Istočnoj Hercegovini te o tome kakvo bi bilo to prirodno stanje,a kakvo je trenutno stanje, odnosno što se to namjerava dalje raditi na izgradnji hidroenergetskog sustava na Trebišnjici koji ima i može imati velike posljedice na samu Neretvu odnosno njezine pritoke u ovom konkretnom slučaju to su Buna, Bunica i Bregava, ali i na Park prirode "Hutovo blato" kao i deltu Neretve u Hrvatskoj.

"To bi značilo skupljanje voda Istočne Hercegovine na krškim poljima koji su visinski posloženi od Gatačkog preko Nevesinjskog pa u konačnici do Popovog polja, te dreniranje ovih prirodnih kolektora prema rijekama Buni, Bunici, Bregavi, Hutovom blatu, delti Neretve. Također bi se iz Popovog polja vode drenirale u malostonski zaljev što je također jako bitno jer je i to zaštićeni predio", pojasnio je Mateljak.

Navodi kako je situacija koju imamo danas takva da imamo više od pola tog hidroenergetskog sustava već završenog.

"Tunelima odnosno kanalima vode se skupljaju u akumulaciji Bileća koja je najveća umjetna akumulacija na Balkanu sa zapreminom od milijardu i 300 milijuna kubika vode. Prirodno srce sustava, Popovo polje danas je suho, Trebišnjica je kanalizirana i,

zapravo, srce cijelog tog sustava je premješteno u akumulaciju Bileća", istaknuo je Mateljak.

Ono što je izazvalo najveće probleme za prirodni režim voda u ovom području je daljnje preusmjeravanje tih voda tunelom prema hidroelektrani Plat kod Dubrovnika koja je kapaciteta 90 kubnih metara u sekundi s tim da se završetkom kompletnog hidroenergetskog sustava na Trebišnjici zapravo namjerava povećati kapacitet na čak 210 kubnih metara u sekundi, istaknuo je Mateljak .

Prema njegovim riječima, projektom Gornji horizonti bi se skupljale vode rijeke Zalomke akumulacijom u Nevesinjskom polju potom bi se preusmjeravale tunelom u Dabarsko polje, a potom kanalima i tunelima u Bilećko jezero.

Profesor s Dubrovačkog sveučilišta Branko Glamuzina kazao je kako jedina vrsta koju su izabrali kao indikatorsku vrstu u Buni i Bunici je mekousna neretvanska pastrva koja jedina ostaje kao riba koja ima održivu populaciju dok je većini ostalih riba značajno smanjena brojnost. Mekousne neretvanske pastrve nema nigdje u svijetu osim što imaju podvrste.

"Spomenuta riba se upravo sada mrijesti u Buni i Bunici i djelu Neretve oko Mostara i prema Žitomislićima i upravo sada vidimo direktan učinak smanjivanja tih voda jer je tek neki dio populacije ušao u Bunu i Bunicu kada su digle i spojile. Ako se ne spoje ta riba ne može više ulaziti u Bunu i Bunicu i propadaju sva ta prirodna mrjestilišta", istaknuo je Glamuzina.

Ako se spriječi ulazak nema više prirodnog mrjestilišta, ako nema mrijesta populacija dramatično pada i ostaje samo poribljavanje kao nekakav krajnji izlaz očuvanja vrste, kazao je Glamuzina te istaknuo da će se kroz projekt CEPF-e fokusirati na taj aspekt mekousne pastrve.

Inače, u Neretvi i njezinim pritokama živi 75 vrsta riba, od kojih je 30 autohtonih, a od najveće vrijednosti je 12 vrsta endemskih riba, koje su i najugroženije. Elektroprivreda Republike Srpske kao glavni investitor projekta "Gornji horizonti" predviđa određene mjere ublažavanja negativnih utjecaja projekta.

H.E.U. BUNA

PROJECT

“Education of the public on sustainable water use and the protection of endemic fish in the Neretva River Valley”

Component 2: Protection of endemic fish species and their spawning grounds on Buna, Bunica and Bregava rivers

Product 2: Action Plan for efficient protection of spawning grounds and endemic fish stocks

Prepared by: Prof Branko Glamuzina, University of Dubrovnik, Croatia

EXECUTIVE SUMMARY

Fish fauna in three investigated karst rivers is significantly threatened by different reasons. The most important is impact of recent water management changes, due to building of new dams and reservoirs for production of energy. As a main impact, the water quantity and natural seasonality is significantly changed threatening most of the life cycles of important endemic species. Furthermore, the planned dams and water diverting to another watershed will make the situation worse. The main issue of future fish management is how to secure natural water conditions for endangered fish species and critical periods of life cycles, such as spawning and juvenile recruitment.

Several endemic species were recorded in these three rivers. In Buna and Bunica rivers salmonid species dominated, while in Bregava River endemic cyprinids species are abundant. These rivers are important habitats for endemic salmonids, as they use rivers for spawning and juvenile feeding grounds. The dominant salmonid species is soft-mouth trout, *Salmo obtusirostris*. It was very abundant in Neretva River watershed, but after building of five dams in major river flow, the present population is restricted to major flow between towns of Mostar and Čapljina, where all three rivers also flow in. It is questionable is this habitat is sufficient to sustain species survival, especially in the years of water flow changes and observed climatic and precipitation changes.

Composition of ichthyofauna in these rivers is result of their ecological properties and level of anthropogenic impact. In Buna River salmonid species dominate, with a significant number of endemic trouts. In Bregava River, endemic cyprinids dominated, with a low number of salmonids, mainly introduced and stocked rainbow trout. These important findings acquired through this project execution provide local community (including NGO-s and fishery societies) with new evidence how to manage these important resources and habitats.

To answer this question more investigation in complete areal of the species is called for. However, present research point to necessity of detailed mapping of spawning grounds in Buna and Bunica rivers and their better protection and more research on status of amphipod crustaceans as a major food of soft-mouth trout. These research needs to be executed at least during one year, while evaluation of water regime needs several years of investigation.

As soft-mouth trout, also known as Adriatic Salmon, is very important species for local economy, recreational fishery and gastronomy, more efforts and funding should be invested in order to protect species and its natural habitats. Efforts should be also oriented towards production of juveniles for restocking and stock enhancement purposes in parts of the Neretva watershed where natural spawning is stopped due to river damming and habitat changes.

Soft-mouth trout-Adriatic Salmon is pearl of Neretva River watershed and also symbol of endemism richness of this karst area of Bosnia and Herzegovina. Because of this and result of this project, the species deserve to be managed and protected by any means.

2.2 Survey on status of ichthyofauna in all three rivers with main target on native and endemic species status

Methods and methodology

Study area

The study area was located in middle Herzegovina, in the area of town of Mostar and Stolac. Three rivers were object of research executed for this project: Buna, Bunica and Bregava rivers. All three rivers are left tributaries of Neretva River and received water mainly from mountain carst area, popularly called "Upper Horizons", due to energy-hydrological project which is presently under execution. Buna and Bunica rivers flow through field and the bottom and banks are mainly composed of ground and mud, with some gravel parts. The bottom is mostly covered with water plants and algae during summer period and less during winter. The Bregava River flows through hills, mostly canyon. Banks and bottom is mostly composed of stones, and the bottom is usually graveled of different sizes.

Sampling and measurements

Sampling of fish was carried out once in each river. The rivers were investigated during lower water condition in late June (Buna River during 26th June, Bunica River 27th June and Bregava River 28th June). Fish was sampled with "Aquatech-Austria) batterie-powered Electrofishing-Backcarry units (20-100 Impuls/sec. 300-600 Volt) device. Each river was sampled in three zones (mouth, middle and spring) and 300 meters section along these zones were fished out.

After catching all fish were anesthetized in water solution of benzocaine anesthetic. After, all fish were measured. The length was measured to the nearest mm using an ichthyometer, and weight using a KERN digital balance (±0.001g). After measurement the fish were left in bucket with clean water until it recovers and actively start moving. Then it was released into river. Data on length and weight were used for common statistical analysis using Statistica 10.0 software package.

Additional fish for reproduction and feeding survey were obtained during winter for reproduction study and during summer for feeding studies. Only ten specimens of soft-mouth trout were analyzed during reproduction cycle and most of them in February. The number of fish is limited due to no-catch season and ban on marketing of this species, and these ten specimens were obtained from local partner fishery society. Fecundity was examined in 8 female individuals covering only some classes in the samples and expressed as the number of eggs per female individual and the number of eggs per 1 kg of female individual body weight. All Statistical analyses were considered significant at $\alpha=0.05$ level.

Feeding survey of soft-mouth trout was executed on 20 specimens from June sampling with addition of several fish obtained from local fishermen. The summer is open fishing period and it was possible to purchase these fish and used it for feeding analysis. After measurement of length and weight, the stomachs content of 20 individuals of each species, randomly selected every month, were dissected and preserved in 96% ethanol. Prey composition was determined under inverted Olympus microscope (400 x magnifications) to the lowest possible systematic status.

Because of uniformity of prey found in stomachs, common analysis of food preference such as: percentage frequency of occurrence, percentage abundance and vacuity index were not performed.

Monitoring of spawning activity of endemic species was executed during January-March, 2013. Every week project staff including researchers, fishermen and volunteers monitored chosen parts of river flow

(indicated in Fig.1) in order to locate spawning zones of soft-mouth trout and other potential endemic fish spawners in these rivers.

Composition of fish catch

All three rivers were investigated with electrofishing and nets during April-June period in order to investigate fish composition for each river. The structure of fish fauna in each river is described in Table 1.

Table 1. Structure of fish community (number of caught specimens and their percentage in total sample) in three rivers: Buna, Bunica and Bregava during June sampling campaigns

Fish species	Buna River		Bunica River		Bregava River (in Federation BiH)	
Salmo obtusirostris	42	23%	13	18%	15	7%
Salmo marmoratus dentex	15	8%	2	3%	8	4%
Salmo trutta	20	11%	7	10%	23	11%
Oncorhynchus mykiss	15	8%	0	-	8	4%
Gasterosteus aculeatus	28	15%	6	8%	27	13%
Squalius cephalus	48	26%	15	20%	25	12%
Squalius svallize	4	2%	6	8%	51	24%
Rutilus basak	7	4%	11	15%	38	18%
Chondrostoma kneri	5	3%	13	18%	15	7%
Total fish caught	184		73		210	

Total of 184 fish was sampled in Buna River, 73 fish specimen in Bunica River and 211 specimens in Bregava River. From the catch structure it is evident that salmonid fish dominate in Buna and cyprinids in Bregava River. Bunica River is specific and represent mix of these two fish families. The dominate species in Buna and Bunica is softmout trout, followed with Neretvan nase and Adriatic Dace. Dace and Roach are also most represented in Bregava River.

The sampling was executed during summer season. It is evident that during summer period none of introduced species was sampled, which is possibly result of their spawning migrations to lower shallow areas (Hutovo Blato wetlands) of Neretva watershed. Only rainbow trout was sampled and all of them were result of recent stock enhancement with hatchery fish.

The fish composition was in some sense expected. The dominance of salmonids in Buna River is result of good water quality and stable flow. Their lower number in close Bunica River is result of different

river properties (smaller, stones). The dominance of endemic cyprinids in Bregava River is result of higher water temperatures and lower oxygen levels, the conditions not suitable to sensitive trout species. Furthermore, Bregava River is closer to most spawning grounds of these species, and closest river to recruit. The problem lies in drying of river during summer, when significant number of these fished died in water remnants, if not migrated to main Neretva flow.

Figure 1. Pictures of sampling campaigns and caught fish during project execution.

Sampling campaign were organized with major stakeholders dealing with this river, including fishery societies which have concessions for organized recreational and sport fishery on those rivers. The other people which take part in sampling, fish analysis and educational sessions were from NGO-s, primary school in Buna village and local fishermen.

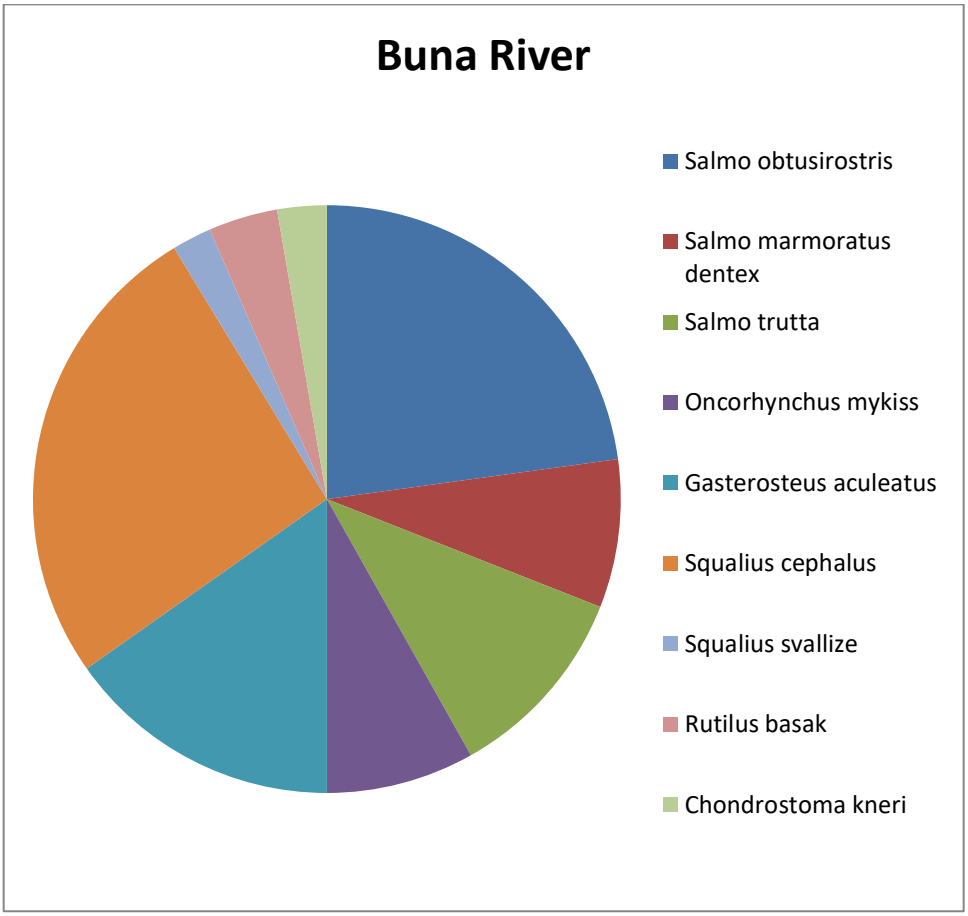

Fig. 2. Composition of fish catch in Buna River (summer sampling)

In Buna River, fish from Salmonidae family dominated, while the rest belong to endemic cyprinids. The dominant salmonid fish is soft-mouth trout, followed with dentex trout and brown trout. Small numbers of rainbow trout was also recorded as a consequence of frequent stock enhancement or escapes from local fish farm. Among cyprinids, small local endemic species are frequent, especially endemic dace, roach and nase. Small fish threespine stickleback *Gasterosteus aculeatus*, which is not endemic, but is native in Neretva River watershed is also frequent in Buna River.

The result of catch in Buna River reflects good status of fish fauna, which is mainly due to good protection, prevention of illegal fishing and poaching. The only introduced recorded species was rainbow trout, as a result of stock enhancement activities. But, this species never reproduce in waters of Neretva River, it do not present significant threats to local fauna.

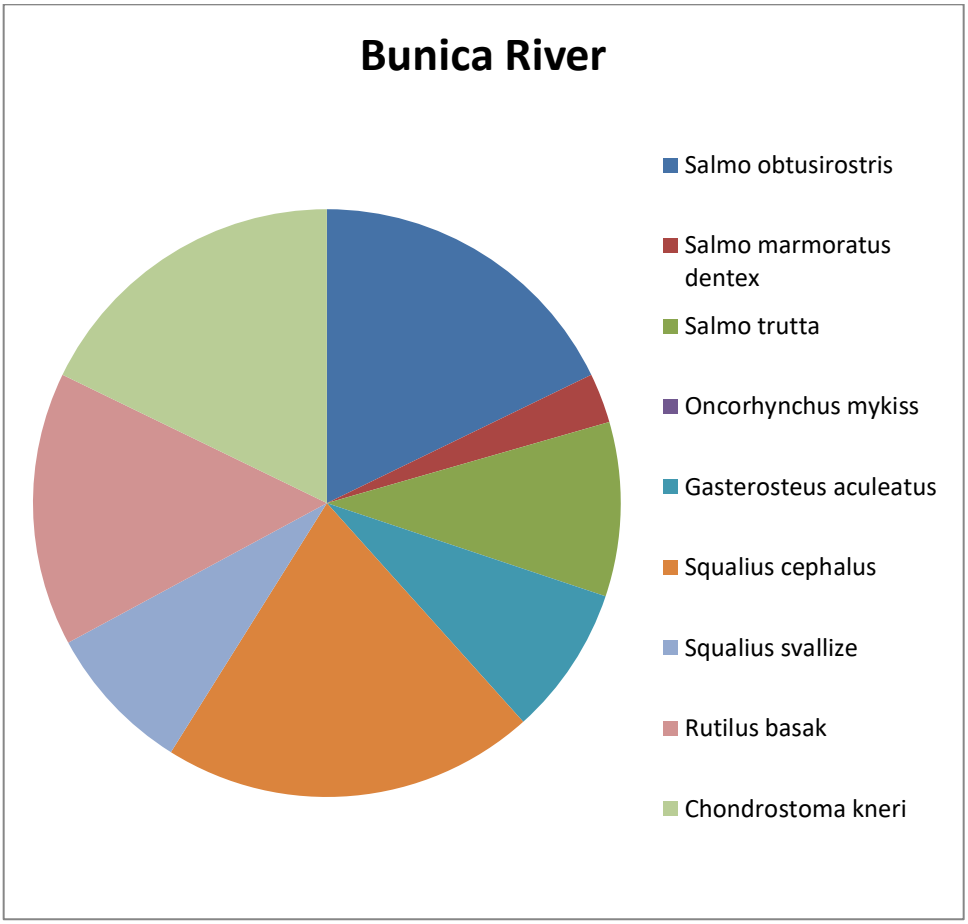

Fig. 3. Composition of fish catch in Bunica River (summer sampling)

The fish composition in Bunica River is similar to Buna River, which is expected as it is tributary. However, due to river slower flow and different nature, the cyprinid fish slightly dominated in catch. The two smaller cyprinids which should eventually use this river springs as spawning grounds; namely endemic roach, *Rutilus basak* and endemic Neretvan nase were recorded in higher number than in Buna River. Although, this river is not typical habitat for cyprinid species, as they usually prefer warmer waters, and temperature of Bunica River is in the range of 10-18 °C, this indicate preference of endemic cyprinids to use colder water for their habitats. Although spawning activity as a final proof of spending of whole life cycle in this river is not documented through this project execution, this should be good preliminary finding for further more detailed scientific research. If confirmed, this should be used as evidence to protect Bunica River as sanctuary for this endangered small endemic cyprinids.

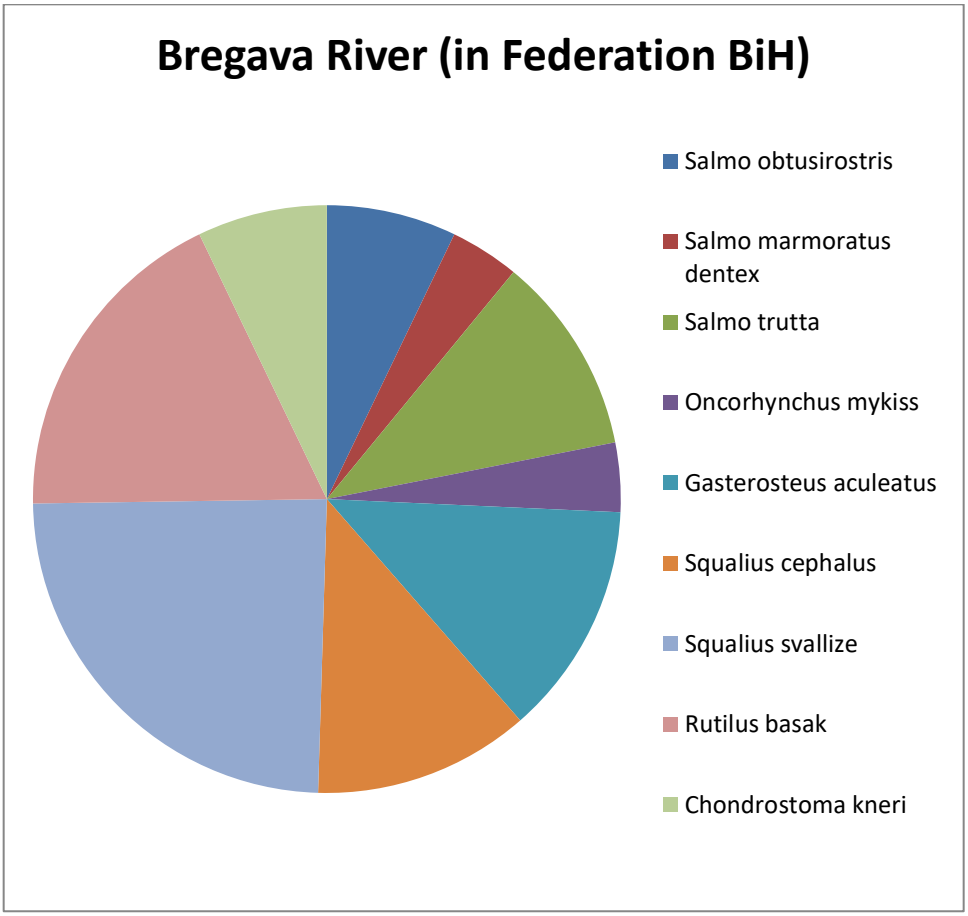

Fig. 4. Composition of fish catch in Bregava River (summer sampling)

The Bregava River is most southern of all three rivers and is already threatened with water condition changes. During autumn-spring seasons the river is in its natural shape, but during summer season due to lack of water, half of the river dried. As a result, the river ecosystem is divided in two sections: upper part with constant yearly flow present typical salmonid water ecosystems with a dominance of trouts, while lower part which dried during summer is mixture of species with dominance of endemic cyprinids. These two parts are divided with waterfall system in the middle (in town of Stolac). Usually the fish from lower dried part migrate to major flow of Neretva River during summer and return back when water conditions improve in autumn.

This river is difficult to manage, as upper part is situated in Republika Srpska (the other entity of Bosnia and Herzegovina), while the second part is in Federation of B&H. The Action plan should be result of joint activities, but because of recent political situation it is difficult to estimate how this should be accomplished.

Important fish species

Soft-mouth trout, *Salmo obtusirostris*

The River Neretva and its tributaries represent the main drainage system in the east Adriatic watershed and the foremost ichthyofaunal habitat of the region. Salmonid fishes from the Neretva basin show considerable variation in morphology, ecology and behaviour. It is therefore not surprising that several species, i.e. *Salmo trutta* Linnaeus, 1758 (brown trout), *Salmo marmoratus* Cuvier, 1817 (marble trout), *Salmo obtusirostris* Heckel, 1851 (soft-mouth trout), *Salmo farioides* Karaman, 1937 and dentex trout *Salmo dentex* Heckel, 1851 (no common name exists for the last two) were identified by early studies (Heckel, 1852; Karaman, 1937).

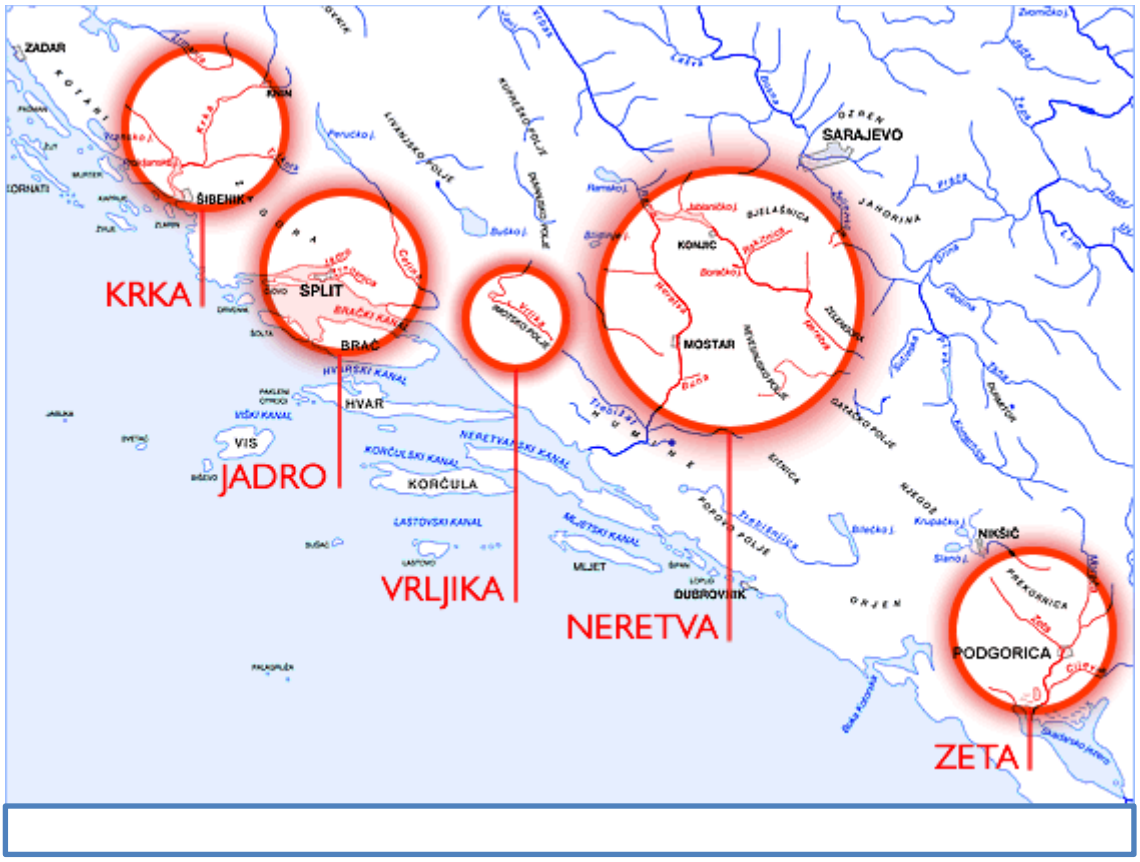

Figure 5. Five populations of soft-mouth trout, *Salmo obtusirostris* living in different rivers (red) of Adriatic Sea watershed.

On the basis of DNA analysis of several salmonid genera (for details see Snoj et al., 2002), a close relationship between the soft-mouth and brown trout was established. Phylogenetic analysis on combined data set of mitochondrial and nuclear DNA indicated that soft-mouth trout exhibits a closer relationship to the brown trout (*Salmo trutta*) than to Atlantic salmon (*Salmo salar)*. This finding refutes the classification that recognizes the soft-mouth trout as a separate genus Salmothymus, and suggests its reclassification on the species level as *Salmo obtusirostris*. The areal of soft-mouth trout is showed in Fig. 5. It lives in five major rivers, while only abundant population is registered in Neretva River watershed.

2.3 Survey on status of flora and fauna which are important for life cycle of endemic species

The status of flora and fauna which are important for life cycles of endemic species was executed partially and was oriented to important species for these rivers.

The most important fish species in these rivers is soft-mouth trout, due to endemic status and importance for sport fishery. This species occupied watercourses with gravel bottom with benthic fauna and primary species prey gammarid crustaceans. Gammarus is an amphipod crustacean genus in the family Gammaridae. It contains more than 200 described species, making it one of the most speciose genera of crustaceans. Different species have different optimal conditions, particularly in terms of salinity, and different tolerances; *Gammarus pulex*, for instance, is a purely freshwater species, while *Gammarus locusta* is estuarine, only living where the salinity is greater than 25‰. The species live in Neretva River is described as *Gammarus balcanicus*.

Figure 6. Typical image of gammarid crustacean, the major food of soft-mouth trout in Neretva River

The major finding of this project survey is in fact that gammarus is a major and only summer prey of soft-mouth trout, and best indicator of suitability of different watercourses for its habitat. All 20 fish used for analysis of food have stomachs filled with gammarus (Fig. 7). No other prey, except some smaller stones was found. Hence, although the food analysis was performed on only 20 fish, we may preliminary conclude that gamarid shrimp is major and exclusive food of soft-mouth trout in Buna and Bunica River.

Simply, when benthic fauna is rich in gammarid shrimps, we should expect good status of soft-mouth population. When this shrimp is missing there is no soft-mouth trout in such watercourses. This statement is supported with catching of these animals using small net device. All major research stations benthos is rich with these shrimps. The abundance and life cycle of these animals is not investigated. Bregava River, opposite to Buna River is poor with shrimp, and we did not find any

specimens using similar net device. This was also followed with smaller number of soft-mouth trout in catch.

Fig. 7. Stomach content of softmout trout, *Salmo obtusirostris* in summer season.

Age structure of soft-mouth trout from Buna River

The age structure was determined based on reading of scales (Fig. 8) of chosen fish from established length weight structure of caught fish. In total scales from 30 fish were used for scale reading procedure. The scales are difficult to interpret due to unclear border between rings and seasons. This is result of living in specific water temperature conditions of Buna and Bunica rivers, where temperatures yearly fluctuate in the range of 9-15 °C. This secure slow but stable growth throughout the whole year, what is visible in scale rings. However, the reading of three independent readers provided age structure of Buna River population presented in Fig. 5.

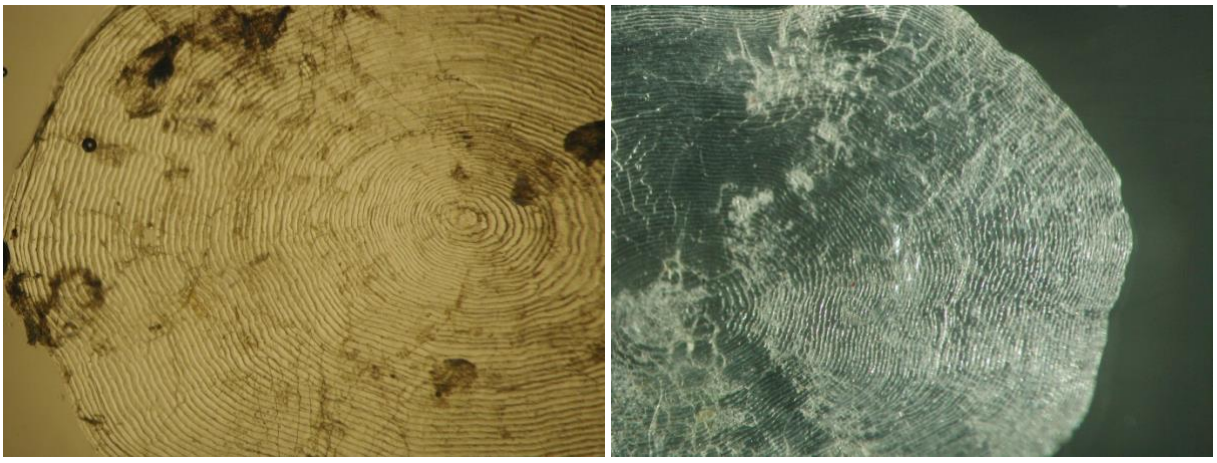

Figure 8. Scales of soft-mouth trout, *Salmo obtusirostris* specimens

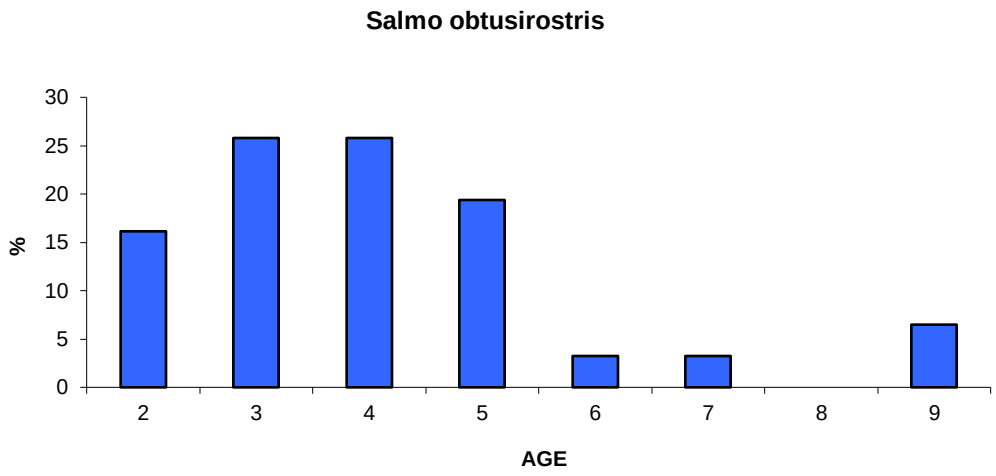

Figure 9. Age structure of soft-mouth trout, *Salmo obtusirostris* from Buna River, Herzegovina (scales of 30 fish were analyzed).

The structure of population in Buna River is good, with a dominance of younger fish from 2 to 5 years of age (Fig. 9). Older fish are smaller in number due to fishing activity and migration to major Neretva flow.

The length classes and growth rate curve are present in figures 10 and 11. All length classes are present in Buna River samples, indicated good biological status of soft-mouth trout in Buna River.

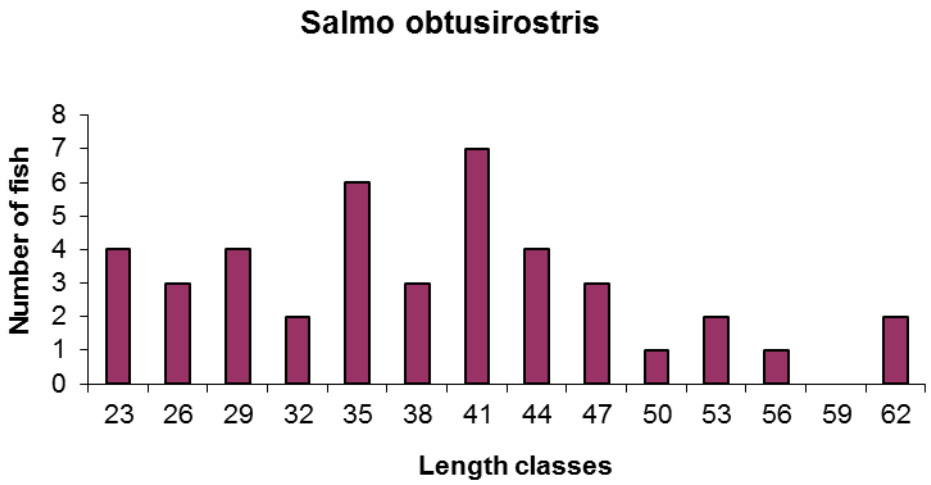

Figure 10. Length classes of soft-mouth trout, *Salmo obtusirostris* from Buna River, Herzegovina (N of caught fish is 42)

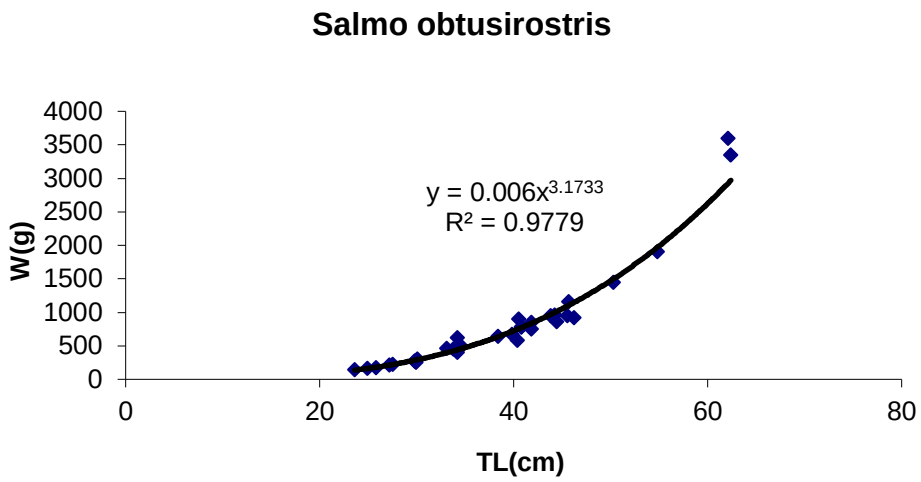

Figure 11. Length-weight relationship of soft-mouth trout, *Salmo obtusirostris* from Buna River, Herzegovina

It is evident from the graph that soft-mout trout exhibit positive allometric growth, meaning fish is growing more in weight then in length exhibiting typical "bold" body shape. This also showed that food resources are rich in Buna River and fish is of good condition and nutritional status.

Reproduction

The soft-mouth trout, *Salmo obtusirostis* exhibit typical salmonid reproduction patterns. The eggs are released from ovary to abdomen cavity after finally matured. The fecundity which was counted on nine matured females in February 2013 is in the range of 2000-2000 eggs per kg of body mass. The diameters of eggs are from 4-5 mm, which is similar to other world trouts (Fig 12 and 13). The number of analyzed fish is too low to make statistically significant conclusions. However, this provide some important data for further management and population dynamics models and investigated ecosystems properties for this species.

Figure 12. Matured females and males of soft-mouth trout, *Salmo obtusirostris* from Buna River, Herzegovina

Figure 13. Matured eggs of soft-mouth trout, *Salmo obtusirostris* from Buna River, Herzegovina

2.4 Define physical condition in the rivers targeting mainly flow, temperature and oxygen levels that would secure stable population of endemic fish species

The soft-mouth trout spawn during winter, from late December to early March, at specific locations along Neretva River and tributaries watershed. This indicates that for successful spawning and recruitment of juveniles winter water regime (Fig. 14) is crucial.

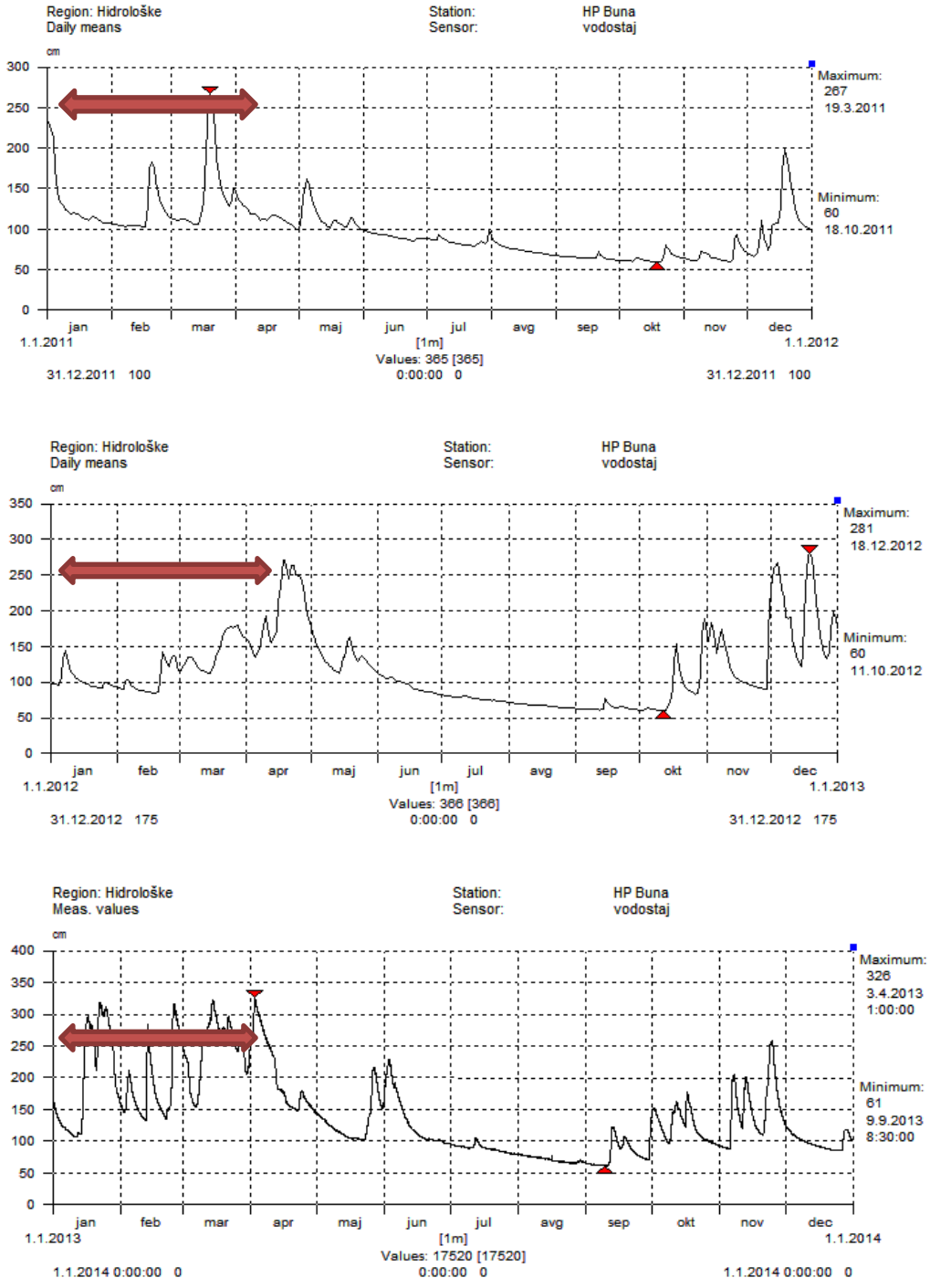

Figure 14. Water regime of Buna river during 2011, 2012 and 2013. (Source: www.jdran.ba)

In the natural conditions of Herzegovina's climate this is period of highest water flows and waters level, but also highest oxygen concentrations (above 10 mg/lit). The optimal temperature for spawning is from 8-13 °C. From the Figure 11 we may see that water level significantly varied in the last three years,

with lowest level during 2012. The reasons are unclear and not investigated. This should be natural (dry year, no snow melting, etc.) or first result of water transfer from Neretva River to hydropower system "Gornji Horizonti" and Adriatic Sea. This is one of the major threats to successful spawning activity of softmout trout. However, due to under research status of Buna River and fish populations in long term sense, final conclusions are difficult to establish. Among three years flow regime, most suitable for spawning activity was 2013 years, due to high water flows during January- April period. These high water levels not promote successful spawning but also migrations of spawners from main Neretva channel to Buna River. When water flows are low, like during 2012, they prevent migrations of spawners to Buna River, so have significant negative impact on softmout trout conservation status.

2.5 Mapping of spawning grounds of endemic species in the rivers

Most of the spawning ground of endemic fish species are scattered in Neretva River watershed. The majority of endemic species belong to family Cyprinidae and their spawning grounds are located in the shallow and slower waters. All investigated cyprinid species spawn in wetlands of Hutovo Blato, which are protected as Park of Nature and under serious protection activity. After spawning and recruitment juveniles migrate to major Neretva flow and inhabit also Buna, Bunica and Bregava rivers. However, as these rivers are not typical cyprinid habitat, due to stronger flow, gravel bottom and lack of typical food of these species, their abundance is not high. We did not observe any spawning activity of these cyprinid species in all three rivers during period of intensive monitoring from January to April, 2013.

Figure 15. Typical spawning ground of Neretvan soft-mouth trout, *Salmo obtusirostris* in Buna River: cleaned gravel area inside algae/plant cover river bottom

Definitely, during this project we didn't notice spawning activity of cyprinid species in these rivers nor interviews with local stakeholders confirm this. However, there is small possibility that endemic nase, *Chondrostoma kneri* spawn in Bunica River spring, but in order to prove this more research is needed. This species normally spawn in Hutovo blato wetlands area, together with other endemic cyprinids.

The only endemic species which spawn in investigated rivers is soft-mouth trout, but only few spawning grounds in Buna River were noticed and mapped during 2014 spawning season (Fig. 15). In Bunica and Bregava rivers spawning grounds were not observed.

The typical spawning ground is located inside Buna flow from the bridge on the main road to spring. We observed several potential grounds, but because of high water level and fast flow, this was not accurately confirmed by egg or alevin samplings. The spawning ground present depression inside plant/algae covered bottom and is made by action of males (Fig. 11). More detailed survey (at least three years) should provide answer are spawning grounds locations fixed for Buna River or spawners change locations yearly depends on water conditions.

2.6 Identification and description of spawning grounds for each species with a focus of type of bottom and habitat, flow regime and temperature, which are needed for successful spawning result and recruitment of juveniles

Based on the preliminary observation made during this project execution, the only species for which these three rivers are important spawning ground is soft-mouth trout. There is potential possibility that endemic nase and roach spawn in Bunica River, but this have to be proved with further investigation.

The most important spawning parts are several locations along Buna River, where spawning grounds where identified during spawning season, based on whiter color of bottom.

Figure 16. Locations of spawning ground of soft-mouth trout, *Salmo obtusirostris* in Buna River (blue circles)

It is evident that soft-mouth trout use complete river length for spawning and not only spring area, as is case with other salmonid species. It is necessary to strictly protect spawning grounds (i.e. with fences, wire, warning signs, etc.) to initiate better care during critical life stages.

The typical spawning ground is composed of gravel bottom, which male cleaned of algae and make depression where females laid their eggs. The water flow should be between 0.5 to 1m/sec, but this statement needs more investigation to be finally confirmed. The oxygen should be higher than 10 mg/lit. As this species spawn during January-April period, low temperature waters (below 10°C) are

necessary for successful spawning and deposition of eggs, as well as egg incubation period and development of larvae.

2.7 Writing the Action Plan for efficient protection of spawning grounds and endemic fish stocks

The results of this project point to very important aspects of protection of endemic fish species in three investigated rivers, previously unknown and under researched. Activities in this project produce interesting results and define conclusions to initiate promotion of several actions to enhance status of investigated species and habitats.

So, the Action Plan is oriented towards three aspects of three targeted rivers importance to endemic fish species. The first aspect is widening of knowledge of biology and ecology of the soft-mouth trout. The second aspect is research on impact of recent decrease of water flow in these rivers due to climatic changes and hydropower projects execution. The focus should be on Buna River, but other parts of habitat are also important. The third aspect is public promotion of project results and fostering of cooperation among important stakeholders, including local people, fishery society and governmental bodies.

It is definitely clear that Bregava River is presently seriously affected with lack of water during summer season and half of its flow (from town of Stolac to the mouth in Neretva River) is without water during July-August period. This means that fish either migrate to Neretva River or stay in water remnants subject to lack of oxygen, high temperatures and human catch. This show that any action plan for Bregava River is superfluous before this “water problem” shall be solved. However, as the new hydro-energy system is building in watershed of this river, its future and potential management is unclear. More political and public efforts must be invested to improve this situation, and success of these activities is very difficult to predict in future, due to complex structure of state of Bosnia and Herzegovina (result of Dayton Agreement).

The Action Plan should thus in this moment be oriented mainly towards Buna and Bunica Rivers and only to one important endemic species, soft-mouth trout, *Salmo obtusirostris*. The possibility that Bunica River is used by endemic cyprinids as spawning ground has to be confirmed with more extensive research.

Having this in mind, we should propose these actions towards better protection of soft-mouth trout as endemic and under investigated species.

Action 1. Detailed survey of present status of soft-mouth trout in Neretva River, Buna and Bunica rivers and other smaller tributaries should be executed. The target of this action is to describe abundance, population and age structure, growth rate, food and feeding and other important biological aspects of populations in all parts where it lives. Research of this project showed that Buna River is rich in soft-mouth trout, rich in main food resource and important as spawning and nursery ground. This must be supported with more data missing in present report, such as ecology of juveniles and their feeding preferences, mapping of more spawning areas, and study on migrations of spawners from main Neretva River flow. After acquisition of these set of data complete management plan for this species in specific habitat of Buna River should be prepared. It is important to state that scientific literature on this species is scarce, older than 40-years and not applicable to recent status of species after significant river alterations.

Action 2. Description of soft-mouth trout reproduction cycle and characteristic: egg size and number, fecundity, which are important not only to management of population, but also for aquaculture development. Due to legislative restriction on catch of fish during maturation and spawning period (November-April), we were limited in this study as NGO is not allowed to obtain license for scientific fishing. Therefore, this research have to be executed by local scientific organization (university or institute) in order to obtain appropriate set of data for detailed description of those species properties

Action 3. Detailed mapping of spawning grounds in all watersheds: Neretva, Buna and tributaries at least during three years. This has to be executed in cooperation with Fishery Society in Mostar, as they have employed guards for daily monitoring of spawning activity. After mapping most important spawning sites should be protected and guarded during critical periods.

Action 4. Development of sustainable plan for recreational and sport fishery, targeting soft-mouth trout, in cooperation with local stakeholders, communities and fishery societies.

Action 5. Detailed research on status of endemic roach, *Rutilus basak* and nase, *Chondrostoma kneri* in Bunica River, with a specific focus of reproduction and spawning of these two species in this river. If confirmed, this should be used as evidence for more protection and preparation of legislative to proclaim river as sanctuary designed for protection of those two endemic cyprinids. The most important spawning grounds of these two species is Hutovo Blato wetland area which is protected as a park of Nature, but these potential spawning sites should be of great significance for the preservation of these threatened species.

Action 6. Research on flow regime of Buna and Bunica rivers during several years and its impact on spawning and recruitment of soft-mouth trout. This will propose optimal water flow regime for successful spawning and recruitment of juveniles of this species. This has to be described as m^3 per second at spring of Buna and Bunica, in order to launch suitable measure for the future water management projects in upper mountain part.

ENDEMSKA RIBE
SU NAŠE BOGATSTVO - SAČUVAJMO IH!

Podustva
Chondrostoma kneri

Mekousna pastrva,
Salmo obtustirostris

Plotica,
Rutilus basak

Sval,
Squalius svallize

Bunu, Bunicu i Bregavu naseljavaju endemske vrste riba koje su prilagođene na brze i hladne vode. U glavnom su to salmonidne pastrvske vrste, od kojih je najznačajnija mekousna pastrva, Salmoobtusirostris. Pored mekousne pastrve u ove rijeke zalaze i zubatak, Salmomarmoratusdentexi endemska potočna neretvanska pastrva, Salmofarioides.
Od ostalih endemskih vrsta riba, ove rijeke naseljavaju i endemske ciprinidnešaranske vrste, od kojih su najbrojnije podustva, Chondrostomaknerii i plotica, Rutilusbasak.
U vode Bregave u donji dio toka zalazi i sval, Squaliussvallize.

Rijeke Buna i Bunica supoznata mrijestilišta mekousne pastrve, te se dijelovi u kojima su u tvrđena područja polaganja jaja moraju posebno zaštititi.

Zubatak,
Salmo dentex

Tisakano zahvaljujući finacijskoj potpori Critical Ecosystem Partnership Fund

BUNA

CRITICAL ECOSYSTEM PARTNERSHIP FUND

ENDEMSKA IHIOFAUNA BUNE, BUNICE I BREGAVE

Tisakano zahvaljujući finacijskoj potpori Critical Ecosystem Partnership Fund

BUNA

CRITICAL ECOSYSTEM PARTNERSHIP FUND