

Detailed report of the project

**“The study of reproduction ecology of endangered endemic fish species
Sevan Trout”**



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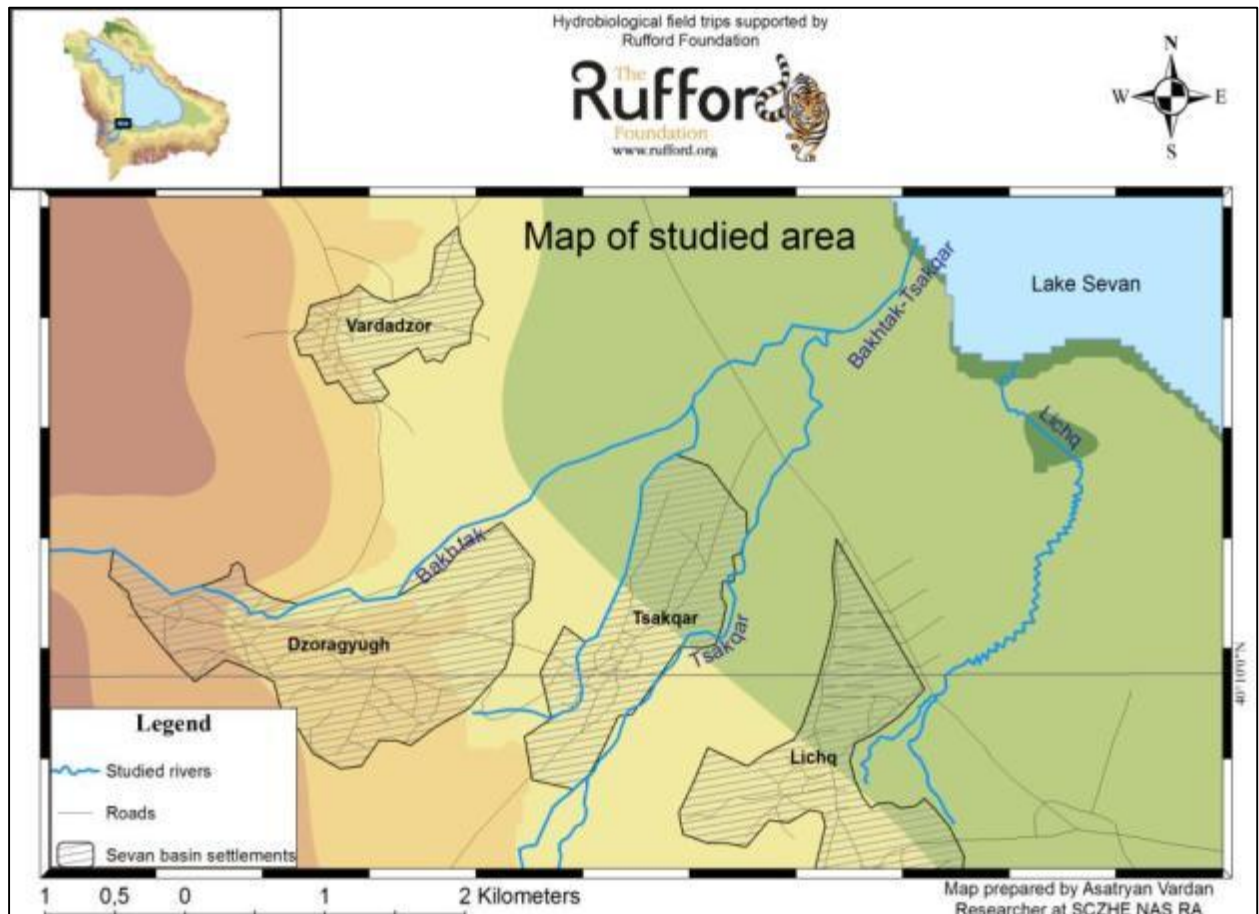
Introduction. As it is known, Sevan trout is one of the most valuable fish species of Armenian ichthyofauna. However, it's endangered nowadays, due to mismanagement of Lake Sevan water and bio-resources as well as anthropogenic impact on the rivers inflowing into the lake. Because of lake's water consumption for irrigation and production of electricity, water level periodically decreased from 1930's and up to 1990's, thus, many lakes in the shore zone of Lake Sevan became dry and some races of Sevan trout spawn in the littoral zone of the lake, have lost their spawning areas. Thereby, unfortunately these races have been eliminated. Two other races of Sevan trout: summer ishkhani or summer bakhtak (*Salmo ischchan aestivalis*, Fortunatov) and gegharquni (*Salmo ischchan gegarkuni*, Kessler), which spawn in Lake Sevan basin rivers, have survived, but have become rare. Previous studies of Sevan trout has shown that significant changes in their morphometric parameters as well as size/age structure taken place compare with the data of 80's, which allow to think that reproduction conditions has also possibly been changed, that's why the aim of the project was to reveal the current state of Sevan trout reproduction ecology and the problems constraining its natural reproduction in Bakhtak, Tsakqar and Lichq rivers.

The last investigation of Sevan trout reproduction was implemented in 80's which means that there is serious gap in the current ecological knowledge of this endemic fish, especially if taking into consideration the changes in biological and ecological peculiarities of Sevan trout since mentioned period.

Main activities. Eight field trips to the basins of Lichq, Tsakqar and Bakhtak rivers (Pic. 1) were organized during the spawning seasons of summer ishkhani and gegharquni (May - June, October - November) to reveal their current morphometric and size/age structures in the period of spawning migration. Periods of field trips has been chosen taking into consideration meteorological situation and water temperature data for chosen rivers, because spawning migration of Sevan trout mainly depends on water temperature.

Ichthyological studies. In May ichthyological studies were implemented only in the downstream of the rivers, because in this period of time, as a result of temperature regime, mature individuals of Sevan trout carrying out spawning migration can reach only this part of the rivers. Even though some hydrobiological and hydrochemical investigations have been implemented in different parts of rivers Lichq, Bakhtak and Tsakqar to reveal water quality and assess river's potential as natural spawning areas for Sevan trout. As it known, May-June is a season for Summer ishkhani spawning migration which begins when water temperature rises above +7.8°C. The ichthyological studies proved the critical situation with Sevan trout. During whole project shoal of trout in the rivers hasn't been encountered. Only some individuals or pairs

of fish have been encountered in the downstream of rivers and in some cases in the middlestream of Lichq river. In May-June season totally 9 individuals of Sevan trout were caught and none of them were sexually mature. Moreover only 3 individuals have been caught in May. Two of them have been caught from the downstream of Tsakqar river, and 1 - from downstream of Bakhtak river.



Pic. 1 Map of Studied rivers

Six fish caught in June season have been approximately at the same size as the ones caught in May. The average length of fish has been 15cm, the maximal length - 17cm, minimal length - 14cm. The average mass has been 50g, minimal mass - 35g, maximal - 60g.

All individuals have been in good health conditions, without external parasites and visual physical defects. Thus, they have a possibility to become sexually mature and to reproduce. Based on size-age structure investigations of trout we can conclude that the first spawning of these fish can be only after 2-3 years. 1 individual from 9 has been summer ishkhan, whereas the other 8 have been gegharquni. All caught trout after examination were released to the rivers (<https://www.youtube.com/watch?v=LbkXfvB9dbM>).

During October-November season 8 individuals of mature trout were finally revealed. Three of them were caught in Lichq river (1 female and 2 male), and other five from Bakhtak-Tsakqar system (2 female, 3 male) (Table 1).

Table 1

Sex and morphometric parameters of mature Sevan trout from Lichq river and Bakhtak-Tsakqar system

No	Length, cm	Mass, g	Sex, stage of gonads maturity
Lichq			
1	29.5	256	♀, IV
2	25.0	175	♂, IV
3	28.0	228	♂, IV
Bakhtak-Tsakqar			
4	29.0	420	♀, V
5	19.0	88	♂, IV
6	22.0	158	♂, IV
7	30.0	278	♀, IV
8	27.0	205	♂, IV

Comparison of morphometric parameters with the data of 80's shows that decrease in number of trout lead only some changes in morphometric parameters of spawning population but not significant rejuvenation as it been predicted. Particularly, according Smoley 1987 fish at length 30-35cm were dominant in spawning shoal in 1985 and fish at length 25-30cm were dominant in 1986. Currently studied fish size is accompanied with the data of 1986 and quite small compared with the data of 1985. Only the comparison of weight parameters of mature trout shows significant differences compared with 80's. Particularly, the average mass of female individuals in studied rivers were 318g which about 18% more than the average mass of females at the same size in 1985 (269g) and about 29% more than in 1986 (245g).

Stage of maturity of gonads has been determined by Kiselevich method. If gonads reach the IV stage of maturity due to pressing on lateral sides of fish sexual products will not come out. If they reach V stage of maturity, a little pressure is enough for sexual product to come out. At this stage sexual products coming out even if fish was shaken in vertical position (head upward). Studied fish were mainly at the IV stage of gonads maturity and only one female individual was in the V stage.

To meet the following objectives: 1. to reveal the conditions of possible spawning areas, 2. to reveal the feeding base of fries, 3. to assess water quality of studied rivers and 4. mapping of current state of studied rivers to reveal the potential of rivers to support natural reproduction of Sevan trout, the investigation of benthic macroinvertebrates community as diet base of fish

and indicators of ecological condition of the water as well as hydrophysical and hydrochemical measurements important for ichthyologic aspect has been implemented.

Hydrophysical and hydrochemical studies. Many factors has importance for Sevan trout spawning migration, but the cores are water temperature, water quality, structure of ground, dissolved oxygen (DO), saturation of water by oxygen, pH, and water level. Not less important factor is the presence of obstacles in the rivers which can artificially constrain fish migration to the appropriate for spawning areas. All these parameters has been periodically measured and analyzed during complex field trips and further GIS analyze.

Water temperature measurements has shown that starting from the second half of the May all parts of downstreams became appropriate for summer bakhtak spawning migration because the average temperatures reach necessary $+7.5^{\circ}\text{C}$. Moreover, in the morning time (the lowest possible temperature within one day) average temperature in May was the lowest in Bakhtak river $+5.5^{\circ}\text{C}$, whereas in the other two studied rivers the average temperatures in the morning were quite higher: $+7^{\circ}\text{C}$ in Lichq river and $+8.5^{\circ}\text{C}$ in Tsakqar river. The less daily and seasonal temperature fluctuations have been registered in Lichq river, because it's the shortest river from all studied as well as due to nourishment features (main nourishment is from wellsprings) and small amplitude of elevations in its catchment basin. Literature data for these rivers also shows that annual water temperatures for May are optimal for spawning migration. For example the average temperature of Lichk river water for May is $+9.6^{\circ}\text{C}$, for Bakhtak river water $+9.5^{\circ}\text{C}$ and for Tsakqar river water $+10^{\circ}\text{C}$.

Within June, amount of precipitation became lower and as a result water level decreased which influenced water temperature also. Water temperature in the middle and upper streams of studied rivers fluctuated from $+7.6^{\circ}\text{C}$ in Lichq river sources to $+9.4^{\circ}\text{C}$ in Bakhtak river middlestream part, but water temperature in downstreams was much higher: from $+14.6^{\circ}\text{C}$ in Lichq estuary to $+13.5^{\circ}\text{C}$ in Tsakqar river downstream part (Table 2).

Provided data proves that water temperature is appropriate for the spawning migration in all studied areas. Similar studies in October-November seasons showed that average temperatures in the first half of the October was not appropriate for the spawning migration of gegharquni, but starting from the end of October registered temperatures regularly dropped below 5.8°C , which is the optimal temperature for starting the spawning migration. According to temperature analyses the most appropriate river for gegharquni natural reproduction is Bakhtak. River Lichq due to its nourishment features has stable cold waters all year, but the temperatures below 6°C is very rear in October-November season. Thus, it's not so appropriate river for

gegharquni spawning. Tsakqar river' water temperature satisfying the demands of gegharquni, thus, this river is also can be spawning river for Sevan trout.

Table 2

Hydro-physical and hydro-chemical parameters of some studied parts of the rivers

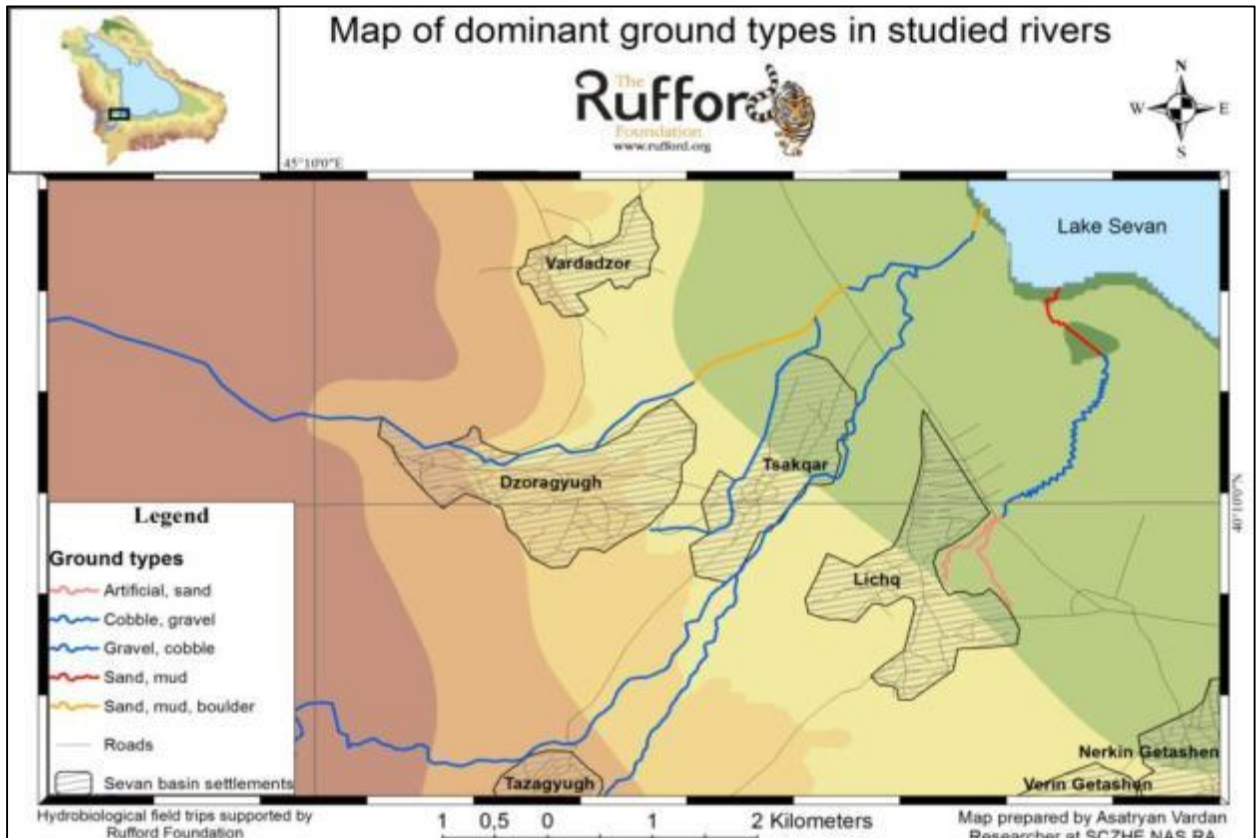
Sampling site	Average Dissolved Oxygen (mg/l)	Average Oxygen saturation (%)	Average temperature (°C)	Average value of pH
May				
Lichq downstream	8.8	78	+8.7	7.8
Tsakqar downstream	8.5	80	+9.1	7.87
Bakhtak downstream	9	96	+8.1	8.07
Bakhtak-Tsakqar	8	72	+10.5	8.01
June				
Lichq upperstream	10,8	89	+7.6	6.92
Lichq middlestream	11.72	100.5	+8.6	7.07
Lichq near the dam	11	99	+10.7	7.26
Lichq downstream	10.5	85	+14.6	7.52
Bakhtak upperstream	10.2	92	+7.9	7.15
Bakhtak middlestream	11.85	103	+9.4	7.58
Bakhtak downstream	8.15	90	+13.5	9.01
Bakhtak-Tsakqar	9.8	95	+13	8.56
October				
Lichq downstream	10.65	96.5	+8.3	7.67
Lichq middlestream	10.35	92	+7.8	7.25
Lichq upperstream	9.96	83.3	+7.4	7.17
Bakhtak-Tsakqar	9.43	85	+6.1	7.75
Bakhtak middlestream	9.71	89	+5.4	7.3
November				
Lichq downstream	11.9	98.5	+6.9	7.62
Lichq middlestream	11.82	98	+6.5	7.1
Lichq upperstream	11.2	93	+6.3	6.98
Tsakqar downstream	13.4	110.4	+5.7	8.1
Bakhtak-Tsakqar	13.33	110	+5.5	8.18
Bakhtak downstream	12.3	104.3	+5.1	8.23
Lichq near the dam	12.51	104.7	+6.5	7.4

Like in May-June, dissolved oxygen and water saturation by oxygen parameters have been more than enough to support Sevan trout natural reproduction and further life cycles of fry in all three rivers. Furthermore, as a result of temperature decrease in October-November season parameters of dissolved oxygen and oxygen saturation has been increased compared with May-June. Rivers Bakhtak and Tsakqar more saturated by the oxygen in November season but in the first half of October due to less water temperature river Lichq was the leader by this parameter.

It's known that pH parameter also can be constraining factor for Sevan trout spawning migration if the values going below 7. The studies carried out in Lichq, Bakhtak and Tsakqar rivers didn't reveal serious seasonal fluctuations of this parameter, but in some cases values

below 7 have been registered. According to this parameter upper stream of Lichq river is quite inappropriate for Sevan trout races as spawning area. In all studied parts of Bakhtak and Tsakqar rivers pH parameter was suitable.

One more important factor for the trout spawning is ground type. Sevan trout prefers to spawn in the cobble, gravel and big-size. As it shown in the pic.2, appropriate ground type for the spawning of Sevan trout has been revealed in the middle and in some cases in the upper stream of the rivers.



Pic. 2 distribution of dominant ground types along studied rivers

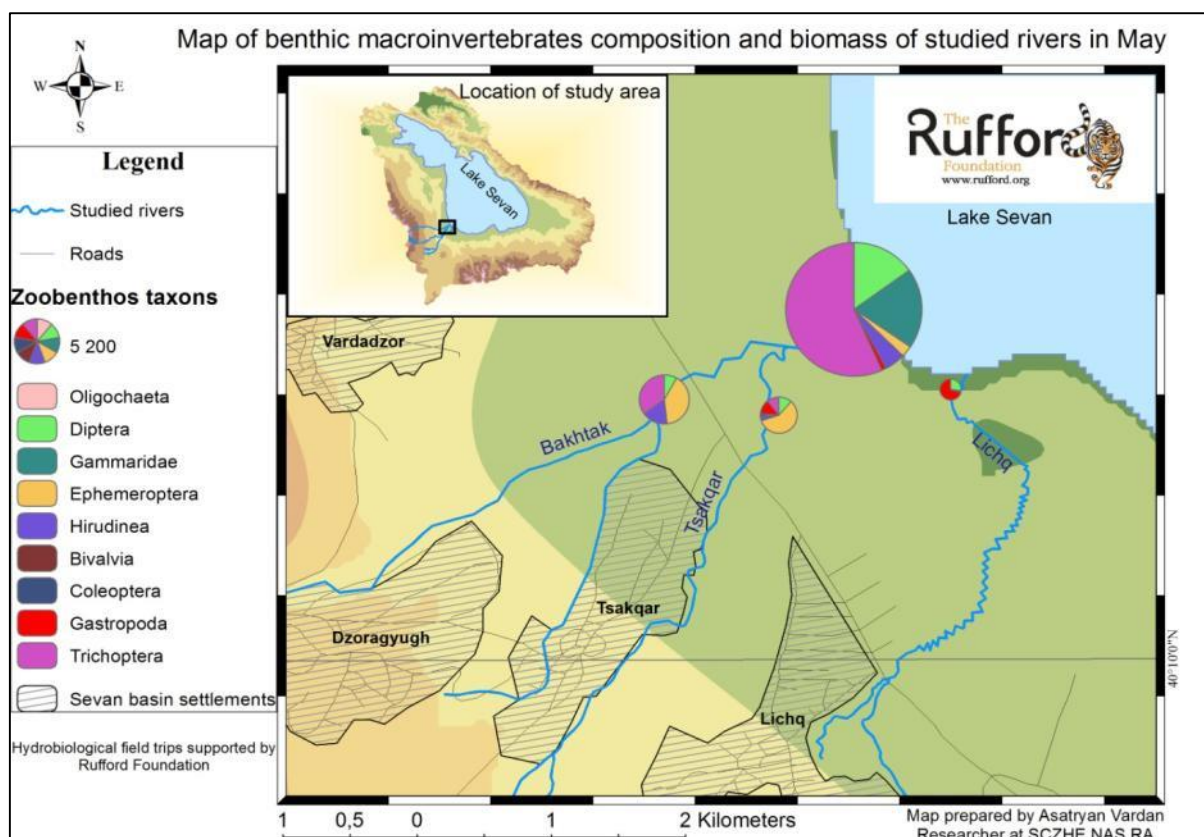
Formally it's possible to say that ground types of downstream parts of Tsakqar and Bakhtak rivers also suitable for Sevan trout spawning, but in reality the stones in that parts covered by periphyton and organic matter, which strongly decreases the possibility of spawning here. Thus, there is a necessity of water quality improvement in the downstreams of the rivers and creation of artificial ground appropriate for Sevan trout spawning. Ground of downstreams mainly consists of sand and mud, which is accumulated in those parts due to the decrease in water velocity and meandering of the rivers.

Study of benthic macroinvertebrate community. As it known from the previous studies implemented in 1986 fries of Sevan trout preferred to feed by the dipteras of chironomidae and simuliidae families in the early months of their life, then the main food components changes to mayflies (Ephemeroptera) and caddisflies (Trichoptera) as well as

gammaridae crustaceans. Fish is starting to eat all kind of benthic macroinvertebrates starting from the age 1+.

Study of benthic macroinvertebrates community has shown that the highest diversity of zoobenthos mainly were in the downstream of Bakhtak-Tsakqar system (from 13 to 17 families) besides November, where the absolute maximum from all studied periods were registered in Tsakqar river downstream part. Generally, the lowest diversity of zoobenthos during each expedition has been revealed in Lichq river, especially in the downstream part. As a result of morphological and geological features of Lichq river floodplain in the downstream water velocity is too low and ground types are very poor to support the diversity of macrozoobenthos. On the other hand created here conditions promote the development of appropriate habitats for the dipteras and mollusks. Thus, the downstream of Lichq river is becoming one of the main parts of the fish food. Though, the biomass features of benthic macroinvertebrates diverse from the compositional features (Pics 3,5,7,9).

In May the highest biomass of zoobenthos in 1sq m were registered in Bakhtak-Tsakqar system (47g/m²) and the lowest in Lichq river downstream (1,1g/m²).



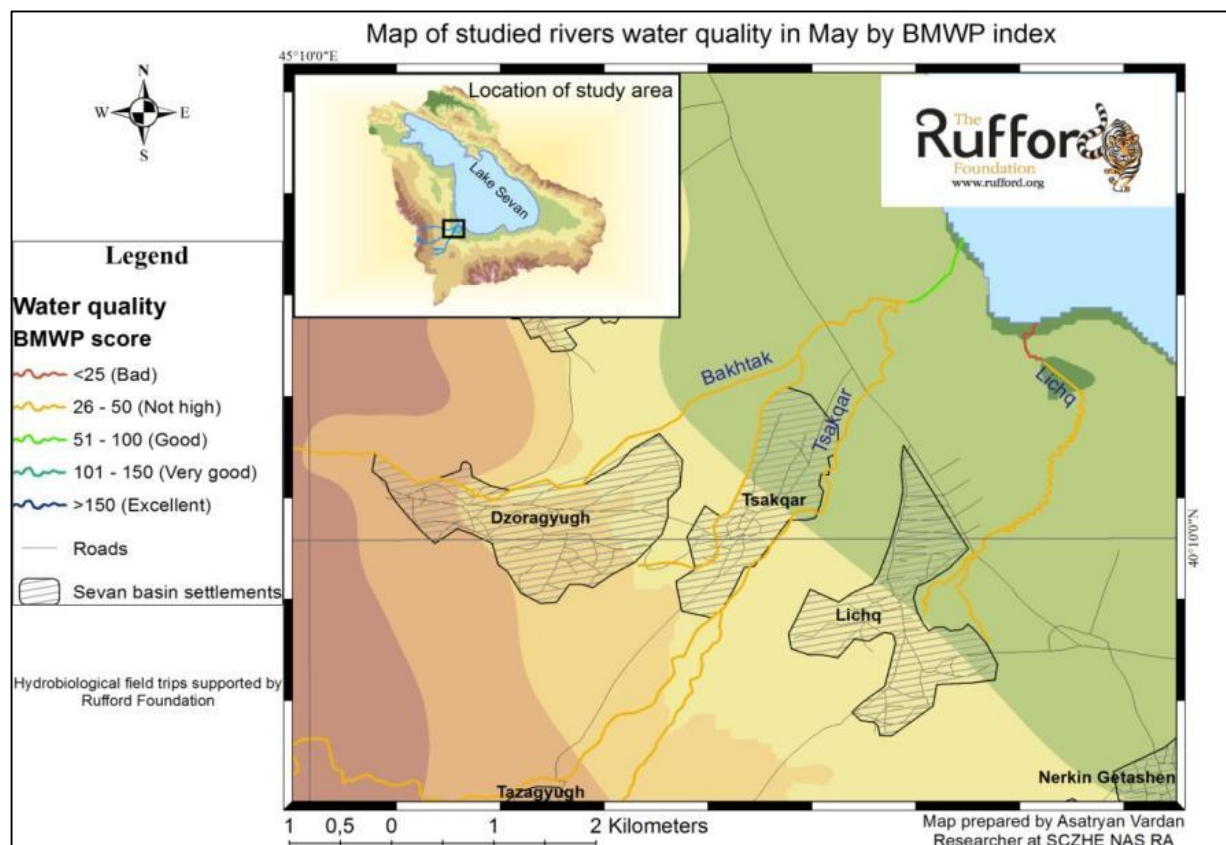
Pic. 3 Benthic macroinvertebrates composition and biomass in studied rivers in May

As it shown in the map dominant and subdominant groups of zoobenthos in Bakhtak and Tsakqar rivers were Mayflies (Ephemeroptera) and Caddisflies (Trichoptera) respectively, but after intermixture of these two tributaries dominant group became caddisflies, subdominant –

gammaridae crustaceans. In opposite to this, snails (Gastropoda) were dominant and dipteras were subdominant in Lichq river (Pic. 3).

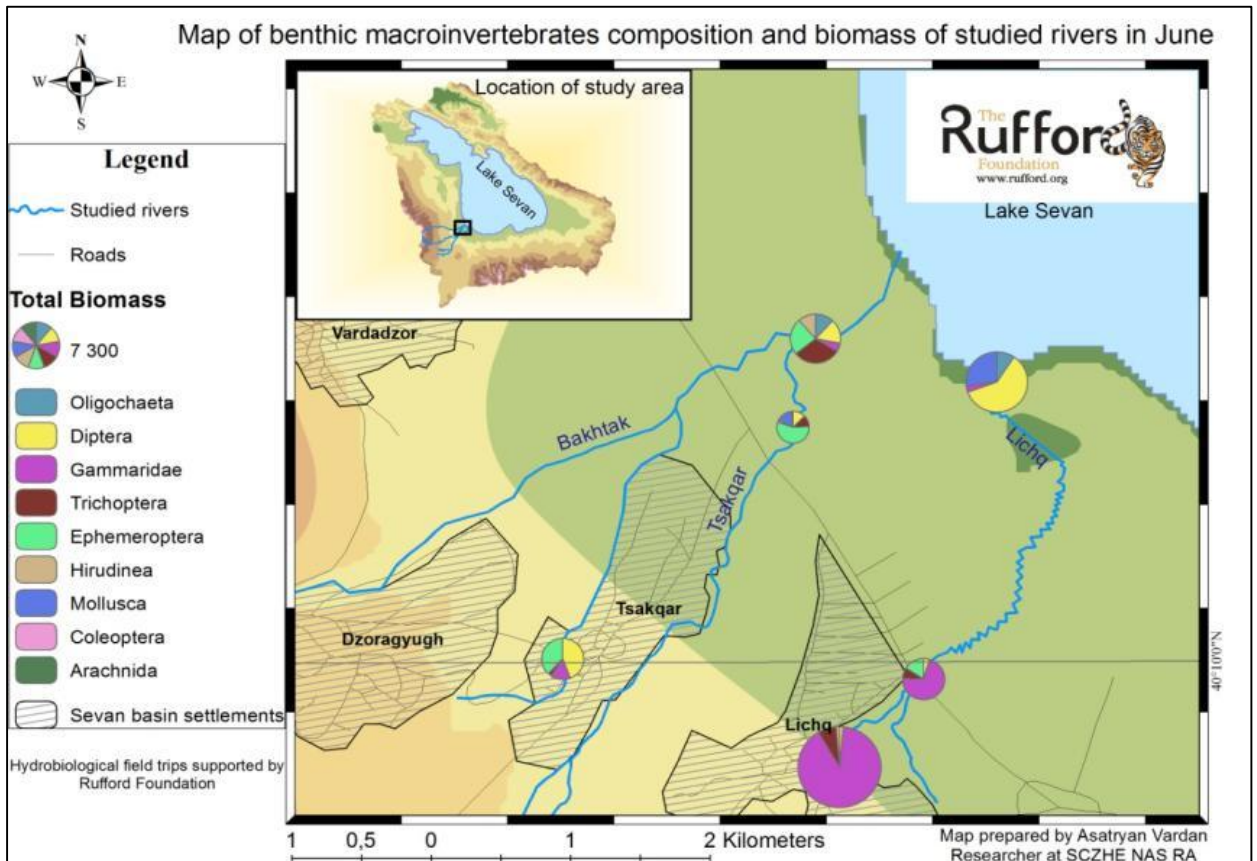
Dipteras were registered in all sampling sites, which mean that all studied river parts can provide enough food for fries of gegharquni. Thus, in aspect of dietary all studied parts of rivers satisfy minimal requirements of Sevan trout.

Water quality assessed by BMWP index based on benthic macroinvertebrates community structure has shown that the most polluted part from all investigated is the downstream of Lichq river (BMWP score -17) and less polluted is a Bakhtak-Tsakqar system (BMWP score -54) (Pic. 4). As a result of water stagnation, self purification potential of Lichq river in downstream is very low and organic matter accumulates there and creates inappropriate conditions for most groups of organisms in general and for Sevan trout particularly. Because Lichq river has relatively stable water regime, its water quality has not fluctuated significantly too, which shown in pictures 6, 8 and 10.



Pic. 4 Water qualities in studied river' different parts in May

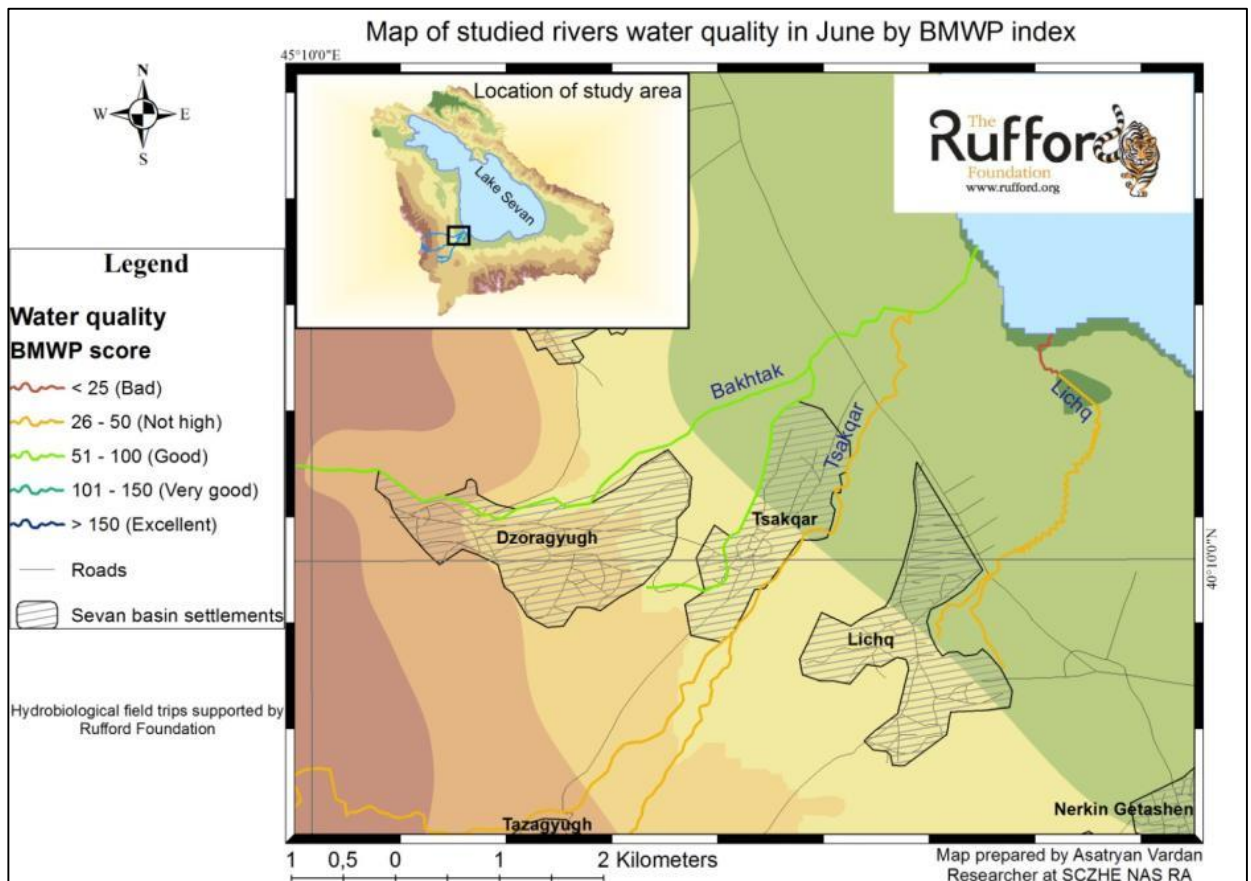
Detailed studies implemented in June have shown some differences in qualitative and quantitative structures of macrozoobenthos (Pic 5). First of all the diversity of macrozoobenthos became higher, because compare with May in June water flow became more calm and transparency as well as aeration of water became higher.



Pic.5 Benthic macroinvertebrates composition and biomass in studied rivers in June

The highest biomass of macroinvertebrates has been recorded in the upperstream of Lichq river ($22,4\text{g/m}^2$), where the absolute dominant group of macrozoobenthos was the gammaridae crustaceans. Subdominant group is caddisflies. The gammarids were absolute dominant in the middlestream of Lichq as well, but in the downstream dipteras and gastropods from mollusks became dominant and subdominant respectively. This kind of changes in such a short distance like in Lichq river obviously shows the differences in water quality as well as hydrophysical and hydrochemical parameters of water. Biomass of mayflies were stable high in all studied areas of Bakhtak and Tsakqar rivers but the role of Caddisflies decreased compared with May. The role of dipteras increased in Tsakqar and Bakhtak rivers, but on the other hand diversity has increased which influences electiveness of food of Sevan trout. In general June season also provide plenty of food for Sevan trout in all studied areas. Consequently fries of gegharquni has enough food in May-June season to stay in these 3 rivers and feeding base can't be limiting factor for fish in this rivers.

Assessment of water quality (Pic. 6) has shown that compared with May BMWP score increased in all studied parts due to hydrophysical changes in water flow, but changes in water quality class has been registered only in Bakhtak river.

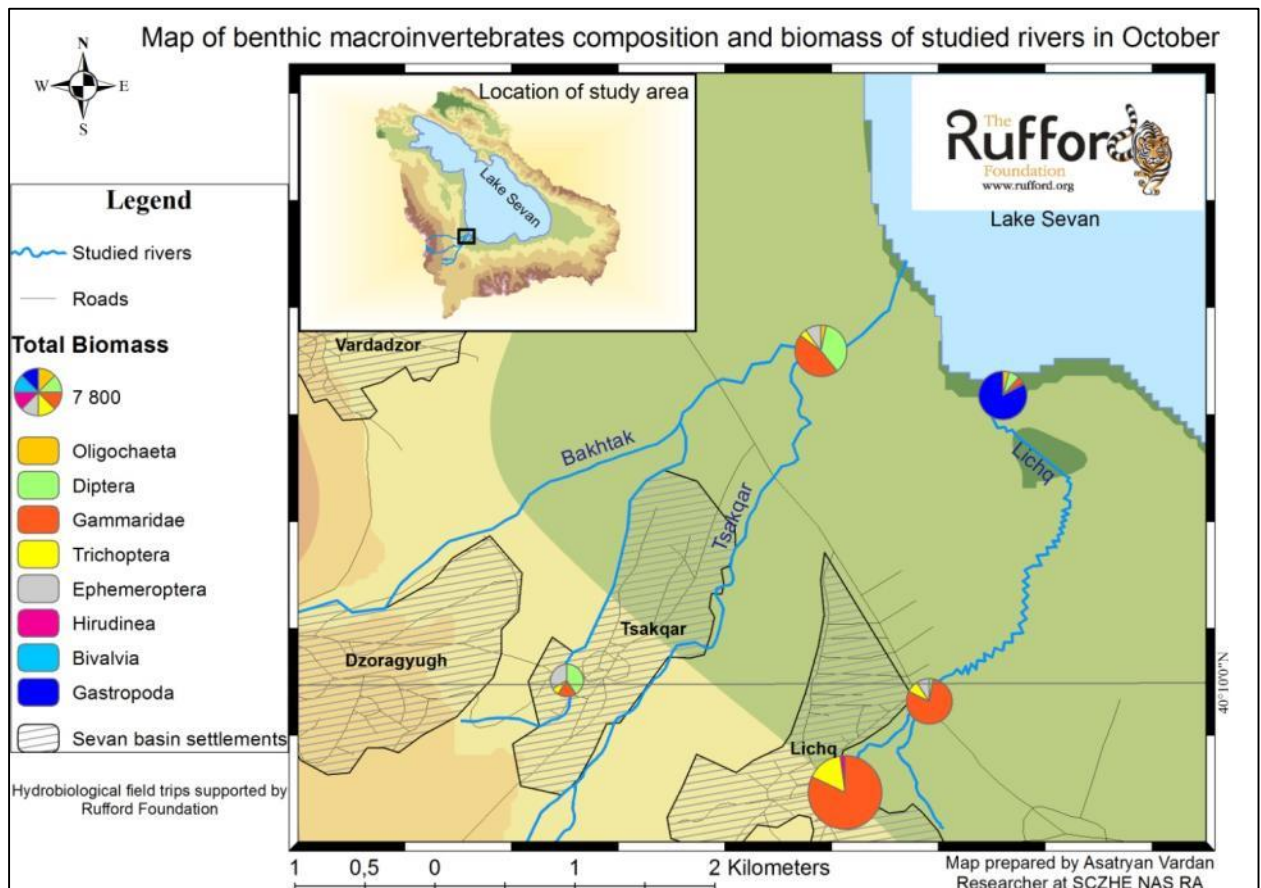


Pic. 6 Water qualities in studied river different parts in June

The most polluted part from all investigated was the downstream of Lichq river (BMWP score -21) and less polluted is a Bakhtak-Tsakqar system (BMWP score -65). The main cause of such increase of BMWP score in this part was registration of oxyphil representatives of caddisflies like insects of sericostomatidae family which were not been registered in May due to high turbidity of water. It's important also that all field trips in June were carried out before the irrigation season starts.

The second part of investigation carried out in October-November season coincides with the end of irrigation season in Lake Sevan basin and this is one of the core factors influencing benthic macroinvertebrate composition and water quality.

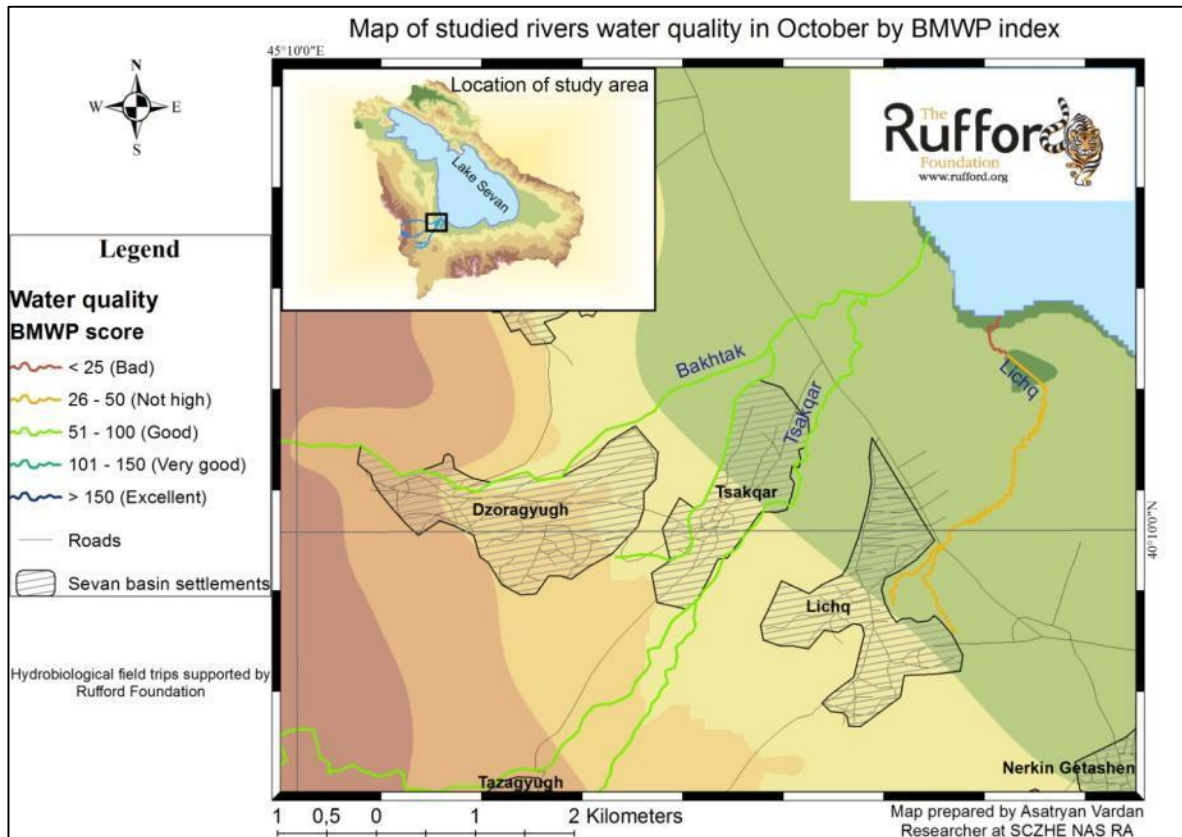
The diversity of benthic macroinvertebrates as well as the biomass mainly decreased in October as a result of water pollution from agriculture (Pic. 7). Significant changes in the structure of benthic macroinvertebrates compared with June have experienced only Bakhtak-Tsakqar system where not only diversity and biomass of zoobenthos were decreased but also dominant and subdominant by the biomass groups were changed. Instead of caddisflies and mayflies dominant and subdominant groups of zoobenthos in this part were gammaridae crustaceans and dipteras which influences water quality assessment results.



Pic. 7 Benthic macroinvertebrates composition and biomass in studied rivers in October

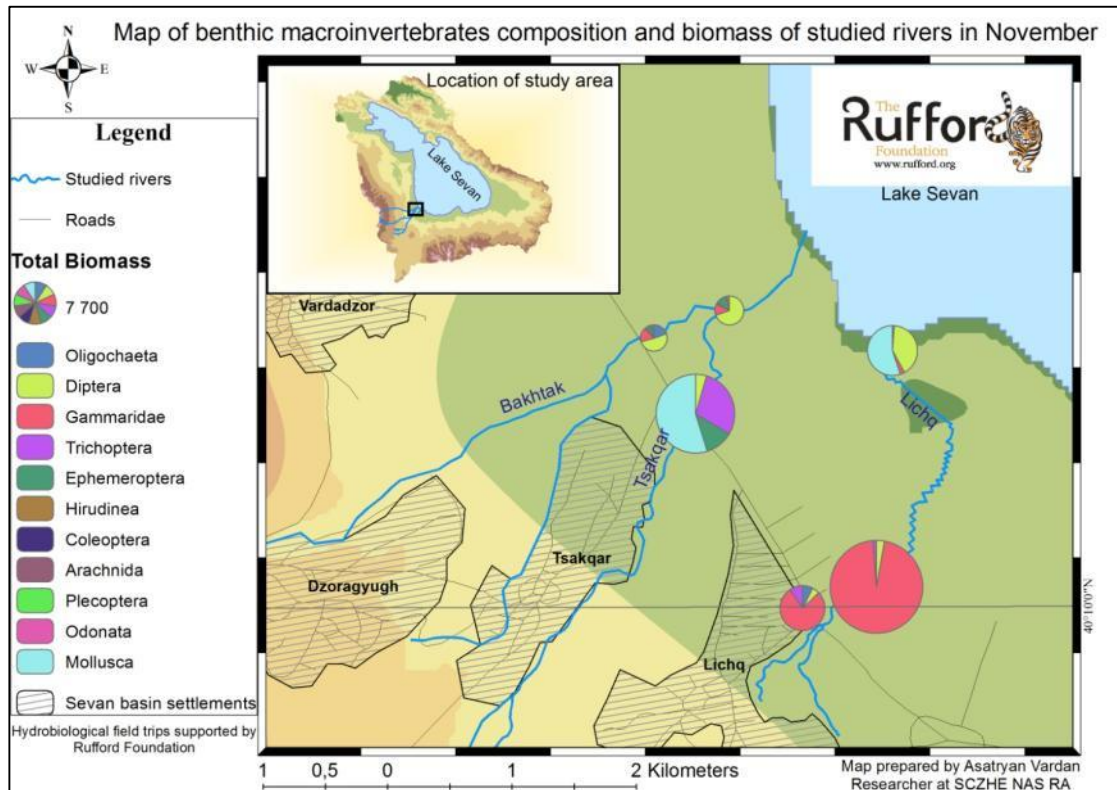
Dominant and subdominant groups of benthic macroinvertebrates in all other parts of studied rivers remained the same, but the biomass of caddisflies increased in all parts of Lich river. The highest total biomass was registered in the upperstream of Lichq river ($18,6\text{g}/\text{m}^2$), which is the lowest registered biomass among highest results for all studied months. Amount of dipteras were comparatively high in Bakhtak and Tsakqar rivers investigated parts, thus, for summer bakhtak' fries these rivers are more appropriate in this season. The downstream part of Lichq river also suitable for summer bakhtak fries as a result of presence of macrophytes as habitat and lurking and dipteras as feeding base in the early months of life.

Results of water quality assessment for October are presented in Pic. 8. Compared with June only water quality of Tsakqar has been improved and as a result water quality in October was assessed as "good" (BMWP score -57). It's probably the consequence of water low consumption from dwellers of Tsakqar village, which prefer to bring water from more saturated Bakhtak river which also flows through the village. The highest water quality has been registered in Bakhtak-Tsakqar system part (BMWP score -61, which also referred to "good" quality class) and like in May and June the worst water quality has been registered in Lichq downstream part (BMWP score -21).



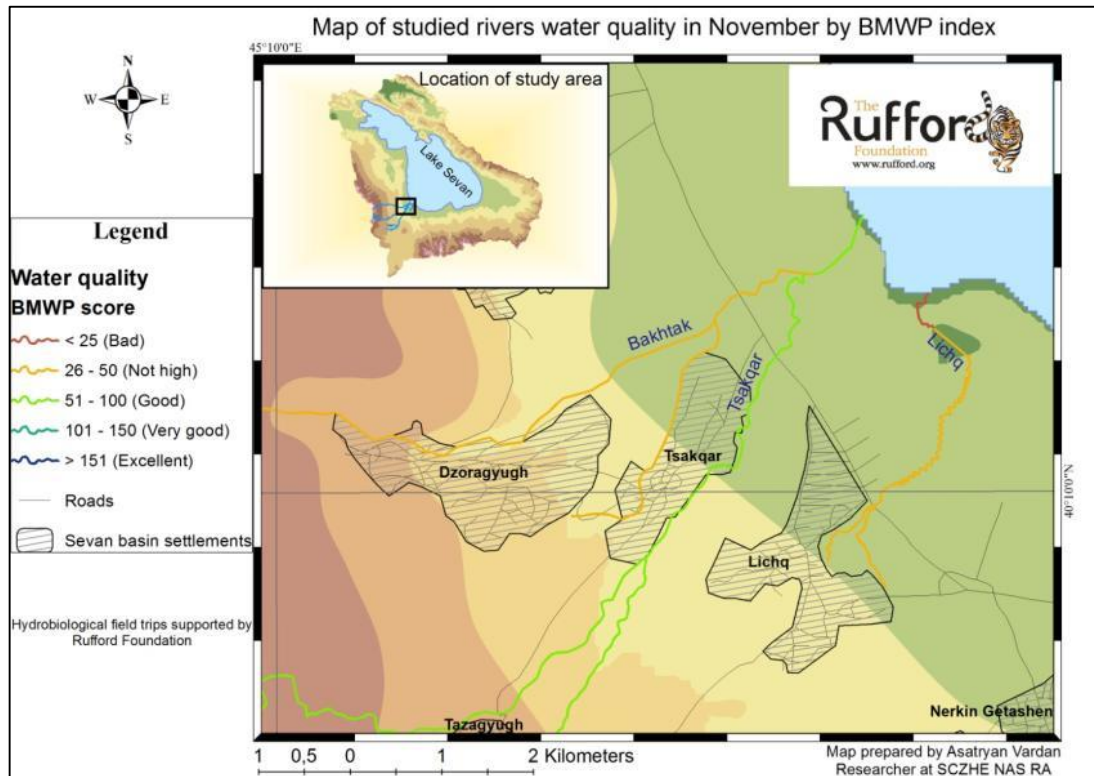
Pic. 8 Water qualities in studied rivers' different parts in October

Obvious changes have been registered in November, because serious weather changes taking place which influencing hydrophysical and hydrochemical parameters of water. It's also important that after first snow agricultural activity significantly decreased, that's why serious changes in BMWP scores of rivers happened. Increase in amount of benthic macroinvertebrates groups have been registered in all studied parts of Bakhtak and Tsakqar rivers. Particularly the highest within all investigations diversity has been registered in the downstream of Tsakqar river (18 families). The biomass of macrozoobenthos in Tsakqar and Lichq rivers has also highly increased. Unlike October the highest biomass has been registered in the middlestream of Lichq river ($37,1\text{g}/\text{m}^2$), where the absolute dominant group has been gammaridae crustaceans (Pic. 9). The next significant transformation referred to dominant groups of zoobenthos of Bakhtak and Tsakqar rivers. Due to life-cycle features gastropods from mollusks became dominant in downstream of Tsakqar river. Opposite to this dipteras of chironomidae and simuliidae families became dominant in the downstream of Bakhtak river and Bakhtak-Tsakqar system, respectively. There were no changes only in Lichq river' macrozoobenthos qualitative structure because Lichq has relatively stable flow regime and water quality due to prevailing of springs nourishment. Thus, middlestreams and downstreams of Bakhtak and Tsakqar rivers in autumn season provide more than enough food for fries of Sevan trout. The similar situation in the downstream of Lichq river.



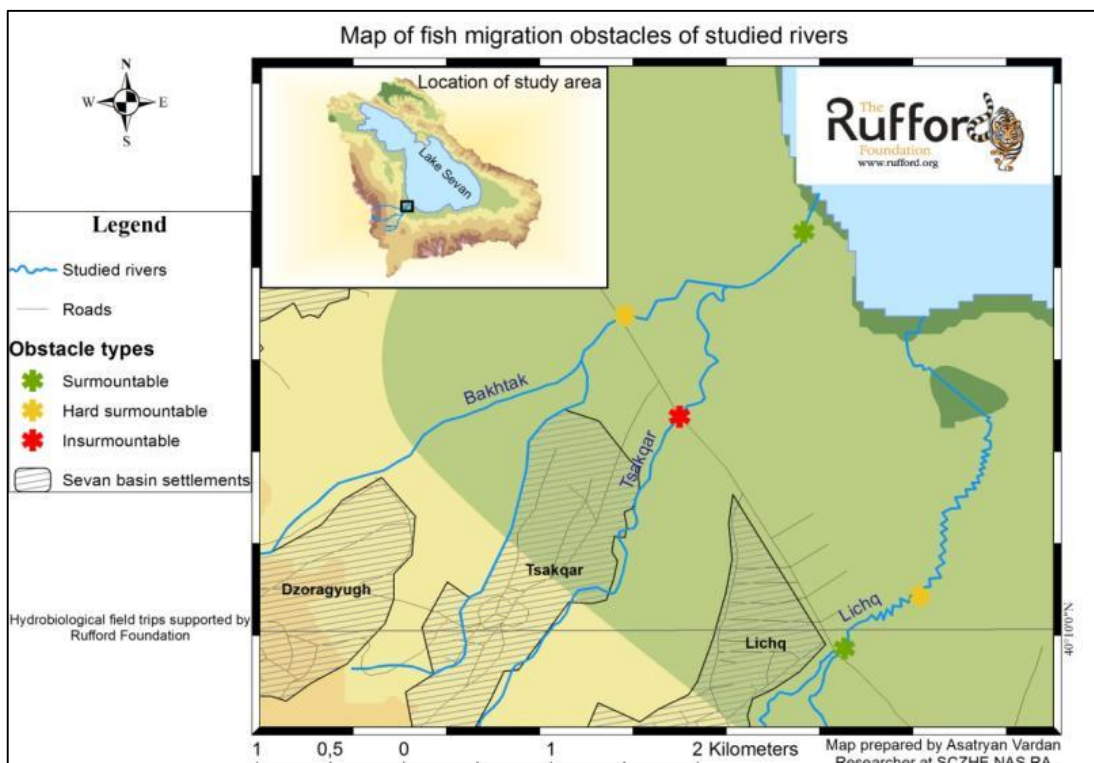
Pic. 9 Benthic macroinvertebrates composition and biomass in studied rivers in November

As a result of macrozoobenthos' high diversity the best from all measurements water quality has also been registered in the downstream part of Tsakqar river (Pic. 10). Value of BMWP score were 75 which referred to "good" water quality. Water quality of Bakhtak-Tsakqar system has also been assessed "good" (BMWP score -74). Unlike these parts, water quality in Bakhtak river worsens, which possibly the result of provided additional organic matter to water by leaves and debris. Water quality in different parts of Lichq river remain nearly the same.



Pic. 10 Water qualities in studied river different parts in November

Study of fish migration constraints. Even the analyze of natural factors allow to make conclusions about suitability and potential of studied rivers as spawning areas for Sevan trout, but in some cases artificial obstacles have bigger importance in decision making than natural factors (pic. 11).



Pic. 11 Distribution of Sevan trout spawning migration obstacles

During the field trips 5 obstacles for Sevan trout spawning migration has been revealed in Lichq, Tsakqar and Bakhtak rivers. Nowadays, one of them is insurmountable for fish, two other are hard surmountable or in some cases insurmountable like during low water periods. The last two revealed obstacles are surmountable but their presence has negative impact on fish (Pic. 12).



A



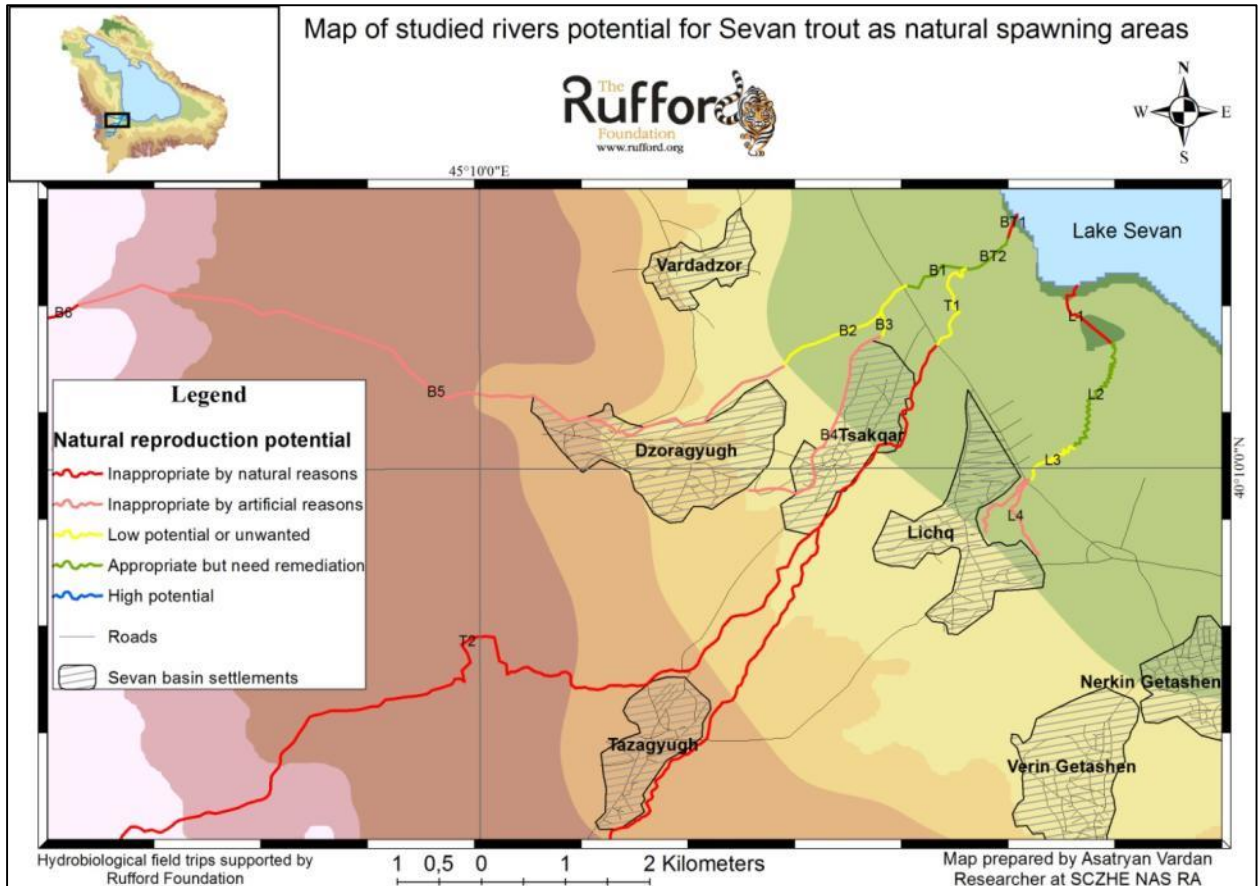
B



C

Pic. 12 Obstacles in the rivers: A, B – hard surmountable obstacles on the rivers Bakhtak and Lichq, respectively, C – insurmountable obstacle on the river Tsakqar

Assessment of studied rivers' potential as habitats for Sevan trout' natural reproduction. Summarizing all mentioned factors with the help of GIS analyze of gathered data assessment of studied rivers potential to support natural reproduction of Sevan trout has been done pic. 13.



Pic 13. Assessment of studied rivers natural reproduction potential for Sevan trout

As it shown in the map the possibilities of river parts to support natural reproduction of Sevan trout have been classified into 5 classes. First two (Inappropriate by natural or by artificial reasons) classes mainly refers to the parts of the rivers with unsuited ground types like sand and mud (L1) or temperature regimes (B6 – parts of the rivers above 2500m a.s.l.) as well as to the parts after insurmountable obstacles (T2) or the territories of settlements where the fishery do not regulates and using of forbidden devices for catch is out of control (B4, B5). There can be also some additional factors like unsuitability of hydrophysical or hydrochemical parameters as well as river bed condition (L4) influencing such assessment. The parts called “low potential or unwanted” refer to the places after hard surmountable obstacles (L3) and to the open access for dwellers and livestock in spawning seasons places (T1, B2, B3). Some specific parameters like water level (T1) and ground types (B2) also had impact on classification. The other parts (B1, BT2, L2) mainly have appropriate conditions to support natural reproduction of Sevan trout and further growing of fries in that areas, but nowadays there is no place which can be ideally

suitable for this fish. Even the parts assessed as appropriate need some improvement of several parameters, like clearing of river beds from the waste (BT2), improvement of water quality (B1, L2), regulation of marginal poaching (L2) etc. To be assessed as “high potential” the reach has to meet the following requirements at the same time: habitats consider to offer a series of flow types to include pools, runs, riffles and glides, complex substrate diversity must also be exhibited throughout the reach. Ample cover on both banks needs to be presented to provide refuge for both juvenile and adult fish as well as the incorporation between in stream and marginal vegetation must be. And of course there need to be suitable ground type without obvious signs of pollution or marginal poaching and the absence of barriers for migration.

Dissemination of the results. As it known the role of local communities in the problem of Sevan trout conservation is really significant. At the same time there is a lack of information about specific problems which constraints natural reproduction of this endemic species. Thereby, one the core parts of this study was the works with the representatives of responsible institutions and local communities which was implemented as follows:

- During the last phase of studies with the help of our partners from Gegharqunik regional administration we’ve organizing working meetings with authorities and staff of local communities aimed at discussing the results of our works and represent the recommendations concerned to the improvement of habitats in situ.
- Summarizing all results of scientific activities 300 brochures have been printed and disseminated among local communities, Aarhus center of Armenia, some environmental NGO’s, responsible institutions like Gegharqunik regional administration, Ministry of Nature Protection, Scientific Center of Zoology and Hydroecology of NAS, and participants of final workshop.
- The final workshop was organized in Yerevan. During that detailed information about the studies and the results has been presented to the leading specialists of Armenia in the fields of hydroecology and zoology as well as to representatives of environmental NGO’s and governmental institutions. After the heated discussion materials has been disseminated to participants and responsible authorities. The workshop has strong effect on participants and some of them proposed to represent the results in their agencies for their stuffs. As a result it is planned to represent the material about the factors constraining spawning migration of Sevan trout to the Ministry of Nature protection as well as to pass the remained published brochures with the results of studies to the universities of Armenia interesting in environmental education.

- Parallel to these activities two scientific papers has already been accepted by international conferences (1. IWA Young Water Professionals 8-th conference, Poland, with further opportunity to publish this material in the Journals of IWA with high ISI index. 2. IV international conference “Biodiversity: Global and regional processes”, Russia).



Pic. 14 During the workshop

Acknowledgement and afterword. First of all our researchers team would like to thank Rufford Foundation for financing and supporting all our activities within this project as well as for this invaluable experience to share our results with other specialists around the World with the help of www.Rufford.org site in a free format.

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As afterword we'd like to mention that even though during the studies some revealed problems and ways of habitat improvements in situ has been presented to local communities ,but before the improvements will be done we finding that in this stage the most rational way to preserve Sevan trout in that region is to support a brood stock of Sevan trout in Lake Sevan by collection of eggs of mature individuals going to spawn for further artificial and natural incubation of them in situ aimed at supporting the amount of fish in the rivers. At the same time there is a necessity to continue such studies in the basins of other rivers famous in the past as spawning rivers for Sevan trout to reveal the most appropriate places for Sevan trout natural reproduction.

We'd like to say as well that this study has the aim not only to increase the public awareness, but also to complete complex hydrobiological and ichthyological studies of Sevan trout carried out by the researchers' team in the recent period, which can be the base for more extensive and large-scale studies.