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Implementation of the Post-Commissioning Monitoring of Dariali HPP in 2017

Results of aquatic biodiversity post-commissioning monitoring in spring 2017

Draft Report



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1. General information

The surveys are conducted in as a part of the post-commissioning monitoring of Dariali HPP in 2017 in accordance with the requirements stated in “Adaptive Management Plan” (2016) and “Aquatic biodiversity: monitoring results in 2016 and mitigation measures proposed” (2017).

There three types of monitoring are mentioned there:

- Brown trout monitoring
- Invertebrates monitoring
- Flow and physical monitoring.

Out of them only one – brown trout monitoring was planned for spring 2017.

The brown trout monitoring took place in the period: 24-30 April 2017.

The main objective was assessment of the changes in the trout distribution in Tergi at the affected reach and in the water reservoir; assessment of the change of the fattening area; assessment of the possibilities of the fish entering the water in-take and sand trap.

The scope of work was the following:

- Catches by fishing rod and flying net in the river in the water reservoir; distribution of the fish in the water reservoir: day and night catches by installed nets, flying nets and rods at left, right banks of water reservoir and in the centre (both at the surface and the bottom) and near the water in-take;
- Monitoring of possible entrance of the trout into the sand trap by flying net and installed nets, echolocation;
- Day and night catches using cone net at the water outlet from the fish pass;
- Brown trout catches at the monitoring stations (Figure 5).

For each day of surveys field protocols of brown trout monitoring were filled (Annex 1).

2. Brown trout monitoring activities

According to the scope of work, the brown trout monitoring included the following activities:

2.1 Study of the fish distribution in the water reservoir

It was conducted using echo depth-sounder, bottom gill net and casting net. In total, 27 attempts by the casting net were done along the whole perimeter of water reservoir and in the centre. Three brown trout specimen were caught: two in upper right corner of the water reservoir and 1 in left corner of water reservoir. During two days, bottom gill nets of the size 20 m long and 1,5 m high and size of the mesh a-15 and a-10 mm were installed. One trout specimen was caught in the net with the mesh size a-10 (Figure 1).



Figure 1. Caught trout by bottom gill net

During the study of the fish distribution in the water reservoir using echo depth-sounder, the biggest number of trout (5-8 specimens) was fixed in right upper corner (Figure 2). Also individual specimens were fixed at the entrance of the river into water reservoir.



Figure 2. Study of the fish distribution using echo depth-sounder

Taking this into account, the Consultant considers that there are a few trout specimen in the water reservoir, mainly concentrated in its upper part. This makes their entrance into sand trap and further into turbines less probable.

Monitoring of the juvenile downgrading fish was conducted also at the entrance of Chkheri (water reservoir backwaters). Four placements of roe net with interval of 6 hours were done during 24 hours. No downgrading juvenile fish was fixed.

2.2. Monitoring of fish presence and their distribution at water in-take and in sand trap

It was conducted using echo depth-sounder and roe net (Figure 3).



Figure 3. Insert of the cone net into water reservoir

The study was conducted with 6 hours interval in near-bottom and surface layers and in the entrance to the sand trap. In total 16 placements were done, out of which 8 near-bottom and 8 surface ones. The results showed that juvenile trout does not enter the sand traps (no fish caught).

2.3 Study of the fish pass efficiency

During the drying out of the fish pass at 4th step from down, the brown trout with the body length 11.5 cm was caught by ichthyologic net (Figure 4). This confirms that it uses the fish pass.



Figure 4. Caught trout in the fish pass

Monitoring of the juvenile fish using the cone net at the outlet of the fish pass was conducted with the interval of 6 hours. Roe and juvenile trout were not fixed.

2.4. Study of the fish distribution at the affected reach

It was done using casting net at stations M2, M3, M4 (Figure 5).



Figure 5. Location of monitoring stations

The following results were obtained:

- M 2 (boulders) 14 catching attempts, 0 fish caught
- M 3 (braided riverbed) 24 catching attempts, 1 fish caught (Figure 6)
- M 4 (single riverbed) 26 catching attempts, 0 fish caught.



Figure 6. Caught trout

The Consultant also made catching attempts just few meters downstream the dam. In total, 21 catching attempts were done, 7 fish are caught (length 11-21 cm).

Besides this, catching attempts were done in the place of trout spawning in Sno, where mass accumulation of the juvenile fish in the Sno river branches and the mouth was fixed.

3. Training on ecological monitoring

On 27–28th of April 2017, in Stepantsminda, there was training on ecological monitoring in the post-commissioning period held (according to the Monitoring programme and the Action Plan). The trainees include the staff of Dariali HPP and ichthyologist Archil Phartsvania (Figure 7).

The training included presentation of the theory as well as practical exercises during the field surveys (on job training).

During training, the provisions of Monitoring programme were presented in detail, namely:

- Selected monitoring stations, where monitoring of invertebrates and fish should be conducted to ensure comparison of the post-commissioning situation with the baseline (Figure 4, Table 1).

Table 1. Monitoring stations selected for the post-commissioning monitoring

No	Monitoring station	Invertebrates monitoring	Flow and fish habitat monitoring
M 1	Tergi upstream the Dariali headworks	+	
M 2	Tergi downstream the Dariali headworks (boulder section)	+	+
M 3	Tergi downstream the Dariali headworks (braided section)	+	+
M 4	Tergi downstream the Dariali headworks (single thread section)	+	+

- Monitoring of the brown trout should be conducted at least twice per year: upstream spawning migration (autumn), including checking of the fish pass efficiency and juvenile fish downstream migration (spring and summer). This could be conducted by two methods. First method gives qualitative assessment of the fish pass efficiency. For this, daily catches by cast net and fishing rod in the lower and upper reaches. If the tagged fish will be caught in the upper reach, it proves the fish pass efficiency. Second method gives quantitative assessment of the fish pass. For this, fish trap should be installed at the fish pass outlet. For the caught fish, the relevant protocol (see Annex 1) should be filled in. Assessment of the total number of the fish, passing the fish pass without electronic devices, can be done using the fish trap or by blocking method.
- Methods of monitoring of fish pass, sand trap and water reservoir were demonstrated:
 - ✓ The main goal is to assess the possibility of fish entering the HPP turbines. Study of the fish distribution in the water reservoir. Fish should be caught (by framed net and casting net) at left and right banks. Other methods include trawling by cone net near the bottom and surface near the fish pass and HPP water intake.

- ✓ The fish should be caught in daytime and night-time with the duration of 6 hours. Monitoring of the fish presence and distribution in the sand trap (by framed net and casting net). The fish should be caught in daytime and night-time with the duration of 6 hours.
- ✓ Periodical catch of the fish using the cone net in the fish pass outlet. The fish should be caught in daytime and night-time.

On 28th of April, the training of the macroinvertebrates monitoring was conducted. Its main goal was to identify the changes in biological status of the river using bioindication at all four stations mentioned in the Table 1.

After the end of the training the final discussion was held about the methods of environmental monitoring, fish pass supervision and ensuring favourable water levels.

The staff of Dariali HPP and expert Archil Phartsvania got needed knowledge for the further continuation of the ecological monitoring in the post-monitoring period (Figure 7).



Figure 7. Photos from the training

4. Conclusions

Based on the conducted studies, the Consultant can make the following conclusions:

- In water reservoir there are favourable conditions for the concentration of adult fish, which in time of surveys were localized in fattening habitats in the riverbed with slow flow.
- Presence of the fish in the fish pass proves its passability. In the period of surveys, adult fish used fish pass for fattening migrations.
- Juvenile trout is concentrated in the places of hatching. At the time of surveys no juvenile fish downgrading were fixed in the Tergi, including through fish pass.
- Monitoring showed the absence of the adult fish and juvenile fish at water in-take and in sand trap.
- Training on ecological monitoring was conducted successfully.

Annex 1. Field protocol of brown trout monitoring

Date:	26. 04. 2017
Time:	15:45
Location:	Lower reach of the HPP
GPS coordinates:	
Remarks:	

Weather condition:

Air temperature, °C	14
Water temperature, °C	11
Cloudiness, %	0
Precipitation (snow, rain etc.)	Small clouds
Wind	Northern

River channel:

Width, m	50-80
Depth, m	0,5-1,5

or

Water reservoir:

Place of catching (right, left or centre)	left
Depth, m	1.2
Distance from fish pass, m	15
Distance from the water in-take, m	-

**Fish catching:

Catching devices	Type (casting net, cone net etc.)	Casting net								
	Size of the mesh	a-15								
	Type of baits									
Time	Used for catching, min									
	Number of attempts,	21								
Brown trout	Number	n								
		1	2	3	4	5	6	7		
	Length, mm	16,5	21	13,5	13	16	14	15		
	Weight, g	65	118	46	41	67	49	66		

Date:	27. 04. 2017
Time:	11:00
Location:	Water reservoir
GPS coordinates:	42°39'52.34"N 44°38'37.54"E
Remarks:	

Weather condition:

Air temperature, °C	14
Water temperature, °C	11
Cloudiness, %	0
Precipitation (snow, rain etc.)	cloudy
Wind	Northern

River channel:

Width, m	
Depth, m	

or

Water reservoir:

Place of catching (right, left or centre)	Along the perimeter of water reservoir
Depth, m	1,2 – 1,5
Distance from fish pass, m	2 - 60
Distance from the water in-take, m	3 - 80

****Fish catching:**

Catching devices	Type (casting net, cone net etc.)	Casting net								
	Size of the mesh	a-15								
	Type of baits									
Time	Used for catching, min									
	Number of attempts,	27								
Brown trout	Number	n								
		1	2	3	4	5	6	7		
	Length, mm	11	13	13,5						
	Weight, g	36	40	44						

Date:	28. 04. 2017
Time:	12:36
Location:	Upper right corner of the water reservoir
GPS coordinates:	42°39'52.34"N 44°38'37.54"E
Remarks:	

Weather condition:

Air temperature, °C	16
Water temperature, °C	12
Cloudiness, %	0
Precipitation (snow, rain etc.)	Few clouds
Wind	Southern

River channel:

Width, m	
Depth, m	

or

Water reservoir:

Place of catching (right, left or centre)	right
Depth, m	1,5
Distance from fish pass, m	25
Distance from the water in-take, m	15-25

****Fish catching:**

Catching devices	Type (casting net, cone net etc.)	Bottom gill nets								
	Size of the mesh	20 m a-10, 20 m a-15								
	Type of baits									
Time	Used for catching, min	48 hours								
	Number of attempts,	2								
Brown trout	Number	n								
		1	2	3	4	5	6	7		
	Length, mm	11								
	Weight, g	36								

Date:	29. 04. 2017
Time:	10:00
Location:	Tergi downstream the Dariali headworks (braided section)
GPS coordinates:	42°40'05.07" 44°38'01.01"
Remarks:	

Weather condition:

Air temperature, °C	16
Water temperature, °C	12
Cloudiness, %	0
Precipitation (snow, rain etc.)	Sunny
Wind	Southern

River channel:

Width, m	10-15
Depth, m	0,5-1

or

Water reservoir:

Place of catching (right, left or centre)	right
Depth, m	1
Distance from fish pass, m	750
Distance from the water in-take, m	

****Fish catching:**

Catching devices	Type (casting net, cone net etc.)	Casting net							
	Size of the mesh	a-15							
	Type of baits								
Time	Used for catching, min								
	Number of attempts,	24							
Brown trout	Number	n							
		1							
	Length, mm	12,5							
	Weight, g	38							