SOUTHERN JOURNAL OF SCIENCES

ESTABLISHED IN 1993

ASSESSMENT OF THE IRRIGATION WEIR REMOVAL IN THE ENGURI RIVER

EDISHERASHVILI, Tamari[1*]

[1] Ilia State University, Faculty of Natural Sciences and Medicine, Ecology. Georgia.

** Tamari Edisherashvili*
e-mail: tamari.edisherashvili.1@iliauni.edu.ge

Received 14 June 2022; received in revised form 06 November 2022; accepted 01 December 2022

ABSTRACT

Background: Dams are one of the biggest threats to aquatic biodiversity. They restrict the movement of migratory fish. The construction of barriers can cause the complete extinction of some species from the rivers. When a dam can no longer perform its function or research will determine the need to demolish it, dams are often removed. In the lower part of the Enguri River, Georgia, an irrigation weir is currently non-functional. **Aims:** This research aims to prove the need to demolish the dam construction on the 44th km of the Enguri River, as it negatively impacts biodiversity and creates an artificial barrier in the river. **Methods:** Visual inspection was used as a method to assess the morphology and habitat of the dam where it is located. The conversation method was used with Engurhesi LTD representatives to understand the current function of the dam. The Questions were related to the current function of the dam. **Results:** Based on the conservation with Engurhesi LTD representatives, the study has shown that there is no reason that an irrigation weir might be left in its current state on the Enguri River. Based on the studies, the damage to biodiversity is real and disturbing. **Discussion:** The irrigation weir on the Enguri River was left untended because of the construction of the Enguri dam. Currently, there is no reason to divert the river Enguri with the help of an irrigation weir as there is no excess water in this river. **Conclusions:** In conclusion, it can be said that it is necessary to remove the irrigation weir on the Enguri River to restore habitat and mitigate the threats to biodiversity.

Keywords: *Dam removal, biodiversity, river restoration, fish passage.*

1. INTRODUCTION

Rivers are susceptible to anthropogenic modification. To fulfill the higher need for freshwater, barriers are constructed for power generation, irrigation, and flood control (Bredenhand and Samways, 2009). However, dams are one of the biggest threats to aquatic biodiversity. They restrict the movement of migratory fish in different parts of rivers (Liu *et al.*, 2019). For some species, it is necessary to move to the upper reaches of the river in order to leave offspring. Dams are insurmountable barriers for such species (Mary *et al.*, 1996). Such migratory species are: sturgeons and salmons (Ferguson *et al*., 2011). The construction of barriers can cause the complete extinction of some species from the rivers (Zhang *et al.*, 2011). Further, dams impede sediment movement downstream of the river. This affects the formation of the seashore. Which, in turn, is associated with high financial costs (Croitoru *et al.*, 2020).

When a dam can no longer perform its function or research will determine the need to demolish it, dams are often removed. Dam removal is a world-renowned practice. More than 60 dams are demolished annually in the United States (Magilligan *et al.*, 2016). For example, to restore the sole stock of Atlantic salmon, France demolished two big dams in the Loire Valley in 1998 (Bednarek, 2001). For a dam to be demolished, it is necessary to assess its economic benefits and environmental impact. In addition, it is necessary to investigate all the consequences that will follow the collapse of the dam (Bednarek, 2001).

In the lower part of the Enguri River, Georgia, 44 km from the Black Sea and 0.7 km from the Enguri bridge in village Rukhi, there is an irrigation weir of 4-5 m in height that is currently non-functional. The weir was built to provide the nearby area with irrigation water in the 50's of the XX century.

This research aims to prove the need to demolish the dam construction on the 44th km of

DOI: 10.48141/SJS.v30.n34.2022.03_EDISHERASHVILI_pgs_28_31.pdf

the Enguri River because there is no need for its existence, and it has a negative impact on biodiversity as it creates an artificial barrier in the river.

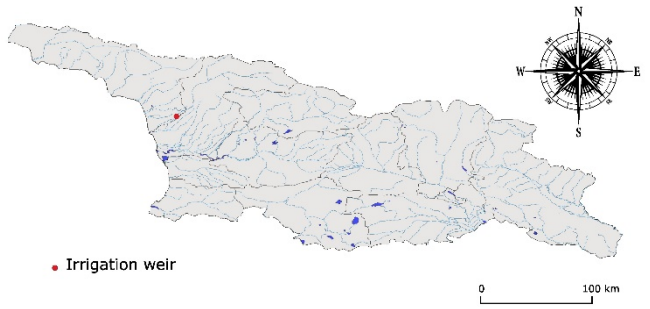
2. MATERIALS AND METHODS

2.1. Study Area

The Weir is located at the following coordinates: 42˚34ˈ33.92ˈˈN; 41˚50ˈ57.85ˈˈE on the Enguri River close to the de facto border of Abkhazia (as Abkhazia is a conflict region, there are security concerns for detailed studies). The elevation is 111 m.

The Enguri river is located in western Georgia. It originates in the high Caucasus, is 213 km long, has a watershed area of 4060 km², runs through the mountain valleys to the de facto border of Abkhazia, and emptyes into the Black Sea near the village Anaklia.

The Enguri dam is located on the Enguri River (km 84) in Tsalenjikha municipality, Georgia. It is a concrete arch dam with a height of 271.5 m.



Figures 1 and 2. Maps of an Irrigation wire on the Enguri river, Georgia.

2.2. Methods

Visual inspection was used as a method to assess the morphology and habitat of the dam where it is located. The conversation method was used with Engurhesi LTD representatives to understand the current function of the dam. The Questions were related to the current function of the dam. The questions were: When was the irrigation dam built? What was the purpose of the irrigation wire? Does it now function as it should? Why is it not functioning as it was designed to do?

The location of the dam was added to a Google map. In addition, the distance to the nearest upstream barrier and the length of the liberated part of the river was measured after removing the dam.

3. RESULTS AND DISCUSSION

3.1. Results

Based on the conservation with Engurhesi LTD representatives, the study has shown that there is no reason that an irrigation weir might be left in its current state on the Enguri River. Based on the studies, the damage to biodiversity is real and disturbing.

3.2. Discussions

The irrigation weir on the Enguri River was left untended because of the construction of the Enguri dam. After the construction of the Enguri dam, more than 90% of the water of the Enguri River is relocated to the Gali reservoir with a 15 km pressure tunnel. From the Gali reservoir, the water flows into the Black Sea by the Eristskali River. Moreover, after the conflict in Abkhazia in the 90s, the infrastructure was completely out of order. The Enguri river has historically been a sturgeon river. There were several species of sturgeon to breed up to 70th km (Arnold, 1896; Marti, 1939; Tikhi, 1929). After the Enguri HPP (1961-1978) construction, which is located north of the town Jvari in Tsalenjikha, Georgia, this river lost its spawning function for sturgeons. From the Enguri dam to the irrigation weir, the Enguri River mainly holds the water from the Rivers Magana (10.3 m³/sec) and Oroli (3.71 m³/sec). There is a low water period in summer, and irrigation is necessary for this season when there

is the least amount of water in the rover. Currently, there is no reason to divert the river Enguri with the help of an irrigation weir as there is no excess water in this river. Prior to the construction of the Enguri dam, the river had the amount of water during flood that needed to be regulated. The research takes the initiative to demolish this weir so it is no longer a barrier to fish migration. Suppose the dam cannot be dismantled for political reasons (the dam is located at the administrative border with the occupied region of Abkhazia). In that case, it will be necessary to arrange a fish pass to allow fish to migrate from the downstream to the upstream. In case of demolition, it will impact the nearby tributaries of the Enguri River, and further studies will be needed.

Figure 3. Irrigation wire on the Enguri river, Georgia.

4. CONCLUSIONS

In conclusion, we can say that there is a necessity to remove the irrigation weir on the Enguri River to restore habitat and mitigate the threats to biodiversity.

5. DECLARATIONS

5.1. Study Limitations

The study is limited to the Enguri river and the dam conditions.

5.2. Acknowledgements

The author thanks the Engurhesi LTD environmental service staff and the Master's student Tornike Murjikneli for contributing to the manuscript's work.

5.3. Funding source

The author funded this research.

5.4. Competing Interests

There is no conflict of interest in this publication.

5.5. Open Access

6. REFERENCES:

1. Arnold. (1896). Report on a business trip to study the fisheries of the eastern coast of the Black Sea. *Bulletin of the Fish Industry*, *2–3*, 64–77
2. Bednarek, A. T. (2001). Undamming rivers: A review of the ecological impacts of dam removal. *Environmental Management*, *27*(6), 803–814. https://doi.org/10.1007/s002670010189
3. Bredenhand, E., and Samways, M. J. (2009). Impact of a dam on benthic macroinvertebrates in a small river in a biodiversity hotspot: Cape Floristic Region, South Africa. *Journal of Insect Conservation*, *13*(3), 297–307. https://doi.org/10.1007/s10841-008-9173-2

4. Croitoru, L., Miranda, J. J., Khattabi, A., and Lee, J. J. (2020). The Cost of Coastal Zone Degradation in Nigeria. *The Cost of Coastal Zone Degradation in Nigeria*, *February*. https://doi.org/10.1596/34758
5. Ferguson, J. W., Healey, M., Dugan, P., and Barlow, C. (2011). Potential effects of dams on migratory fish in the Mekong River: Lessons from salmon in the fraser and Columbia Rivers. *Environmental Management*, *47*(1), 141–159. https://doi.org/10.1007/s00267-010-9563-6
6. Liu, X., Qin, J., Xu, Y., Ouyang, S., and Wu, X. (2019). Biodiversity decline of fish assemblages after the impoundment of the Three Gorges Dam in the Yangtze River Basin, China. *Reviews in Fish Biology and Fisheries*, *29*(1), 177–195. https://doi.org/10.1007/s11160-019-09548-0
7. Magilligan, F. J., Graber, B. E., Nislow, K. H., Chipman, J. W., Sneddon, C. S., and Fox, C. A. (2016). River restoration by dam removal: Enhancing connectivity at watershed scales. *Elementa*, *2016*, 1–14. https://doi.org/10.12952/journal.elementa.000108
8. Marti. (1939). Biology and fishery of Acipenser sturio in the Black Sea. *Journal of Zoology*, *XVIII*(3), 435–442
9. Mary, E. P., William, E. D., and Jacques, C. F. (1996). Dams and downstream aquatic biodiversity: Potential food web consequences of hydrologic and geomorphic change. *Environmental Management*, *V20*(6), 887–895. http://dx.doi.org/10.1007/BF01205969
10. Tikhi. (1929). Research of the fishery of the river Rioni and Paliastomi in connection with the construction of a hydroelectric power station. *Izv. Otd. Appl. Iht. And Scientific and Prom*, *IX*(3), 322–338
11. Zhang, H., Wei, Q. W., Du, H., and Li, L. X. (2011). Present status and risk for extinction of the Dabry's sturgeon (Acipenser dabryanus) in the Yangtze River watershed: A concern for intensified rehabilitation needs. *Journal of Applied Ichthyology*, *27*(2), 181–185. https://doi.org/10.1111/j.1439-0426.2011.01674