

The Wisłoka: Overcoming barriers on a Polish river



Photo: Karol Cieżak

There are over 40,000¹ barriers along Polish rivers, including dams, weirs, steps and sills. Yet only a small percentage of these have effective fish ladders. Until recently, it was no different for the Wisłoka, a river in south-eastern Poland that forms the right-bank tributary of the upper Vistula. Stretching 164 kilometres, the river spans a total catchment area of 4110 square kilometres.

The Wisłoka and its tributaries, like other Carpathian tributaries of the Vistula, used to be a habitat and breeding ground for migratory bi-environmental fish.² However, the construction of barrages and channel regulation works carried out in the second half of the 20th century led to the extinction of sturgeon, salmon, sea trout and bream in the river. As a result, populations of other river fish species, including mono-environmental species that don't migrate between freshwater habitats and the sea, have been disturbed and severely depleted.

Thankfully, the situation has improved considerably in recent years. This is in large part due to the efforts of a team of Polish engineers and biologists.

¹ Information taken from the database of the State Water Holding Polish Waters, a public enterprise responsible for managing Polish inland waters.

² Bi-environmental fish are migratory fish species like salmon, sturgeon and eel that live in the sea and fresh water. See: Wikipedia, [Fish migration](#), Wikipedia, accessed 22 February 2024.

How the project came about

In 2018, the Wisłoka Without Barriers project was launched. The aim was to overcome barriers for aquatic organisms on the Wisłoka and its tributaries, the Ropa and the Jasiołka by building effective fish passes. The project, largely financed by the EU's Cohesion Fund,³ was designed and implemented by the Regional Water Management Authority in Krakow. Nature supervision and monitoring, a key ingredient in the success of the project, was carried out by the private company, the Institute of Ecological Research, and the non-governmental organisation, Society for the Earth.⁴ The project was completed in 2021.



Photo: Karol Ciężak

Purpose of the project

For fish to reproduce, live and thrive in a river, they must be able to migrate freely along its entire length. Depending on the season and their stage of life, fish move along rivers in search of food, suitable hiding places and spawning sites. But obstructing rivers with physical barriers such as weirs and dams prevents these normal life processes from taking their natural course. The best way of dealing with these is to remove them. But where this is not possible, for smaller barriers the construction of fish ladders can be of use. Too often, however, they are poorly designed and not properly monitored, leading to a very high failure rate so a careful, case-by-case approach is essential.

³ The total cost of the project was PLN 28.7 million, with PLN 24.4 million provided by the EU Cohesion Fund.

⁴ These are unofficial English translations of the names of two Polish non-governmental organisations: Zakład Badań Ekologicznych and Towarzystwo na Rzecz Ziemi.

Historically, the focus in Poland has been on building more barriers as opposed to taking action to promote restoration by removing them. In this case, works were carried out to overcome artificial barriers along the river, by supplying the existing weirs, steps, and sills with effective fish ladders. These obstacles had been impeding the migration of aquatic organisms, and preventing fish from gaining access to spawning areas, adversely affecting their populations.⁵

Overview of the works carried out

A total of seven ladders were either newly constructed or upgraded at the various migration barriers along the Wisłoka. Some of them proved technically challenging, particularly the large weir exceeding 4 metres at Mokrzec. Here, the team built an impressive 430-metre fish ladder consisting of 43 pools.

Additionally, monitoring scanners and receivers were installed at the entrances and exits of the fish passages to evaluate their effectiveness. The design of the project was preceded by a detailed inventory of the hydro-technical facilities required. Engineering consultations were also carried out to identify solutions to overcome migration barriers for aquatic organisms while maintaining the original functions of the existing dams.

Therefore, it was decided to mimic the natural conditions and ecological environment of the river. The proposed interventions were assessed based on their ability to ensure uninterrupted water flow, the continuous transport of bottom sediment, and the bi-directional, upstream, and downstream migration of aquatic organisms.

The designs also took into account the migratory requirements of different fish species as well as their sizes, swimming speeds, typical behaviour, and typical migration periods. The successful migration of aquatic organisms of all ages that inhabit rivers and streams is dependent on their ability to quickly and safely cross barriers in their path. This is why it's important that fish ladder basins have minimum depths to accommodate a variety of fish species.

To make sure the design and construction process was as cohesive as possible, a close partnership was forged between engineers and biologists on the project. Importantly, it was agreed early on that evaluating the effectiveness of the fish ladders, once constructed, would be an integral part of the overall investment, not just an additional measure.

According to Karol Ciężak, co-founder of the Save the Rivers Coalition, the success of the fish ladders at the seven reconstructed barriers would not have been possible without changing the role of the nature surveillance team, who went from serving as mere watchdogs to advisors actively involved in the overall planning process.

⁵ Krakow Regional Water Management Authority, [Wisłoka bez barier – Description of the project](#), *Wisłoka bez barier*, accessed 22 February 2024.



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Why the project was needed

In Poland, projects focused on water management, drought, and reducing flood risk are often dominated by engineering measures that disrupt the continuity of rivers, limit migration, and prevent plants and animals from accessing rivers. As such, they fail to meet the objectives of the Water Framework Water Directive and exacerbate the already poor ecological status of Poland's rivers.

This has led to a deterioration in the conditions of the country's surface waters. Currently, 98.9 per cent of Polish rivers do not meet the required standards.⁶ This statistic alone is a strong argument in favour of continued investment in projects that mitigate impacts on rivers.

For this reason, a comprehensive catchment approach like the one adopted for the Wisłoka river plays a crucial role in restoring the biodiversity of rivers and reacquainting fish with their natural migratory routes.

Innovative measures

Video monitoring devices installed at the Mokrzec fish ladder show that large shoals of fish are now using the newly reopened corridors to reach its upper basin. The area around the fish ladder has since become a habitat of choice for 21 species of fish and three species of bivalve molluscs: the *Anodonta anatina*, *Unio tumidus* and *Unio pictorum*.

According to Piotr Sobieszczyk, project manager for Krakow Regional Water Management Authority, the fish inhabiting this stretch of the Wisłoka have regained the ability to migrate upstream to spawn, feed and seek

⁶ Małgorzata Gołota, 'Został nam 1 proc. czystej wody. W rzekach płyną ścieki, solanki i zrzuty kopalniane', *Onet.pl*, 31 January 2024.

refuge. This is likely to contribute to the recovery of fish populations that were previously isolated by the obstacles.

Another key feature that the project organisers wanted to introduce was the use of natural materials, which distinguishes Wisłoka's fish ladders from the concrete and steel structures that typically prevail.

For instance, tightly wedged boulders were laid at the stone ramp at the Dębica weir. The work involved replacing the flat surfaces with a pilaster-like surface of overlapping stone slabs, each about half a metre thick. The boulders were laid to form a herringbone pattern on the ramp, resulting in the natural formation of baffles and pools along the sides, creating areas with lower water velocities. This reduced flow gives weaker or smaller fish the opportunity to traverse the ramp. What's more, these natural rapid-like structures last longer than traditional concrete and steel structures.

Additionally, the restoration-oriented approach of the Wisłoka project has served to strengthen ties with local anglers. At the fish ladder in Gorlice, for example, anglers helped to lay emergency traps to move fish away from danger before construction work began. The Polish Angling Association has affirmed their commitment to continue to monitor the condition of the fish ladders.



Photo: Karol Ciężak

Inspiration for other mitigation projects

As a result of the construction of the ladders at Mokrzec and at other points along the river, a 254-kilometre corridor spanning the Wisłoka river and its tributaries has been allowed to flow freely once again.

The Wisłoka river continuity project is proof that the resources are available and that initiatives like this can be implemented effectively. Indeed, the EU's river restoration manual, *Guidance on Barrier Removal for*

River Restoration, has highlighted the project as an example of good practice in the field.⁷ The project was also recognised with a prestigious Fish Passage 2022 international award.

Where it is not possible to remove dams and weirs completely, the Wistoka river continuity project should serve as a benchmark for like-minded organisations and local authorities in other regions with an interest in improving Poland's rivers. There is no denying that Poland now possesses the capabilities and know-how needed to build functional fish ladders. With European funds available, innovative projects like this can no longer be considered fish out of water.



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⁷ Directorate-General for Environment, [Guidance on Barrier Removal for River Restoration](#), European Commission, 21 December 2021, 39.