

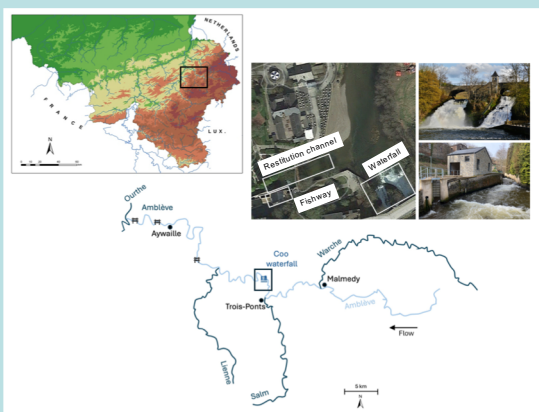
Evaluation of the efficiency and use of a unique fishway in Belgium

Justine Gelder¹, Jean-Philippe Benitez¹, Dylan Colson^{1,2}, Damien Sonny², Michaël Ovidio¹
¹University of Liège – ²Profish Technology S.A.

Context & Objectives

River fragmentation caused by artificial barriers is a major threat to freshwater biodiversity, disrupting ecological connectivity and limiting access to critical habitats. In response, river defragmentation efforts increasingly rely on the installation of fishways as an alternative to dam removal, aiming to restore longitudinal connectivity. However, their efficiency and attractiveness can be highly variable and must be evaluated. In the Amlève River (Belgium), the Coo waterfall, a semi-artificial 11.8 m-high obstacle, had completely blocked upstream fish migration for nearly 50 years. Indeed, the installation of a pumped storage plant in 1970 made the obstacle impassable by diverting the natural arm of the river to power the turbine and release water downstream into a restitution channel. In 2021, a capture–transport fishway was implemented to reopen this migratory axis. Our study aimed to evaluate the attractiveness and efficiency of this fishway by analysing behavioral metrics of three potamodromous species (*Barbus barbus*, *Salmo trutta*, *Thymallus thymallus*) using combined telemetry and fish capture data collected over 3 years (2021–2024).

Coo waterfall site



Material and methods

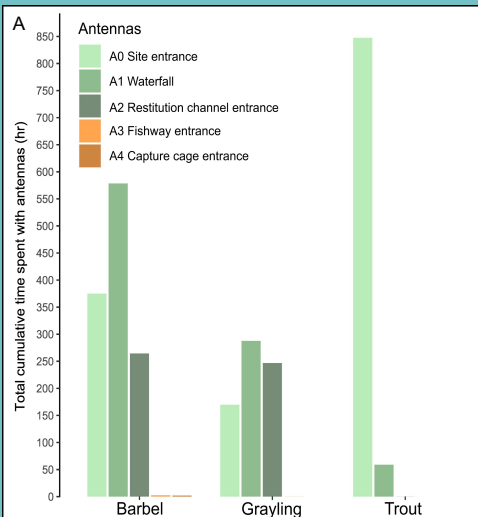
Telemetry

- Ntot = 38 double-tagged (RFID + radio transmitters)
- Captured upstream by electrofishing
- Released 1.2 km downstream the waterfall
- 5 antennas installed (3 radio, 2 RFID)

Capture monitoring

- Capture cage monitored 2–3 times per week over 3 years
- Biological data collected and fish released upstream

Results & Discussion



B	Antenna	N grayling = 6	N barbel = 16	N trout = 16	N total = 38
	A0 (radio antenna)	4	16	14	34
	(Approach rate)	(66.7%)	(100%)	(87.5%)	(89.5%)
	A1 (radio antenna)	4	15	7	26
		(100%)	(93.8%)	(50%)	(76.5%)
	A2 (radio antenna)	2	8	2	12
		(50%)	(53.3%)	(28.6%)	(46.2%)
	A3 (RFID antenna)	1	4	1-2*	6-7*
		(50%)	(50%)	(50-100%)	(50-58.3%)
	Attraction rate	25%	25%	7.2-14.3%*	17.6-20.6%*
	A4 (RFID antenna)	0	4	1-2*	5-6*
			(100%)	(50-100%)	(from 71.4 to 100%)
	Individuals captured in the cage	0	2	1	3
	(Fishway efficiency)		(12.5%)	(6.3%)	(7.9%)
	Adjusted fishway efficiency	0	50%	50-100%*	50-60%*

C	N tot ind	N tot species	Biomass tot (kg)
Capture cage monitoring	2 328	21	338

(A) Total cumulative time spent with antennas by species, (B) Number and proportion of fish detected by fixed antennas, with approach rate and attraction rate and number and proportion of fish discharged upstream of the waterfall with fishway efficiency and adjusted efficiency. *: total taking into account the detection of minimum 1 to maximum 2 trout in A3 and A4 and (C) Total of individuals, species and biomass captured over the 3-year monitoring period.

The waterfall proved more attractive than the fishway entrance, with significantly more detections recorded at its base. This may be explained by the stronger flow at the waterfall, whereas the restitution channel offers limited hydraulic stimulation, further reduced by bank clogging following the 2021 floods. Several individuals exhibited back-and-forth movements or downstream displacement after prolonged searching, suggesting difficulty in locating the fishway entrance and potential abandonment of upstream migration. Nevertheless, the fishway is used by a wide range of species, with over 2,300 individuals captured over 3 years, representing 21 different species, highlighting its ecological and multi-species value. This study helped identify the limitations of the fishway, particularly its low attractiveness. As a result, improvement works are currently underway to enhance attraction flow and increase its functional performance.