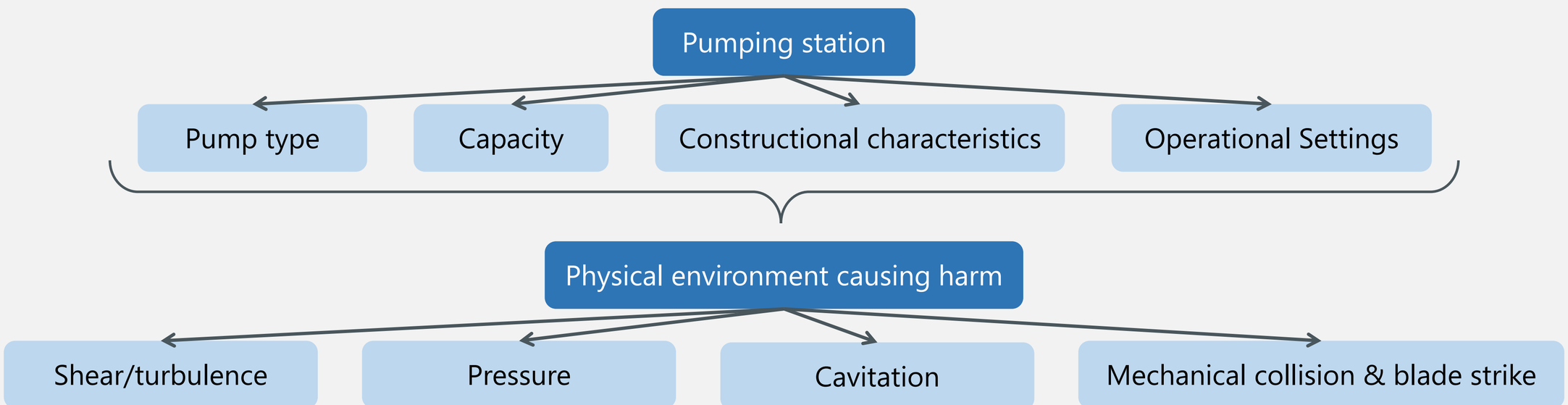
Pumping stations manage water but harm fish: Impact varies with station characteristics

From fish to sensors: Assessing pumping stations impacts on fish and optimizing future research designs using innovative sensors.

Background: The harm of pumping stations depends on various characteristics that determine the physical environment within them. We focus on understanding how this variability affects fish safety, as well as on the replacement, reduction, and refinement of live fish test by studying the link between fish and sensor data.



Methods

Probability of injuries and mortality assessed by **re-using** fish field experiments and natural migration* **data**

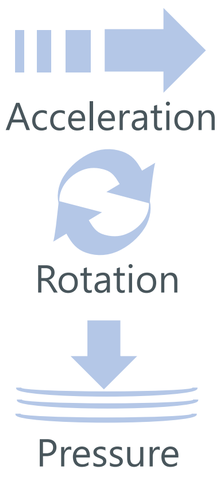
Decapitation of bream due to blade strike

INBO pump fish safety data: green ≤ 5%; orange 5-10%; red > 10% mortality

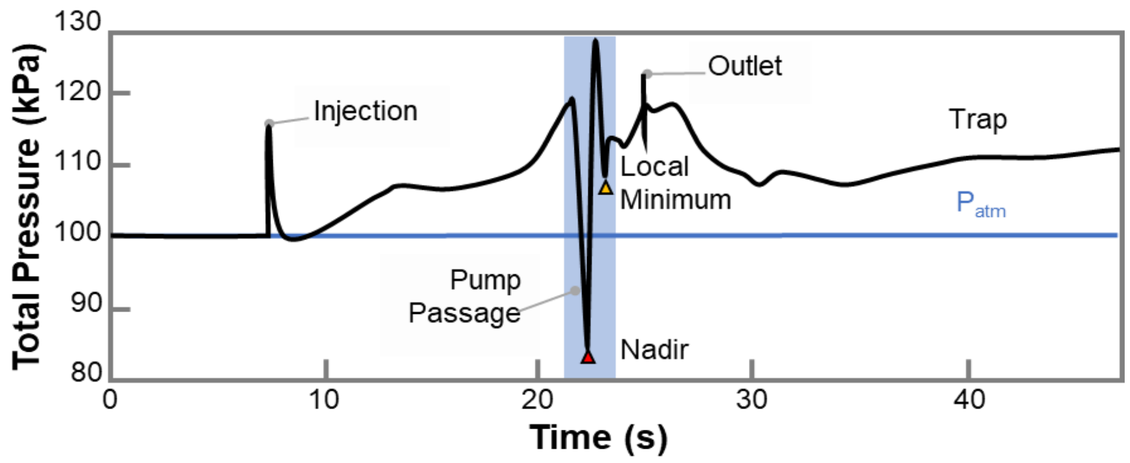
Pumping station in Belgium	Pump type	Working point (rpm)	Mortality rate Eel	Roach	Bream
Groot Schijn	Closed screw	29	1%	3%	NA
	Open screw	23	8%	17%	NA
	Open screw Elst adaptation	23	5%	7%	NA
Isabella*	Open screw	21	17%	25%	65%
	Open screw De Wit adaptation	21	19%	22%	44%
Spiedam*	Classic axial flow pump	450	97%	60%	58%
Devils hole	Pentair Fairbank Nijhuis axial flow pump	550	4%	35%	85%

Severity of impact is assessed through **field experiments** using **sensors** that measure the physical environment

BDS sensor developed by TalTech



Pressure profile of axial flow pump measured with a BDS sensor



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