Atlantic salmon smolts and silver eel migration along a 80 km-long stretch of the Belgian River Maas : from diagnostic to development of mitigation measures

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1. CONTEXT

EDF Luminus operates 6 HPP between Namur and Lixhe
These HPP have new requirements for fish protection in their permits targeting Atlantic salmon smolts and silver eels

To address the fish protection level, EDFL has started a LIFE project, associated with several partners.

The project aims to develop efficient fish protection measures to meet the permits requirements.

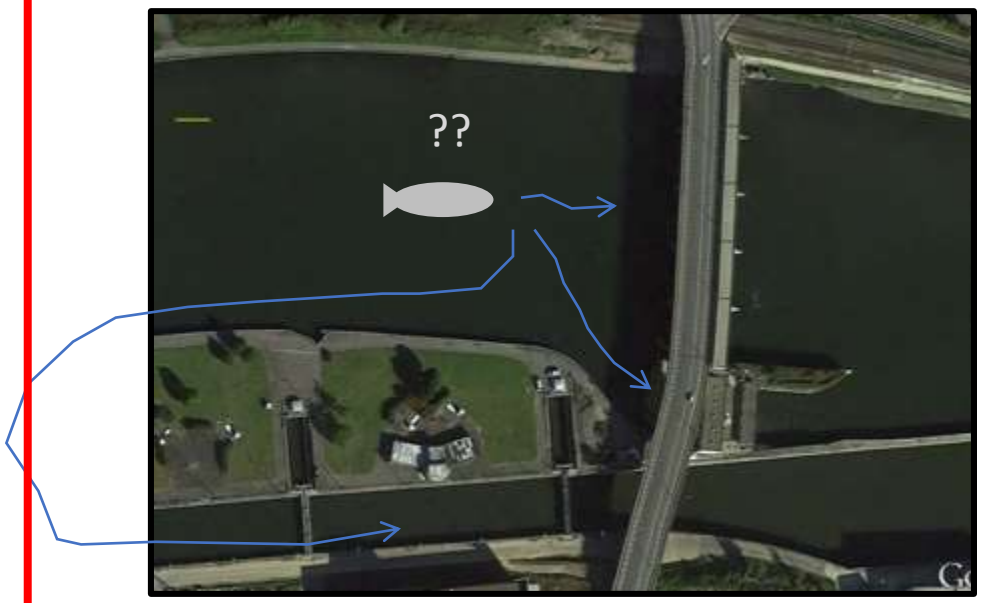
R&D project going from a diagnostic phase to a proofed solution (2017-2022)

2. DIAGNOSTIC

2 axis of study have been investigated prior the start of LIFE4FISH to establish the initial state that will be used as reference to measure the efficiency of fish protection measures.

1. Fish survival after passage through turbines by net capture

2. Fish passage routes at each site by telemetry

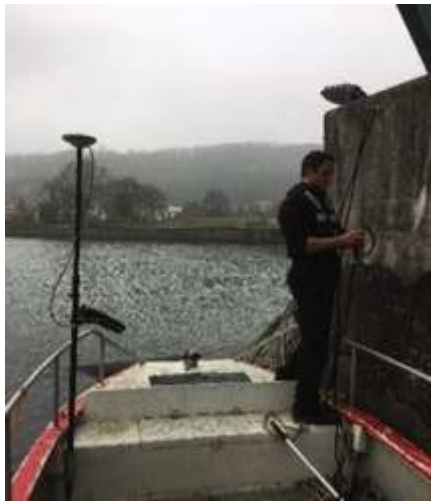


3. SETUP

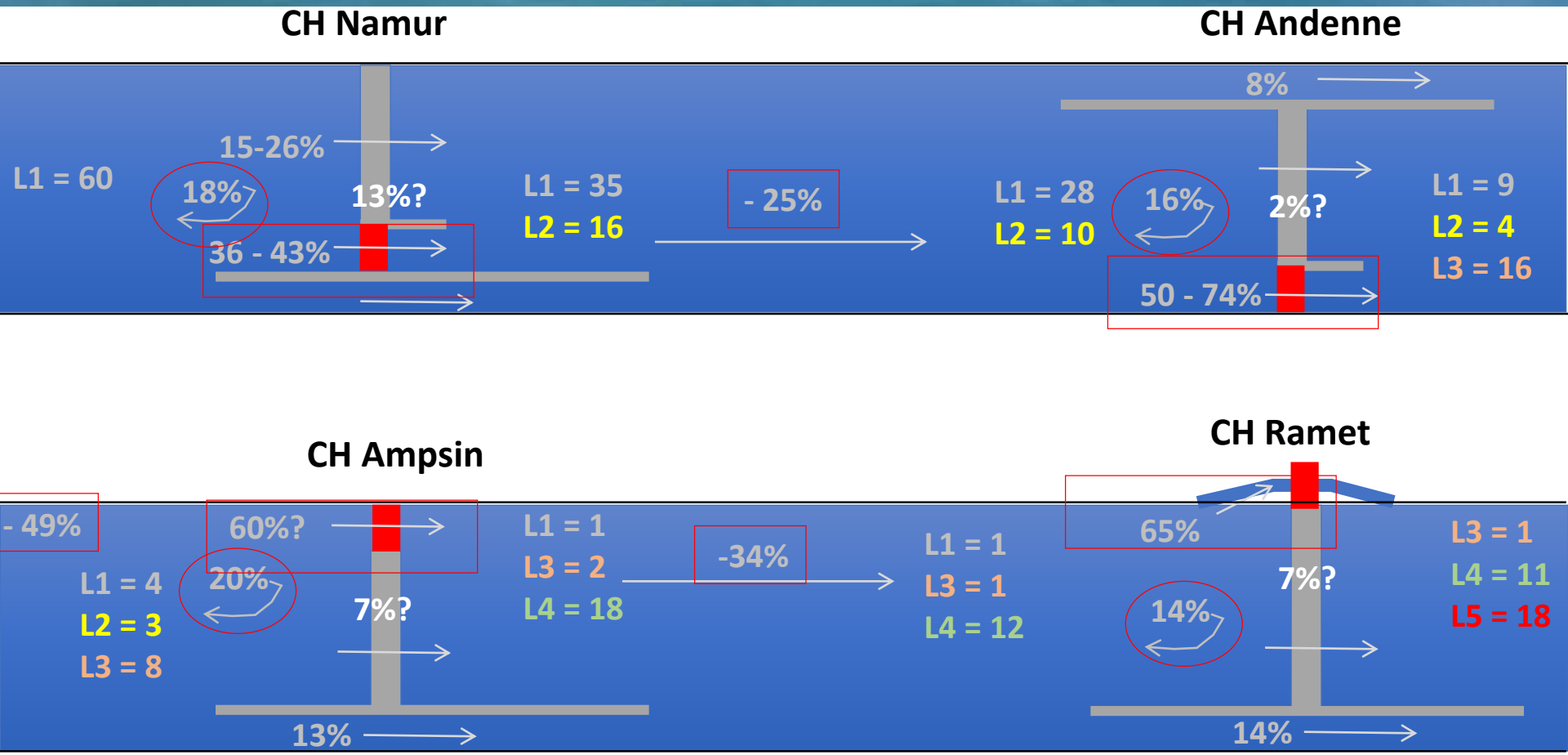
80 LOTEK WHS 4250 L receivers
Bottom anchored in the river to cover :
HPP Forebays
Spillways
Sluices
+ Downstream each dam to confirm dam passage

Namur & Ivoz-Ramet : geo-positionning (< 1m) of the receivers for 2D tracking of fish

Tagging & release in the river
By surgery under anaesthesia
146 smolts released in April 2017
150 eels released in October 2017



4. RESULTS SMOLTS : DRY SPRING 2017



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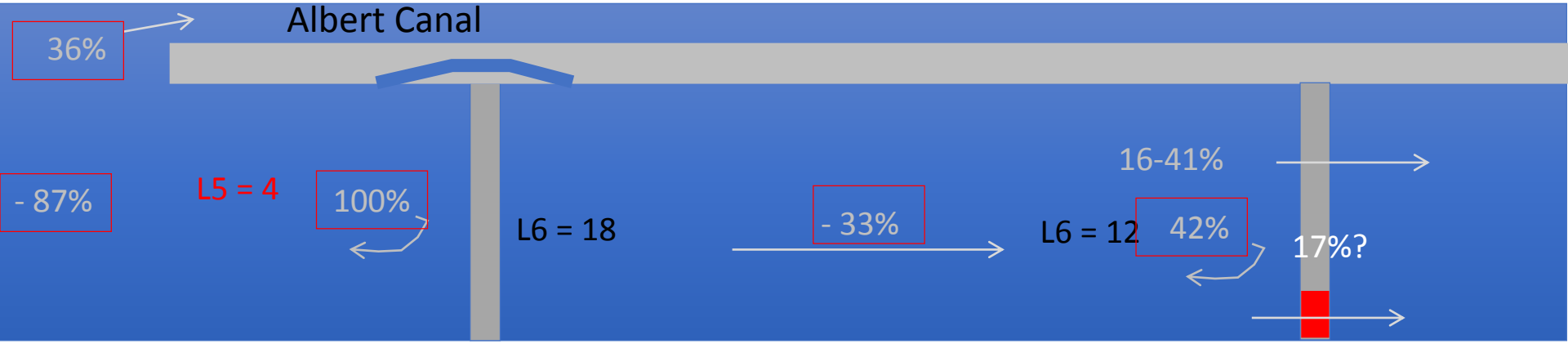


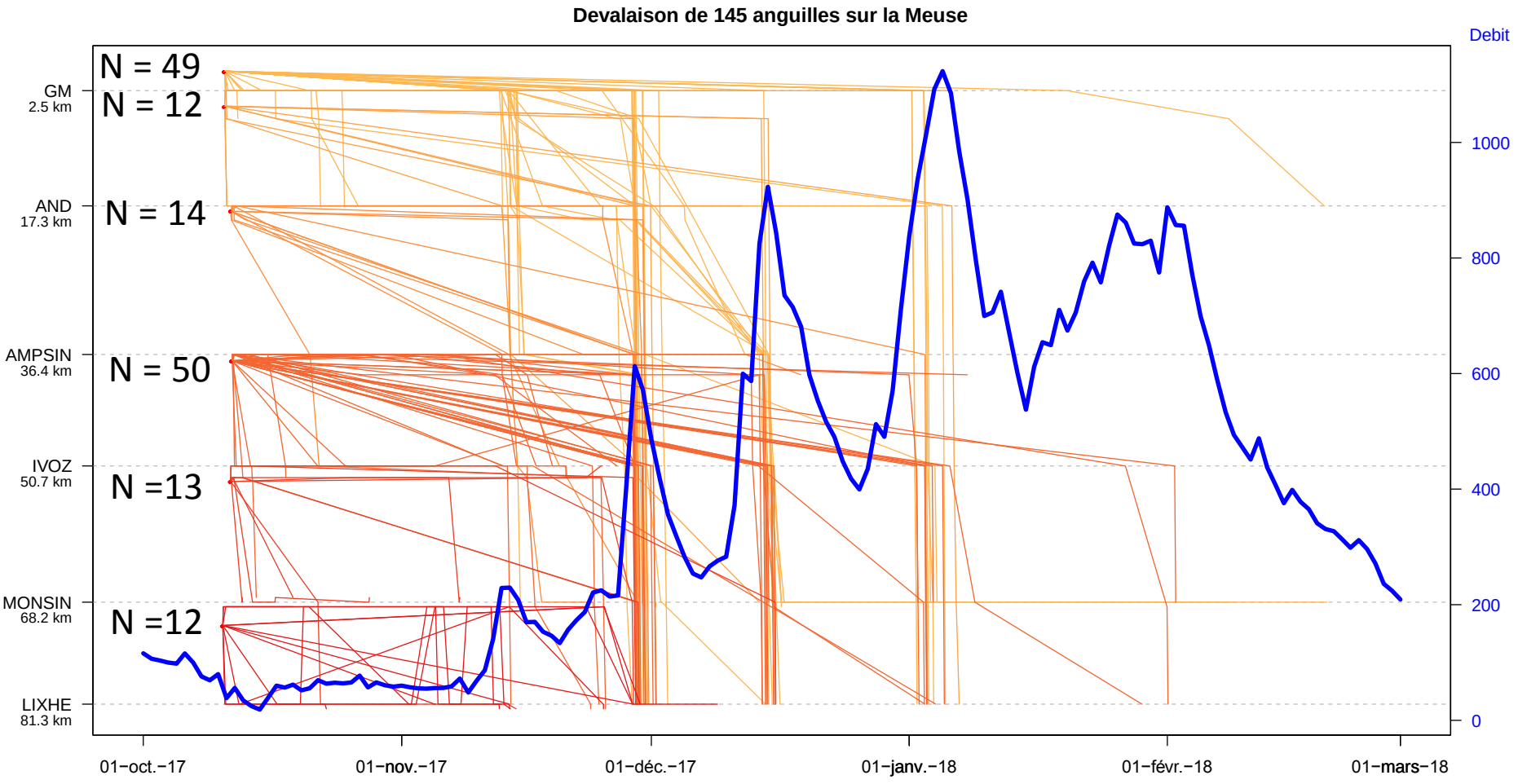
CH Monsin CH Lixhe

<u>In short for smolts :</u>

In dry conditions (Q< 100 m^3/s), smolt migration success seemed very poor
Up to 87% of the migrating individuals disappeared in the sections between dams, but also the water intakes : Nuclear station (-24%) and Albert Canal (-36%).
The proportion of smolts passing through turbines varies between 0% to 60%, with an induced survival ranging between 92.7% and 96.7% (Axis 1 : net capture).
Between 18% and 100% of the individuals did not succeed to cross the sites.

5. RESULTS EELS

Peaks of migration are mainly concentrated during peaks of discharge



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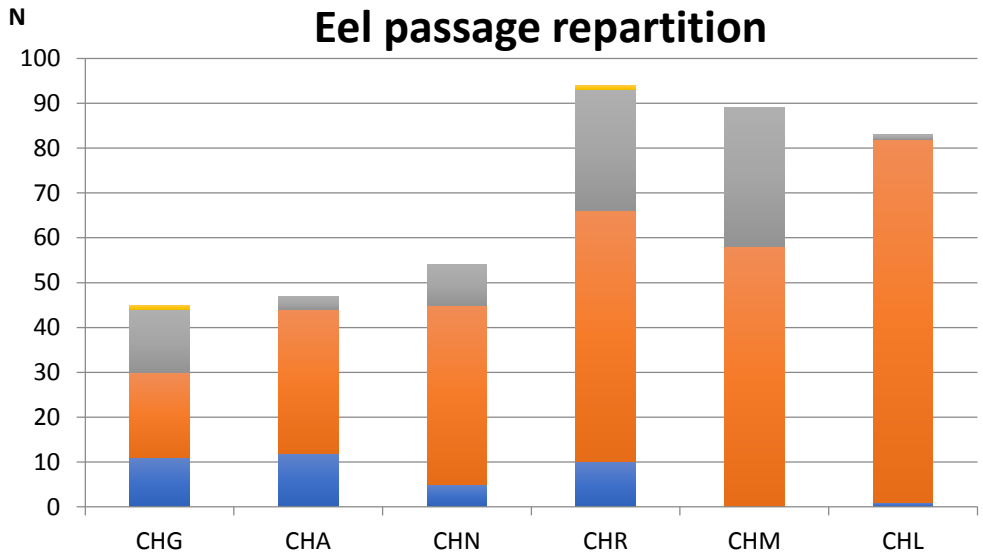
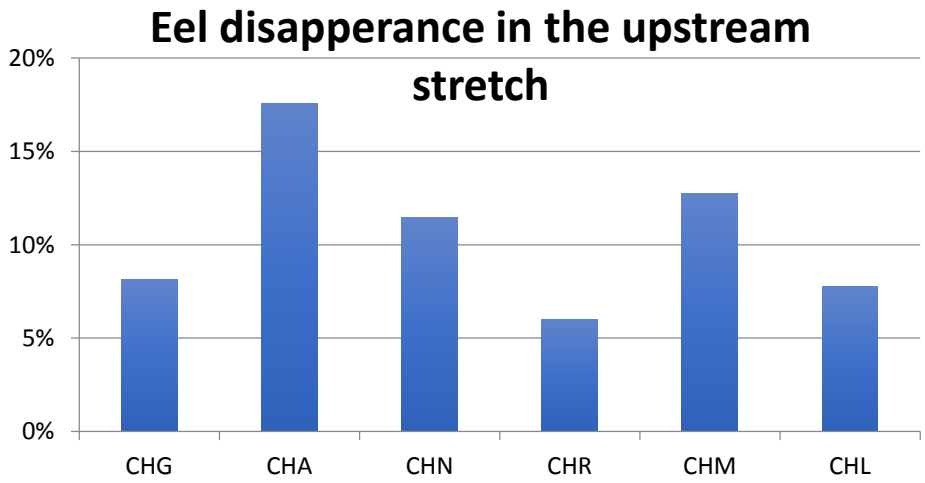


1% to 35 % of passage through turbines
Induced survival of 78,9% to 88,7%
(Axis 1 : net capture)
42% to 97% of passage by spillways



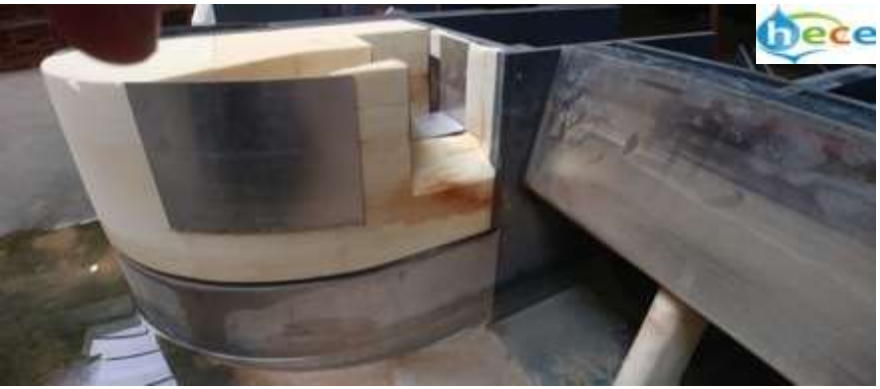
6% to 18 % are disappearing in each stretch between dams
8% disappearing in the Albert Canal

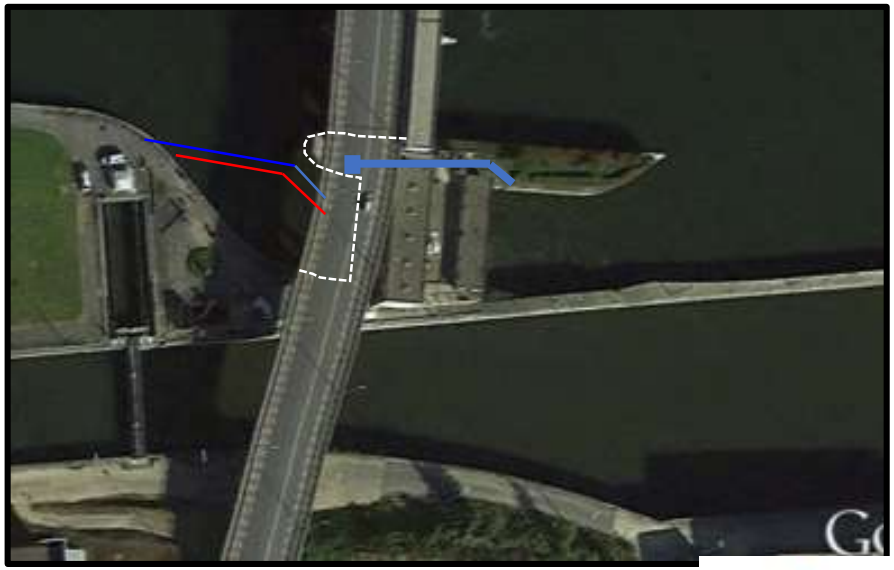
6. From diagnostic to mitigation measures

SMOLTS:

The main impacts is due to hydraulic and physical barrier

➔ Propose an attractive safe passage to smolts



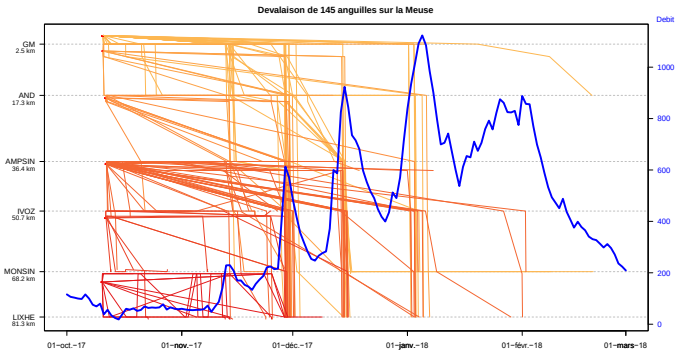


Bypass have been designed for 2 pilot sites
An electrical fence will be tested as a facilitating tool to concentrate smolts in the vicinity of the bypass entrance

Efficiency will be assessed by spring 2020

6. From diagnostic to mitigation measures

EELS:



A prediction model has been developed and will be tested at 1 pilot site in autumn 2019. The migration warnings will be associated with reduction of production.

An electrical fence and a bubble curtain will be tested as facilitating tool to keep eels in the main migration axis towards the spillways Efficiency will be tested in autumn 2019.

Many thanks for your attention