

Jun 23rd, 4:15 PM - 4:30 PM

Session C6: Does Yellow Eel Prefer Old Pool and Weir or New Vertical Slot Fish Pass During Their Upstream Migration?

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Matondo, Billy N.; Dierckx, Arnaud; Benitez, Jean-Philippe; and Ovidio, Michael, "Session C6: Does Yellow Eel Prefer Old Pool and Weir or New Vertical Slot Fish Pass During Their Upstream Migration?" (2015). *International Conference on Engineering and Ecohydrology for Fish Passage*. 24.
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Fish Passage 2015

Groningen, The Netherlands, June 20th – 24th



DOES THE EUROPEAN YELLOW EEL PREFER OLD POOL AND WEIR OR NEW VERTICAL SLOT FISH PASS DURING THEIR UPSTREAM MIGRATION?

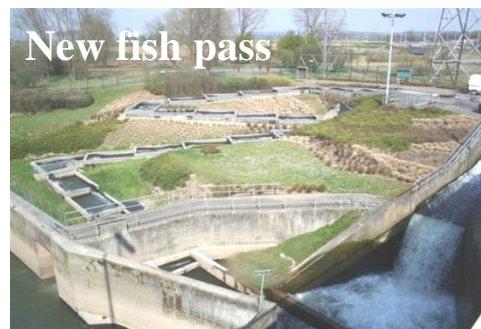


B. Nzau Matondo

A. Dierckx

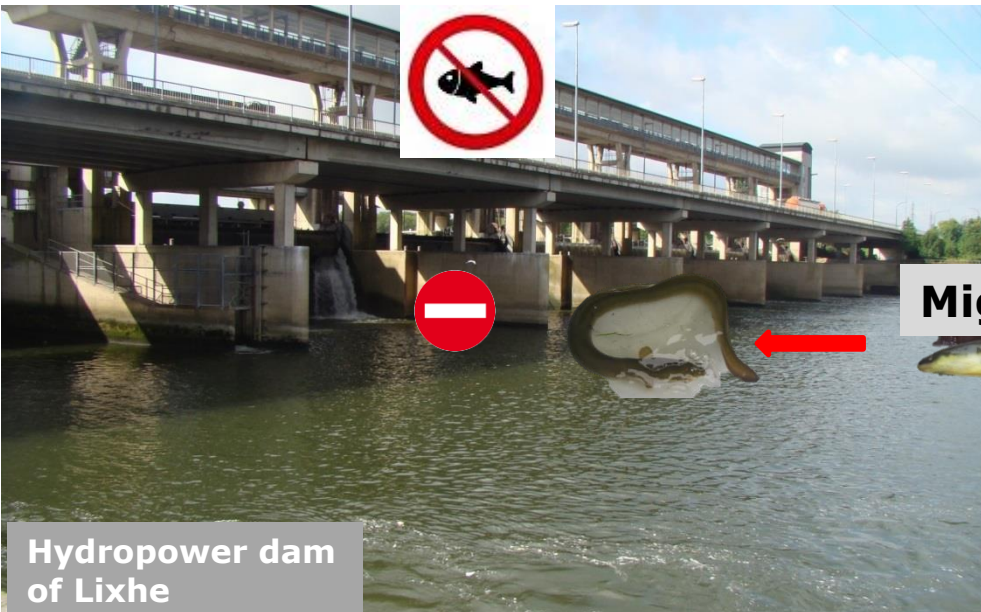
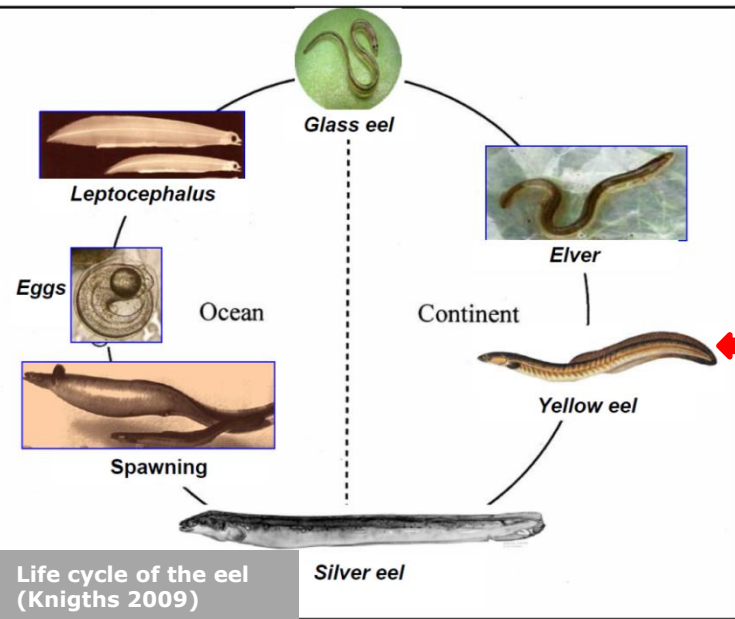
J. P. Benitez

M. Ovidio



INTRODUCTION

Yellow eel is one of the life stages of the European eel *Anguilla anguilla*



Some individuals farther from the sea continue to colonize rivers.

Migrating yellow eel

But, their upstream colonization process in inland waters is usually disturbed by barriers such as hydropower dams.

INTRODUCTION

Fish pass may help eels to continue upstream migration

Fish passes can be:

the old pool-and-weir configuration fish-pass (OFP),

and the new pool-and-vertical slot configuration fish-pass (NFP).

Preference of eels for the two configurations of fish pass remains unknown.

And yet such knowledge is crucial to improve eel-management and conservation plans.

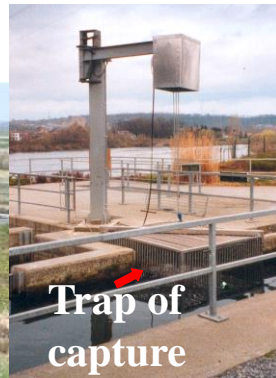
This study aims to investigate on: the PREFERENCE for eels in term of the fish pass use between the old and new configuration



Old fish pass (OFP)



New fish pass (NFP)



Trap of capture



Trap of capture

Study area



The study area

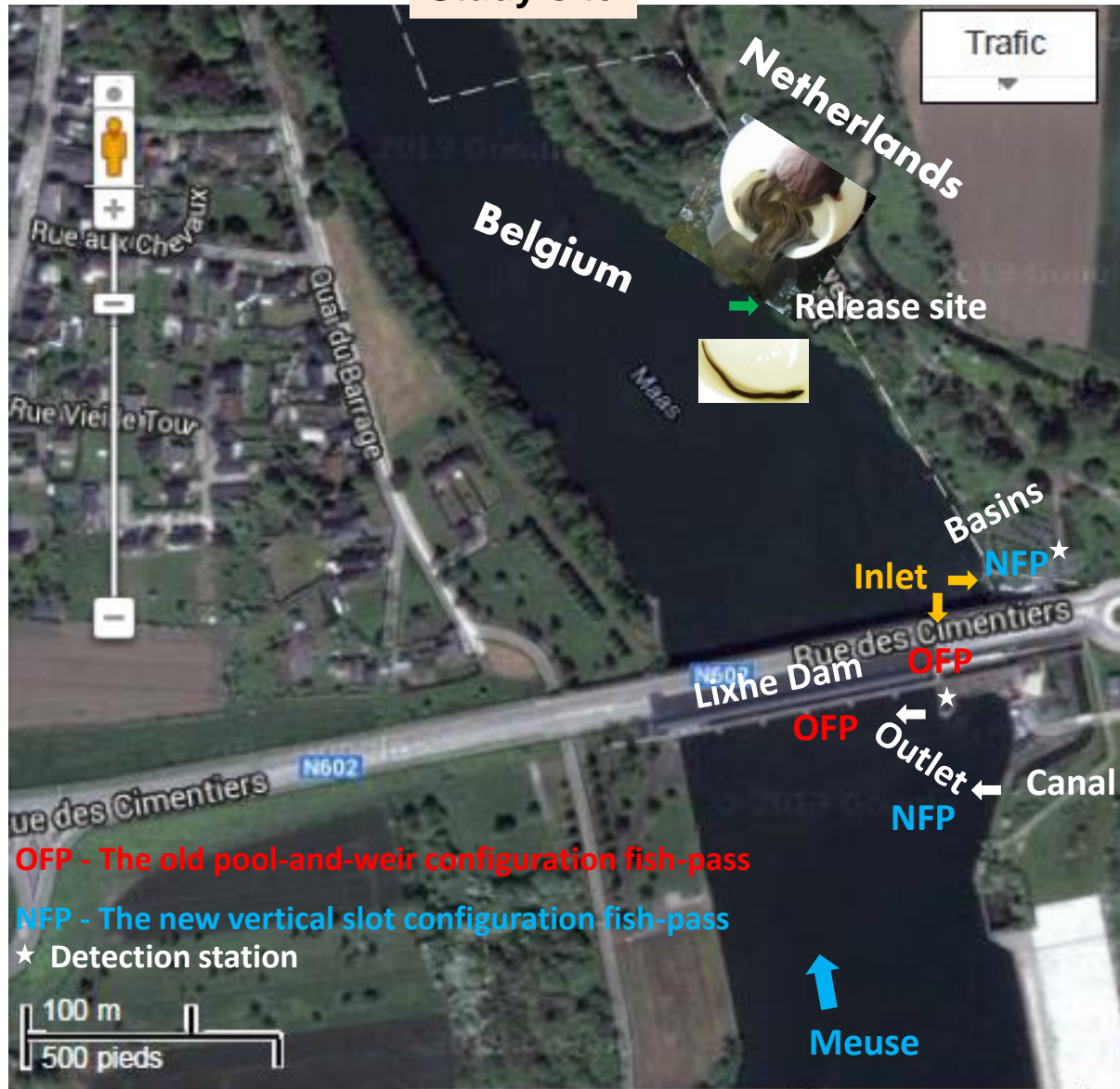
The study was conducted in the River Meuse at:

the Lixhe dam

close the Dutch border in Belgium ,

323 km upstream from the North Sea.

Study site



This map shows the study site with positions of:

the release site

the old fish pass

the new fish pass

the inlet and outlet of fish passes

and the detection stations

OFP - The old pool-and-weir configuration fish-pass

NFP - The new vertical slot configuration fish-pass

★ Detection station

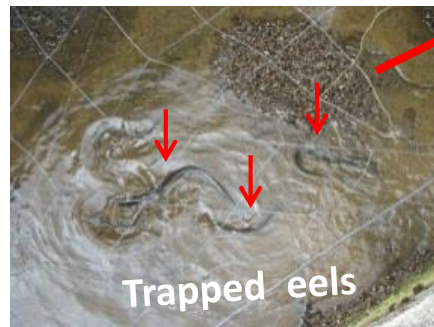
METHODS

These pictures show trapping and detection in old fish pass (OFP), with positions of:

the nonselective cone-trap pool,

the cone and

the detector

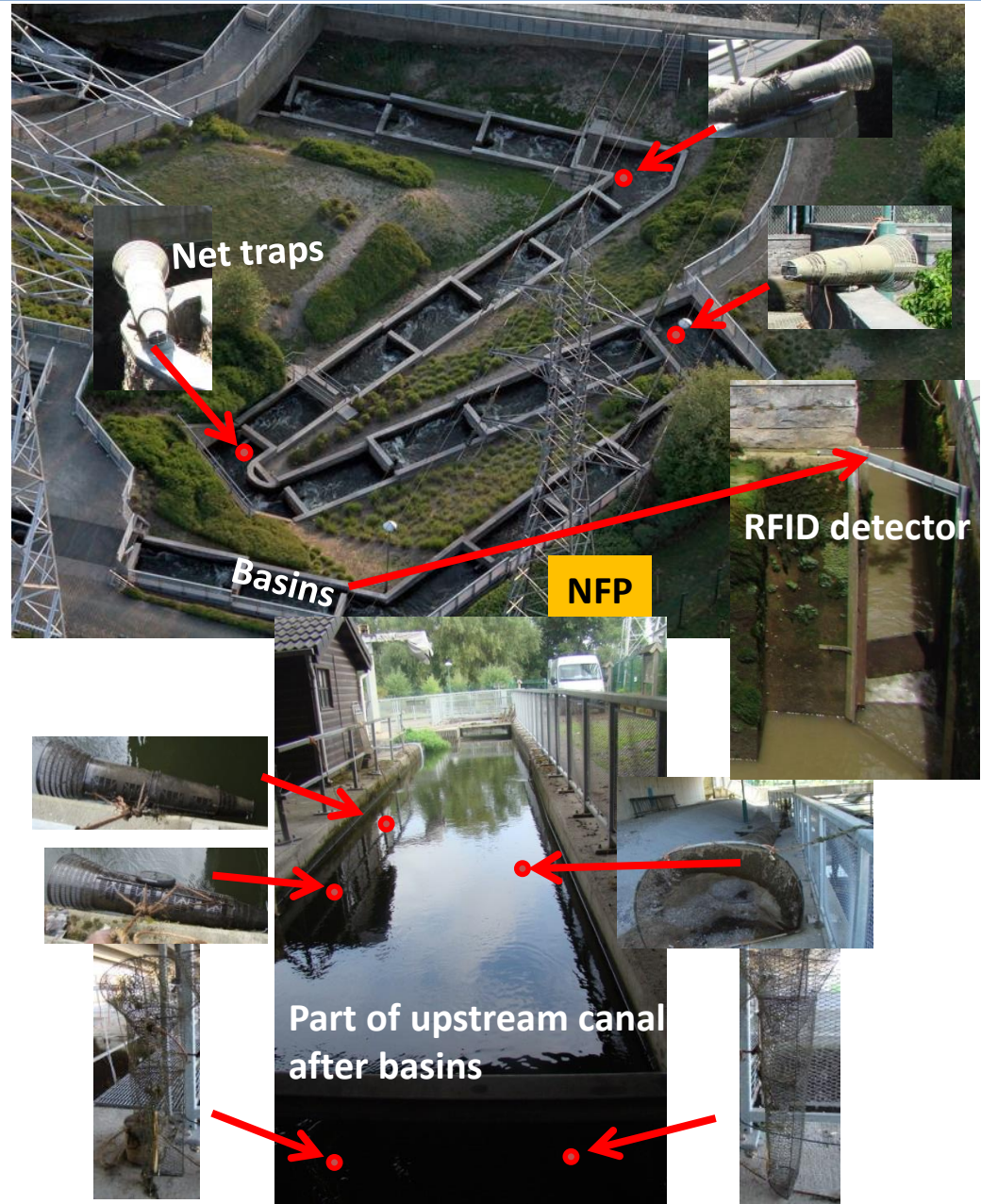


METHODS

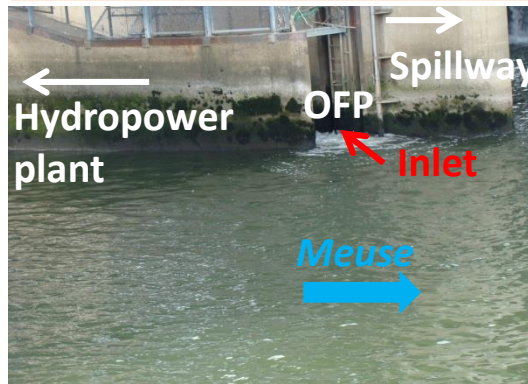
These pictures show trapping and detection in new fish pass (NFP), with positions of:

the net traps and

the detector

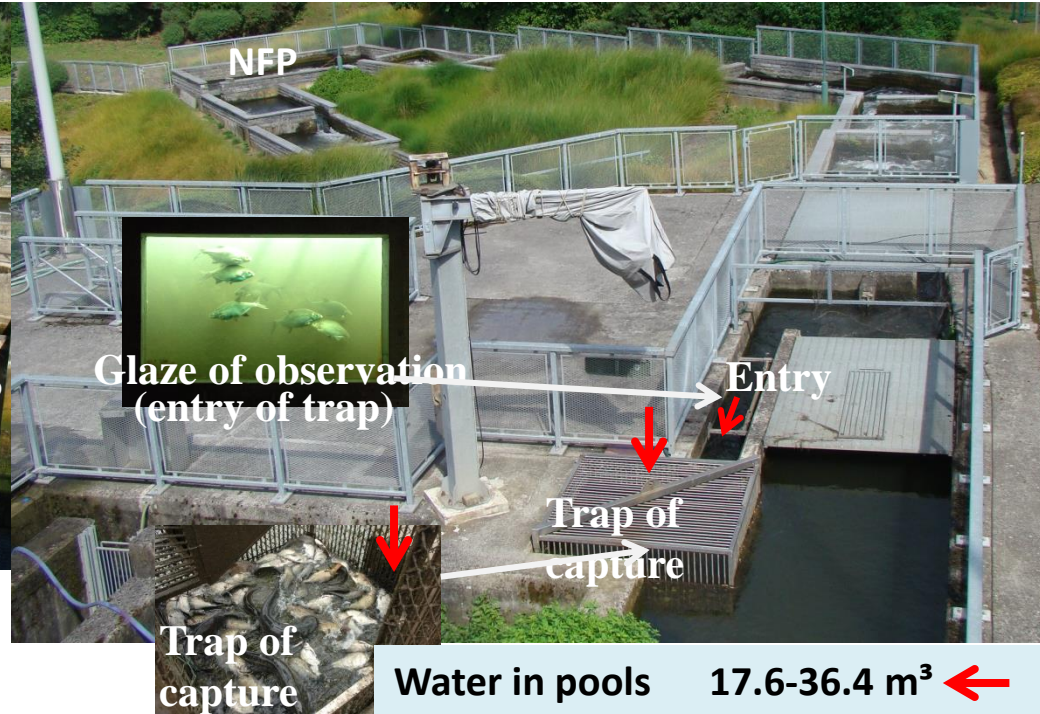
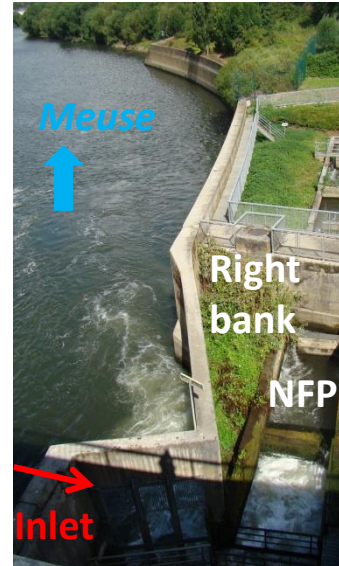
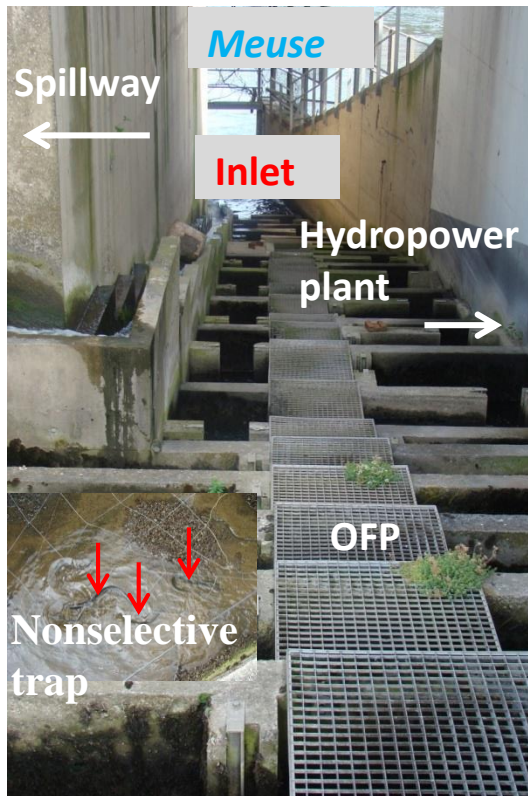


Configuration of fish passes



OFP – Old pool-and-weir fish pass built in 1983

Water in pools	1.3-5.9 m ³
Flow	0.3 m ³ /s (maximum) ←
Pool sizes	1.4-5.35 × 0.9-1.6 m
Length	121 m
Slope	6.8 %



NFP – New pool-and-vertical slot Fish pass built in 1998

Water in pools	17.6-36.4 m ³ ←
Flow	1.0 m ³ /s ←
Pool sizes	4.7-9.7 × 2.5 m ←
Length	145 m (inlet to trap) and 305 m (with upstream canal)
Slope	5.4 %

METHODS

Trapping, tagging and detection

Trapped eels were counted and measured.

Measured eels were tagged.



2. Tagging

Eels tagged were released 0.3 km downstream of Lixhe dam.



3. Release

Trapping and RFID tagging in 2013

RFID detection in 2013 – 2014

To test "PREFERENCE" of eels for fish pass use

1. Detection success of RFID system
2. Environmental conditions of migration
3. Preference of eels for fish pass use

4. Detector

Tagged eels were detected at their second passage in fish passes.



OFP - The old fish-pass
NFP - The new fish-pass



1. Trapping



NFP

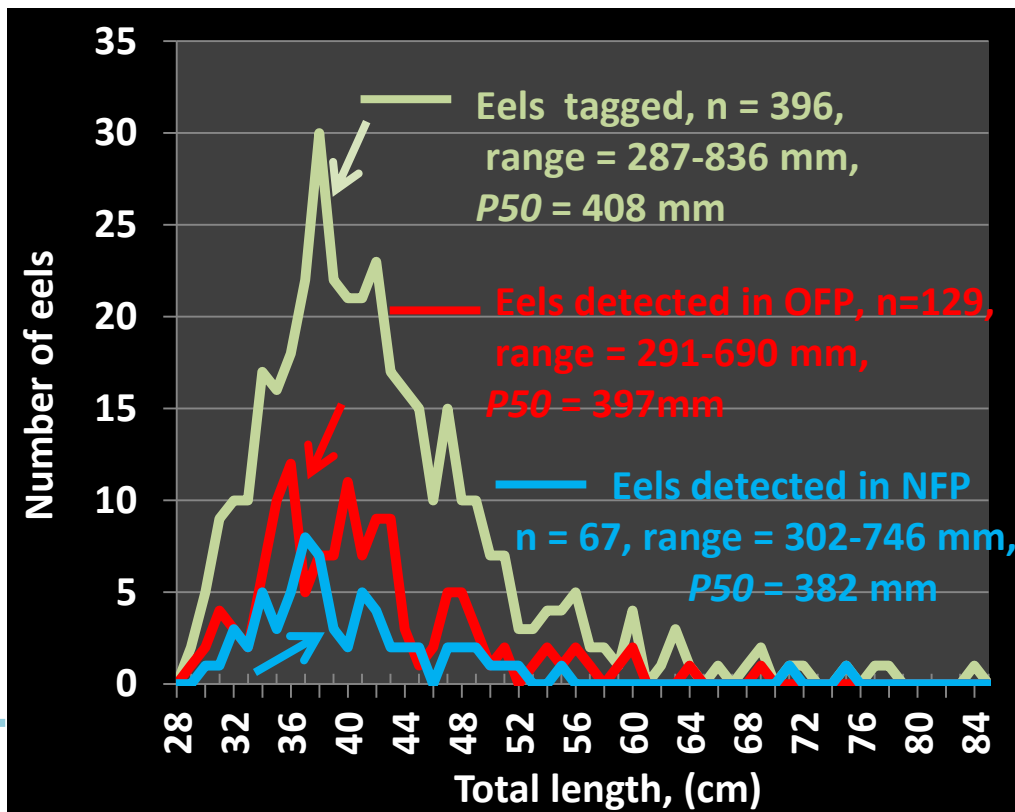
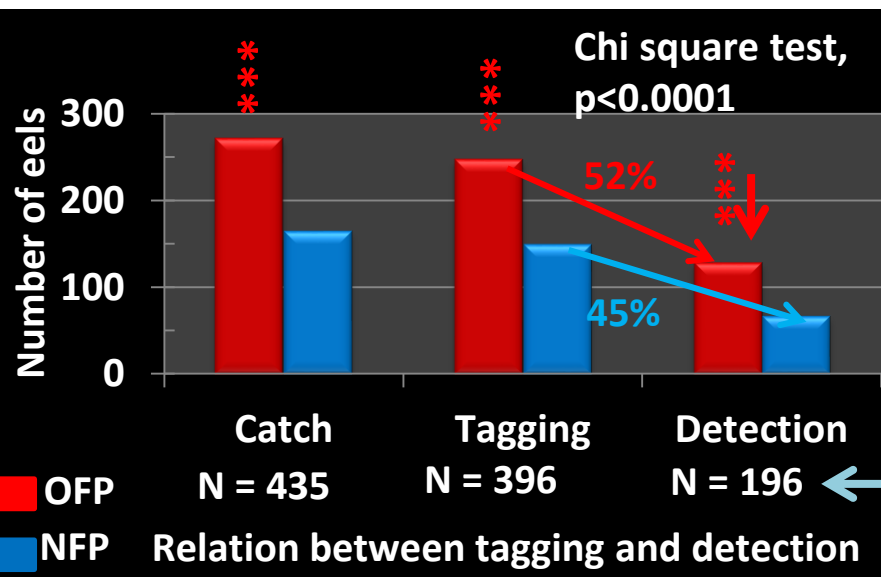


OFP

RFID Detection success

The old fish pass (OFP)

The new fish pass (NFP)



RFID detection results revealed :



Higher detection rate (nearly half of tagged eels)



Higher detection in old fish pass

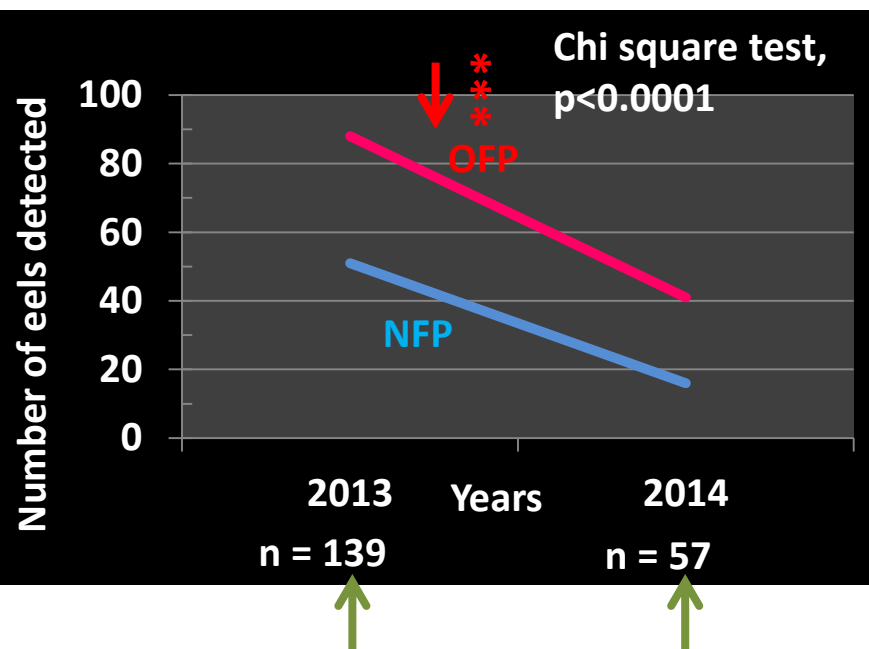


Size range of detected eels overlapping

between fish passes and

with that of tagged eels

RFID detection success



Detection results showed :



higher detection in year of eel tagging (2013: 35.1%) before decreasing in the following year (2014: 14.4%)



higher detection annually in old fish pass

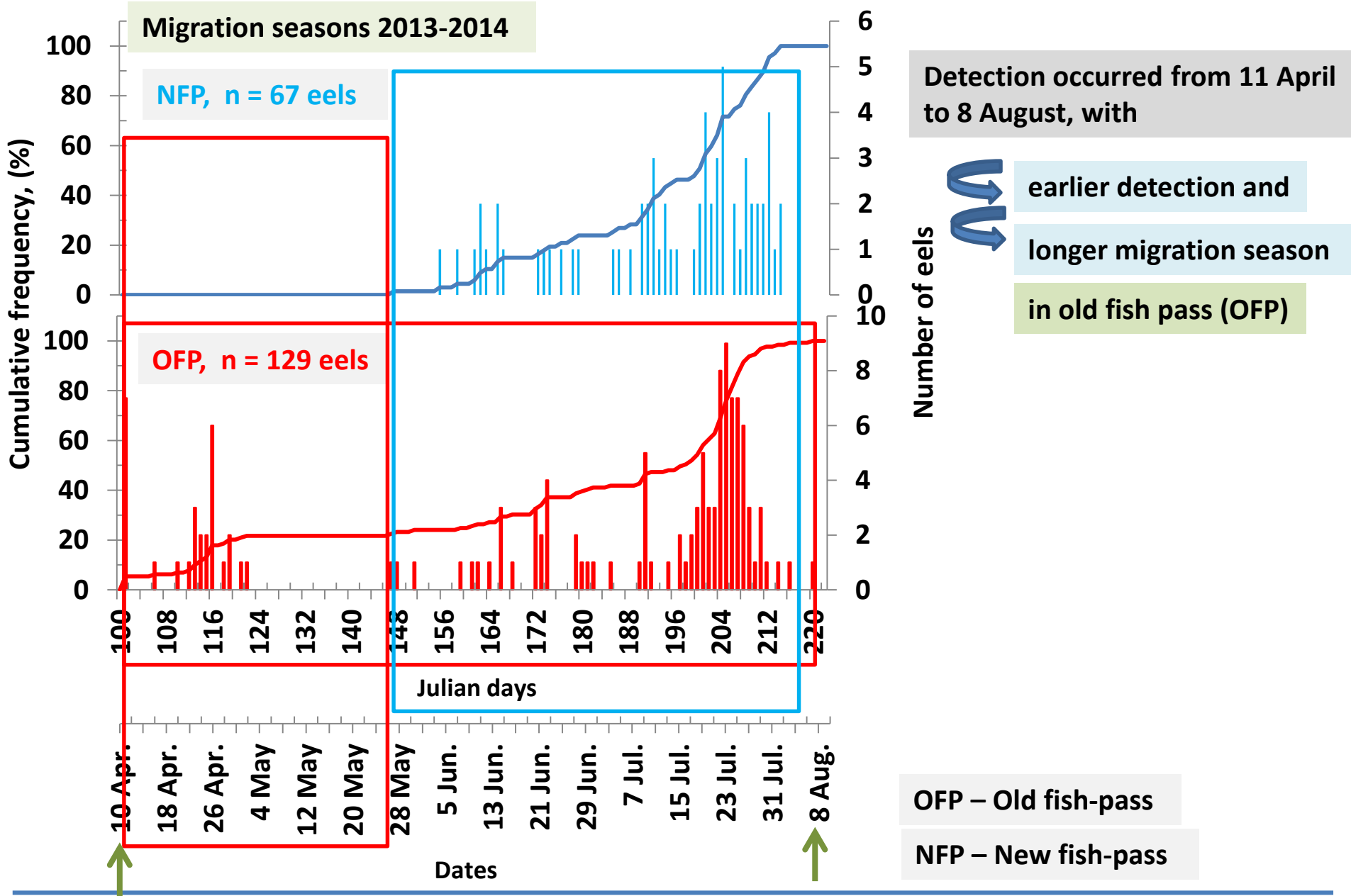
The old fish pass (OFP)
The new fish pass (NFP)

Our results mean:

- very good performance of RFID system
- no selectivity in eel sizes for fish passes
- best detection efficiency to old fish pass

RESULTS

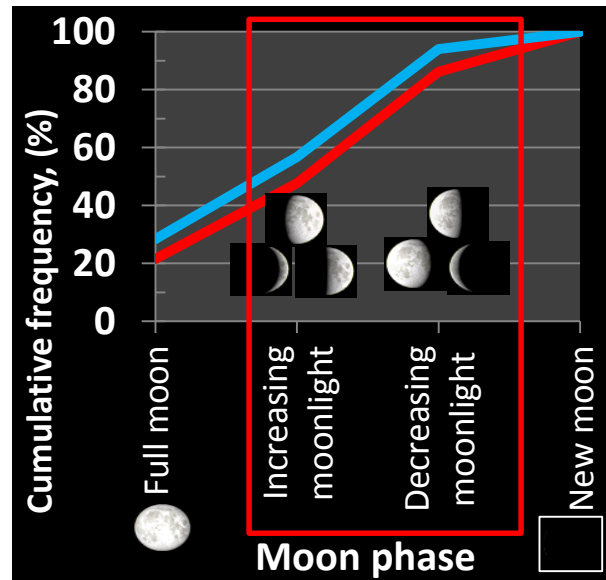
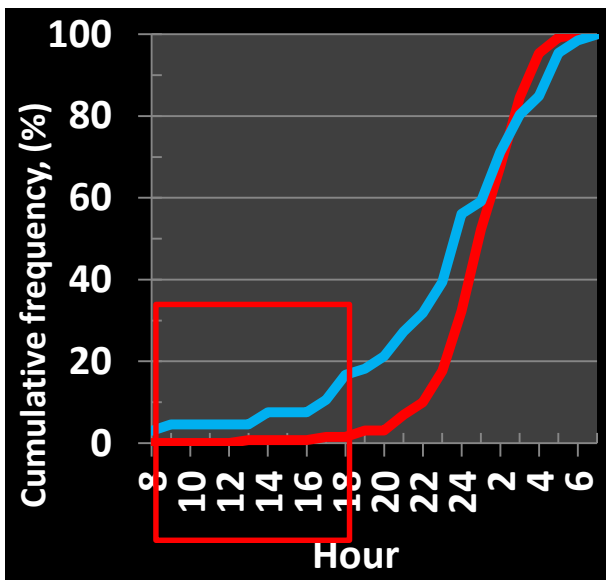
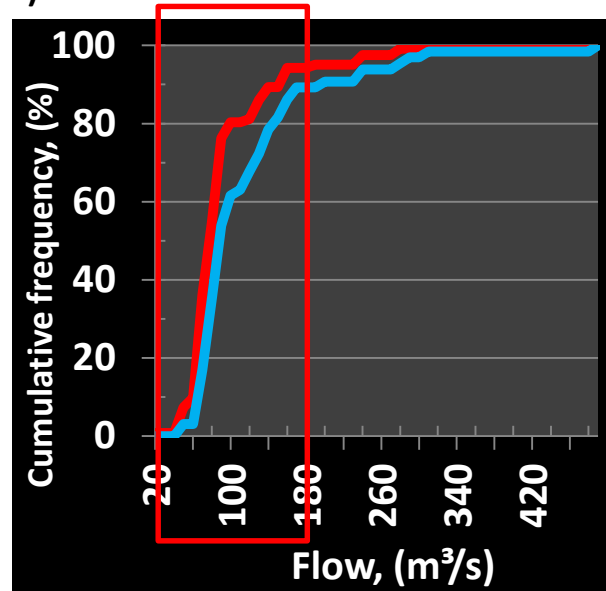
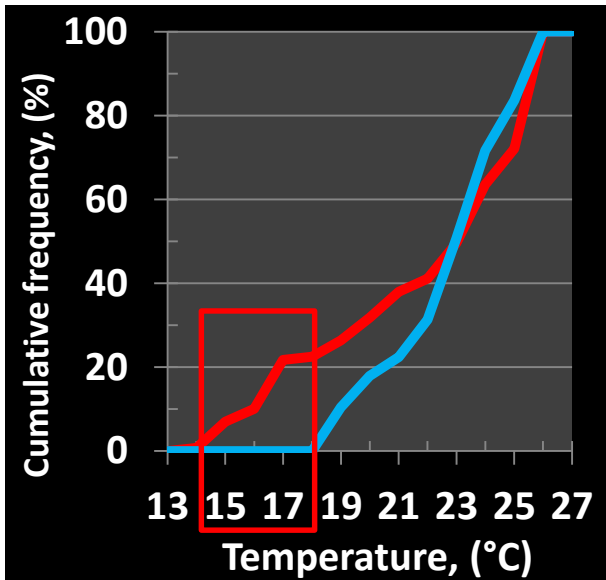
Migration parameters of detected eels



RESULTS

Migration parameters of detected eels

— Old fish pass, n = 129 (2013 – 2014)
 — New fish pass, n = 67 (2013 – 2014)



Comparison of fish passes revealed:

- Similarity
- ↪ detection at low river discharge <math><180\text{m}^3/\text{s}</math> and
- ↪ and when waxing and waning phases of moonlight
- Difference
- ↪ detection at low temperature 14-18°C
- ↪ and daylight 8:00-18:00
- in only old fish pass

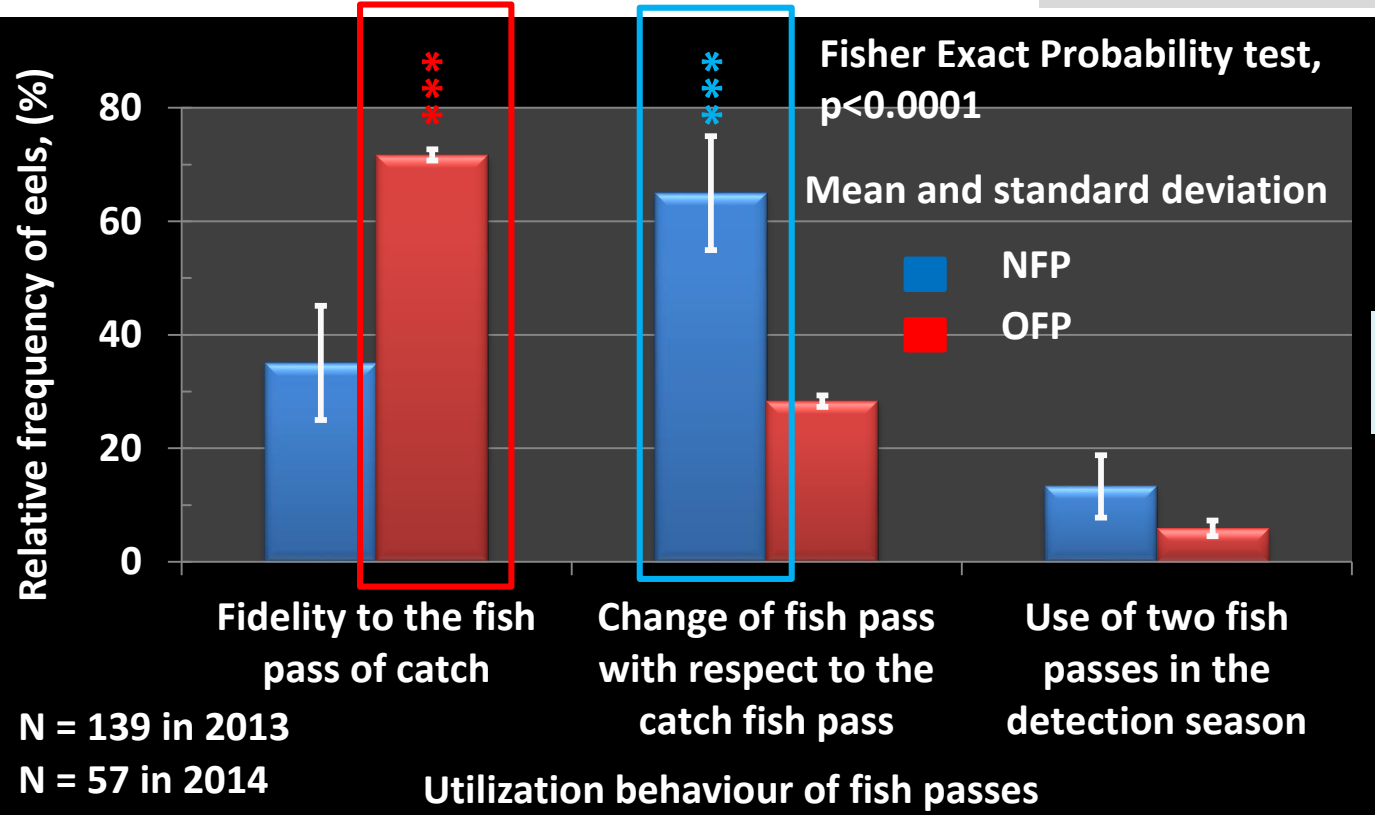
These parameters show:

migration starts early in season and occurs also in daylight in old fish pass

RESULTS

Preference of yellow eels for fish pass

Utilization behaviour revealed annually:



higher fidelity rate of eels for old fish pass (OFP)

higher rate of eels changing the fish pass for new fish pass (NFP)

Results of detection, migration parameters and fish pass use clearly support :

- release of eels from right bank does not favor fish pass (NFP) located on same bank
- and configuration of fish pass affects its utilisation by eels,
- with the old fish pass as the preferred migration route of eels.



These findings provide insight into the fish pass use for migrating yellow eel stage.

Our results clearly show that yellow eels can use the new configuration fish pass, but “**the OLD configuration fish pass**” was their preferred migration route.

This study may help to promote more intelligent eel conservation plans :

1. further reflection before ending the use of old fish pass,
2. improvement of eel comfort in fish pass and,
3. increase the attractiveness and efficiency of new fish pass



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**THANK YOU TO
OUR RESEARCH TEAM**

LDPH team

Wallonia Public Service

European Fisheries Fund



DR. Michael Ovidio
Head of the laboratory



DR. J.C. Philippart



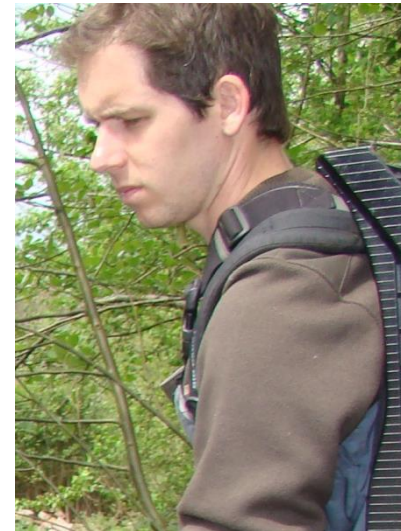
Laboratory of Fish Demography
and Hydroecology



DR. B. Nzau Matondo
Scientist Project



J.P. Benitez
Ph.D. Student and collaborator



A. Dierckx
Collaborator



Wallonia Public Service



With the financial support of
the European Fisheries Fund