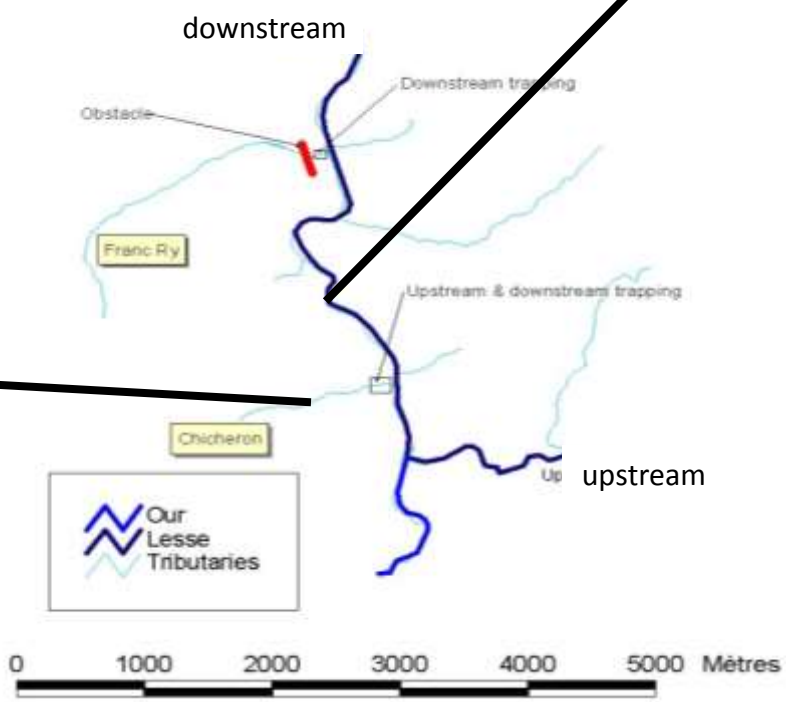
Connection importance
between
a nursery tributary and the main river.

- 1 The natural function of a nursery tributary.
- 2 The disturbances created by a tributary disconnection.
- 3 The recovery observed after the reconnection.
- 4 The original « stairs pipe » fish pass allowing this recovery.

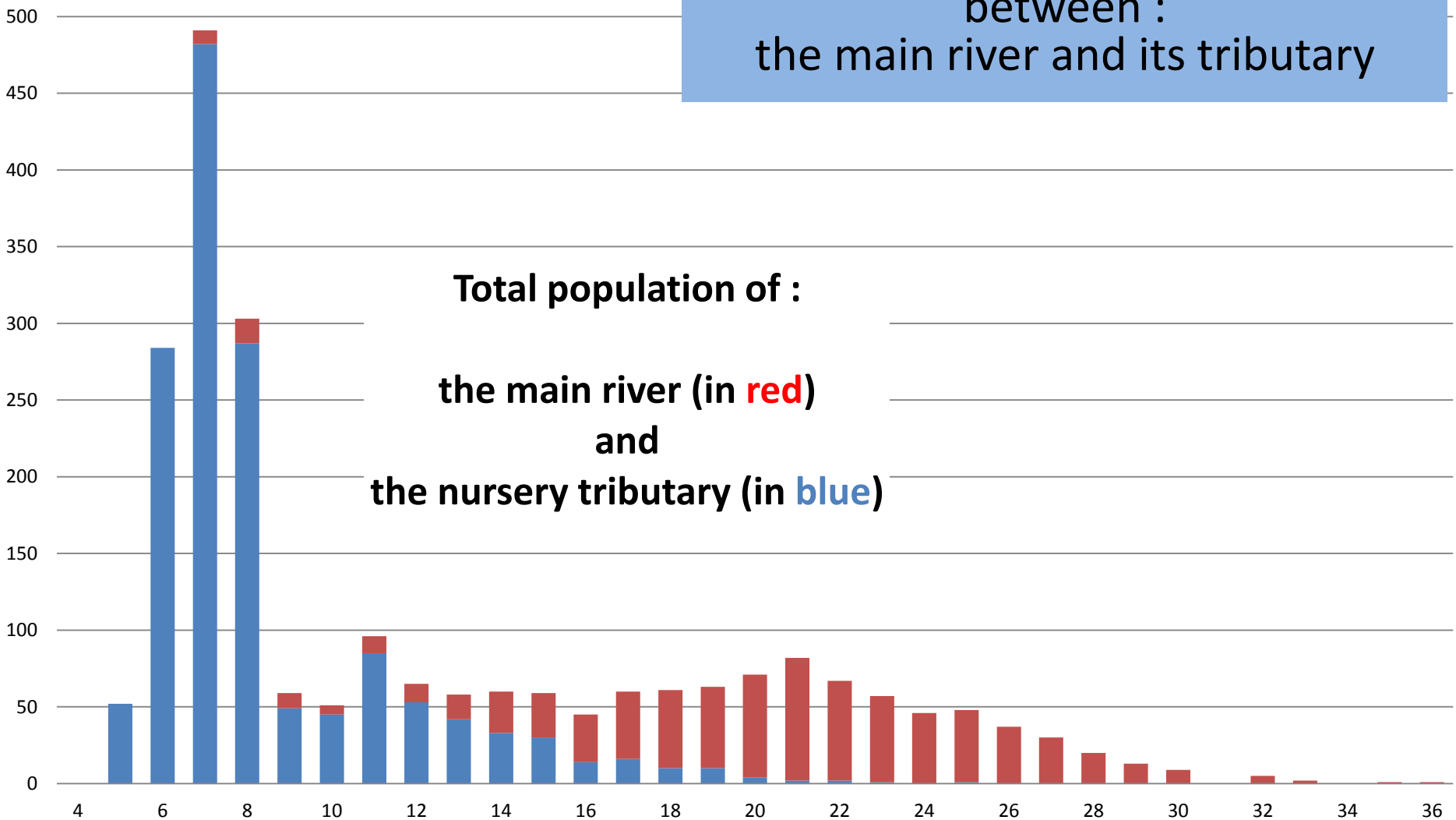
Tributary natural function

The main river and two neighbouring tributaries



Tributary natural function

In the river-tributary system
there is
a trout population splitsing
between :
the main river and its tributary



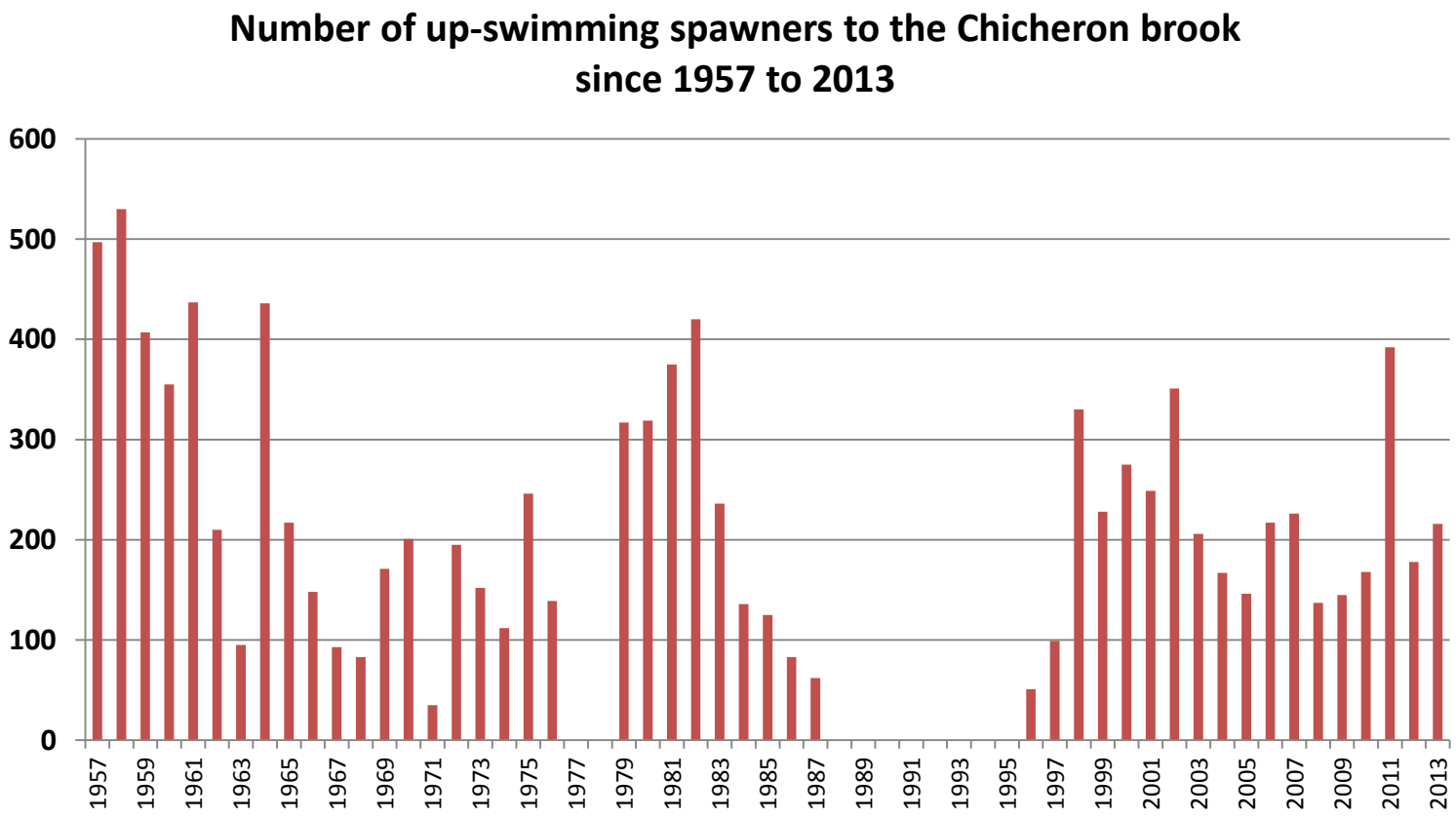
Total population of :

the main river (in red)
and
the nursery tributary (in blue)

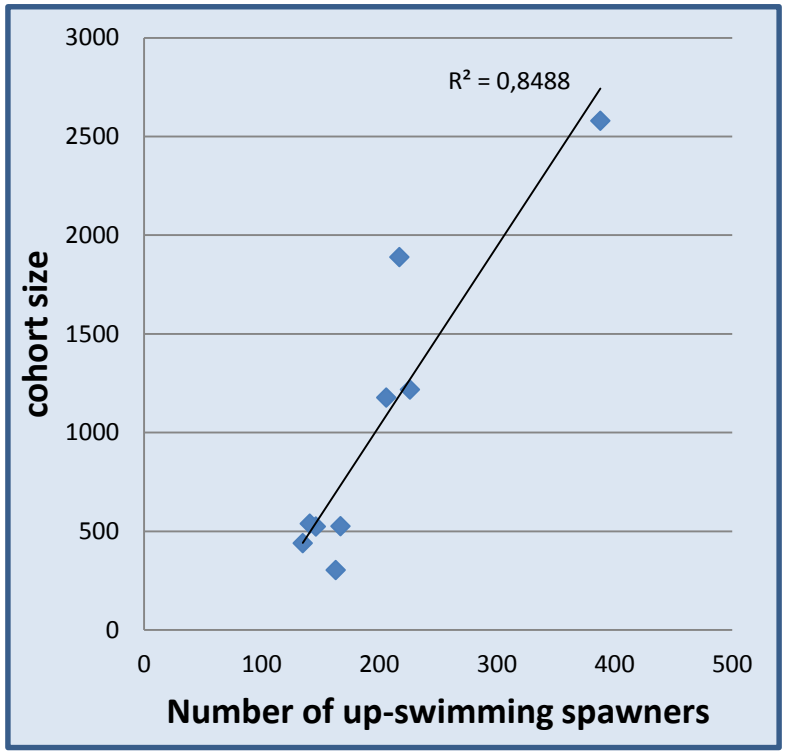
Tributary natural function

A large number of spawners migrate every winter to the brook to spawn.

They are much more numerous than the brook resident ones which are sometimes completely absent.

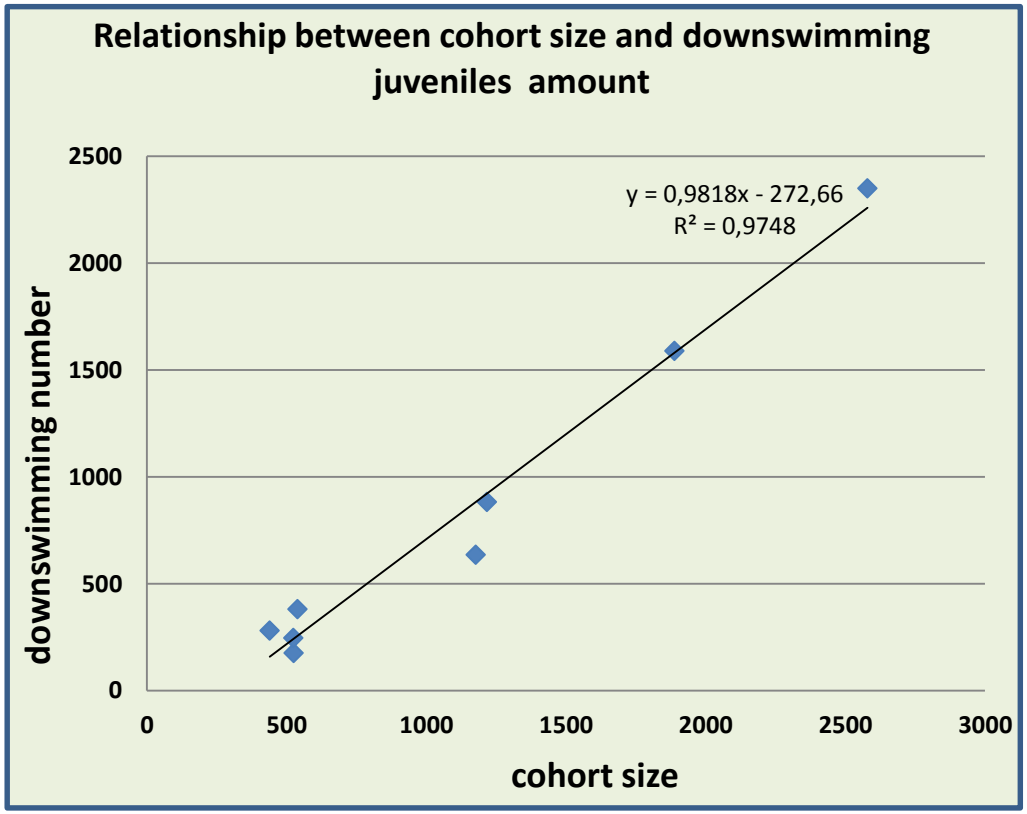


Tributary natural function



The number of migrating spawners determines the produced juveniles cohort size

The largest is the cohort the more numerous are the downswimming juveniles.



RESULTS OF THE DISCONNECTION

CASE OF THE *FRANC RY* BROOK

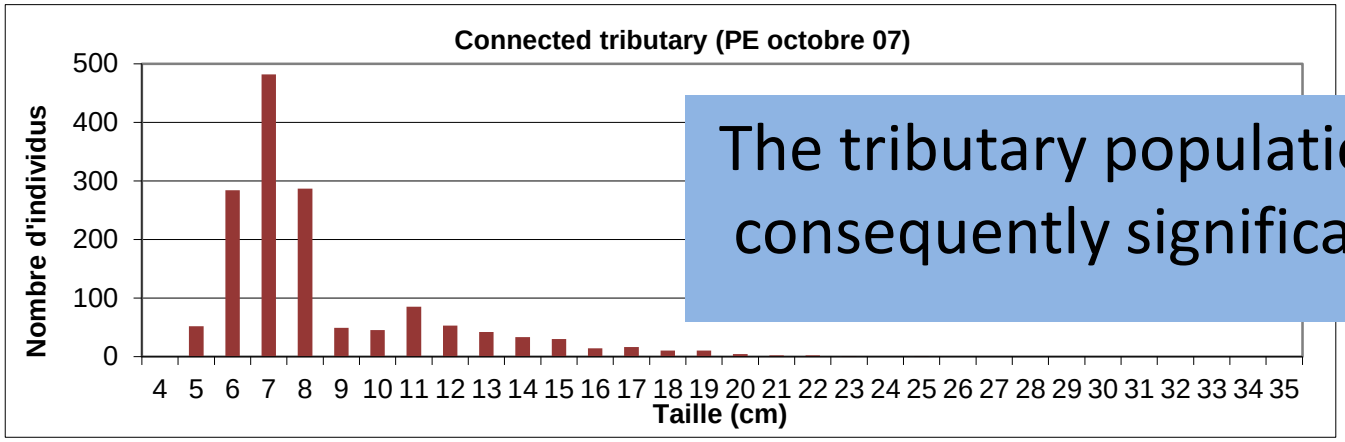
a disconnected tributary

Disturbances due to the tributary disconnection

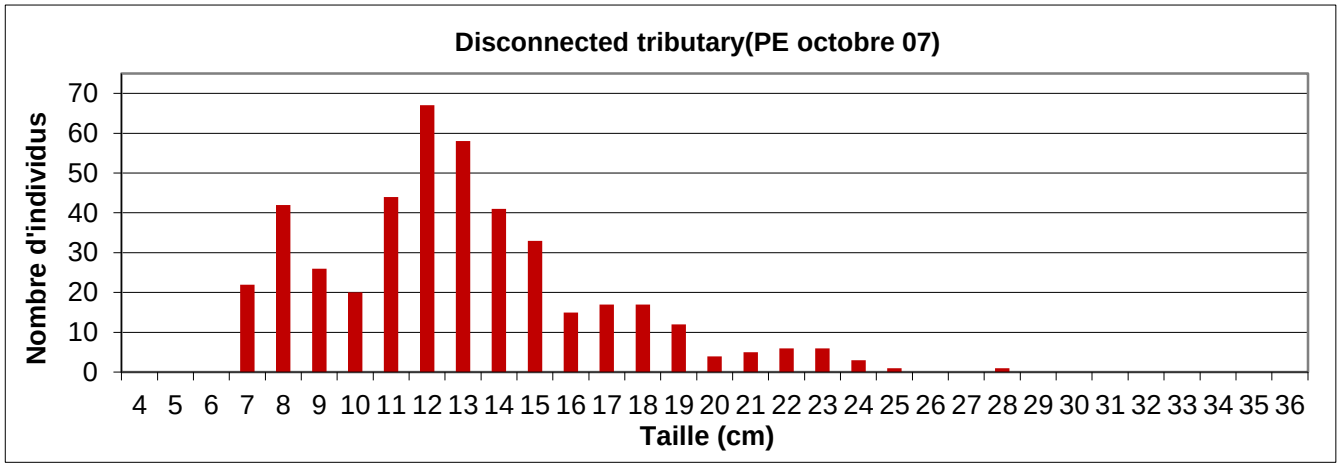
The first result of the disconnection is the absolute impossibility of any run for the main river spawners.

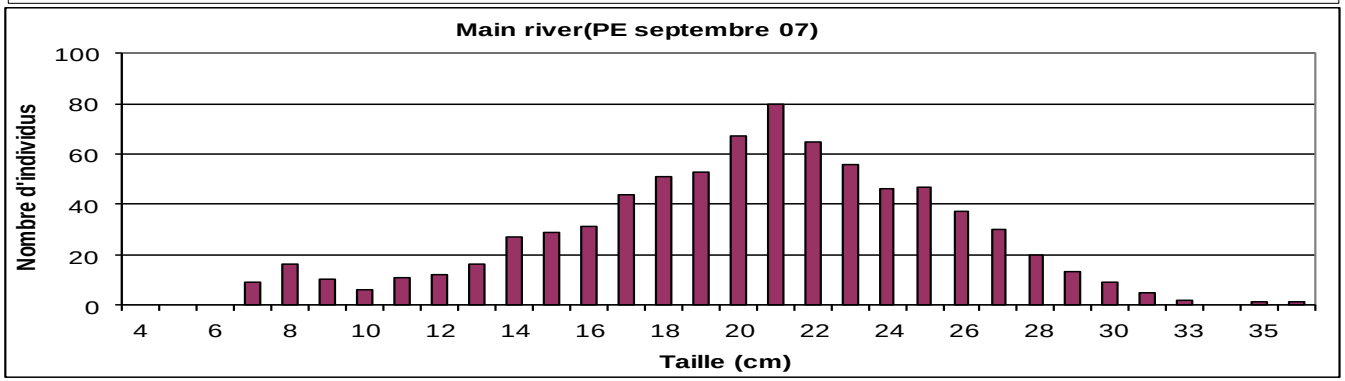
0.6m fall
+
7% sloped culvert
=
Run obstacle

Disturbances due to the tributary disconnection



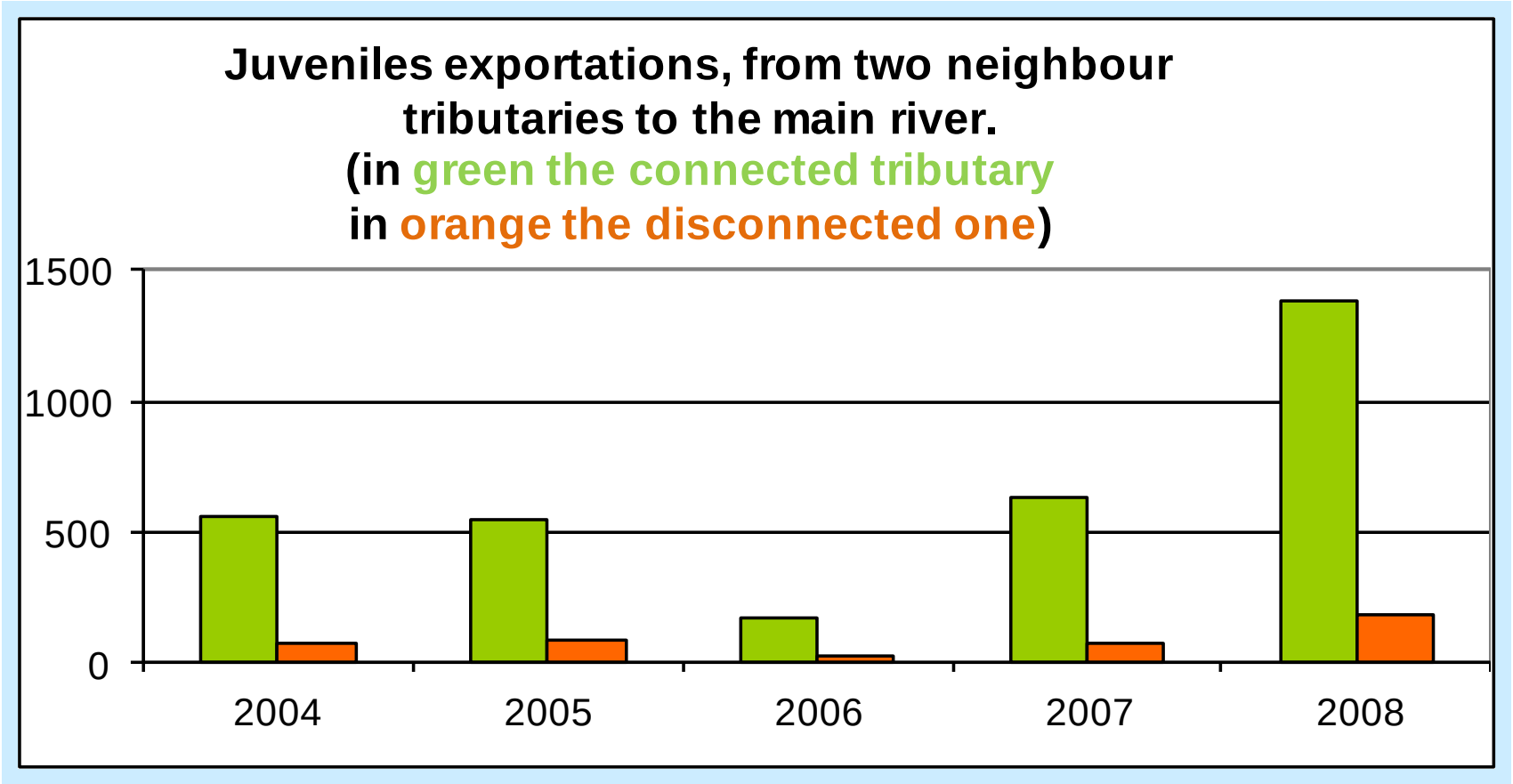
The tributary population structure is consequently significantly modified





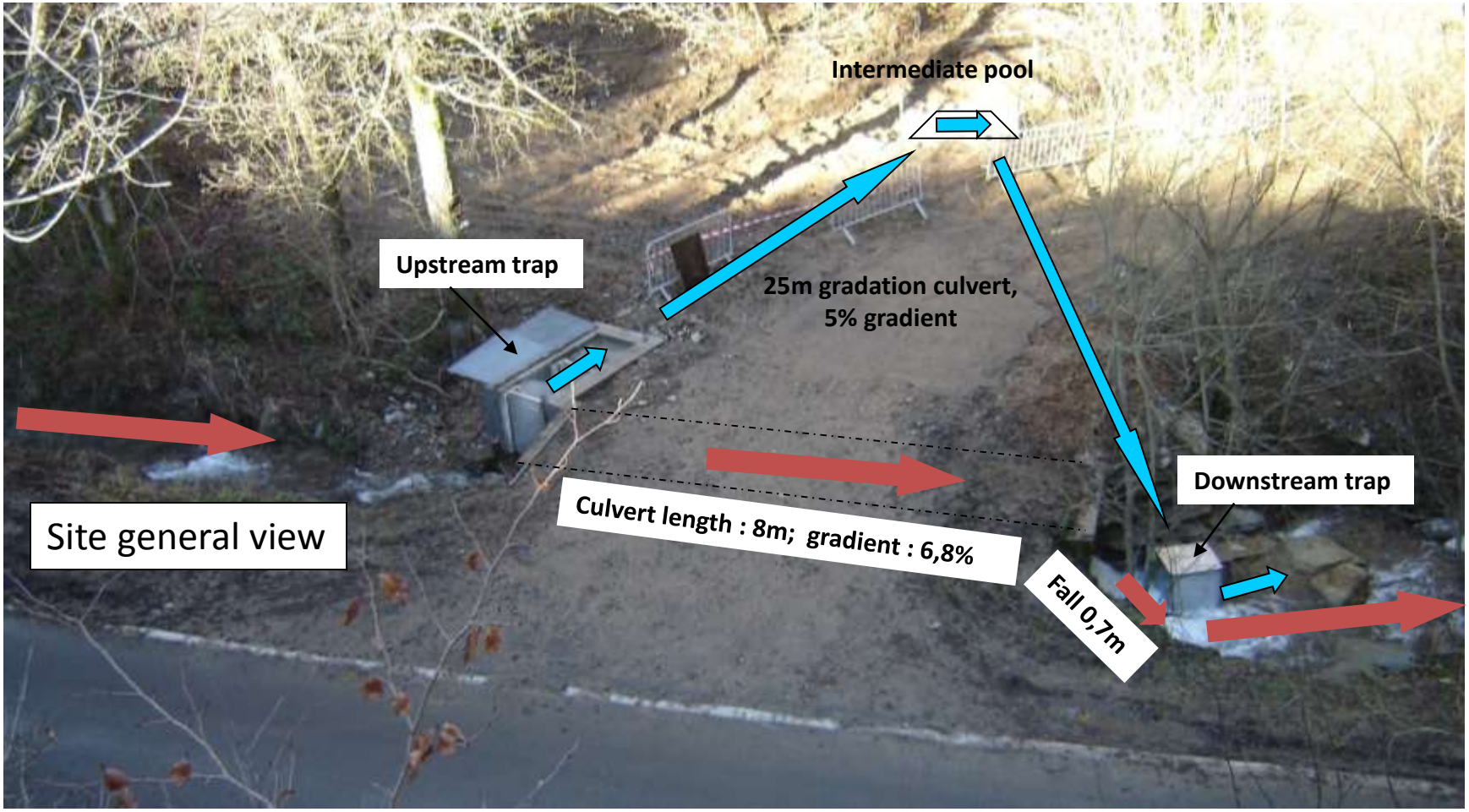
Disturbances due to the tributary disconnection

The tributary contribution to the recruitment in the main river is strongly reduced.



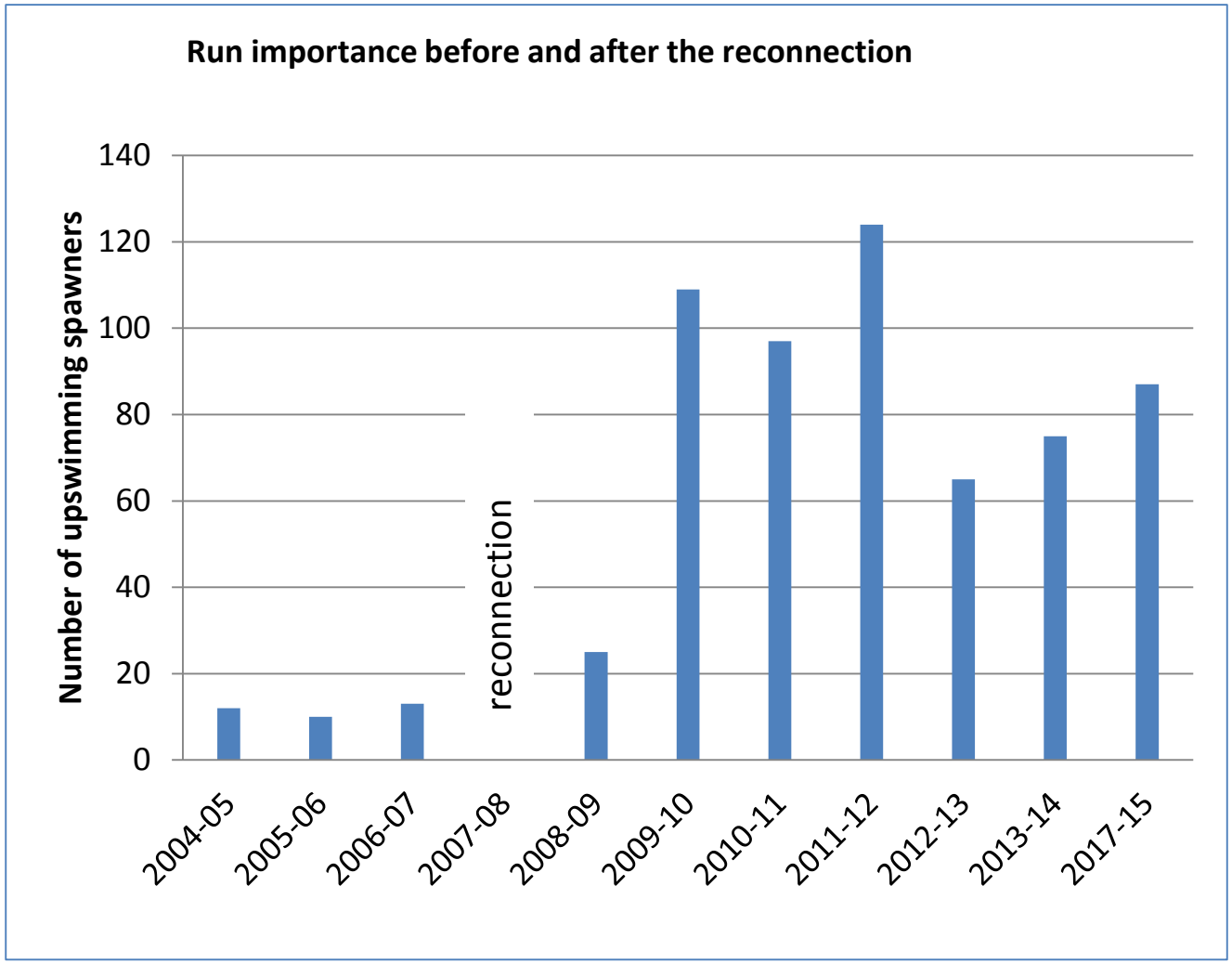
BROOK RECONNECTION TROUGH A FISHPASS IN 2008

a 25 m. long fish pass bypassing the obstacle.

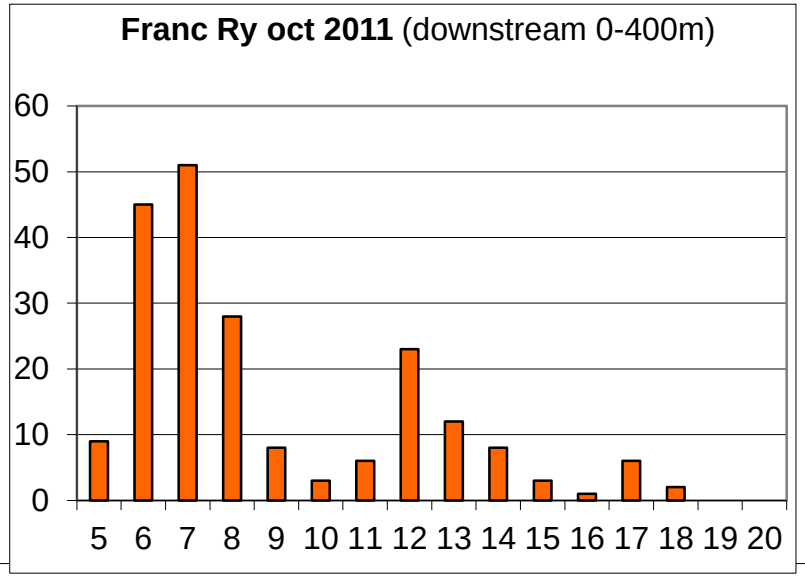


Recovery after the reconnection

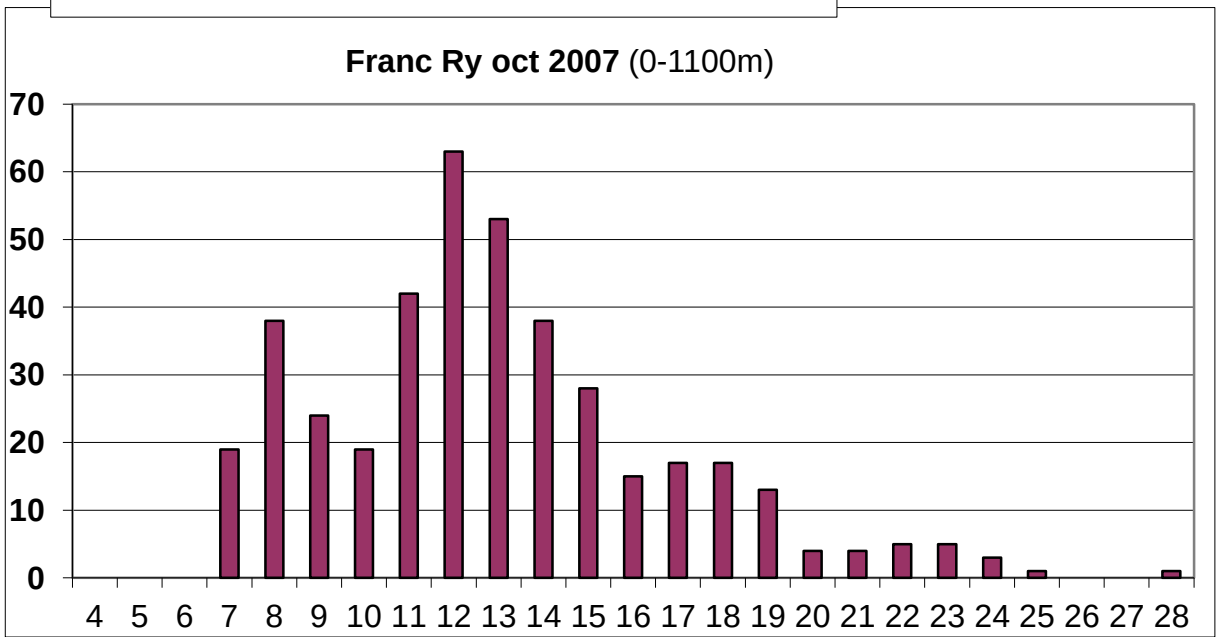
Direct impact on the run : number of spawners trapped at the outlet of the fish pass



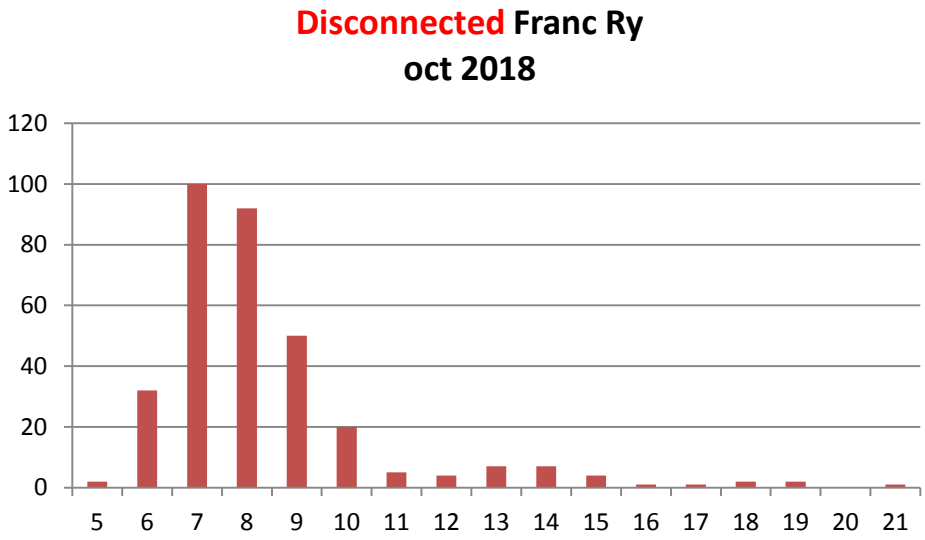
Recovery after the reconnection

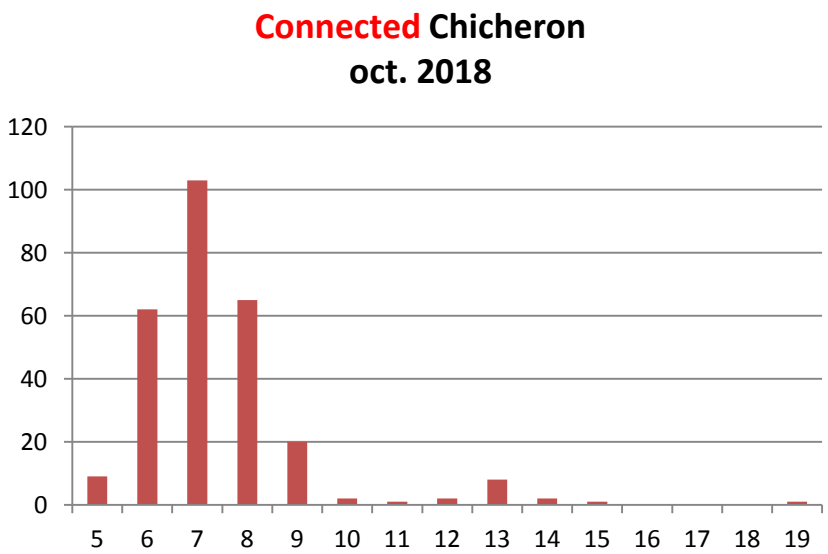


The population structure
turns back to
a nursery brook population structure



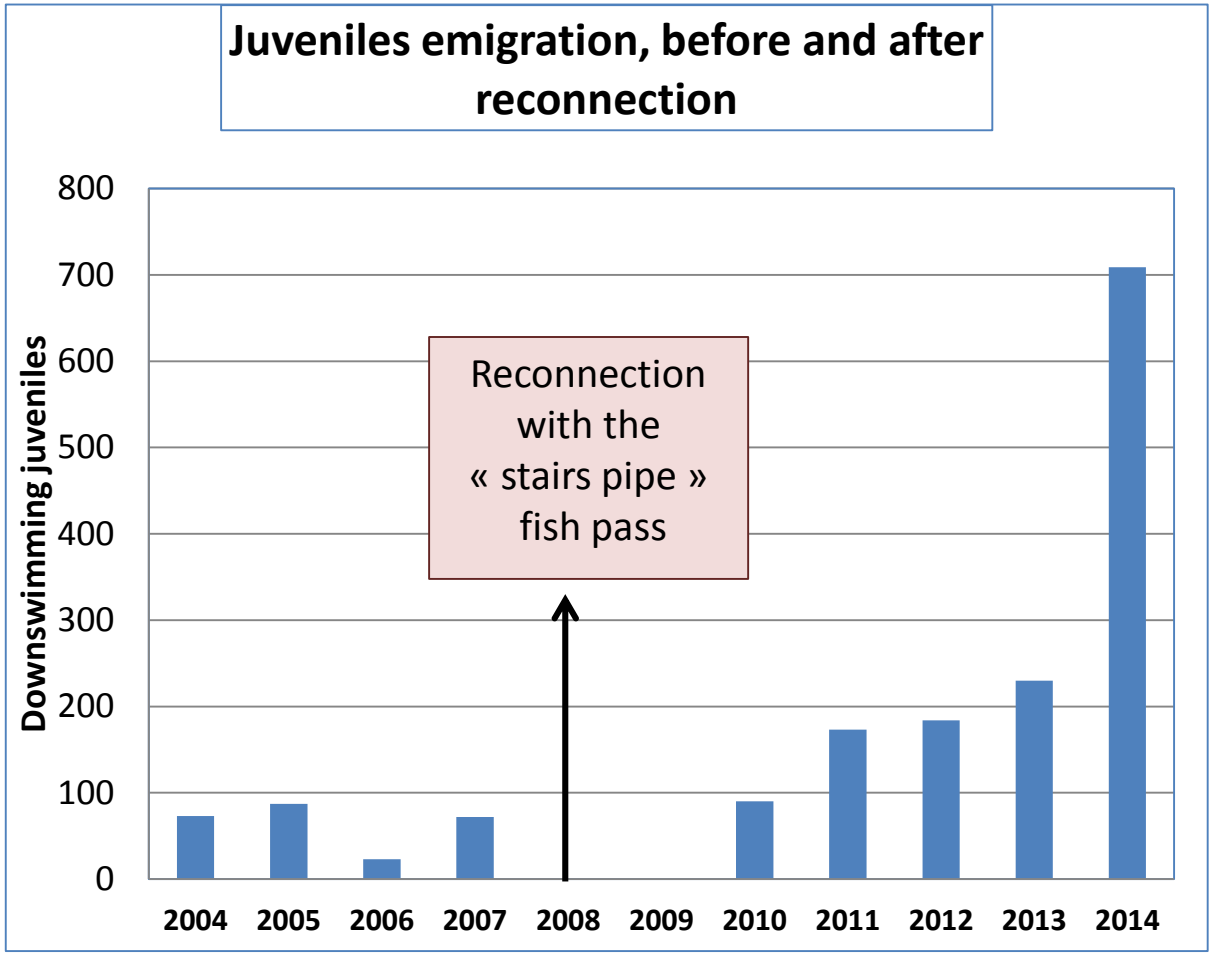
Recovery after the reconnection





Ten years after reconnection
the **populations structures** of
both disconnected and connected
tributaries are
exactly similar.

Recovery after the reconnection



The tributary contribution to the main river recruitment <u>increased immediately</u> and <u>is still increasing</u> five years later

An original fish pass for the reconnection

The main advantages

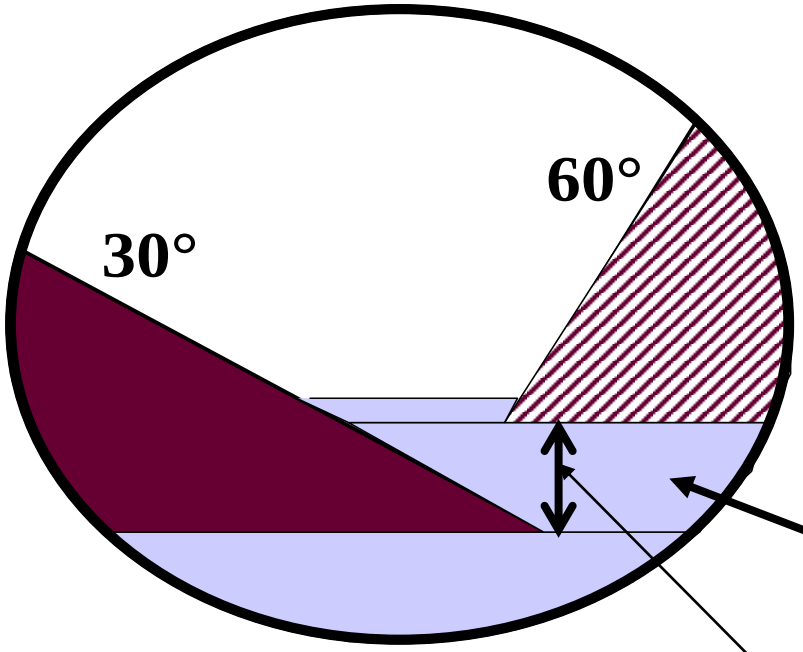
- 1. The fish can stop as often as it wants, therefore it's specially adapted to very long passages.
- 2. It is prepared to be placed underground and is self cleaning so it is particularly useful if lack of space.
- 3. It is cheap and will thus allow to address a lot of small (but complete) obstacles too minor to deserve a true classical fish pass.

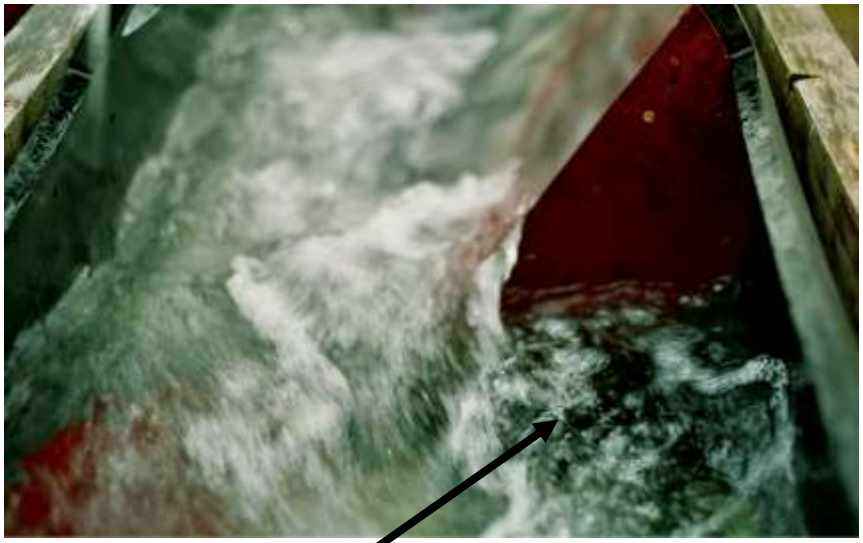
PRINCIPLE :

mimicking natural brooks

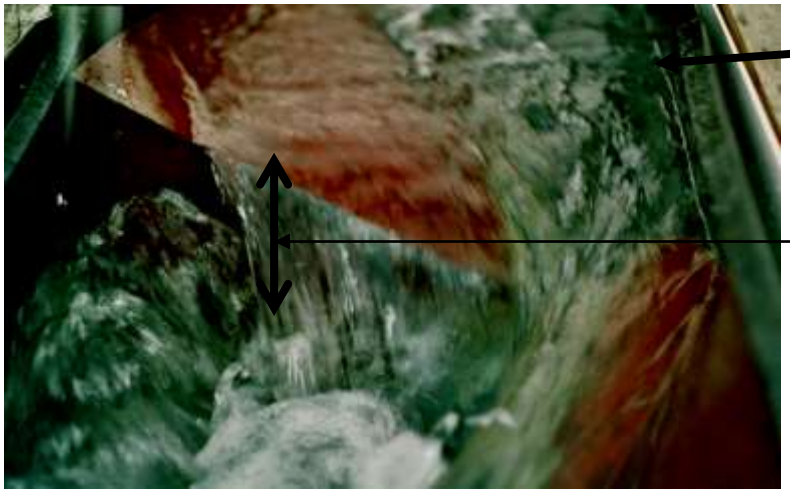
- Staggered baffles
to brake the water velocity
- Sloped baffles to prevent
the hooking of debris and
the culvert clogging

But
THE SUCCESS KEY is the combination of 30° and 60° angles





Water level raised
by the downstream 30° baffle
in the compartment sheltered by
the upstream 60° baffle.
Only a very small fall at this 60°
baffle.



Highest fall at the 30° baffle

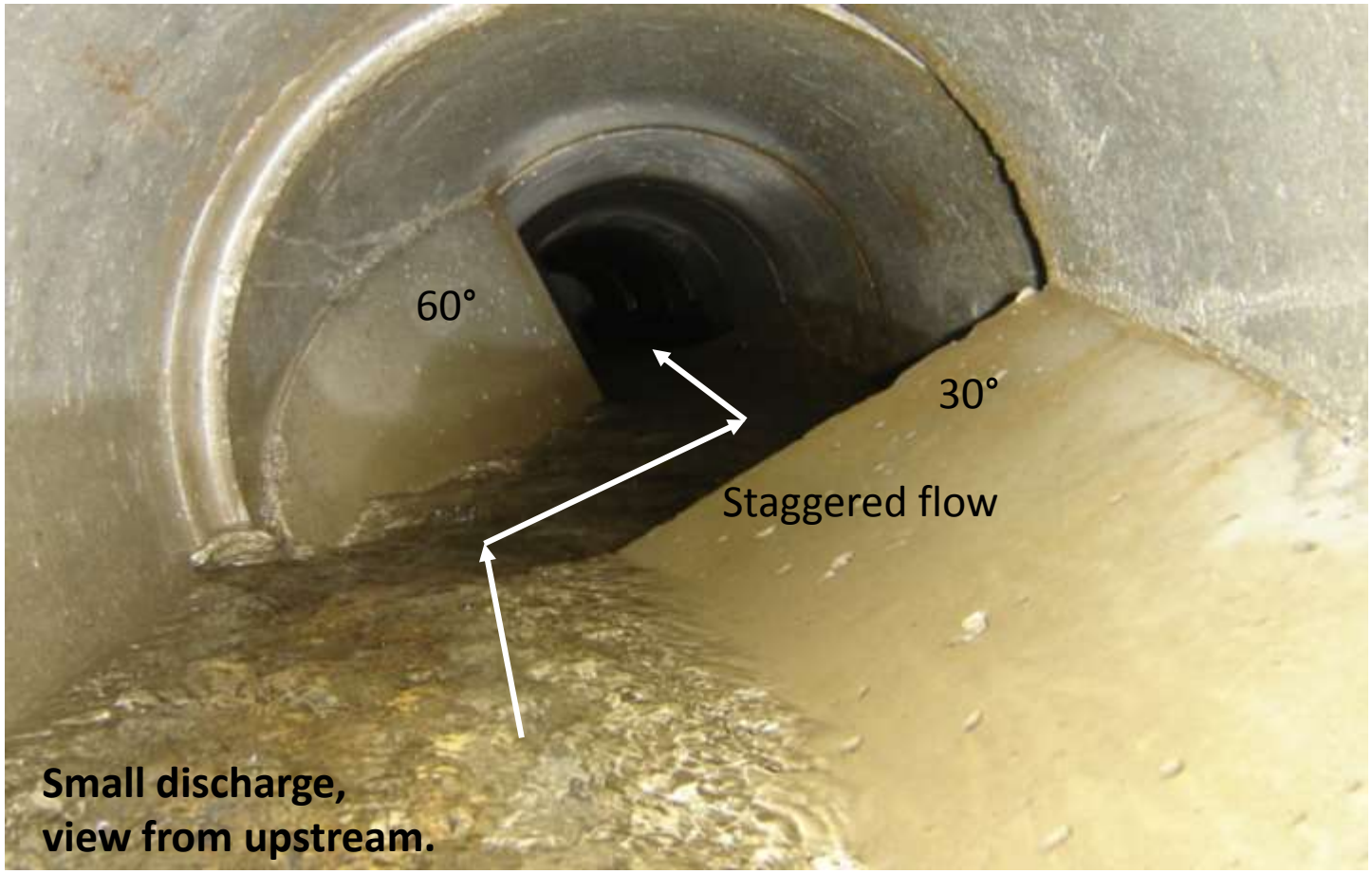
High discharge water levels

Alternate positioning on one sole and on the other provides the two different angles with the same and unique standard element

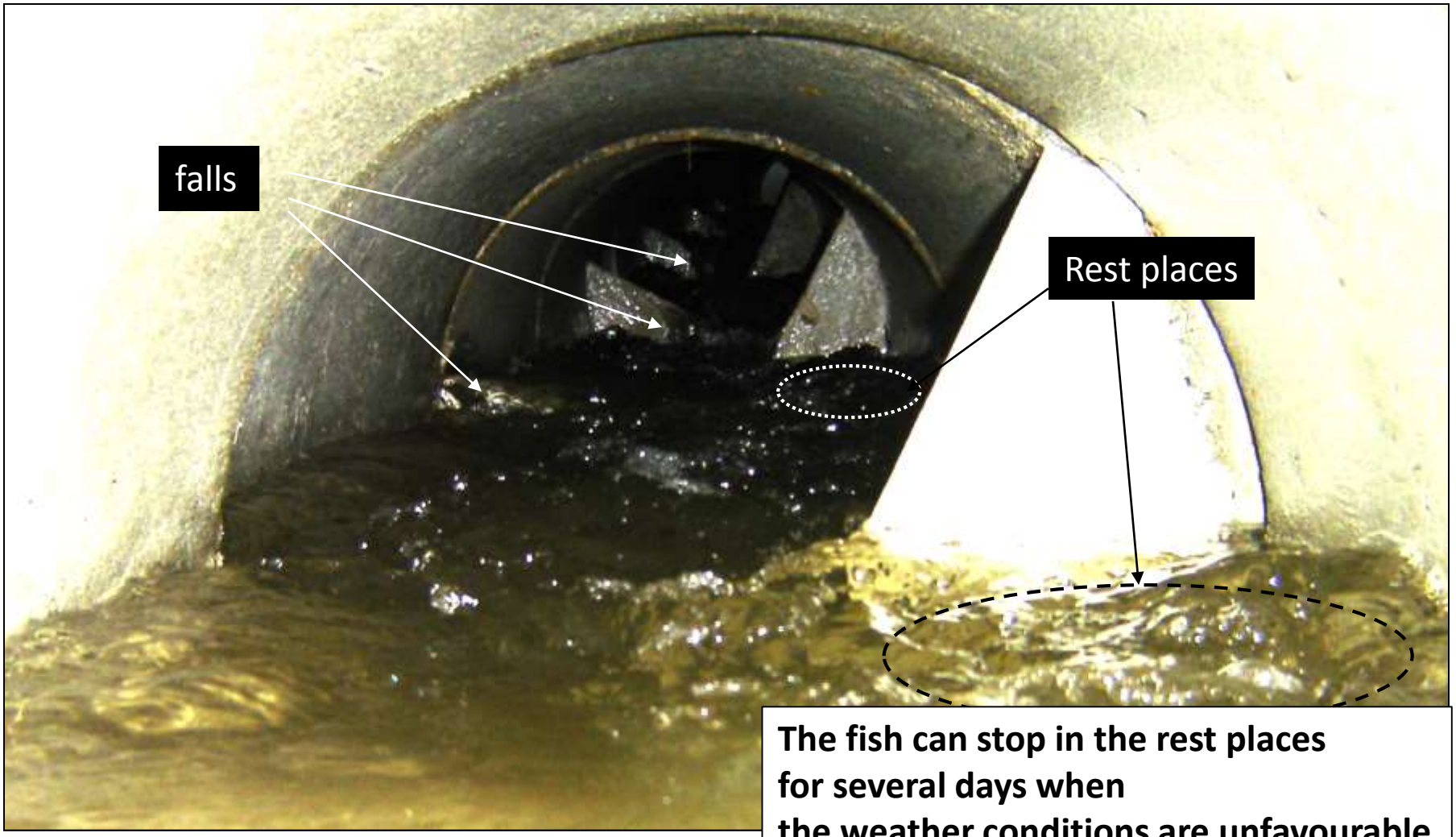
On the **red sole : 30°** angle with the horizontal

On the **blue sole : 60°** angle with the horizontal

ALTERNATE POSITIONING
DETERMINES
STAGGERED BAFFLES
AND A STAGGERED FLOW



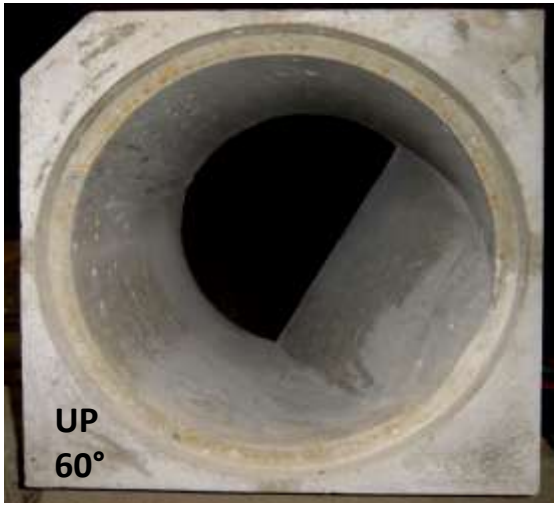
Internal pipe structure viewed towards upstream



The fish can stop in the rest places for several days when the weather conditions are unfavourable


Checking of the 5% slope over several su
30
°
60
°

THANKS FOR YOUR ATTENTION



Stairs pipe

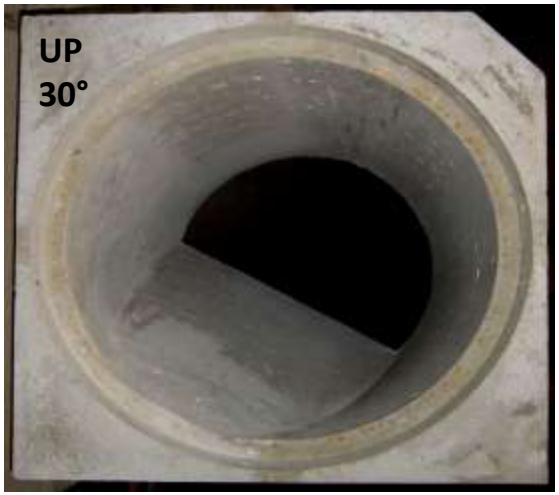
Standard element

side, up and down views

with

notched corner

as external mark of the positioning



Information at :

Dr **Etienne Dupont** (Belgium)

Tel. 32 494 30 22 35

etiennemjdupont@skynet.be

the STAIRS PIPE

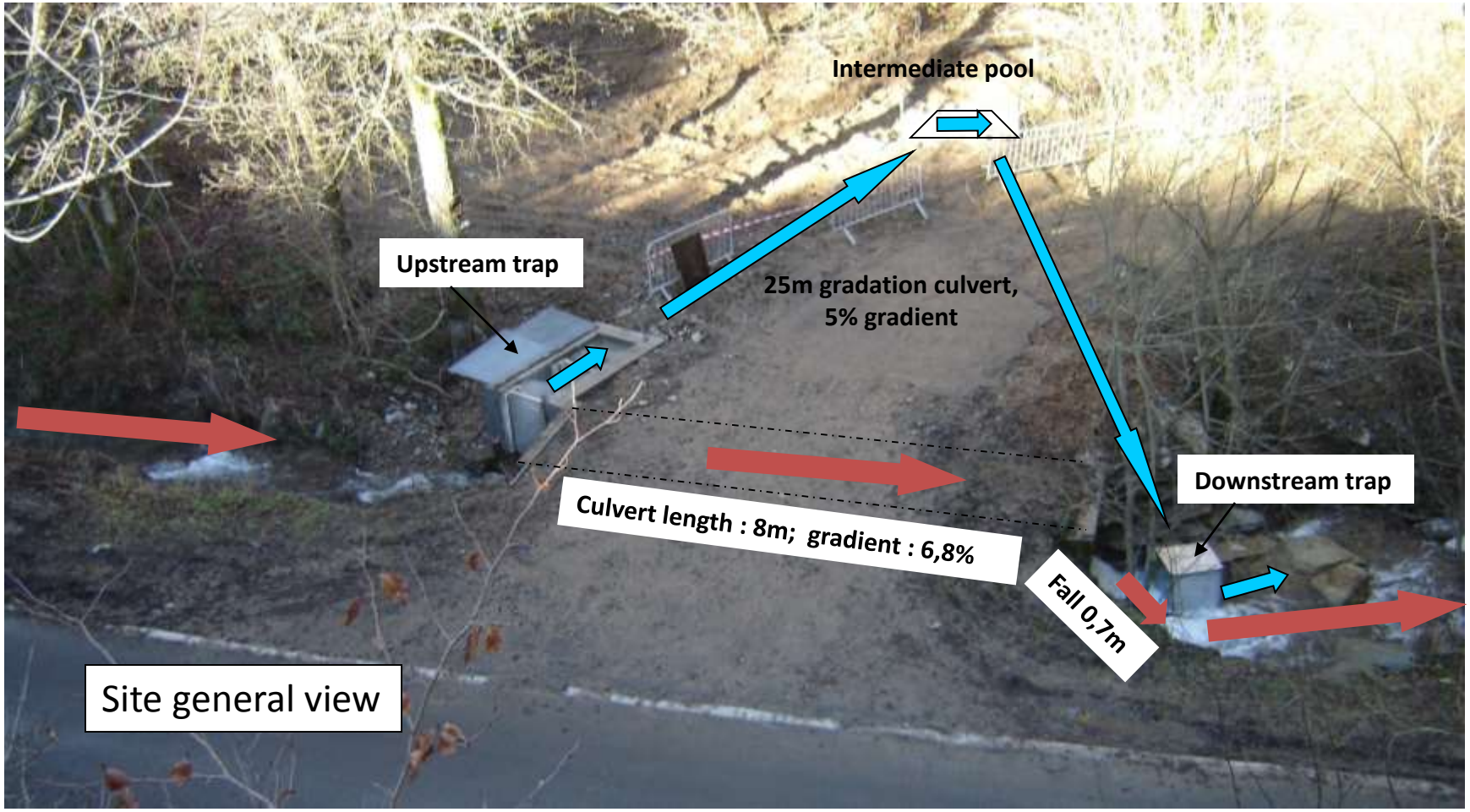
A new concept of fish pass

Conceived by the Walloon Region (Belgium)

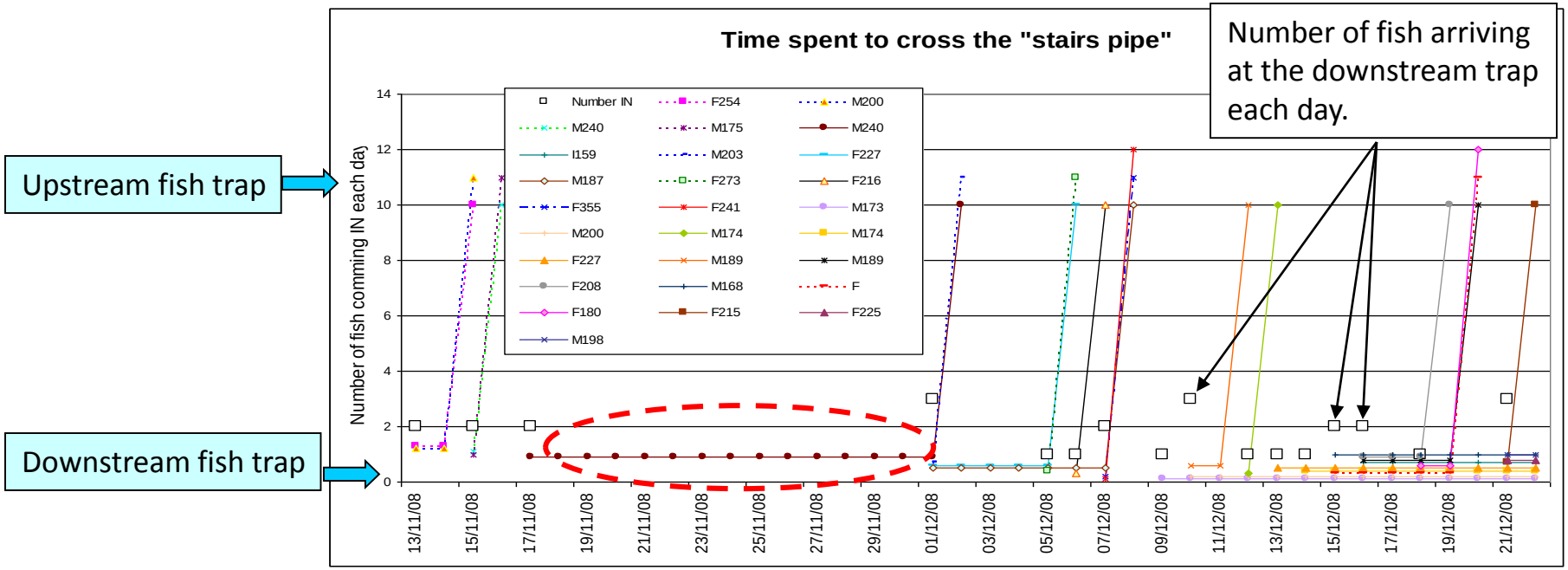
Department for the agricultural and natural environment studies

Etienne Dupont
Saint-Hubert (Belgium)
etiennemjdupont@skynet.be

Pilot 25 m. stairs pipe building for bypassing the obstacle.



Results of the stairs pipe crossing by the fish



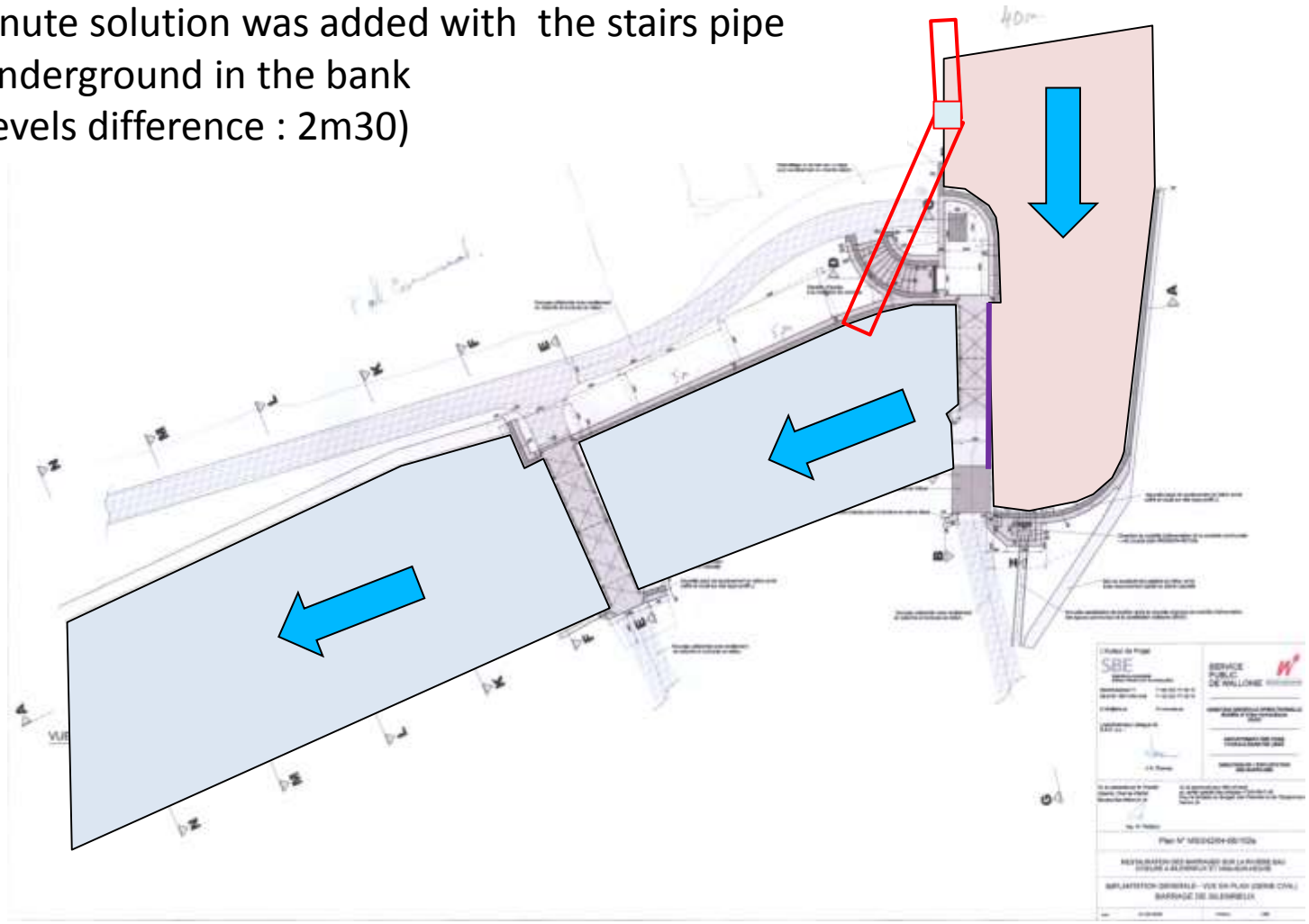
1. Generally they cross it in 1 or 2 days

2. They can also stop into for several weeks

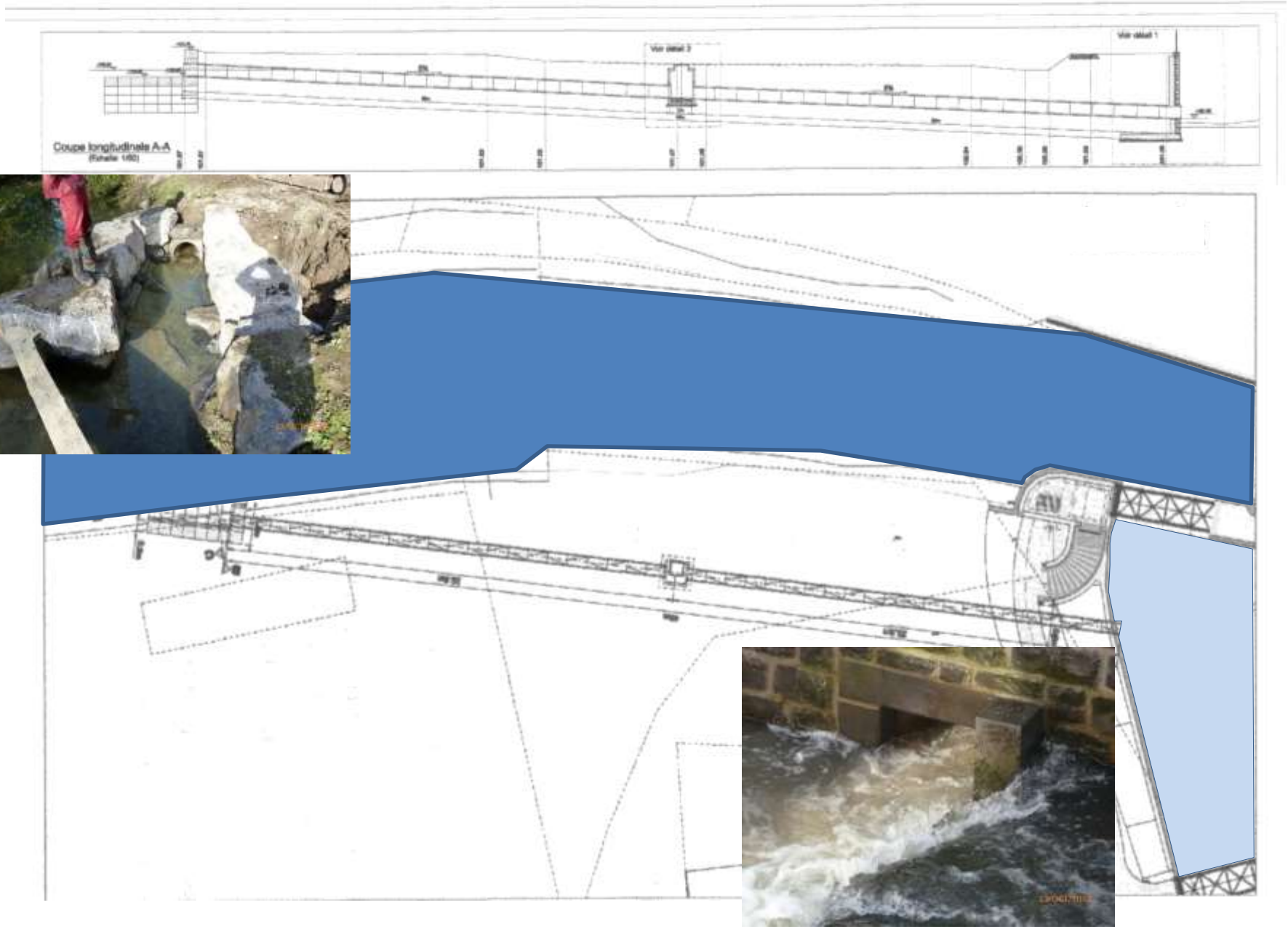
3. Since the first year they come each season more and more numerous : 30, 80, 100 and last winter 130.

Handling and adjustment of the elements

Newly renovated automatic dam on the river Eau d'Heure
No space was reserved for a fish pass.
A last minute solution was added with the stairs pipe placed underground in the bank
(Water levels difference : 2m30)



LONGITUDINAL SECTION AND PLAN VIEW AFTER REALISATION



STAIRS PIPE

Technical data

Squared external cross section : 600mm x 600mm
With a cut corner to check the pipe position

Cylindrical internal cross section, diameter : 500mm

Element length : 1000mm

Weight : 550 Kg

Conical encasement 30mm thick

The cylindrical internal passage is partially filled with a slanting wall, inclined at 60° with the horizontal.
This slanting wall starts from the internal cylindrical wall at the upstream end to reach the dowstream end at 170mm from the cylindrical wall.

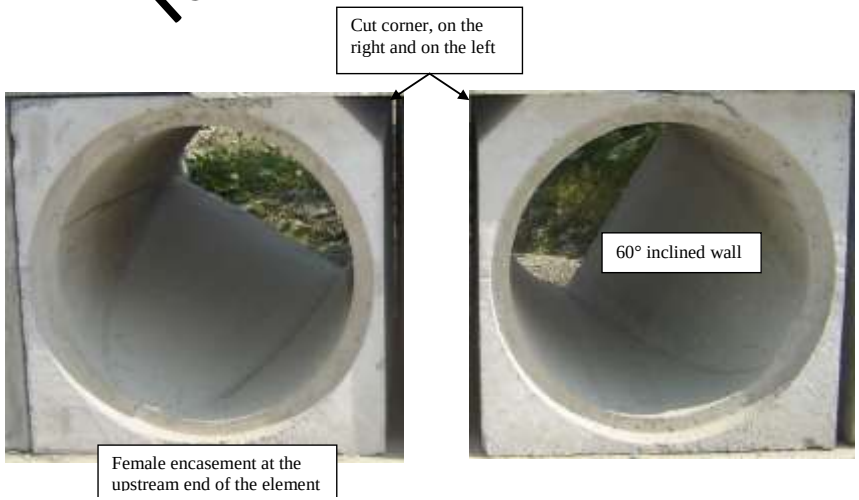
The pipe elements have to be alternately placed on one side and on the other so that the cut corner would alternately be on the right and on the left side on the up side of the successive pipe elements.

The "stairs pipe" was tested for trout up to a gradient of 5%.

Probably it will also run for other species.

It is possible it will still work for higher gradients.

Technical data sheet



And, last but not least,
It is the **cheapest way**
to help the fish
crossing road and
dams

One element costs
only 75€
It means for a
water level difference of 1m,
at 5% slope, material
will costs
20 x 75 = **1500€**

Conclusion

Key points of the stairs pipe

1. The fish can stop as often as it wants, therefore it's specially adapted to very long passages.

2. It is prepared to be placed underground and is self cleaning so it is particularly useful in case of lack of space.

3. It is very cheap and will thus allow to address a lot of small (but complete) obstacles too minor to deserve a true classical fish pass.