

THE MEUSE SALMON PROJECT : ACHIEVEMENTS AND FUTUR CHALLENGES



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THE SALMON BEFORE ITS EXTINCTION IN THE MEUSE



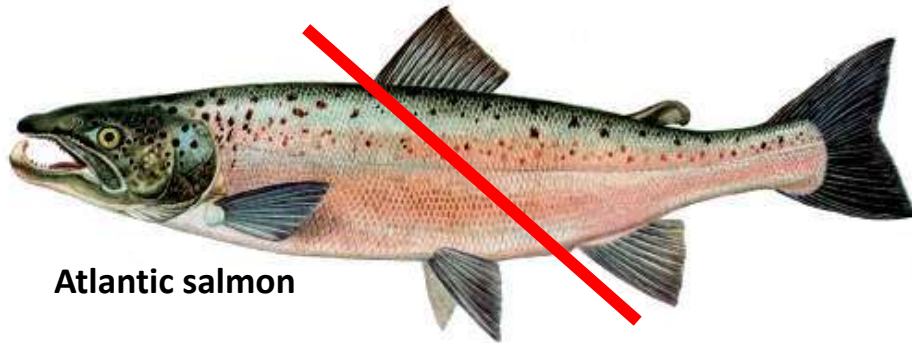
THE NUMBER OF SALMON AND SEA TROUT CAPTURES REACHES 57000 IND/YEAR
IN THE DUTCH RHINE-MEUSE DELTA DURING THE BEST YEARS

CONSTRUCTION OF NAVIGATION AND HYDROELECTRIC DAMS

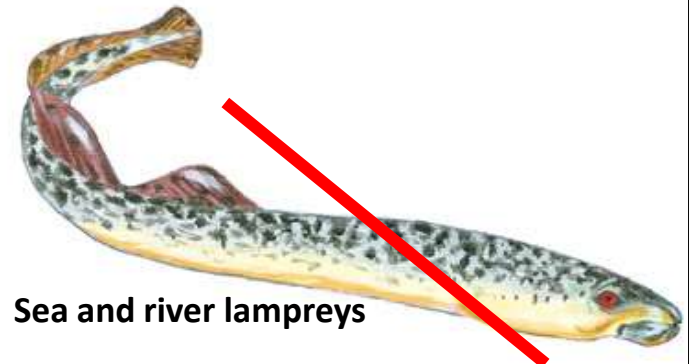


THE CONSTRUCTION OF BIG NAVIGATION AND HYDROELECTRIC DAMS IN THE MAIN COURSE OF THE MEUSE WAS ONE OF THE MAIN CAUSE OF THE EXTINCTION OF MIGRATORY FISH SPECIES

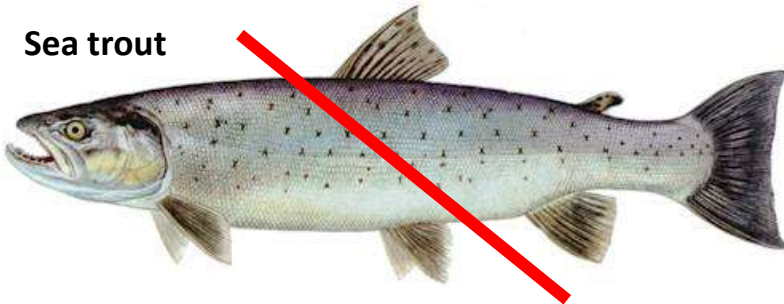
EXTINCTION OF DIADROMOUS FISH SPECIES



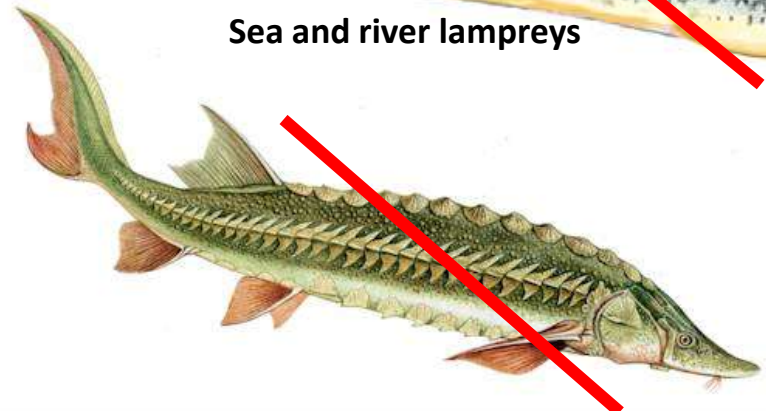
Atlantic salmon



Sea and river lampreys



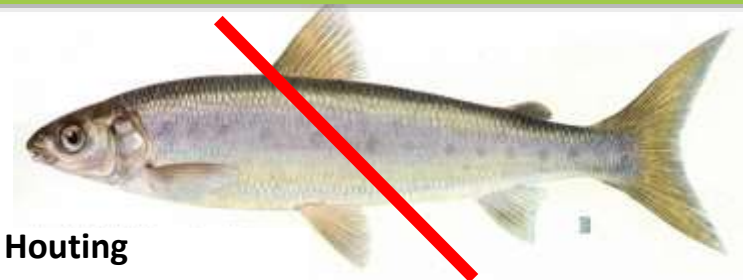
Sea trout



ALL THE DIADROMOUS FISH SPECIES OF THE MEUSE HAVE SUFFERED EXTINCTION IN THE BEGINING OF THE 20TH CENTURY, EXCEPTED THE EUROPEAN EEL



European eel



Houting

EMERGENCE OF THE MEUSE SALMON PROJECT IN 1983



THE MEUSE SALMON PROJECT EMERGED IN THE YEAR 1983 WHEN POTENTIAL SEA TROUT INDIVIDUALS WERE CAPTURED IN THE BERWINNE AND INITIATE THE IDEA TO REINTRODUCE SALMON IN THE RIVER MEUSE

THE ACHIEVEMENTS

THE POSITIVE POINTS

SIGNIFICATIVE IMPROVEMENT OF THE WATER QUALITY



Ourthe, Colonster



Ourthe, Grosses Battes



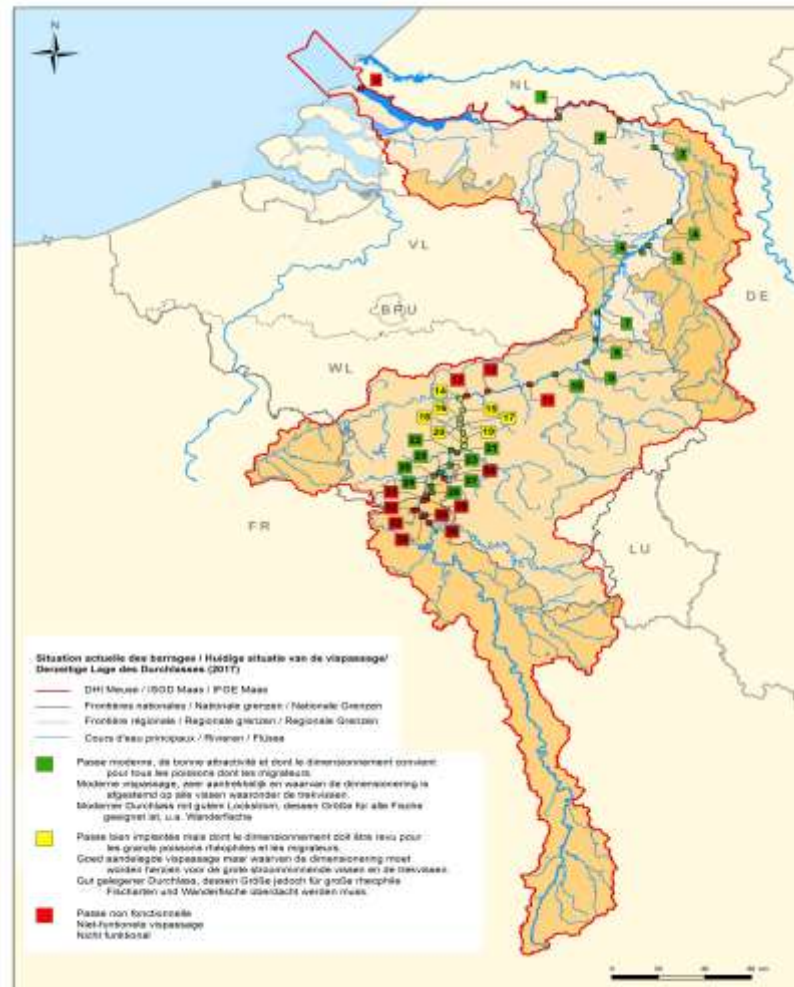
Vesdre, Wégnez



Meuse, Oupeye

A SIGNIFICATIVE IMPROVEMENT OF THE WATER QUALITY OF THE MEUSE AND TRIBUTARIES WAS OBSERVED IN THE LAST YEARS AND WILL STILL INCREASE IN THE FUTURE WITH NEW WASTEWATER TREATMENT PLANTS

FISH-PASSES IN THE INTERNATIONAL RIVER MEUSE



MANY MODERN FISH PASSES WERE CONSTRUCTED IN THE MAIN COURSE OF THE INTERNATIONAL RIVER MEUSE WITH ACCESS TO IMPORTANT TRIBUTARIES

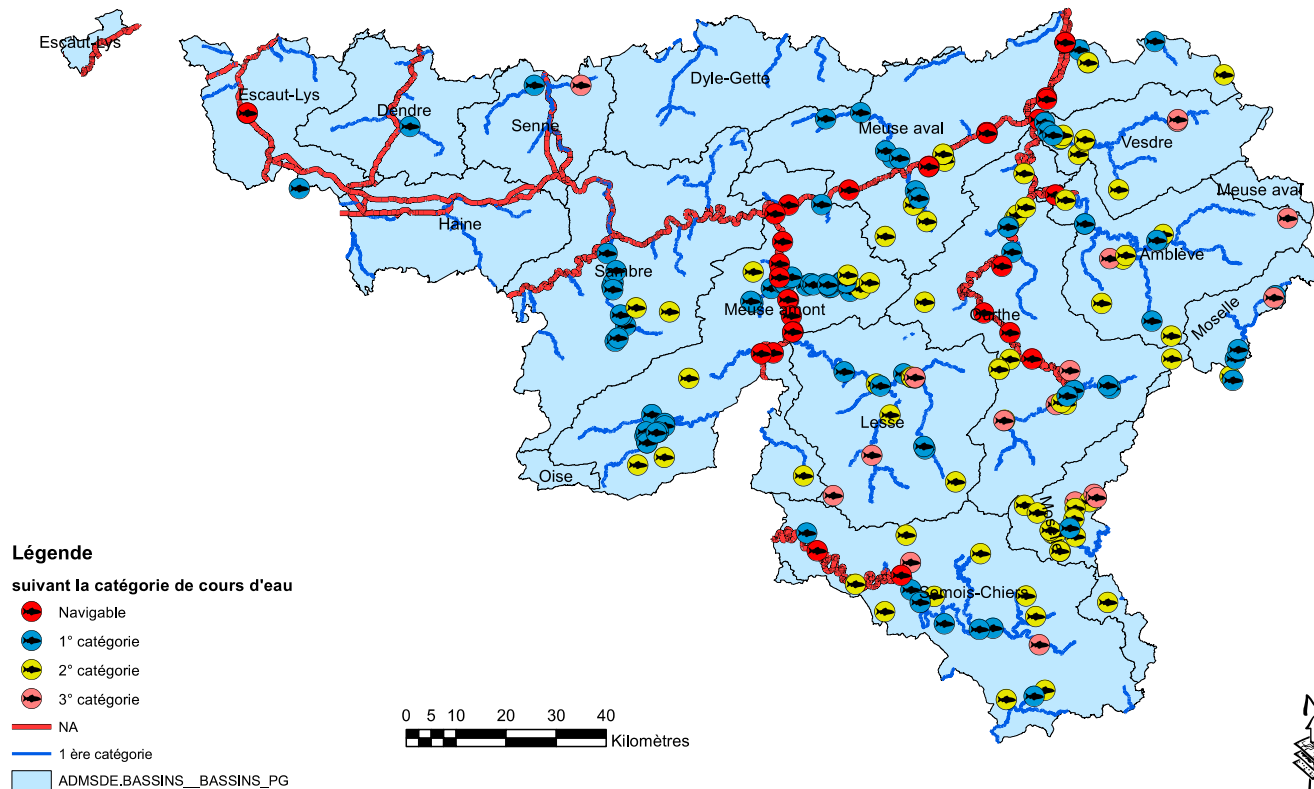
FISH-PASSES IN THE INTERNATIONAL RIVER MEUSE



FISH-PASSES IN WALLONIA



Inventaire wallon des passes à poissons en mai 2017



MODERN FISH PASSES WERE ALSO CONSTRUCTED IN TRIBUTARIES AND SUB-TRIBUTARIES OF THE RIVER MEUSE BASIN IN WALLON REGION

FISH-PASSES IN NON NAVIGABLE WATERCOURSES



QUALITY OF THE HABITATS



IN THE BELGIAN UPLAND RIVERS, THE DISPONIBILITY OF HIGH QUALITY HABITATS FOR THE SALMON IS SUFFICIENT AND NOT YET SATURATED FOR JUVENILES

INVENTORY OF SPAWNING GROUNDS AND POTENTIAL HABITATS IN THE OURTHE, AMBLEVE AND SAMSON

1

Sectorization of rivers in sections

- the presence of structures
- the arrival of important tributaries
- the ruptures of slopes

2

Description and identification of production areas

- Definition of spawning and growing areas
- Correlation between aerial views and field photos
- Location and estimation of the surface of the various facies

3

Estimation of the river's capacity according three production hypotheses



Low

- 1 ♀ per 100 m² of spawning area
- 5 fry 0+ and 1 smolt per 100 m² of growing area

Medium

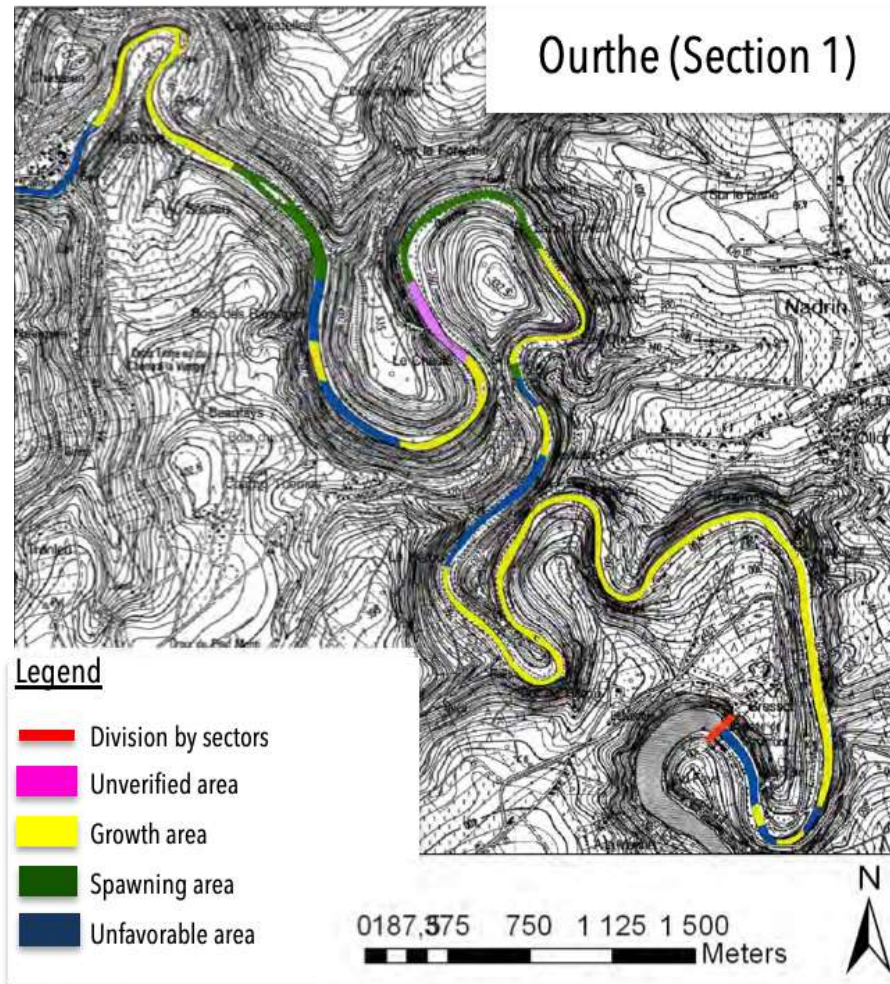
- 2 ♀ per 100 m² of spawning area
- 25 fry 0+ and 5 smolts per 100 m² of growing area

High

- 3 ♀ per 100 m² of spawning area
- 50 fry 0+ and 10 smolts per 100 m² of growing area

INVENTORY OF SPAWNING GROUNDS AND POTENTIAL HABITATS IN THE OURTHE, AMBLEVE AND SAMSON

- A map and a general description of each section have been produced



- An estimate of the hosting potential in the Ourthe, Amblève and Samson according to the different assumptions has been realized

THE SALMON HATCHERY IN EREZEE IN 2009



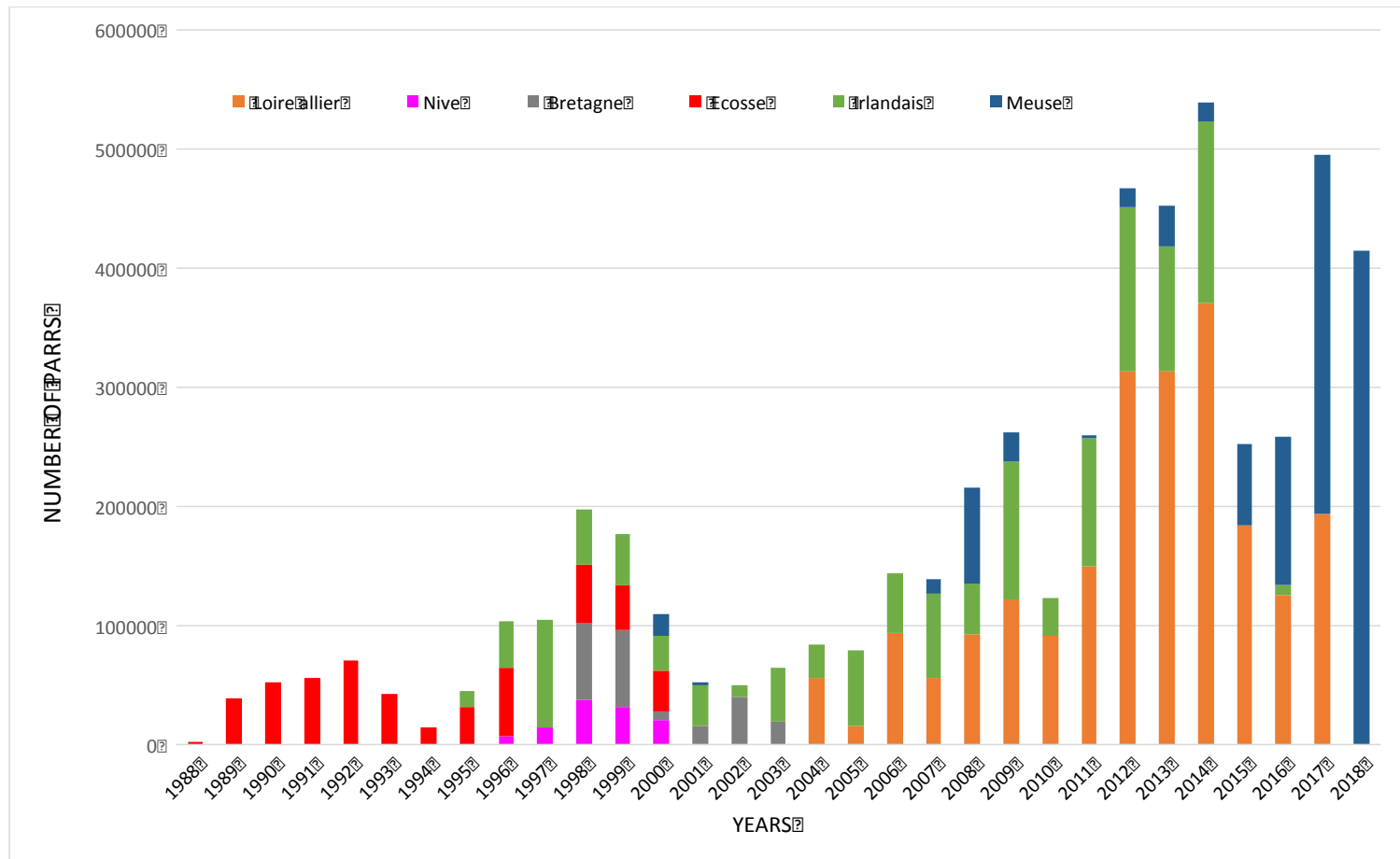
THE CONSTRUCTION OF THE HATCHERY OF EREZEE IS A MAJOR KEY POINT FOR THE SUCCESS OF THE PROJECT THAT ALLOW TO INCREASE THE PRODUCTION OF JUVENILES AND TO CONTROL THE STRAINS USED FOR RESTOCKING

THE CONTROL OF THE ARTIFICIAL REPRODUCTION IN EREZEE



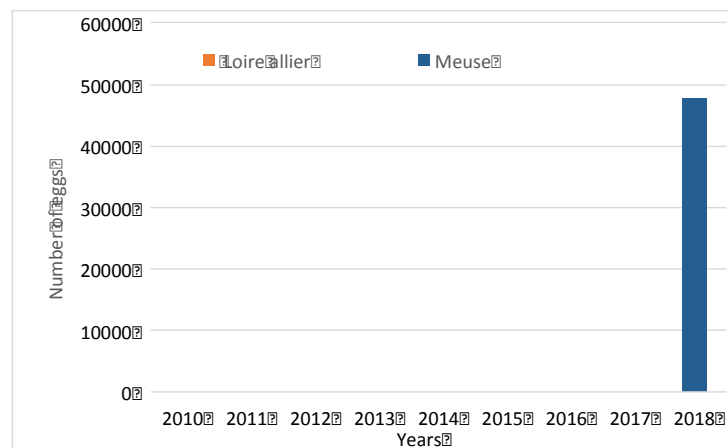
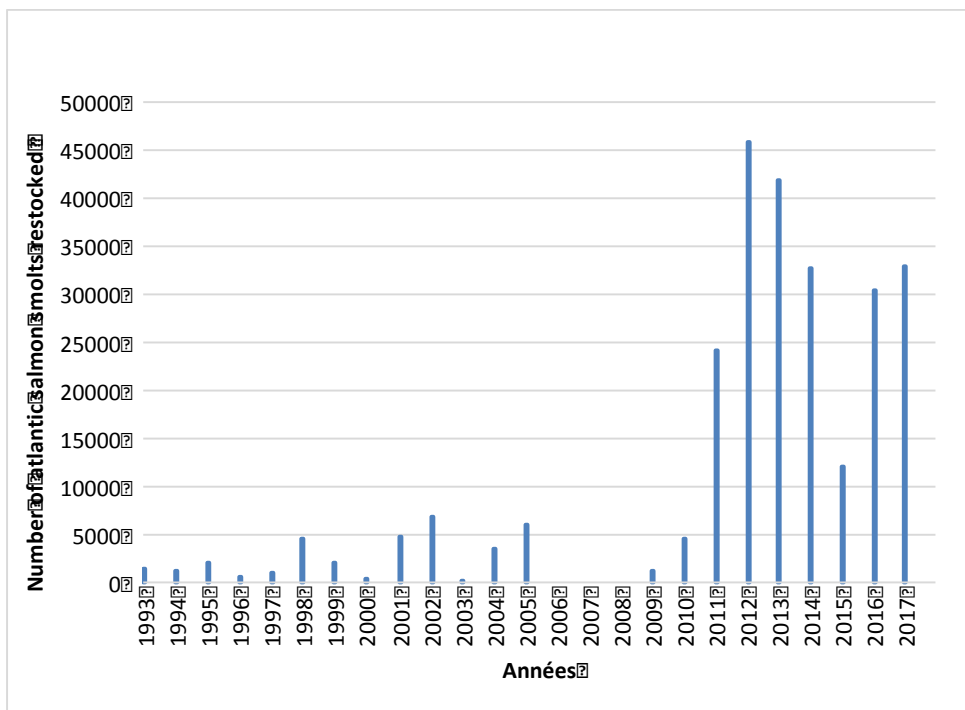
THE ADULT SALMON CAPTURED IN LIXHE AND ROERMOND ARE TRANSFERED TO THE HATCHERY OF EREZEE TO PERFORM ARTIFICIAL REPRODUCTION

RESTOCKING WITH JUVENILES



THE QUANTITY OF RESTOCKED JUVENILES LARGELY INCREASE IN THE LAST YEARS, MAINLY WITH THE LOIRE ALLIER AND MEUSE STRAINS

RESTOCKING WITH SMOLTS, RESORBED VESICLE AND EGGS



THE NUMBER OF ATLANTIC SALMON SMOLTS RESTOCKED ALSO INCREASED IN THE LAST YEARS, AS WELL A TESTS WITH MORE PRECOCE STAGES

THE FIRST SALMON

Nature On avait plus vu ça depuis 1934 dans les eaux de la Meuse >P.9

Voici le premier saumon "liégeois"

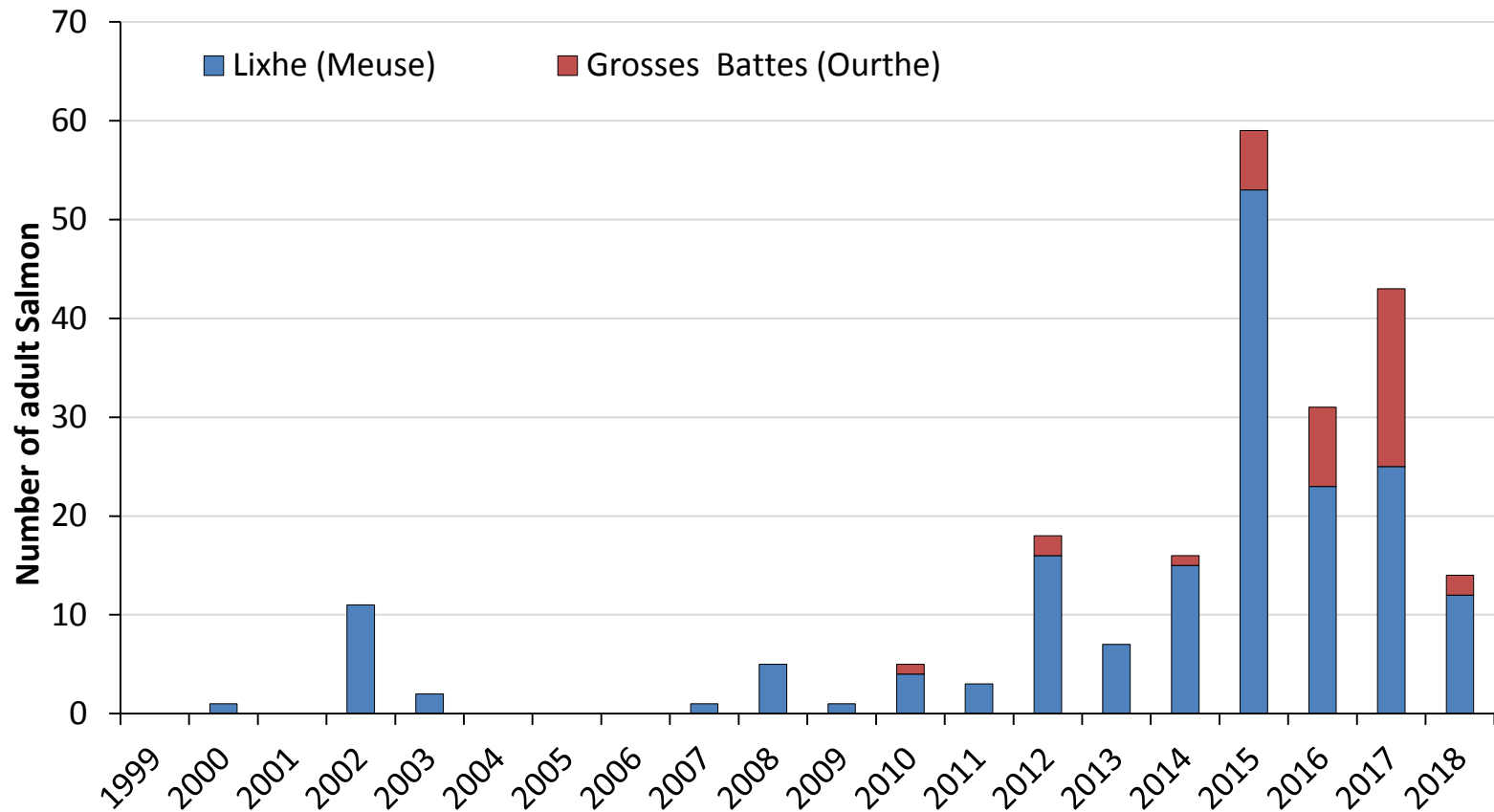
■ **LIXHE** Le saumon de mer avait disparu des eaux de la Meuse depuis 1934. Dans les années 80, entre 50 000 et 200 000 d'entre eux ont été réintroduits chaque année avec le secret espoir de les voir revenir un jour frayer sur les lieux de leur naissance. Enfin, on y est ! Hier, les trois premiers saumons "liégeois" ont été pris dans l'échelle à poissons de Lixhe. Un mâle et deux femelles de près de 70 centimètres, mûrs pour la reproduction.

» Voici le premier saumon pris hier, il fait la fierté du professeur Philippart de l'ULg, cheville ouvrière de l'opération Saumon 2000.



IN THE BELGIAN MEUSE, THE FIRST ADULT SALMON WAS CAPTURED IN THE YEAR 2000 IN THE FISH PASS OF LIXHE

NUMBER OF RETURNING ADULTS IN BELGIUM



THE NUMBER OF ADULT ATLANTIC SALMON CAPTURE RISE THE LAST YEARS, EXCEPTED IN 2018 PROBABLY DUE TO THE EXTREME DRYNESS

EXAMPLES OF BEAUTIFUL RETURNING SALMON



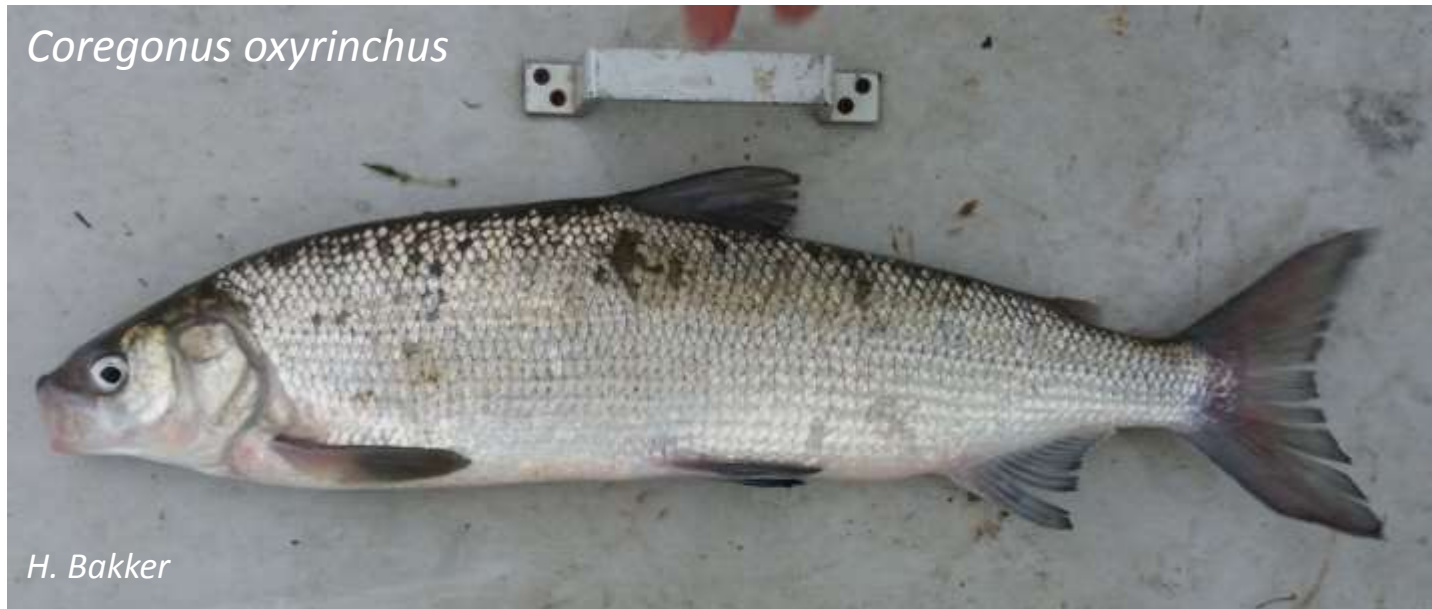
**THE ADULT SALMON CAPTURED IN LIXHE AND IN THE OURTE ARE GENERALLY
IN GOOD HEALTH**

THE OPENING OF THE HARINGVLIET



THE OPENING OF THE HARINGVLIET DAM IN LATE 2018 IS A MAJOR EVENT EXPECTED SINCE LONG TIME AND THAT WILL PROBABLY HAVE BENEFITS FOR THE MEUSE SALMON PROJECT

THE NEW HISTORICAL CAPTURE OF HOUTING

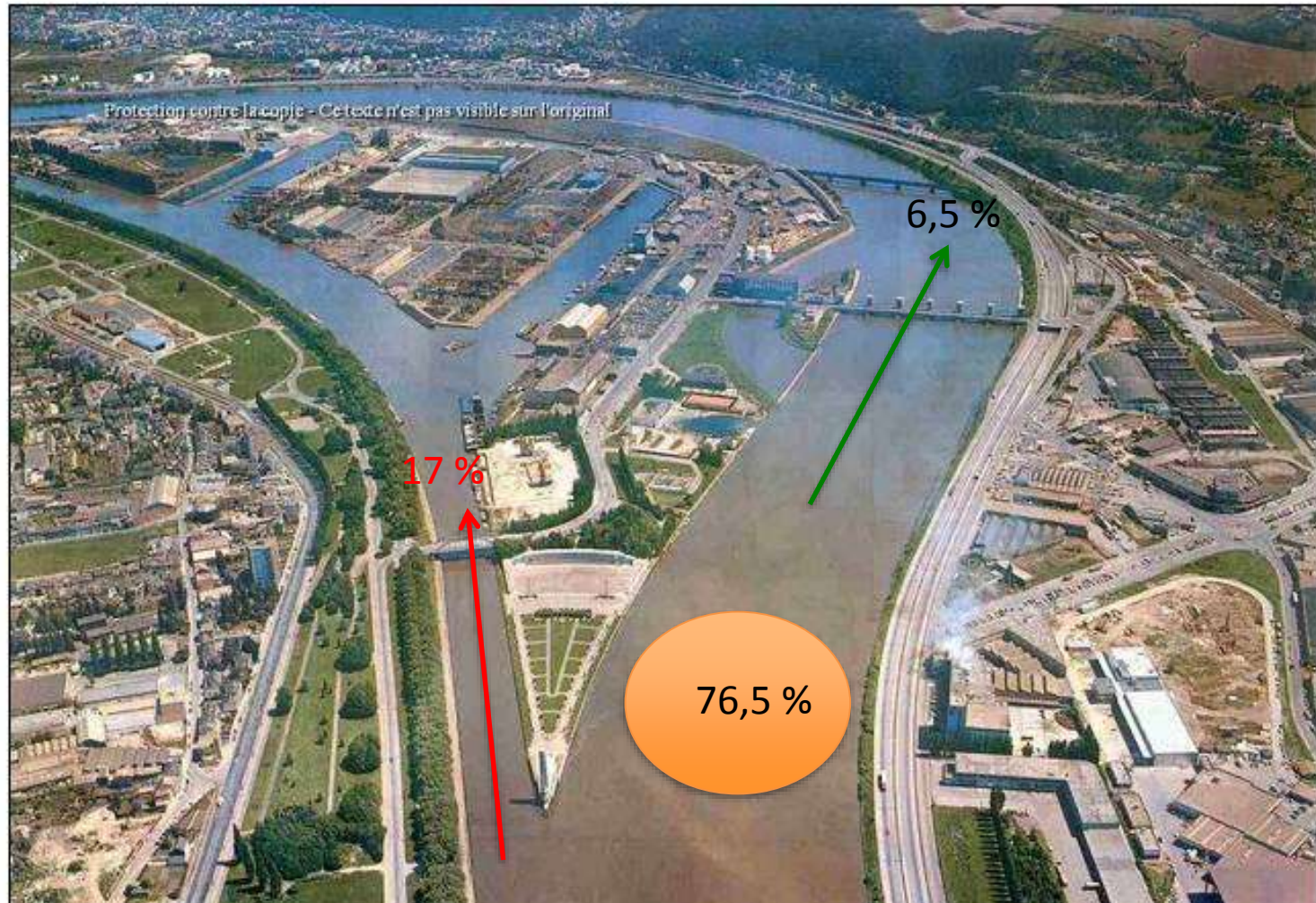


TWENTY HOUTING (*Coregonus oxyrinchus*) CAPTURED WITH SALMON FYKES, DOWNSTREAM THE DAM OF LITH IN FEBRUARY 2018 (SOURCE: H. BAKKER)

THE FUTUR CHALLENGES

THE NEGATIVE POINTS

THE MAJOR PROBLEM OF THE DOWNSTREAM MIGRATION



THE HYDROELECTRIC DAM OF MONSIN IS AN IMPORTANT BLACK SPOT AS MOST OF THE DOWNSTREAM MIGRATING SMOLT DID NOT SUCCEED TO PASS OR CONTINUED THEIR MIGRATION IN THE ALBRET CHANNEL AS AN ALTERNATIVE ROUTE

THE NEW BOAT LOCK OF LANAYE



THE CONSTRUCTION OF THE NEW LANAYE BOAT LOCK ALSO INFLUENCES THE BEHAVIOUR OF DOWNSTREAM MIGRATING SMOLTS

EFFECT OF A TEMPERATURE INCREASE DUE TO HUMAN ACTIVITIES ON SMOLT DOWNSTREAM MIGRATION



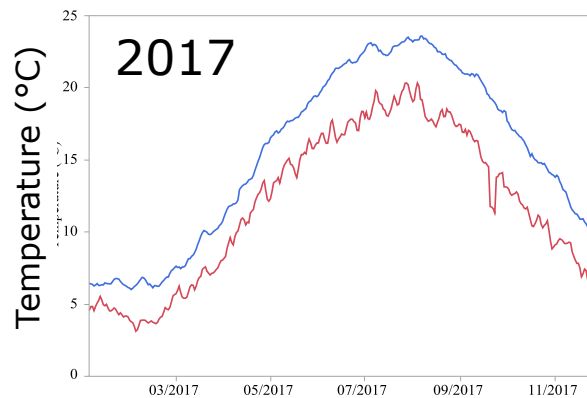
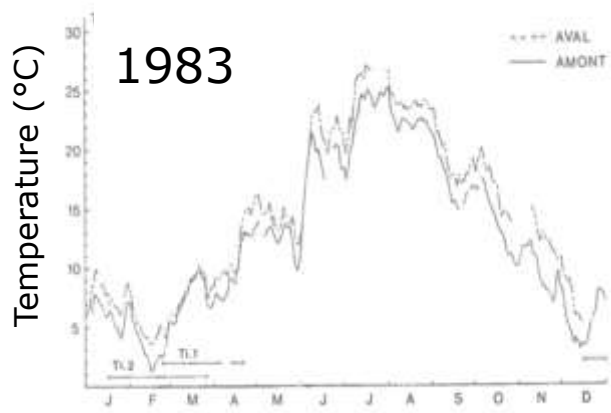
Smoltification

- Hypo-osmoregulation (NKA activity)
- Mediation through endocrine system (GH ; IGF-1)

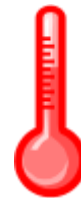


❖ **TEMPERATURE** = crucial factor for smoltification and migration (timing, survival)

➤ Climatic changes and anthropogenic water's use = $T^{\circ}\text{C}$ gap between tributaries and main channel



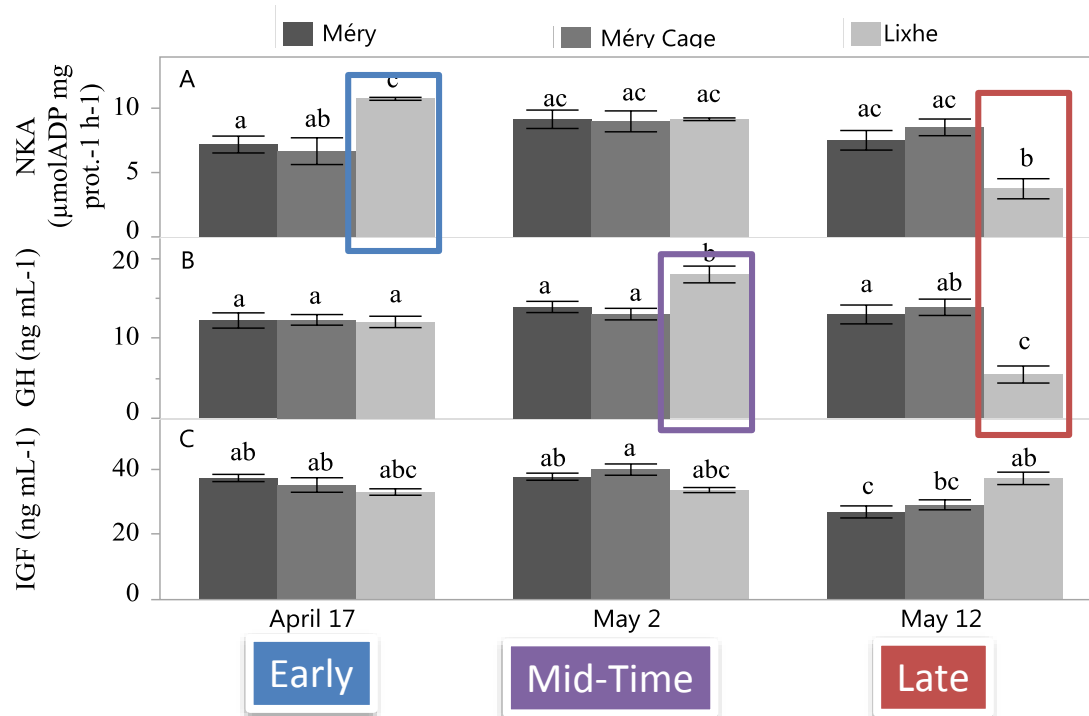
Meuse (Lixhe)
Ourthe (Sauheid)



Difference up to 5°C

DOES A TEMPERATURE GAP OCCURING DURING MIGRATION IMPAIR SMOLTIFICATION?

EFFECT OF A TEMPERATURE INCREASE DUE TO HUMAN ACTIVITIES ON SMOLT DOWNSTREAM MIGRATION



	April 17	May 2	May 12
Lixhe	15.1 °C	17.8 °C	16.0 °C
Méry	11.4 °C	14.7 °C	12.0 °C
Difference	3.7 °C	3.1 °C	4.0 °C

- NKA increase in Lixhe (April 17)
- GH increase in Lixhe (May 2)
- NKA and GH decrease in Lixhe (May 12)

EARLY MIGRANTS: T° SEEMS TO ACCELERATE SMOLTING BY AN ACCUMULATION OF THERMAL UNITS NECESSARY TO ACQUIRE SALINITY TOLERANCE.

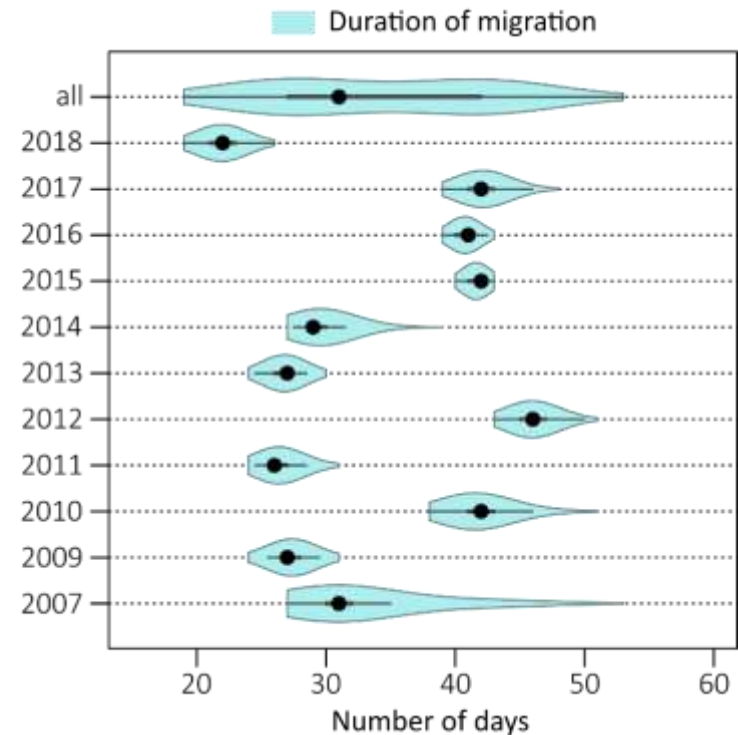
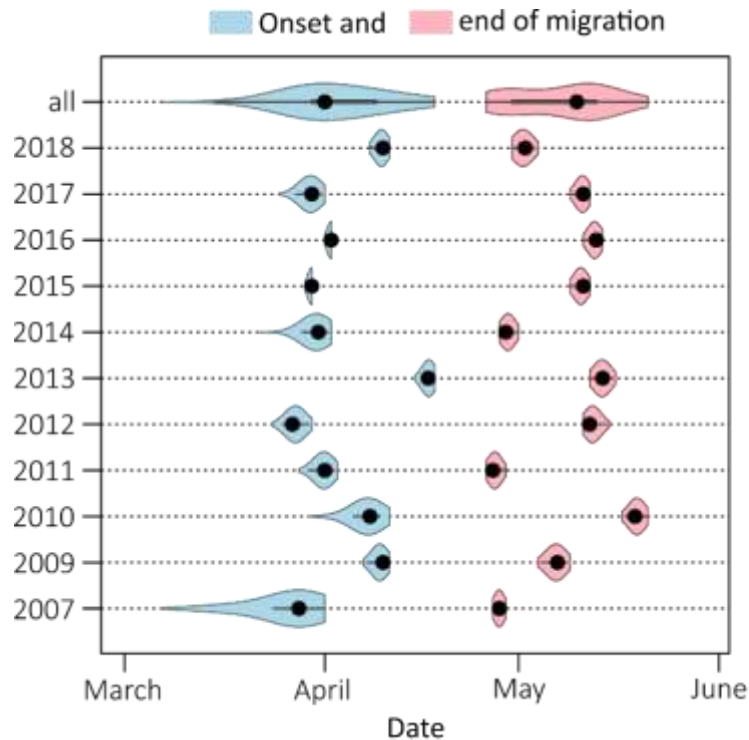
LATE MIGRANTS EXHIBIT ↘ LEVELS OF GH AND NKA ACTIVITY SUGGESTING THAT DESMOLTIFICATION HAD STARTED

INCREASE THE QUANTITY OF RESTOCKING WITH JUVENILES



IN ORDER TO INCREASE THE QUANTITY OF RESTOCKED SALMON, WE HAVE TO TEST THE EFFICIENCY OF RESTOCKING METHOD WITH JUVENILES STAGES

A PREDICTIVE MODEL FOR THE DOWNSTREAM MIGRATION OF SMOLTS



BASED ON THE DATA OF DOWNSTREAM MIGRATION IN MERY (RIVER OUTHE) WE INTEND TO ELABORATE A PREDICTIVE MODEL OF SMOLT DOWNSTREAM MIGRATION

NATURAL REPRODUCITON IN RIVERS IN THE FUTUR



**IT'S IMPORTANT TO DEMONSTRATE THAT NATURAL REPRODUCUTION IS POSSIBLE.
MAYBE SOME ESCAPED SALMON OR SEA TROUT ALREADY SUCCEEDED TO SPAWN IN
THE RIVER MEUSE BASIN ?**

MANY THANKS FOR YOUR ATTENTION !

(and thanks to all the actors of the Meuse Salmon project)

