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zesumme fir d'natur

6 years of monitoring and restoration during the LIFE Resto Unio project in the Luxemburgish Ardennes

Heumann S., Frisch M., Michels K., Schirtz M., Thielen F.



Restoration of *Unio crassus* rivers in the Luxemburgish Ardennes (LIFE 11 NAT/LU/857)



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Project executing organization

natur&emwelt – Fondation Hëllef fir'd Natur

Runtime:

September 2012 - February 2019

Budget

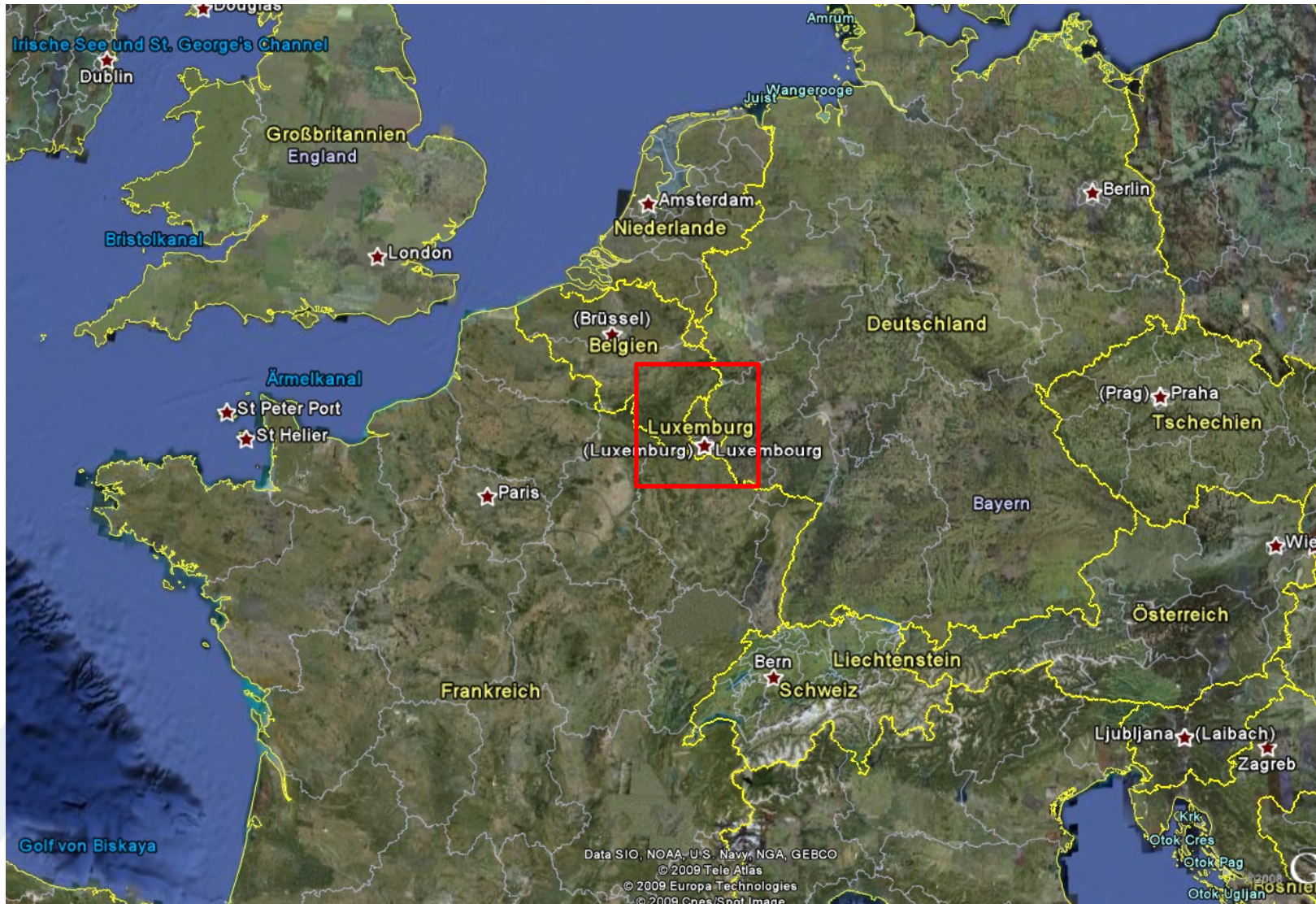
2.057.068 €

Contribution EU:50%

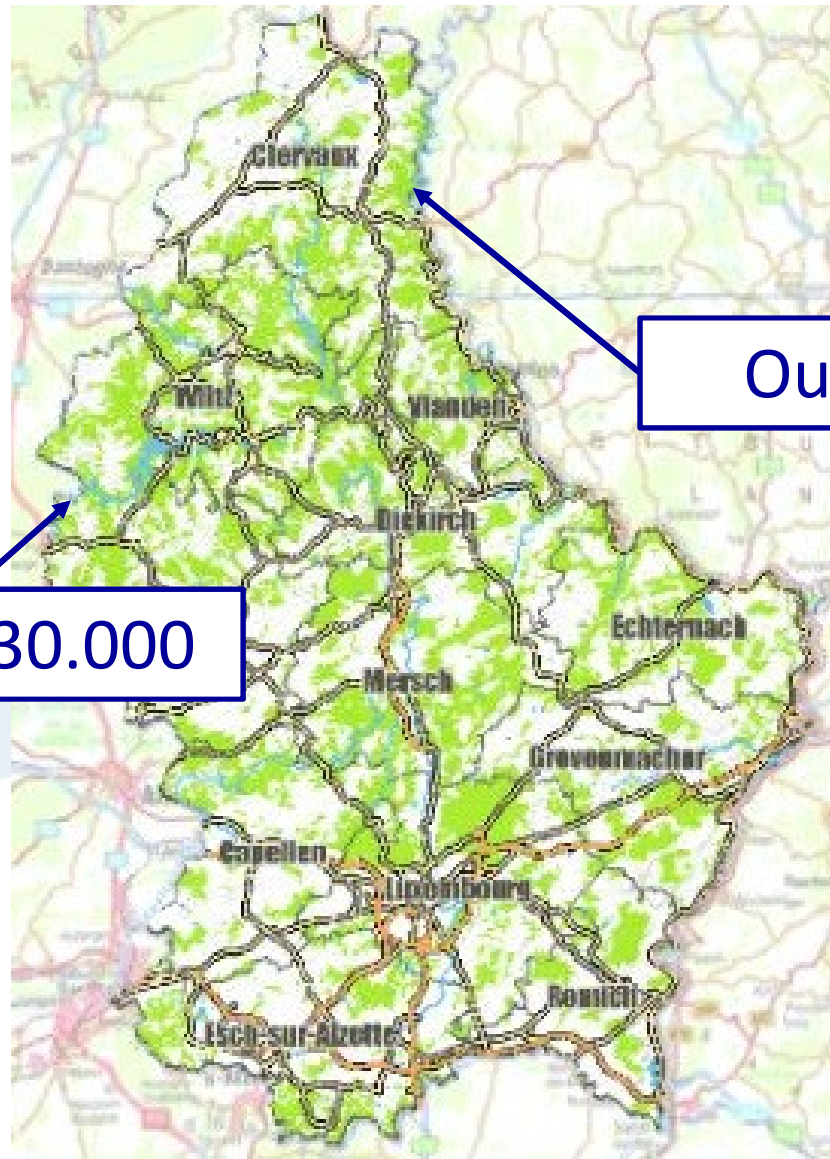
National Partners:50%



Location



Unio crassus 2003



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Sauer – 30.000

Our – 10.000

Impacts on *Unio crassus*



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pollution with not treated
waste water

crayfish

drugs

fine sediments

less host fishes

hydro peaking

pesticides

pH value and
oxygen peaking

dry seasons –
no dilution of pollution

microbiology

muskrats

less amount
of individuals

increase of water
temperature

pollution with road
waste water



Main objectives of the LIFE project

- Monitoring
- Rearing of *Unio crassus*
- Restoration of rivers and streams
- Information and public awareness



Main topics

- **Monitoring**

- *Unio crassus*
- Fish
- Soil
- Water

- **Restoration of rivers and streams**

- Fencing and installation of watering places
- Removing of fish obstacles
- Input of gravel

- **Rearing**

- **Information and public awareness**

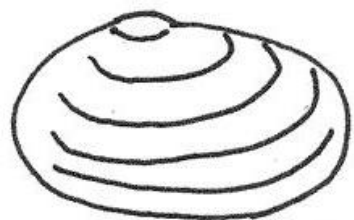




97 km
monitored



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7.074
mussels found



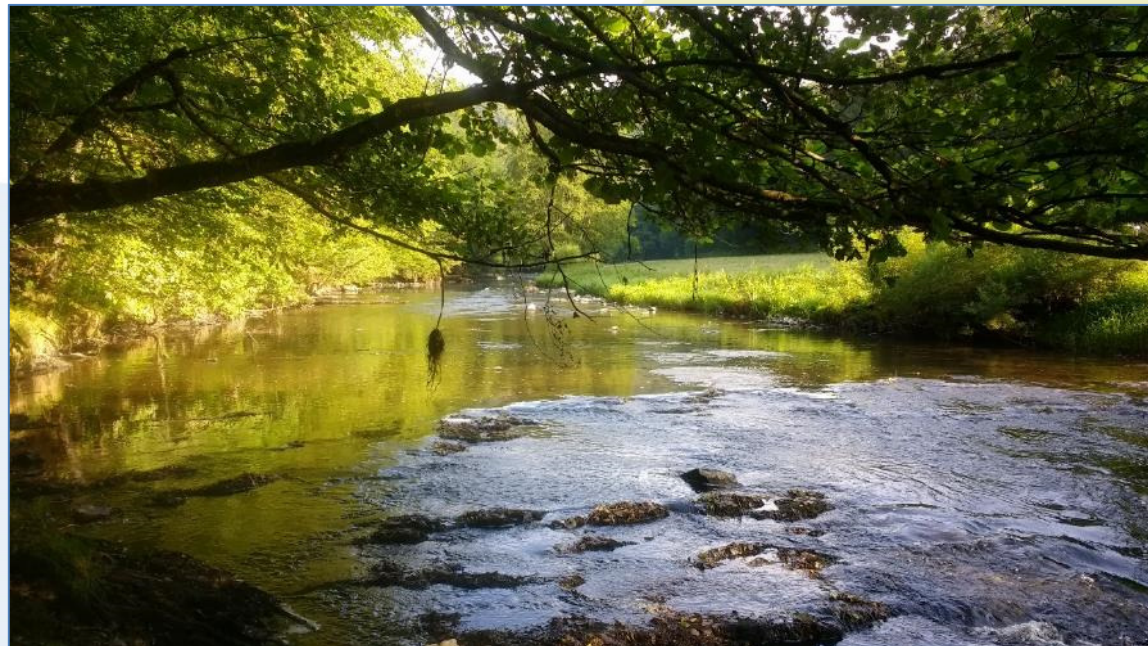




Unio crassus in the river Our



- **Period**
 - June 2013 - September 2017
- **Length**
 - 32 km
 - 64 sections
- **Results**
 - 4563 alive
 - 1805 shells

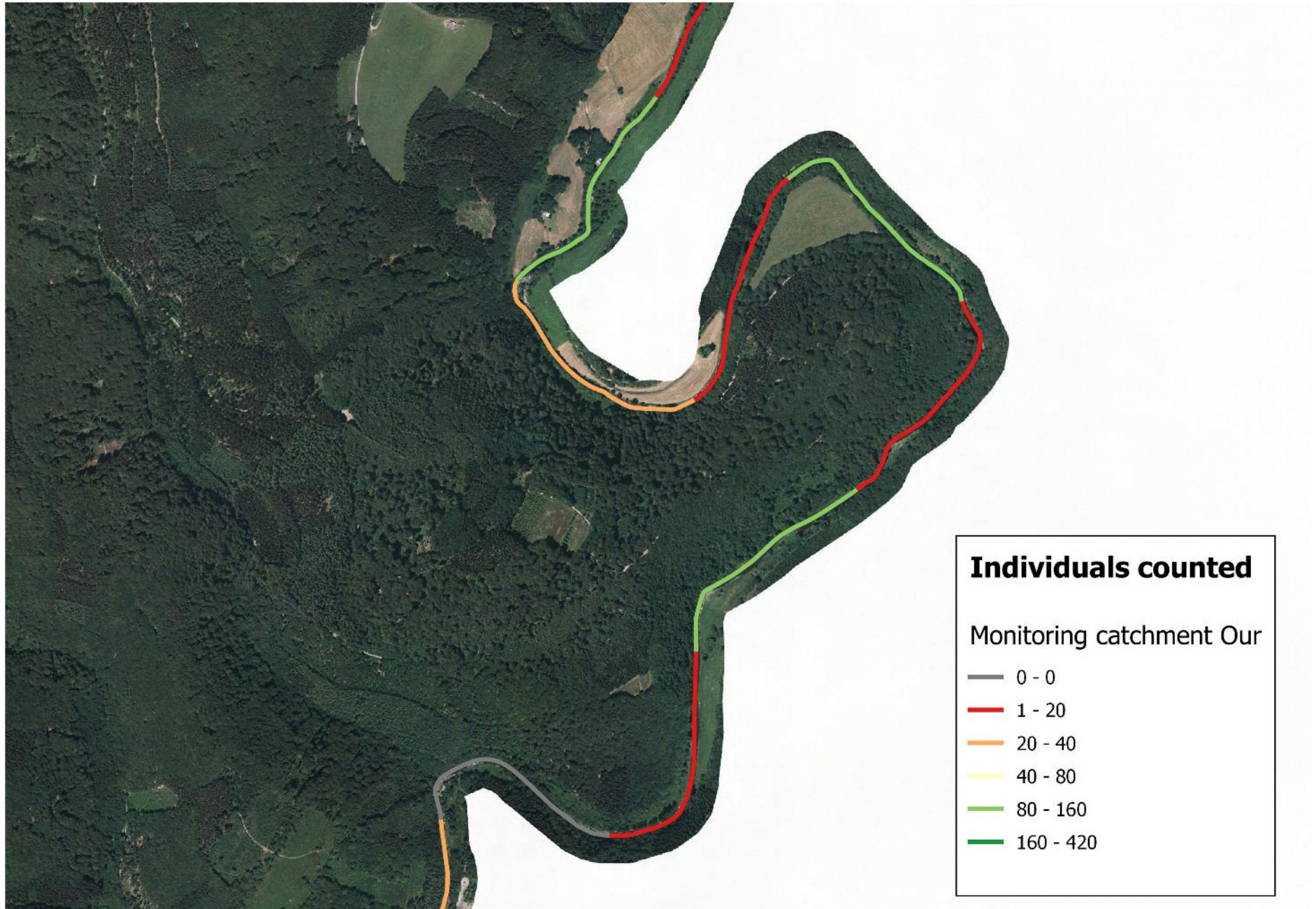




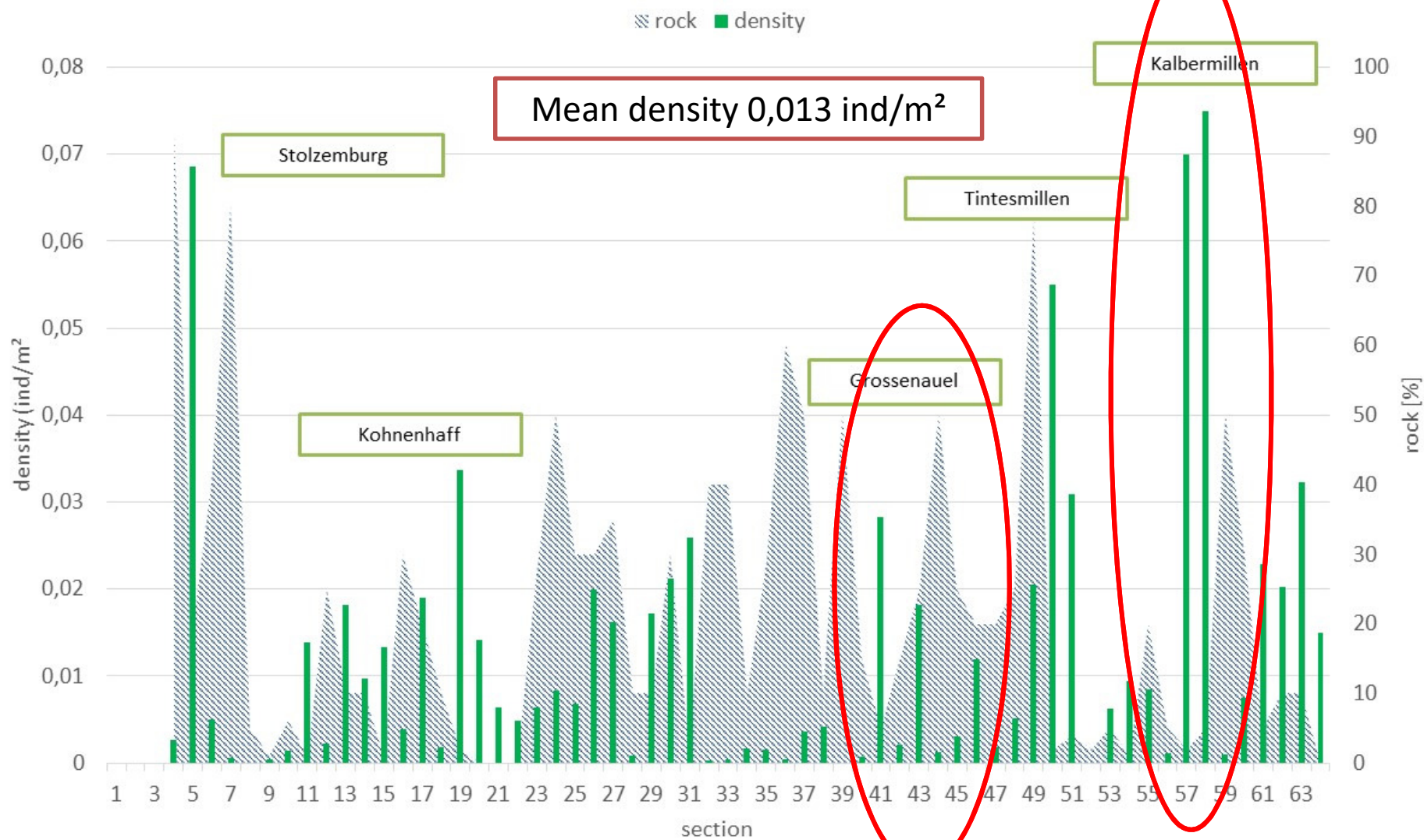
Individuals counted

Monitoring catchment Our

- 0 - 0
- 1 - 20
- 20 - 40
- 40 - 80
- 80 - 160
- 160 - 420



Density in the river Our - sections

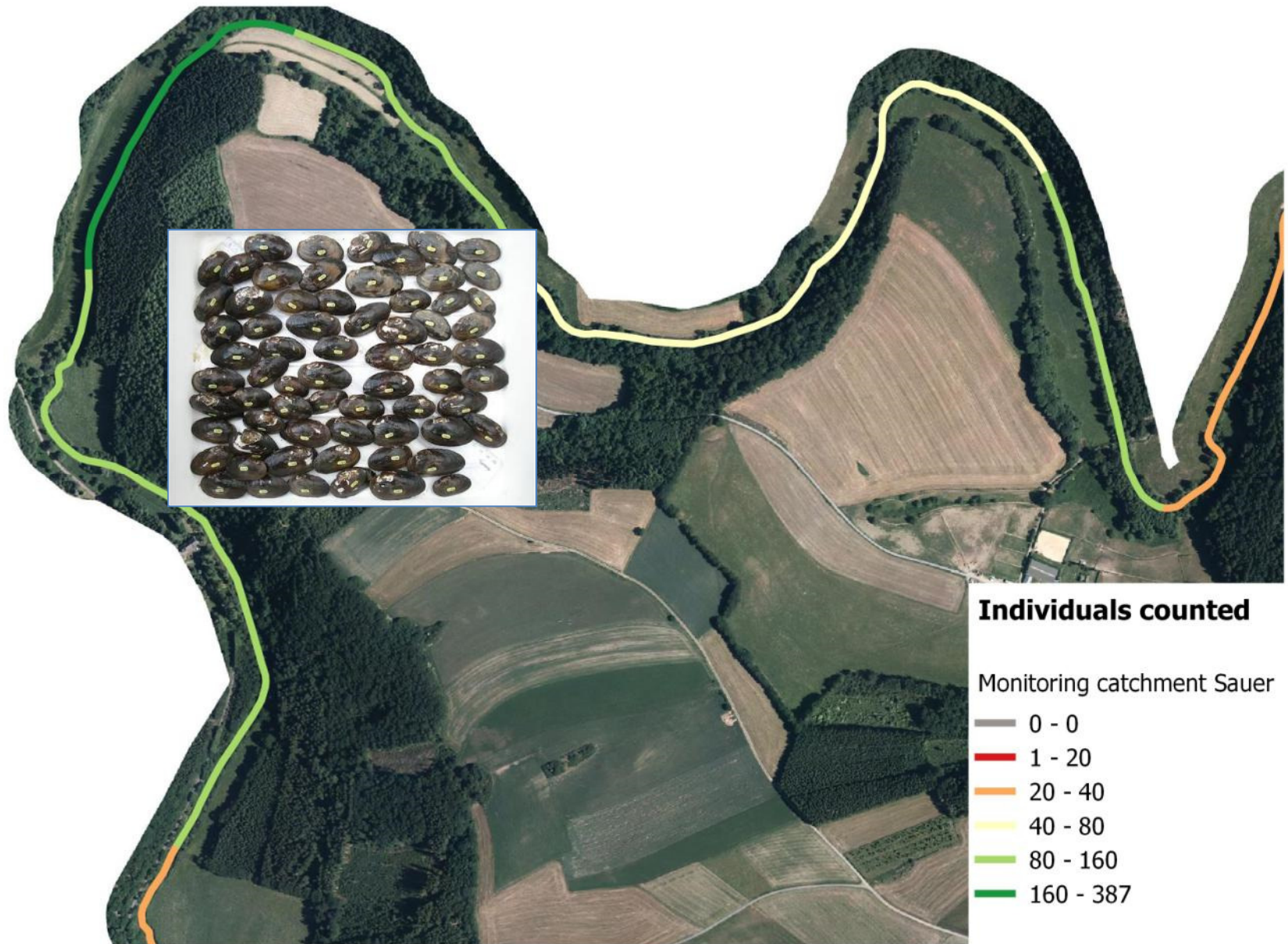


Unio crassus in the river Sauer

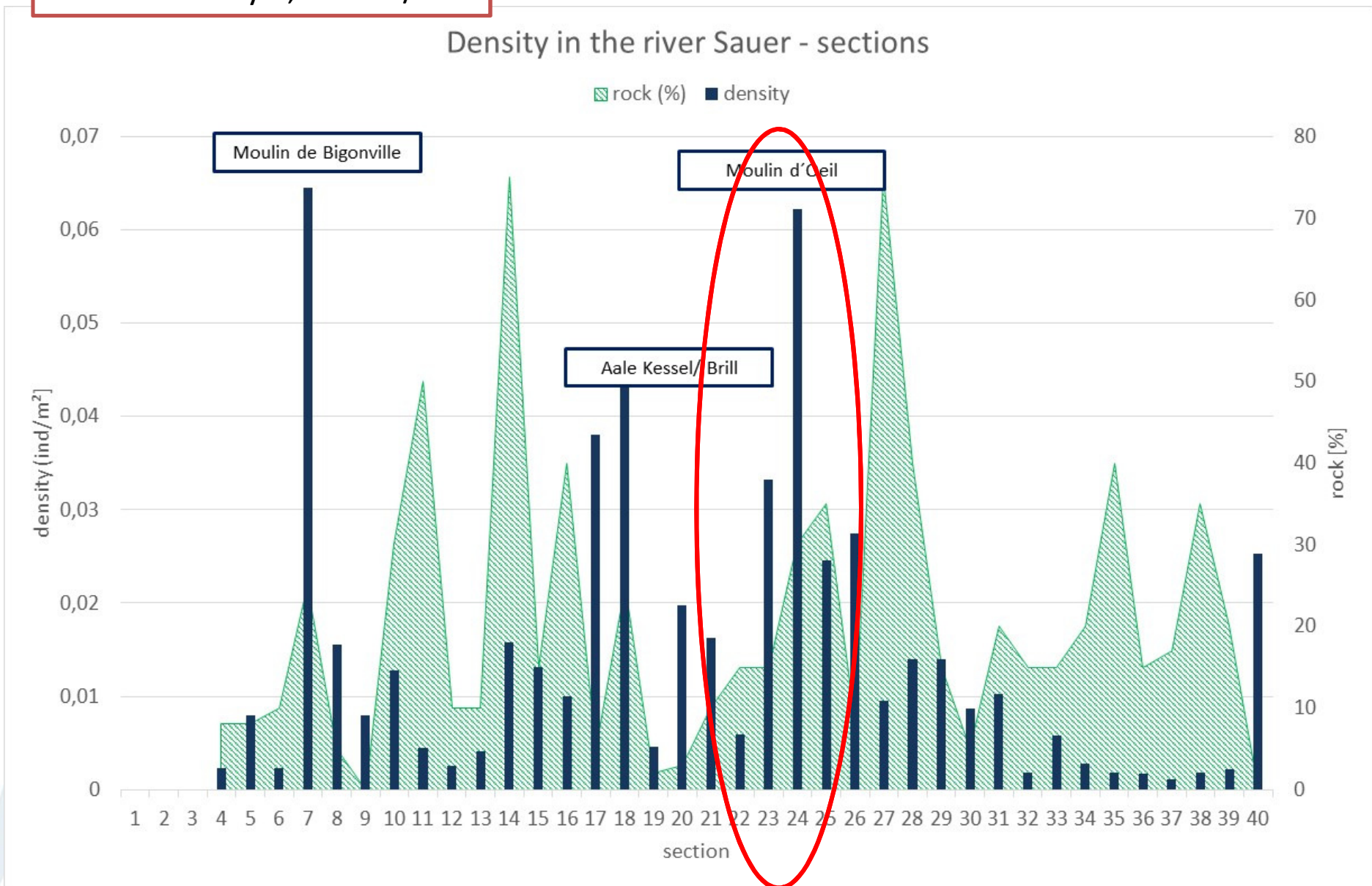


- **Period**
 - June 2013 - August 2018
- **Length**
 - 20 km
 - 40 sections
- **Results**
 - 2612 alive
 - 3545 shells

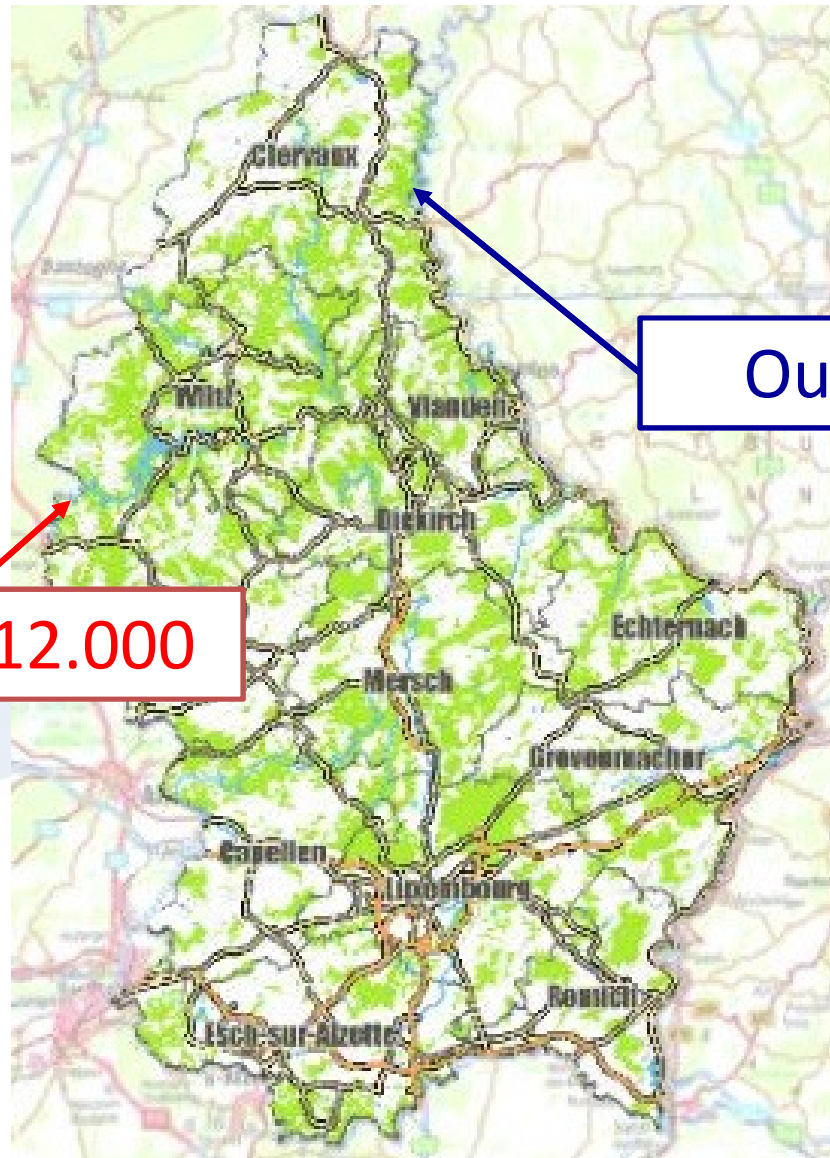




Mean density 0,014 ind/m²



Unio crassus 2018



Sauer – 12.000

Our – 15.000



Tagged mussels in Our and Sauer

• Our

- Kohnenhaff
- Kalbermillen
- Tintesmillen
- Stolzemburg

• Sauer

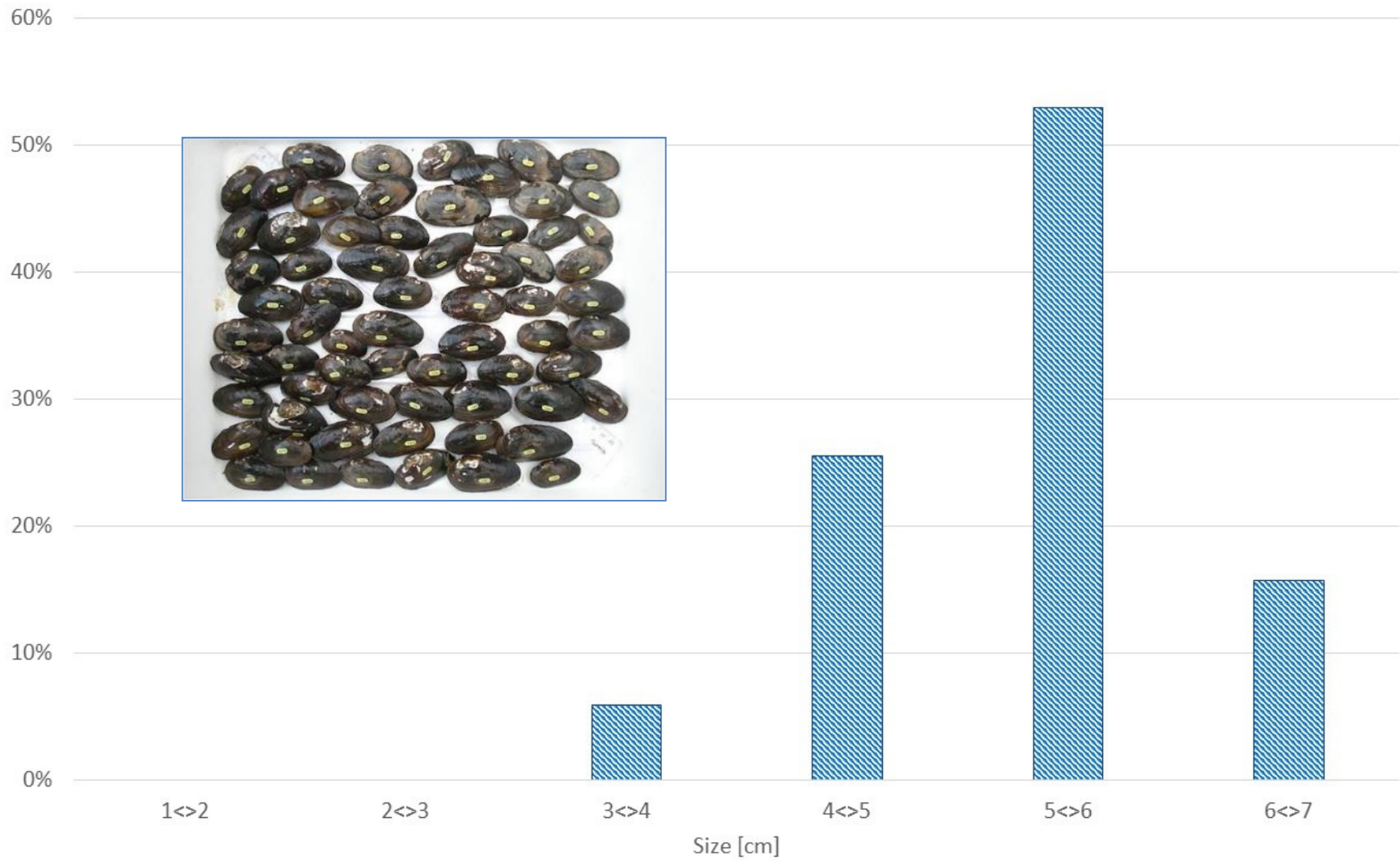
- Moulin de Bigonville
- Moulin d'Oeil



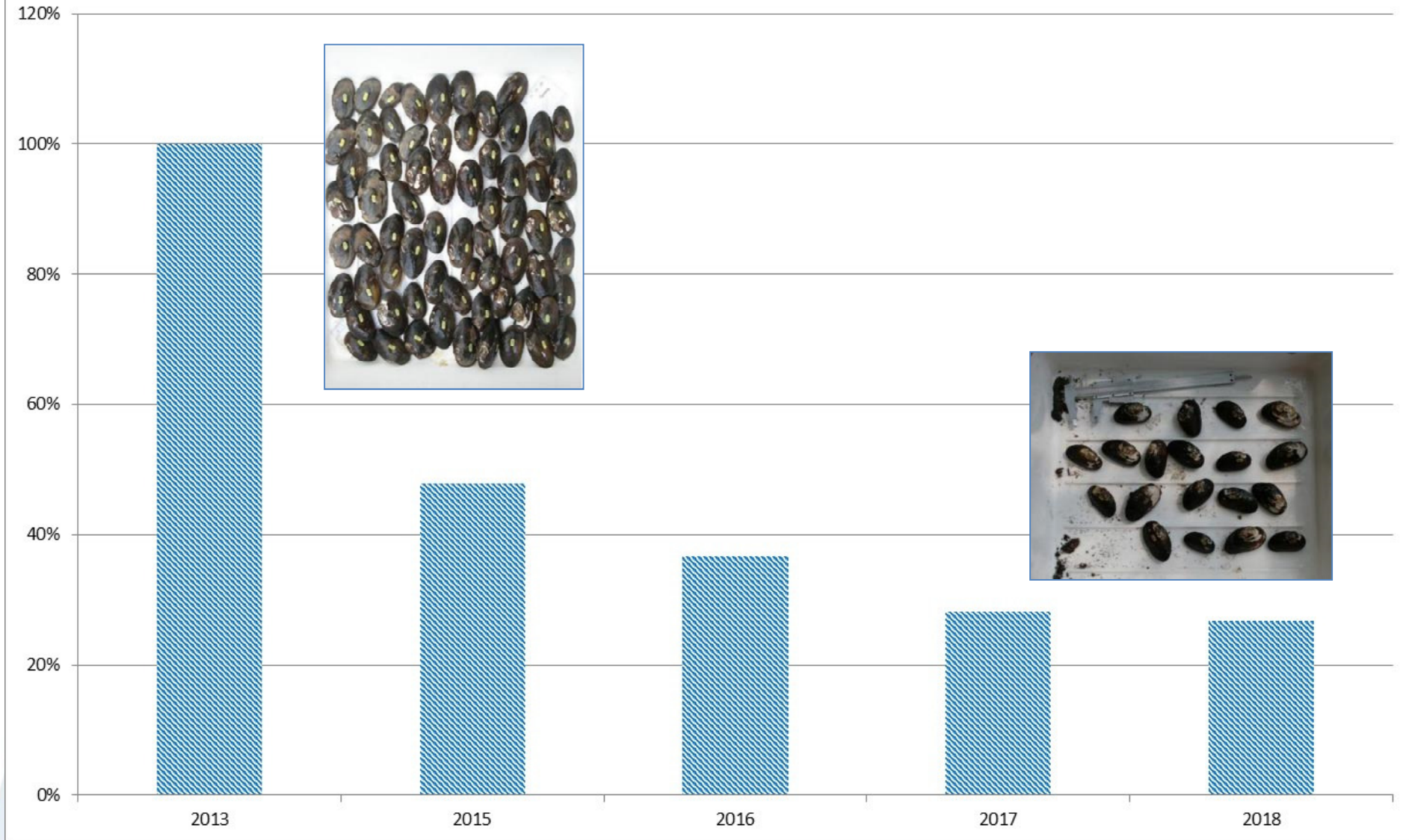




Size distribution of tagged mussels at Kohnehaff - 2014

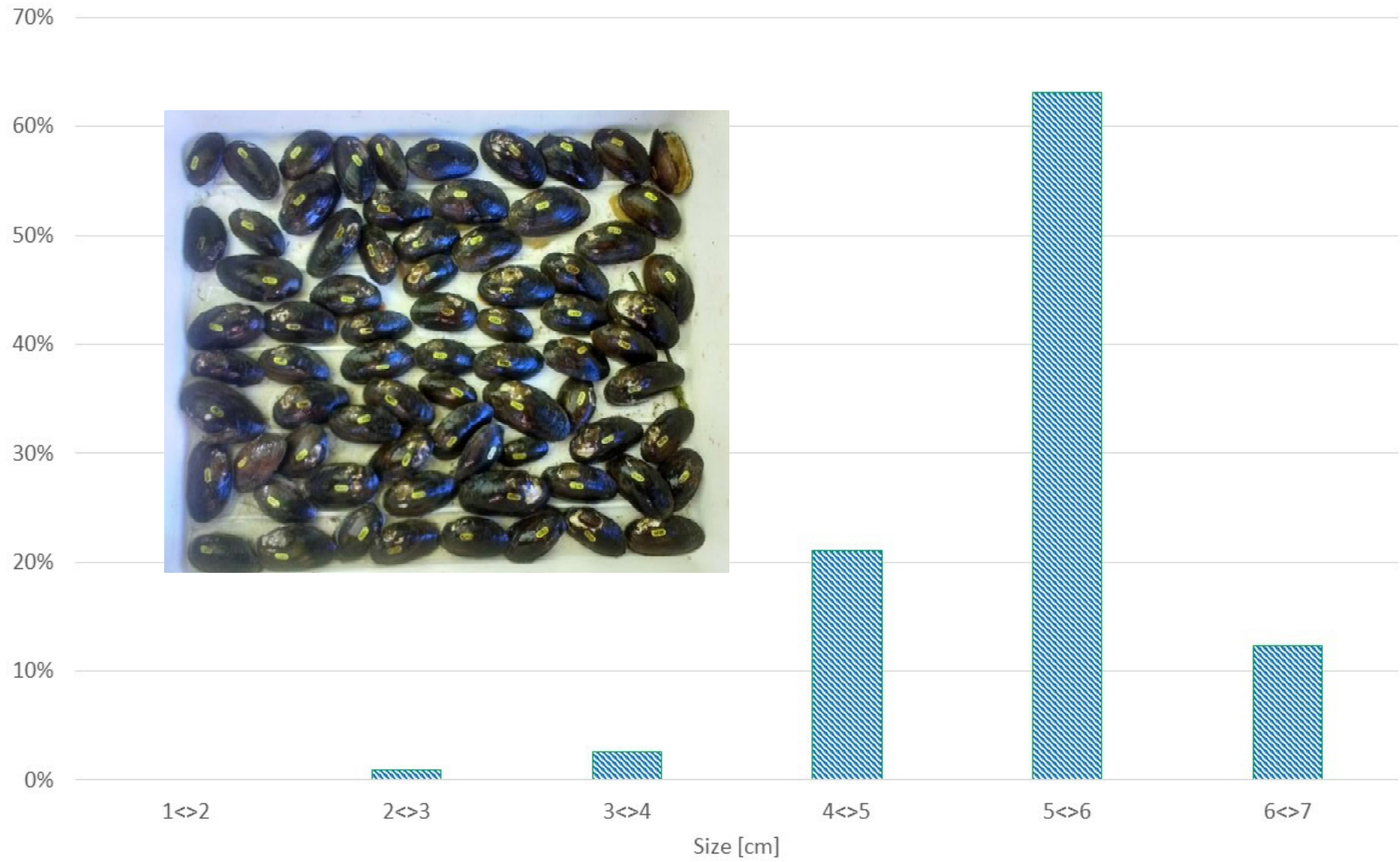


Recovery rate - Kohnenhaff

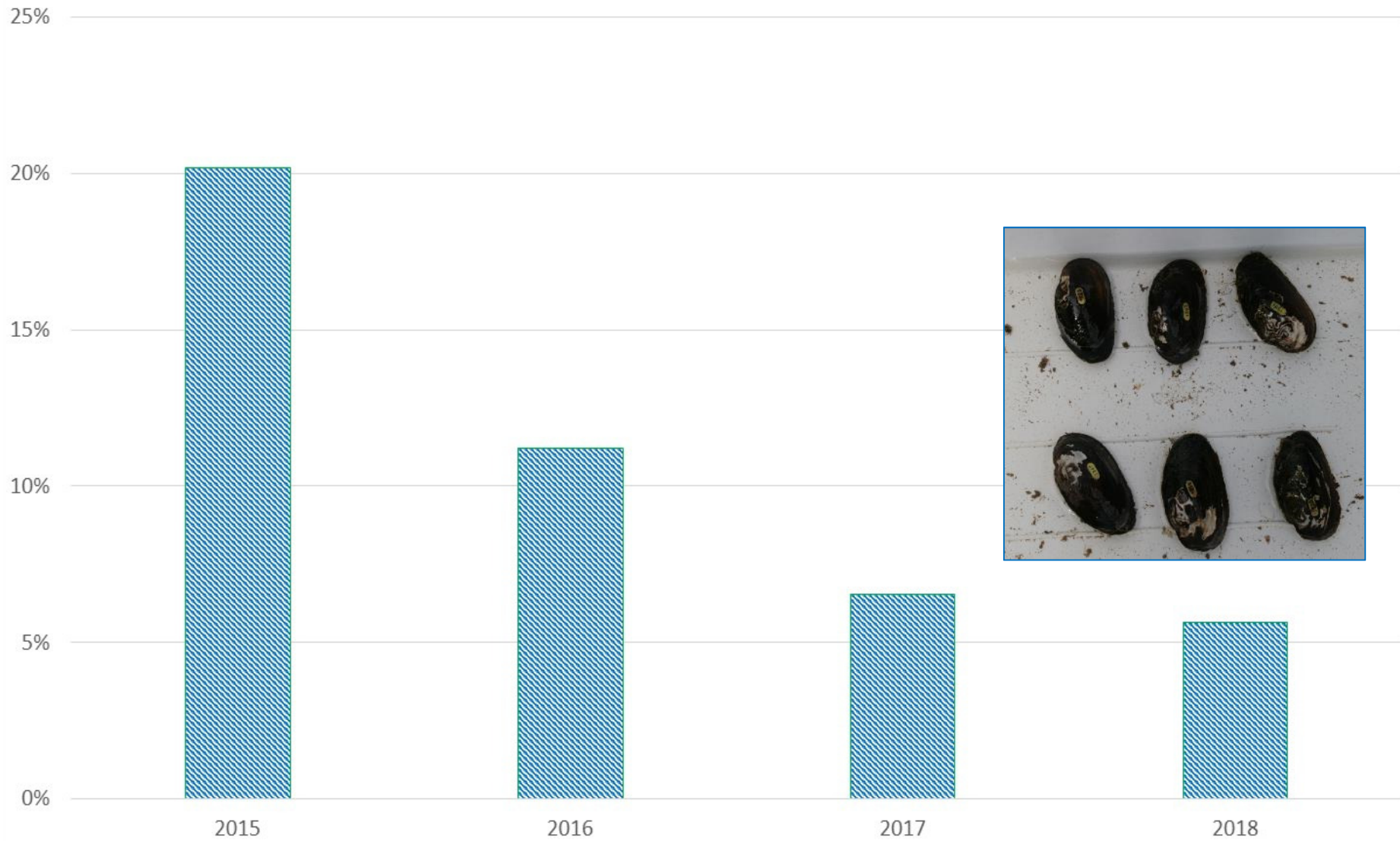




Size distribution of 114 tagged mussels at Kalbermillen - 2014



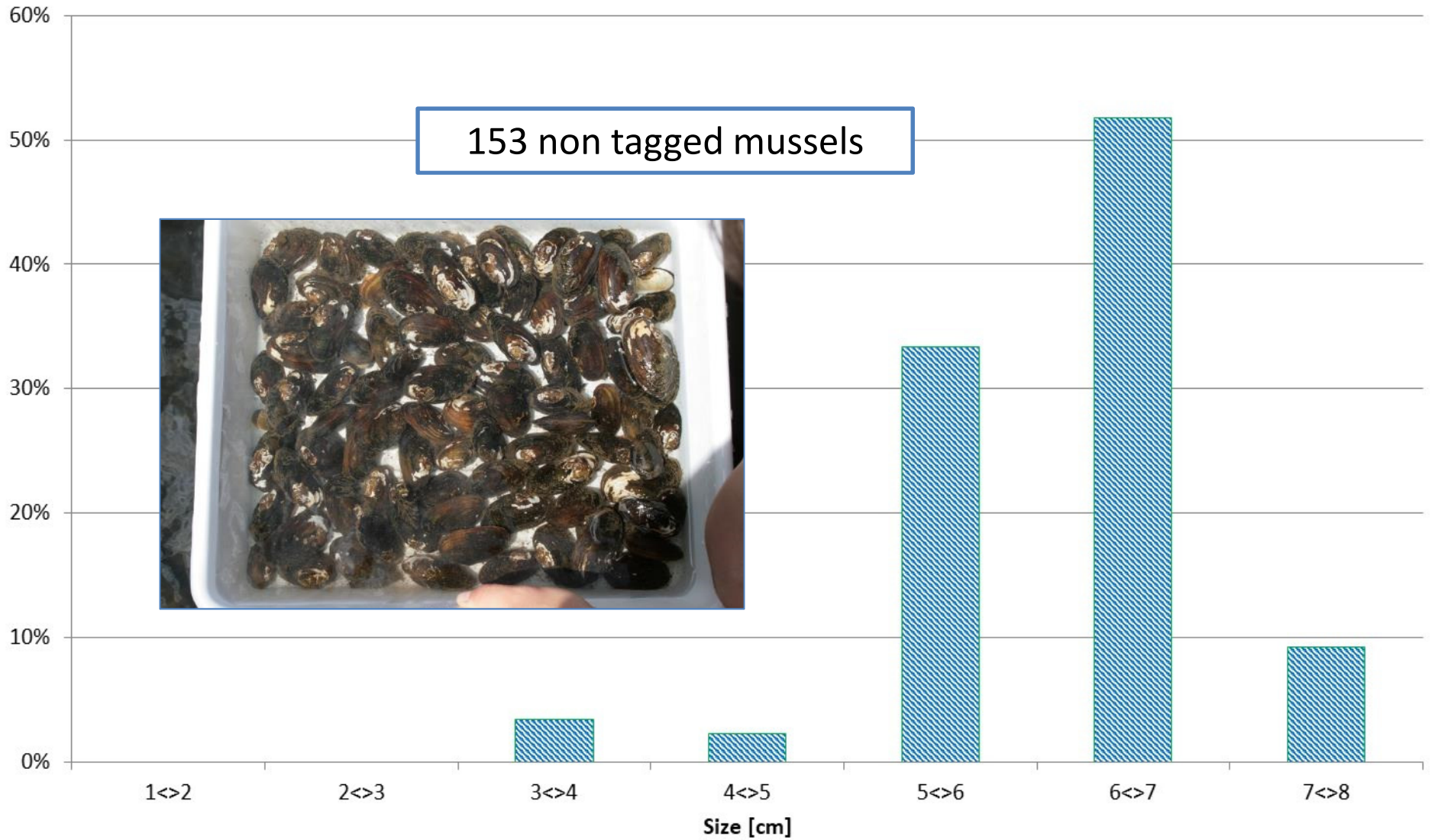
Recovery rate of tagged mussels - Kalbermillen





Size distribution of non tagged mussels - Kalbermillen 2018

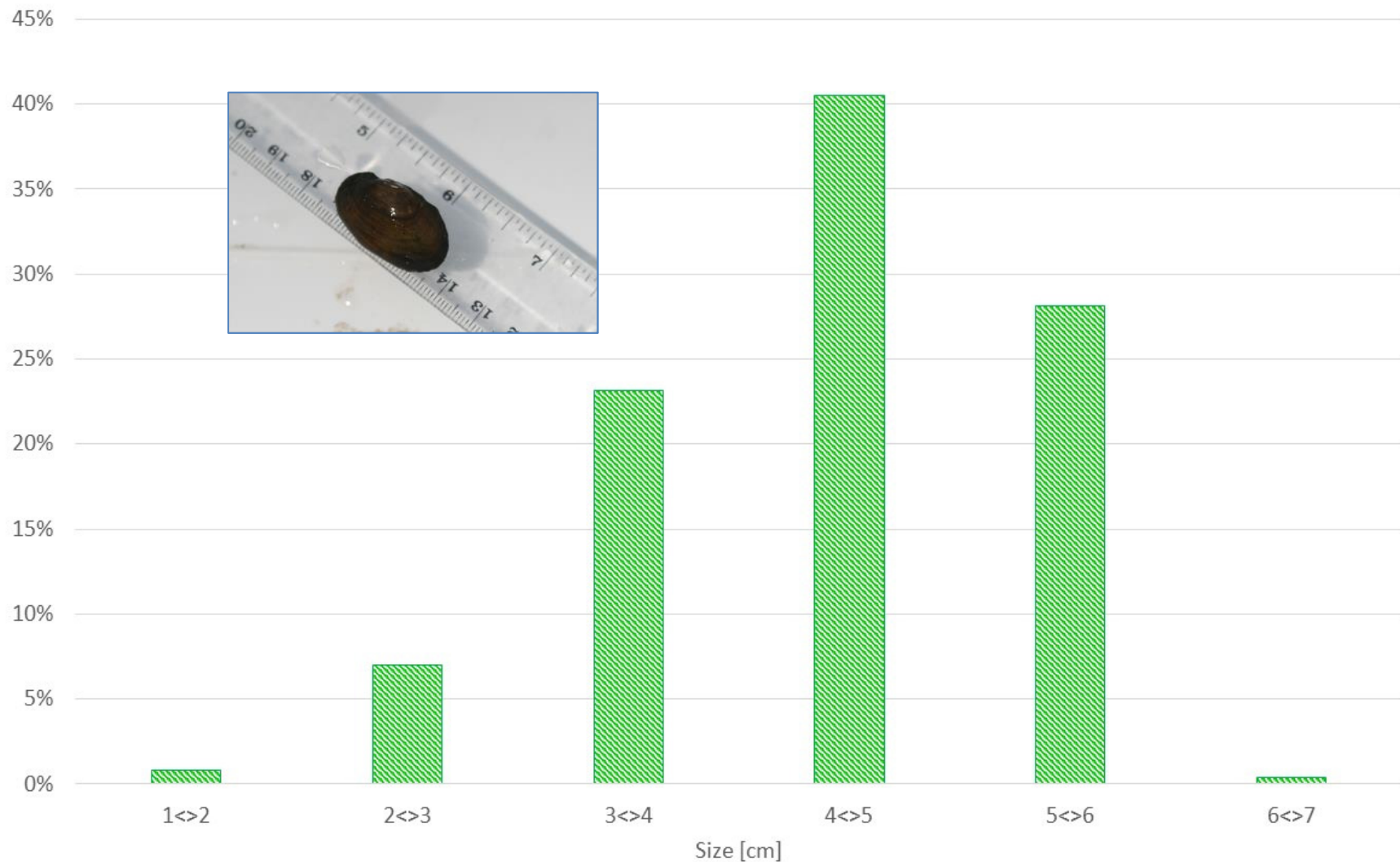
153 non tagged mussels



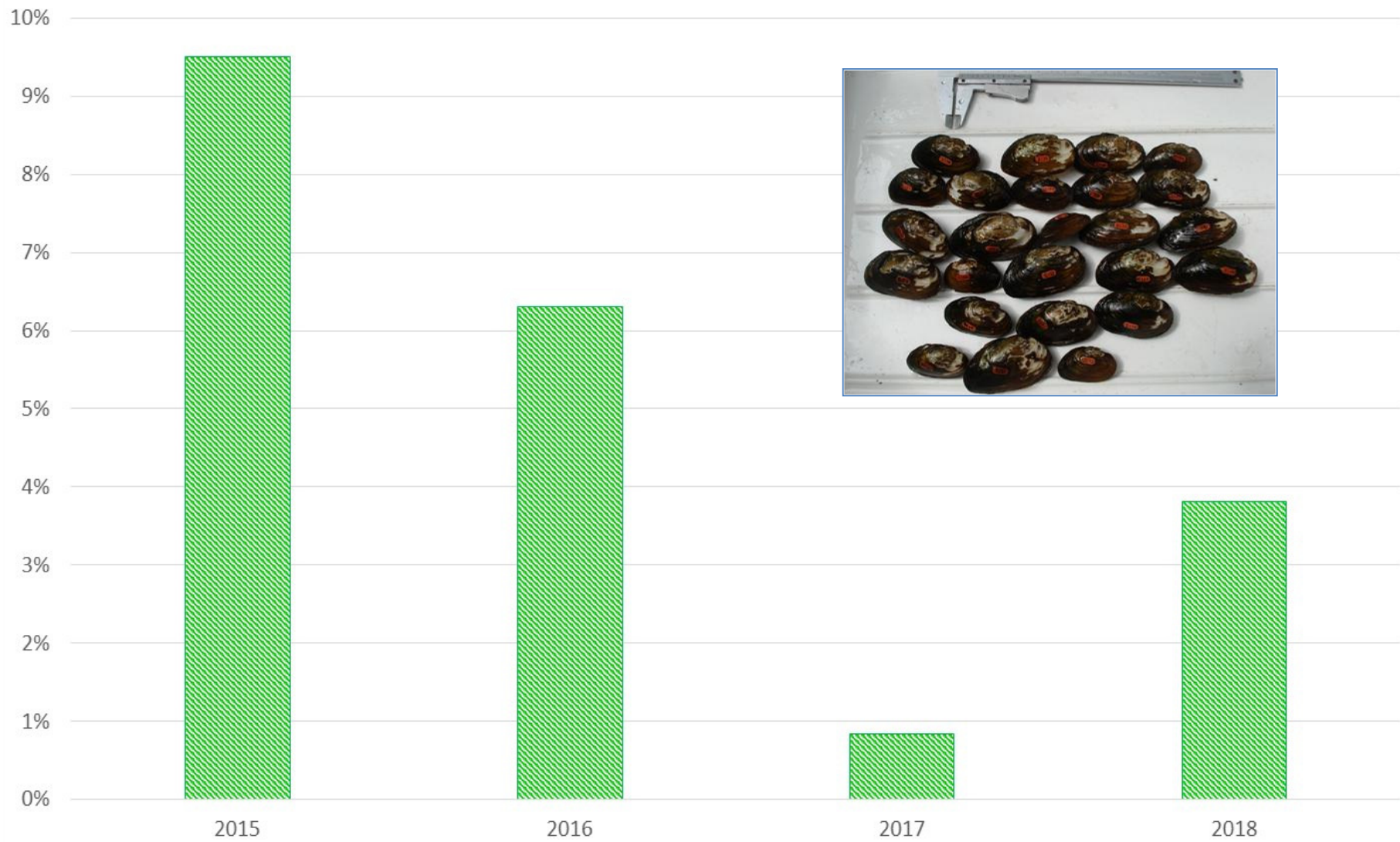


Tagged mussels in the river Sauer

Size distribution of 242 tagged mussels at Moulin de Bigonville - 2014



Recovery rate of tagged mussels - Moulin de Bigonville

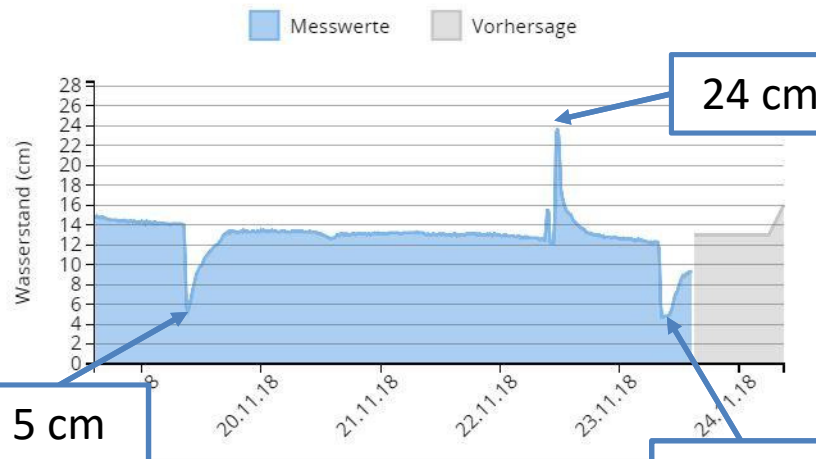


Hydro peaking at the Moulin de Bigonville

- Hydro power station
- Hydro peaking for more than 5 years



Cote de préalerte	250 cm
Cote d'alerte	300 cm
REZENTESTE MESSDATEN	
Datum	23.11.2018
Zeit	14:15 14:30 Differenz
Wasserstand	9 cm 9 cm 0 cm



Offizieller **Meldepegel**.

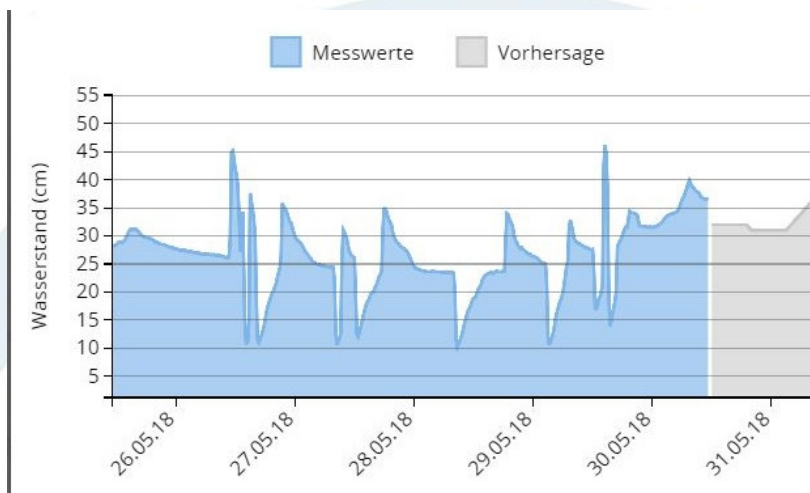
Durch Kraftwerk (Mühle) beeinflusst.

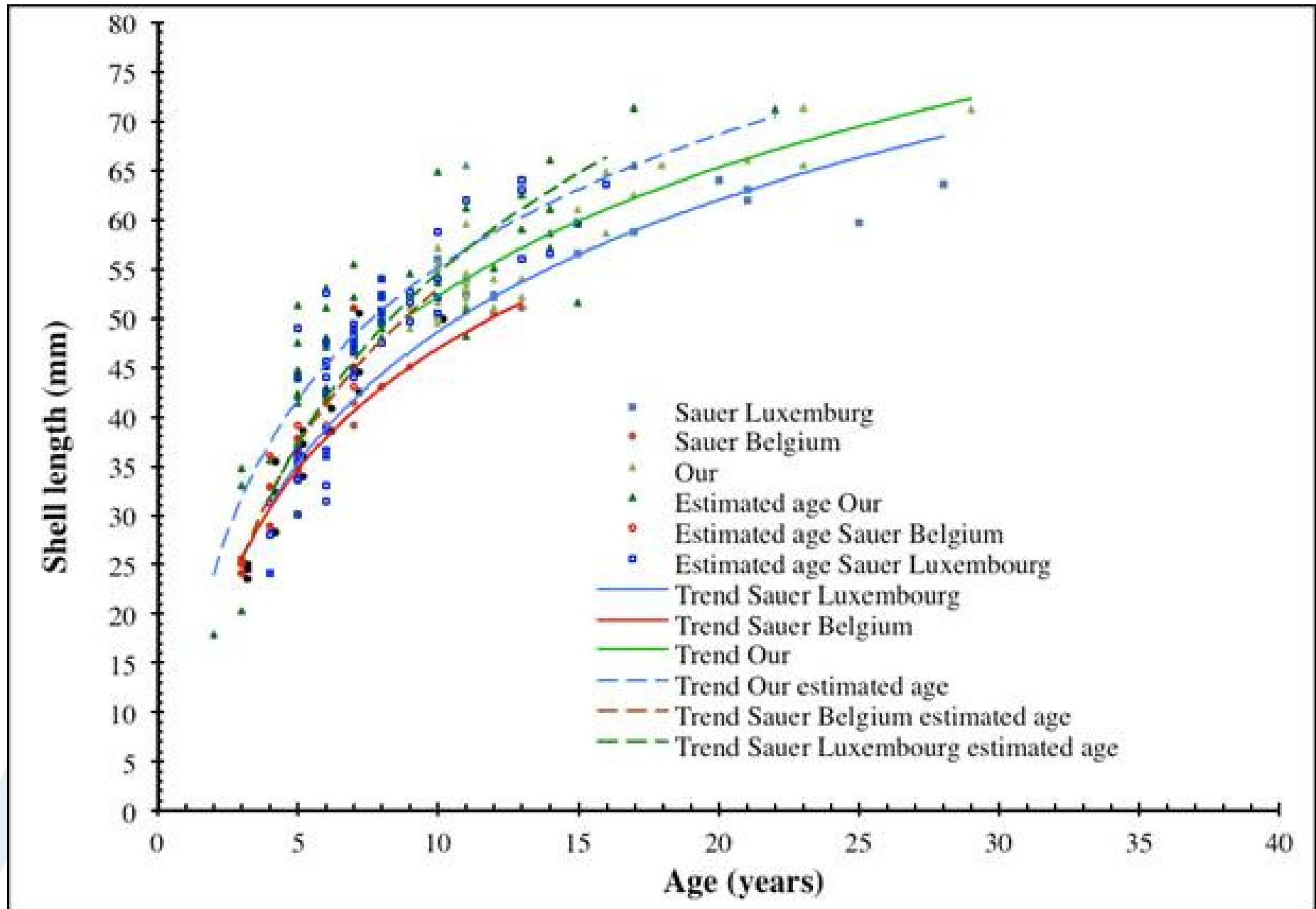


Impact on *Unio crassus*

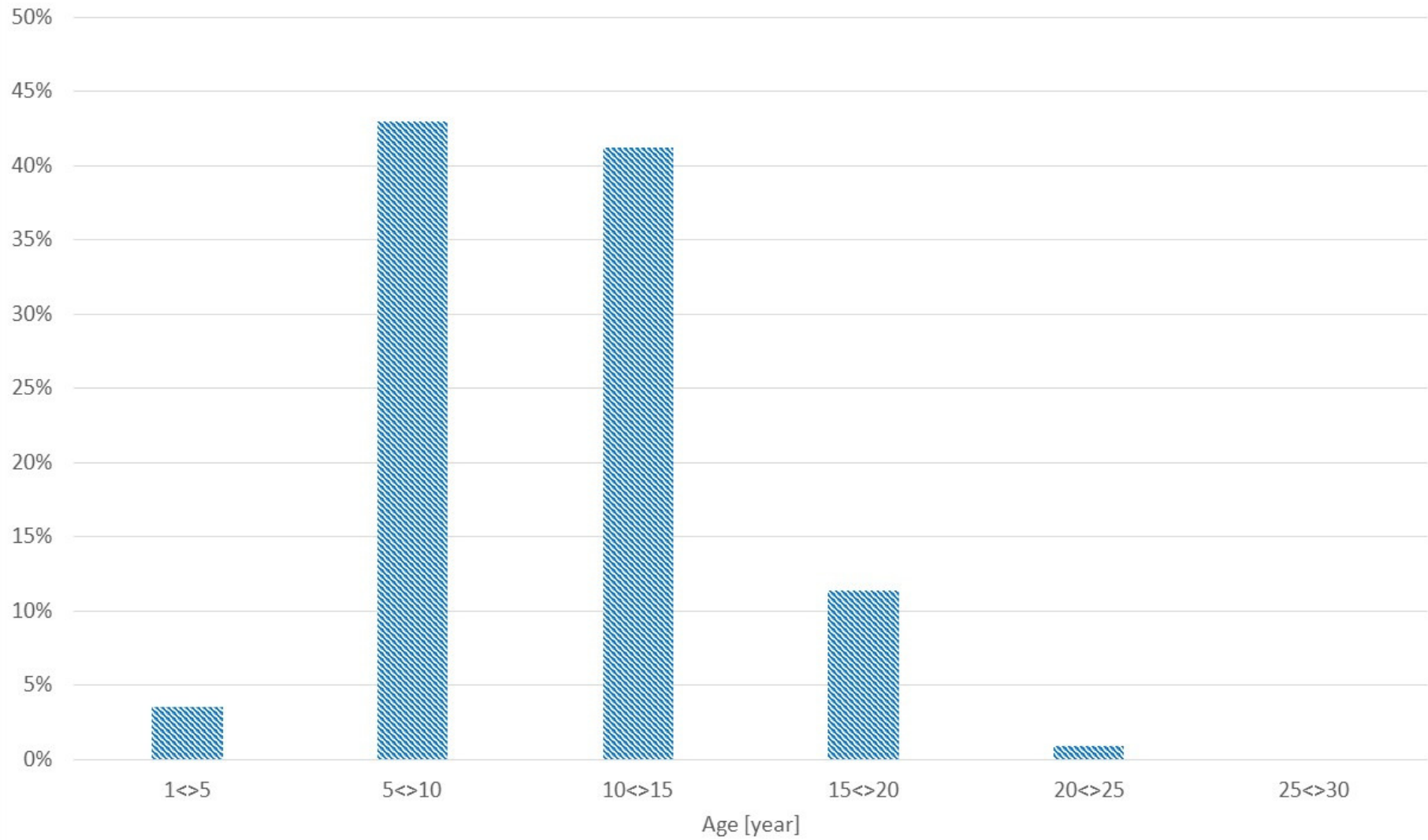


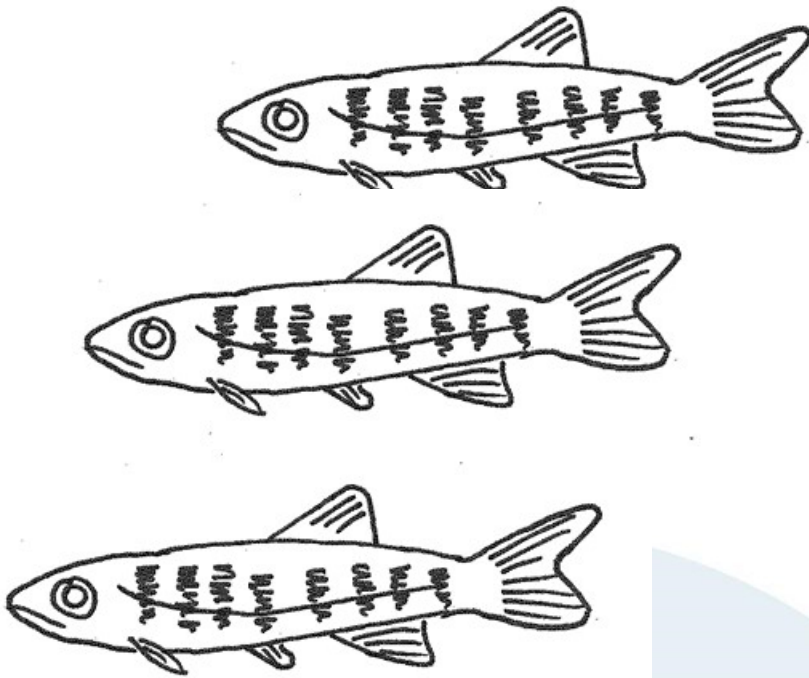
- Moving from the river bank to the middle
- Impact on all species living next to the river bank
- Loss of habitat





Age of *Unio crassus* - Kalbermillen





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34

**Electrofishing
sessions**

Monitoring of the fish in the rivers and their tributaries



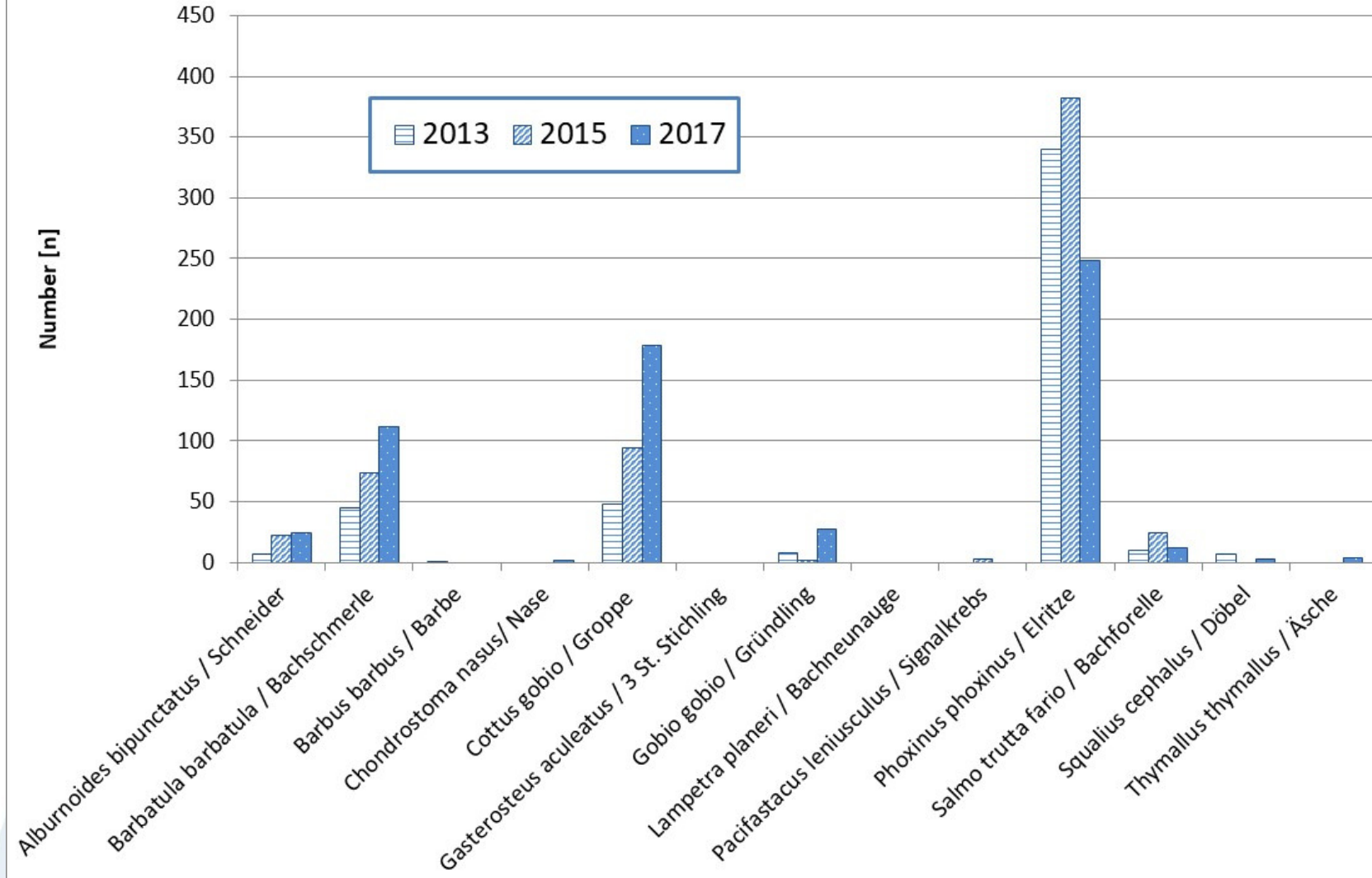
- Fish in Our and Sauer
- Fish in tributaries
- Fish before and after restoration



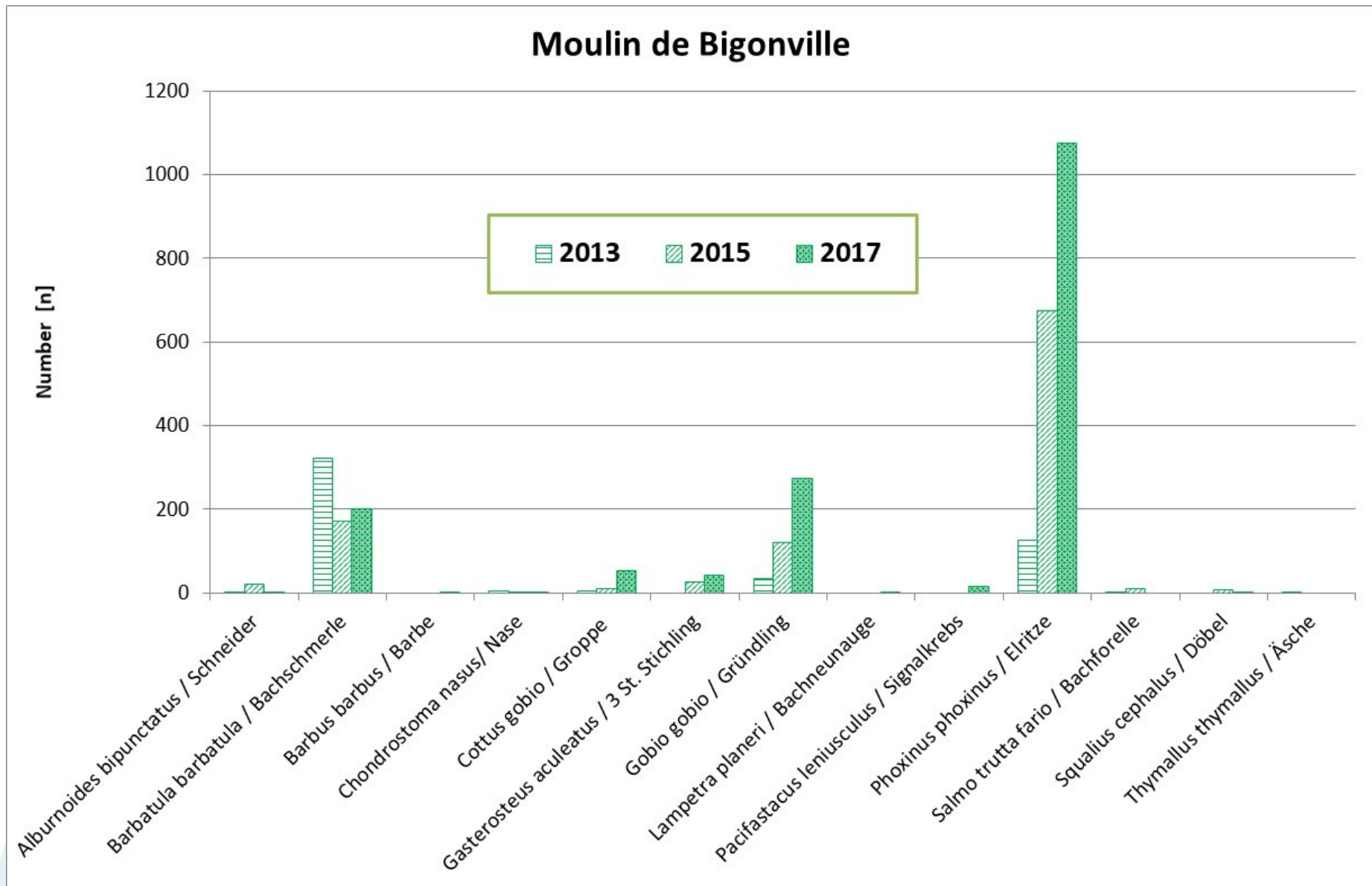




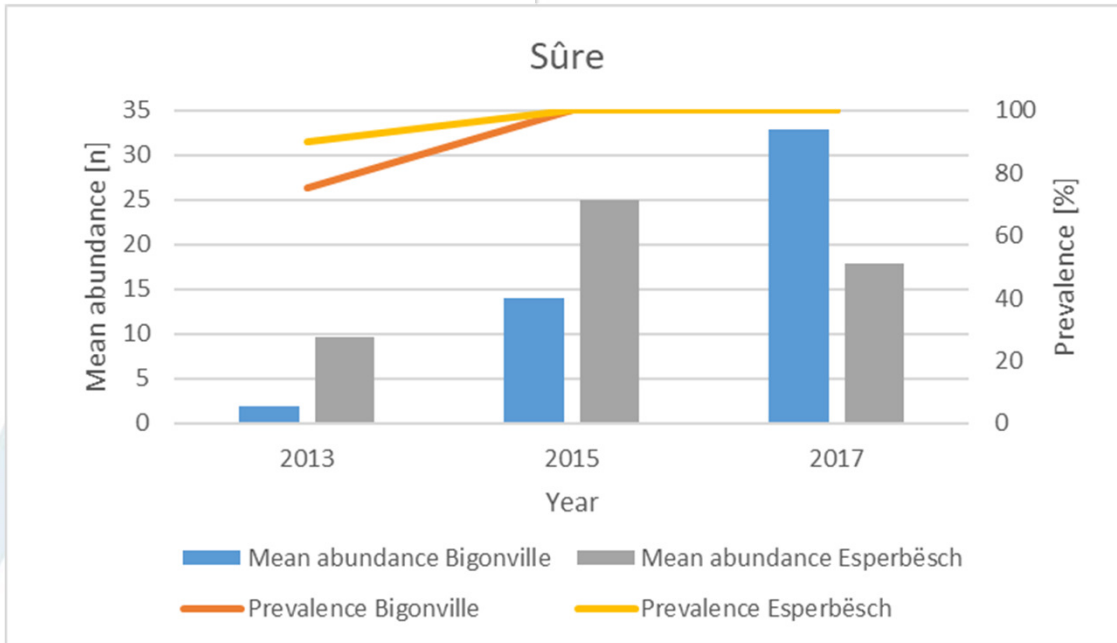
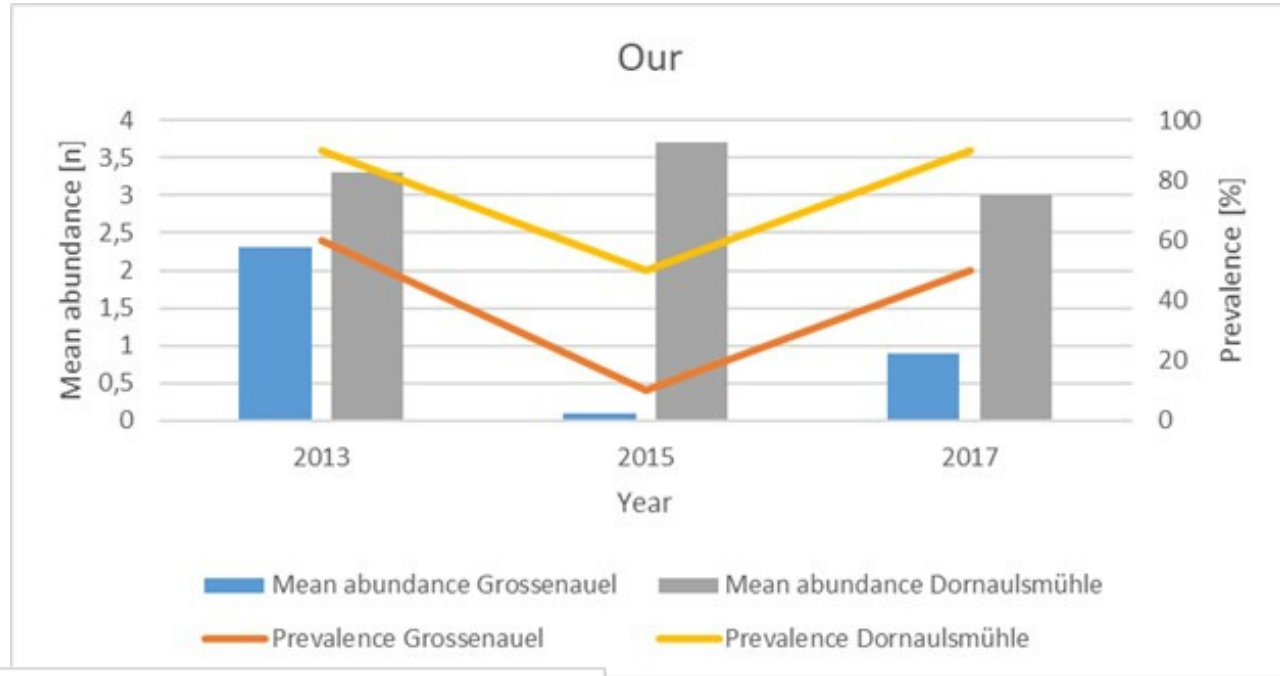
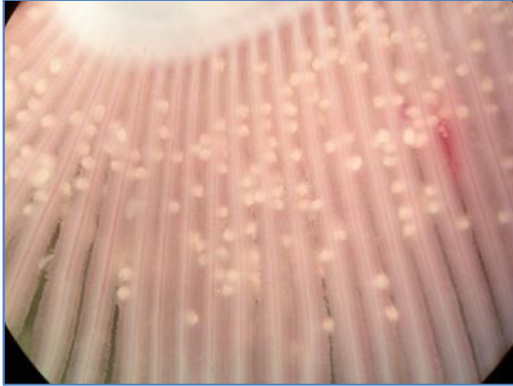
Grossenauel

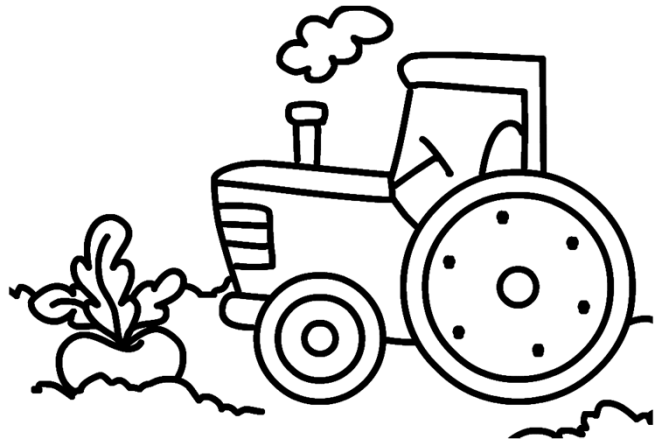


Grossenauel – river Our



Moulin de Bigonville – river Sauer





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**Soil samples
analysed**

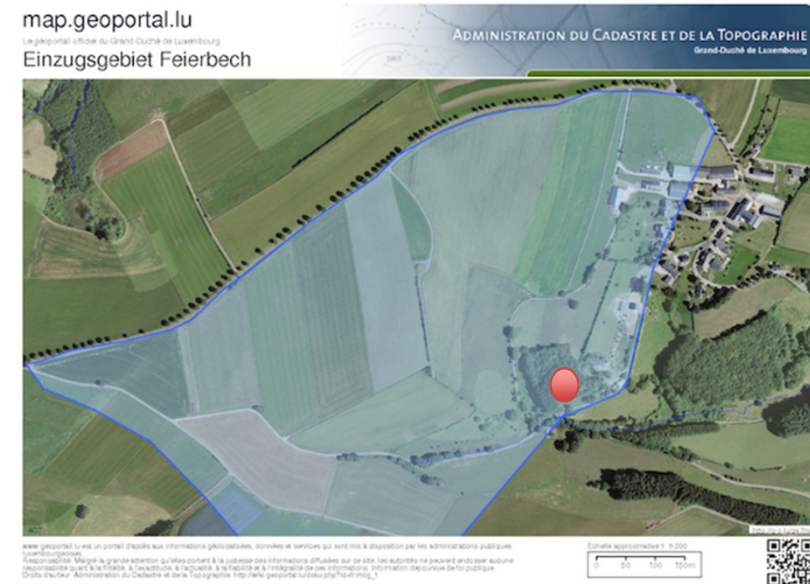
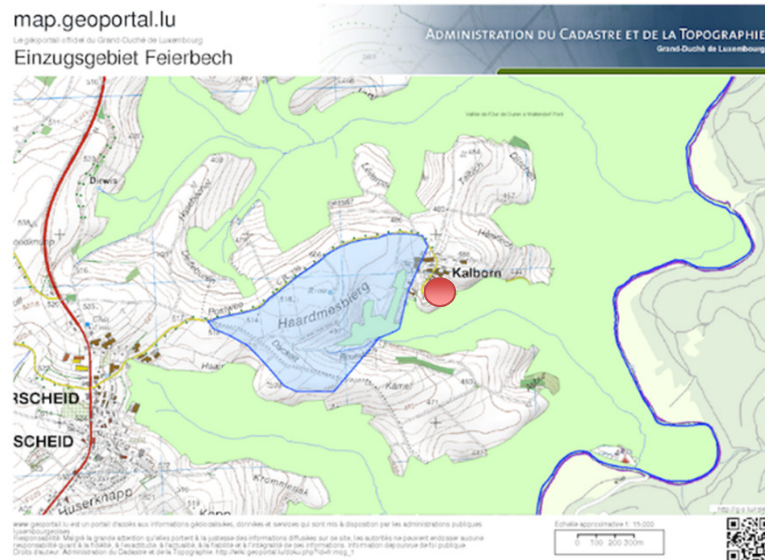
Project in a small catchment area

- Catchment area

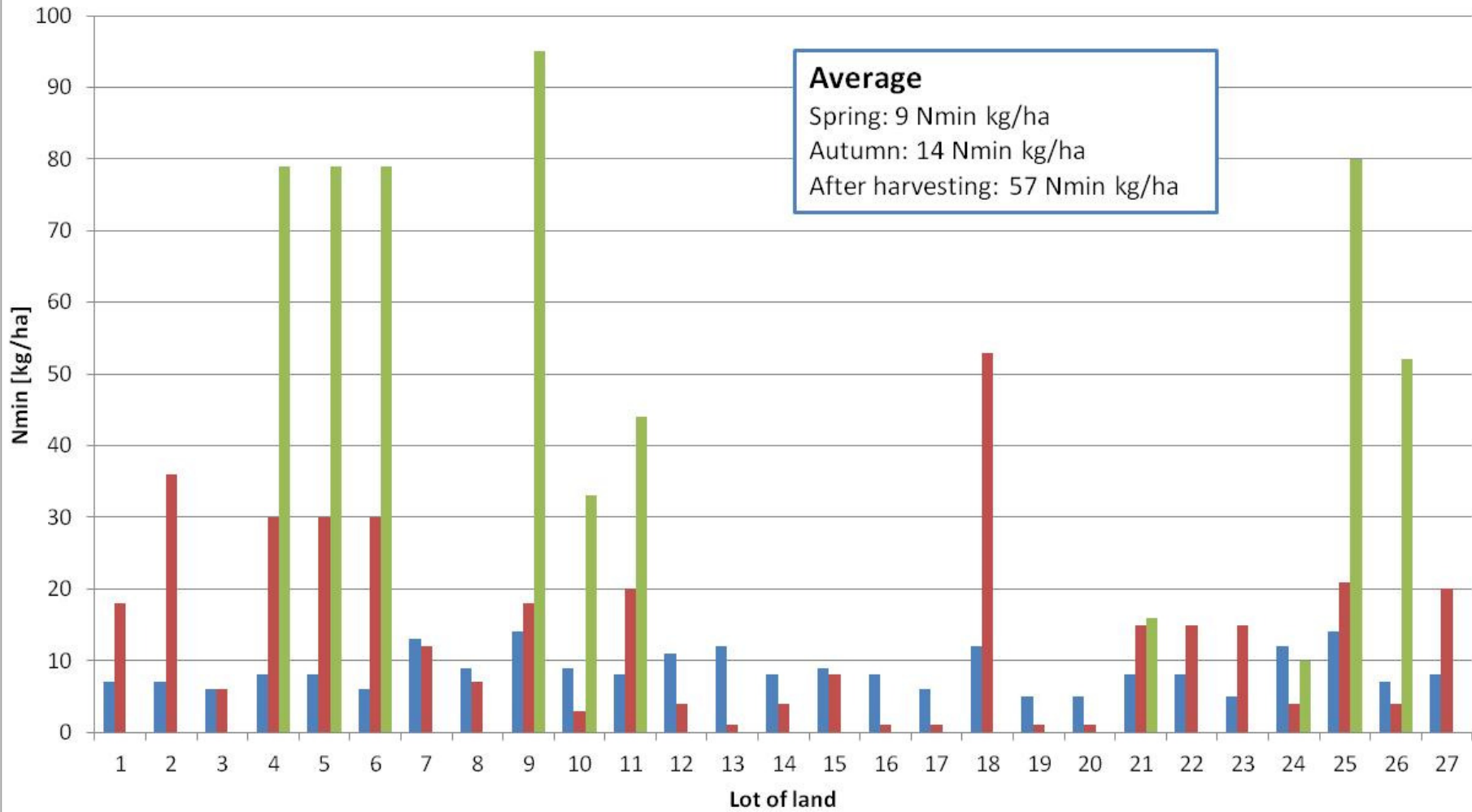
 - 0,5 km², 10 farmers, 70 ha

- Objectives

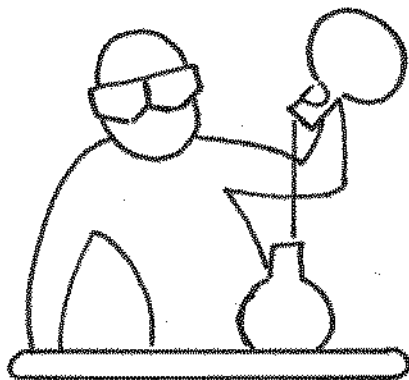
 - Relation between good practices and nutrient concentration in soil and water



Feierbech - soil samples 2017



■ Spring ■ Autumn ■ After harvesting

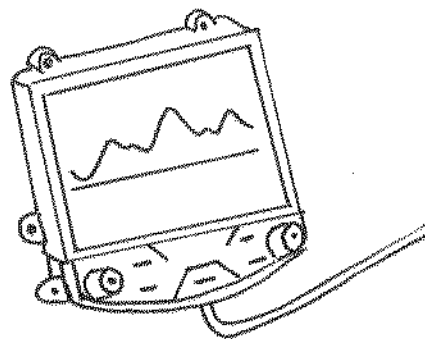


3.752

**Water samples
analysed**

3

**Mobile
measurement
devices**



1

**Online
measurement
device**

Monitoring of water quality

- **Laboratory – since November 2012**
 - Once a week – Our, Sure and places with planned or already installed measures
 - Every three months
 - ✓ Our and Sure and its tributaries springs and mouthes
- **Online measurement – since June 2013**
 - Our – Kalborn Millen since June 2013
 - Mobile measurement device since August 2014
- **Data from different administrations and organisations**
 - Administration of Water
 - SEBES

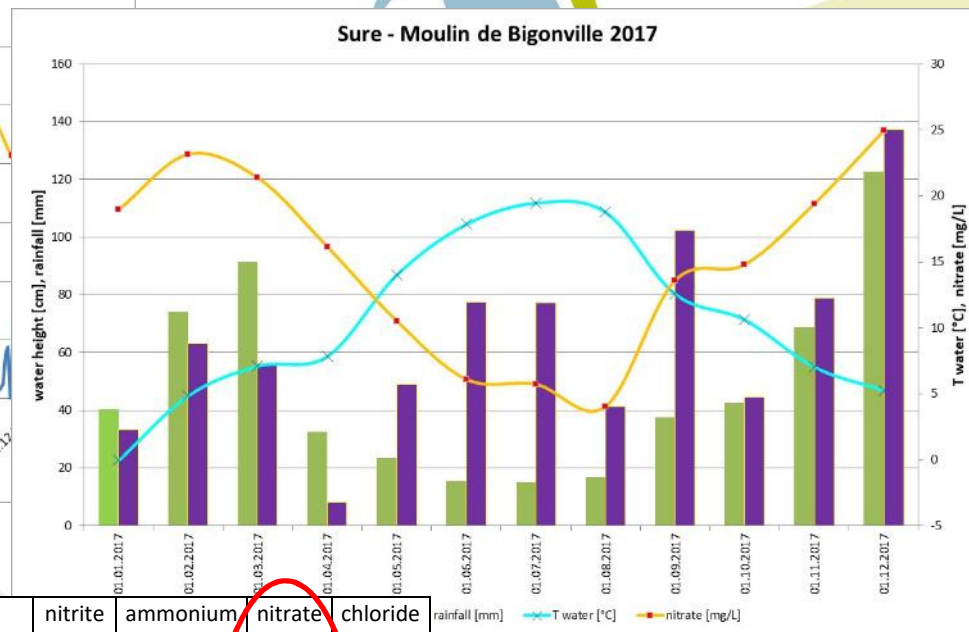
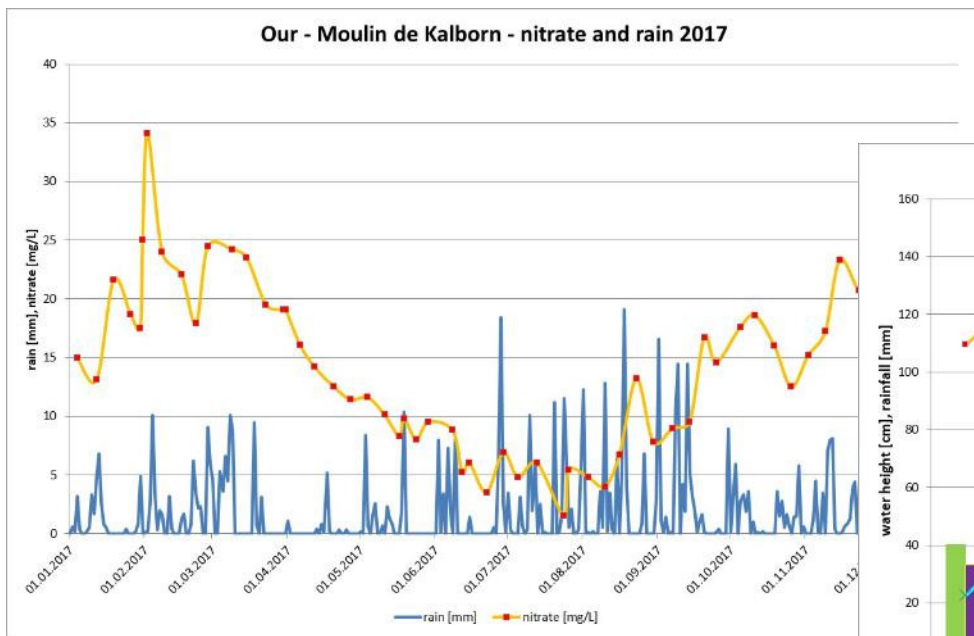


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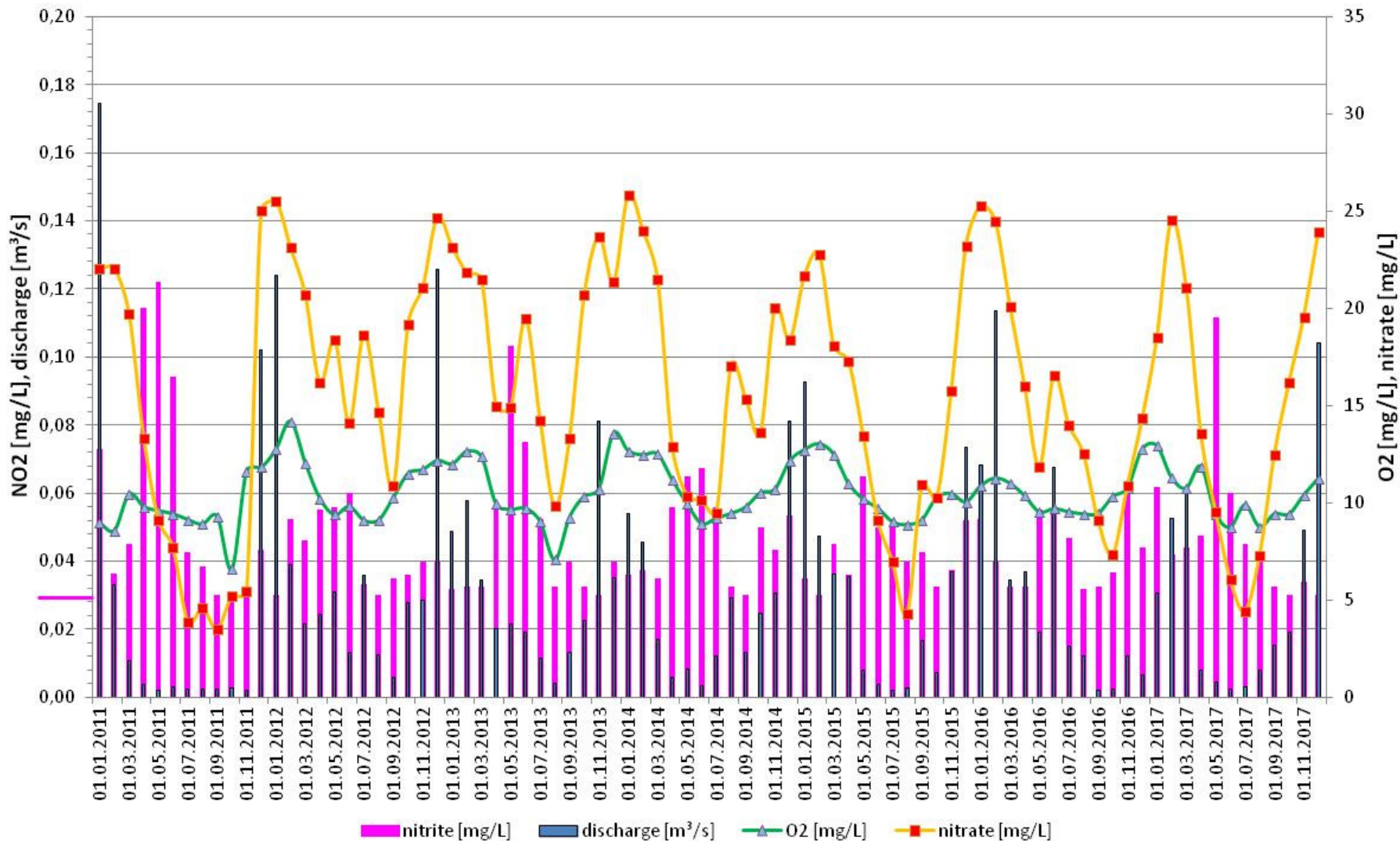
Data about the rivers and tributaries



Sampling point	Nb. of sample	Twater [°C]	conductivity [µS/cm]	pH	turbidity [FNU]	o-phosphate [mg/L]	nitrite [mg/L]	ammonium [mg/L]	nitrate [mg/L]	chloride [mg/L]
Springs	224	9,9	240	6,9	3,3	0,4	0,0	0,1	42,5	35,2
Maximum		18	874	8,0	87,3	15,3	0,7	3,9	102,4	194,0
Minimum		1,4	87	5,5	0,0	0,1	0,0	0,0	1,7	0,5
Mouths	110	10,0	201	7,5	10,7	0,6	0,1	0,2	26,0	23,1
Maximum		18,0	465	8,9	162	4,9	1,2	8,0	89,1	68,0
Minimum		-0,3	134	6,8	0,0	0,1	0,0	0,0	6,4	4,6

2017

Our - Moulin de Kalborn 2011-2017

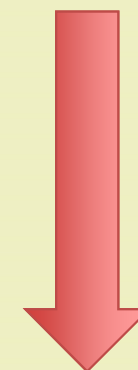
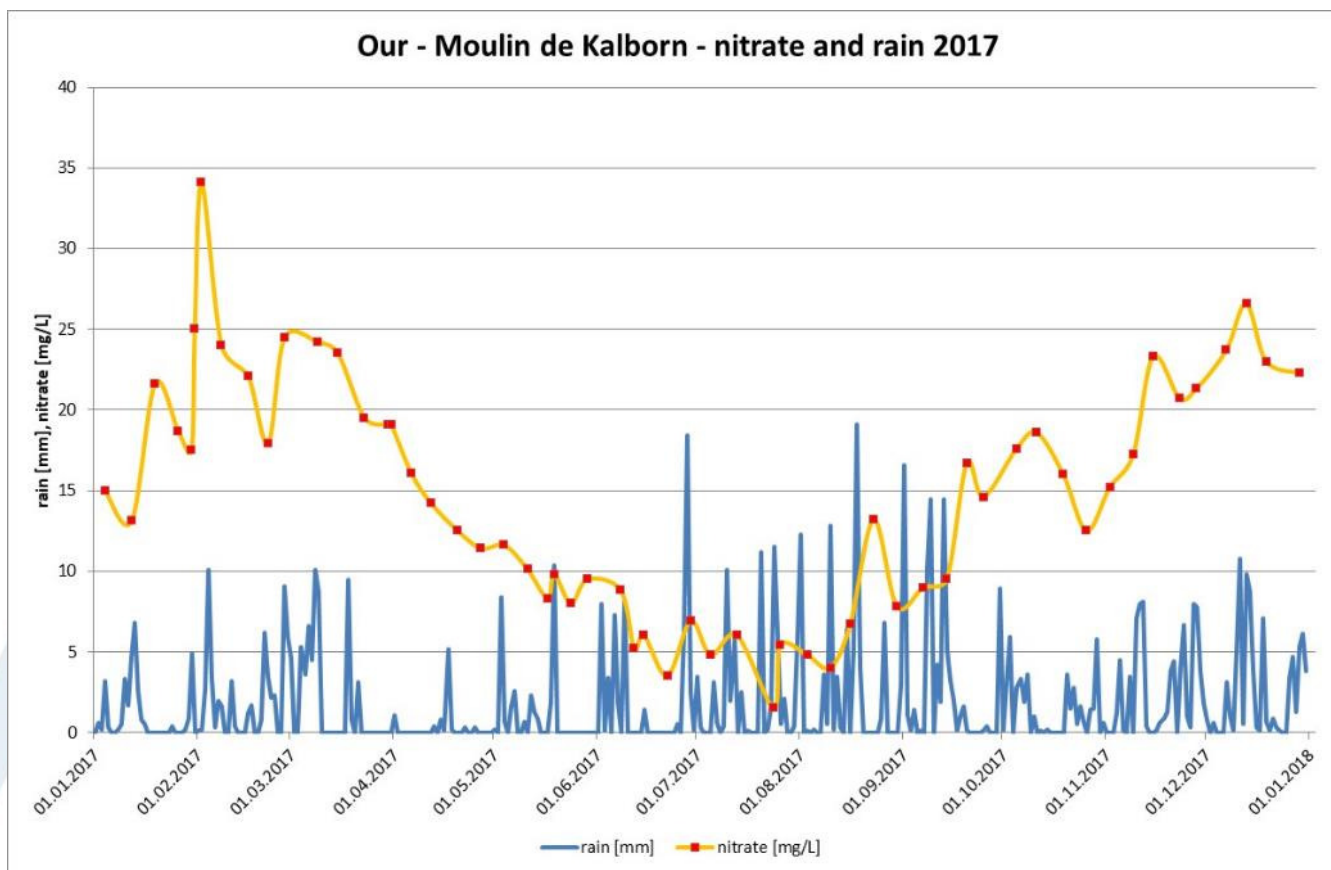


Nitrate in the river

Debit 4,1 m³/s

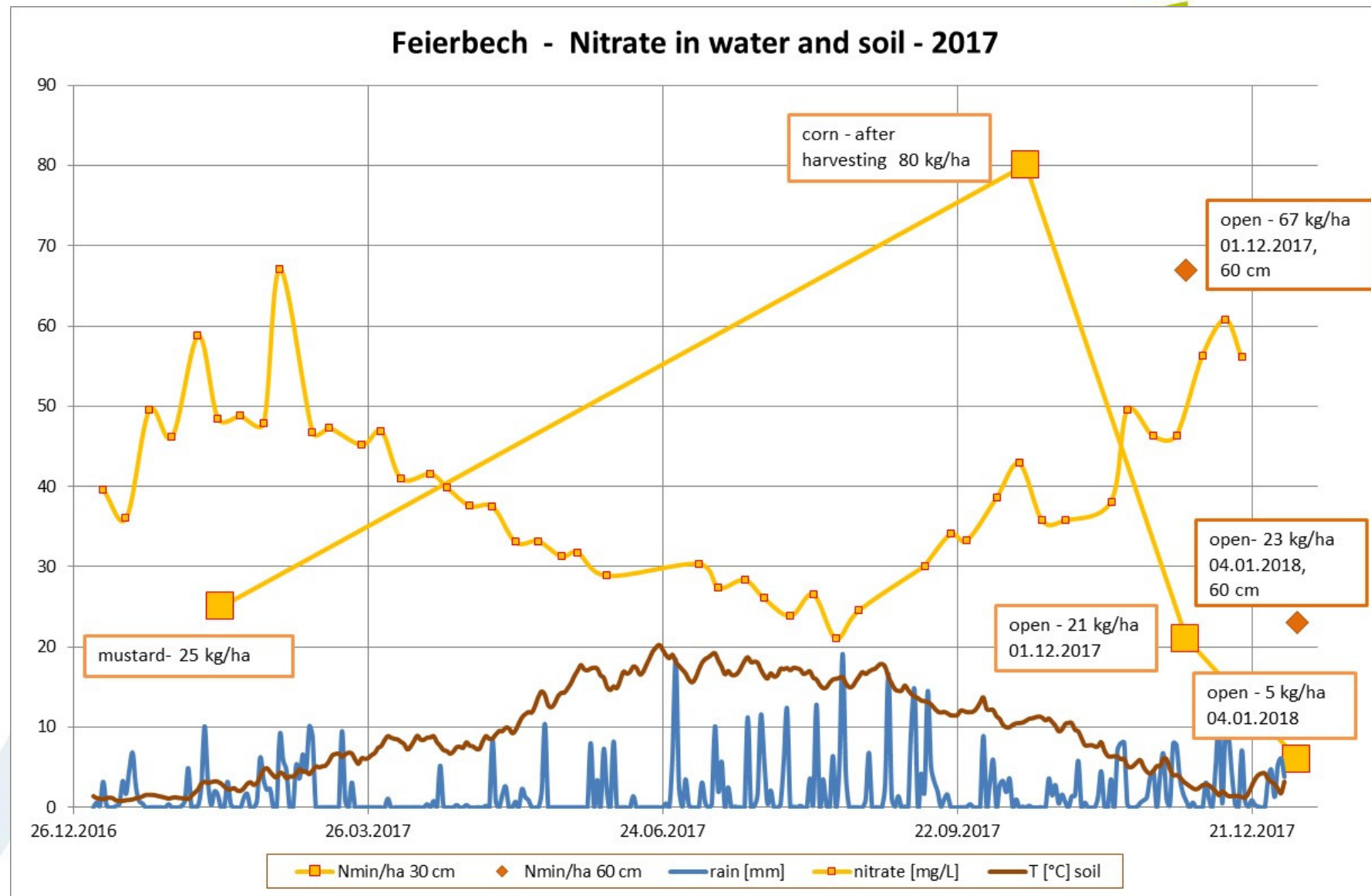
Nitrate concentration – 14,8 mg/L (average)

Total amount of N-NO₃ per year: 700 tons loss



170 kg N/ ha
–
4.100 ha
fertilized

Nitrate in water and soil – small catchment area

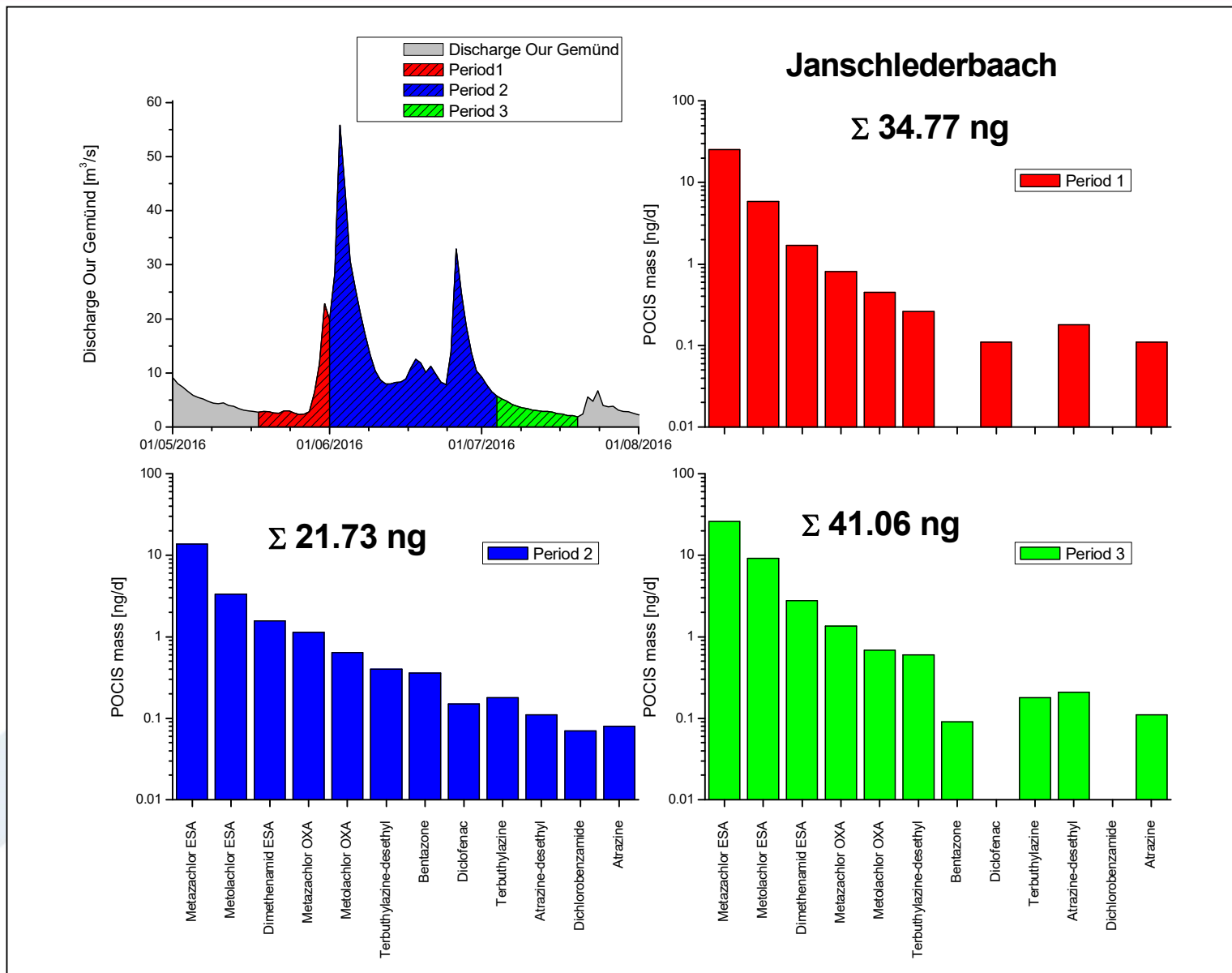


Pesticides in the rivers and tributaries

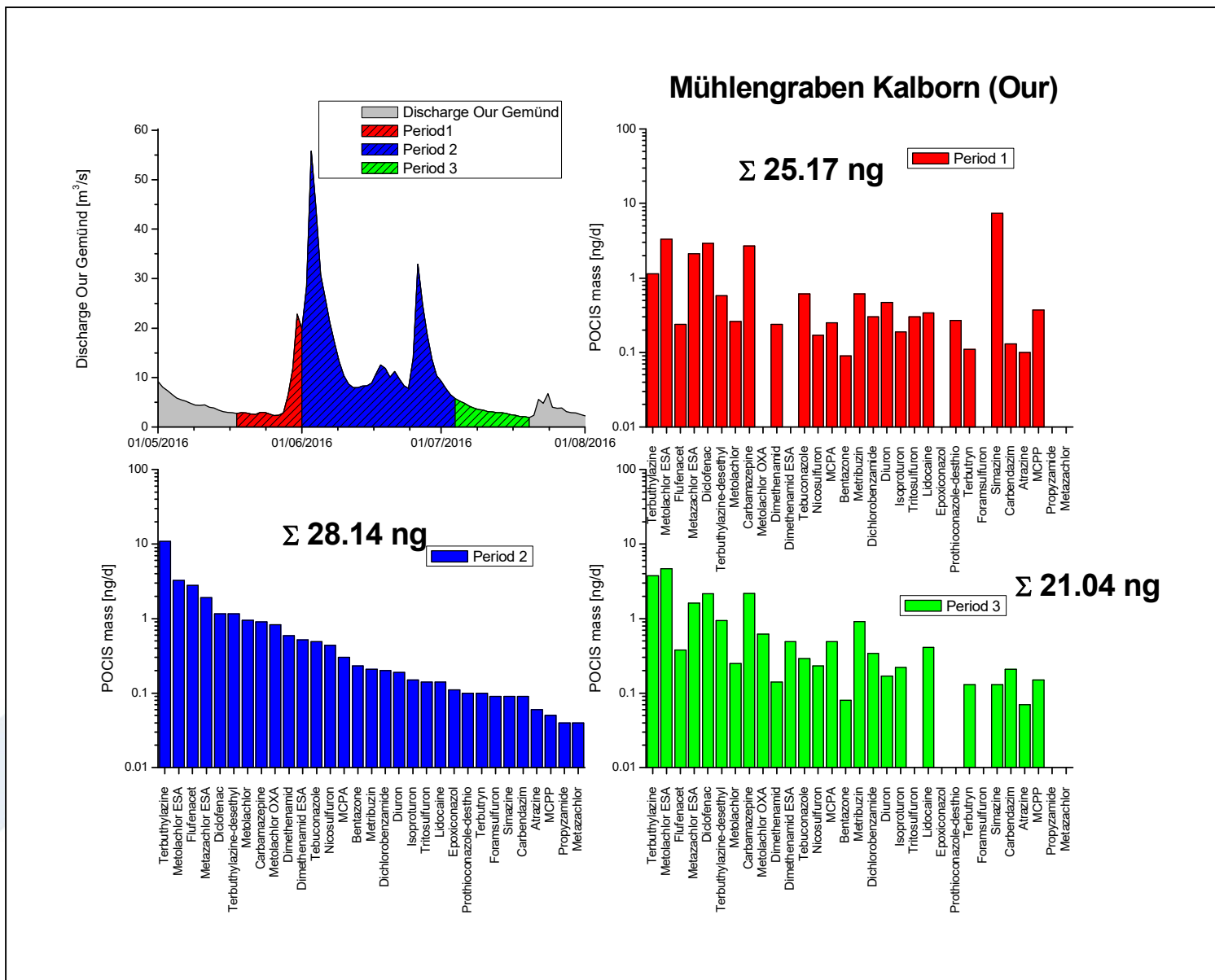


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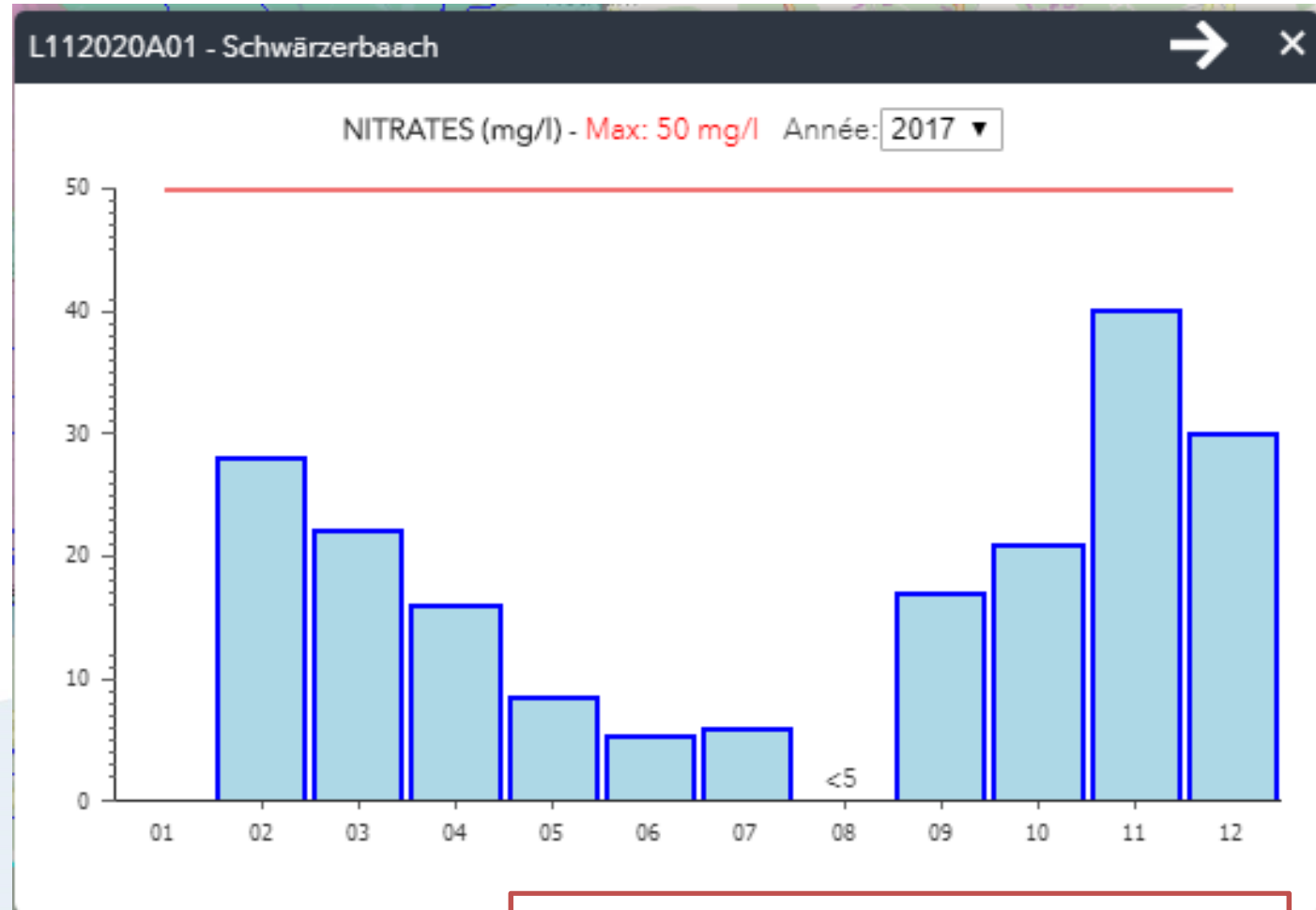
- **Project together with LIST (Tom Gallé)**
- **Sampling of drinking water supplier (catchment of Sauer)**
- **Annual sampling in different springs in the catchment area of Our and Sauer**



Pesticides and other compounds in the tributary Janschlederbaach



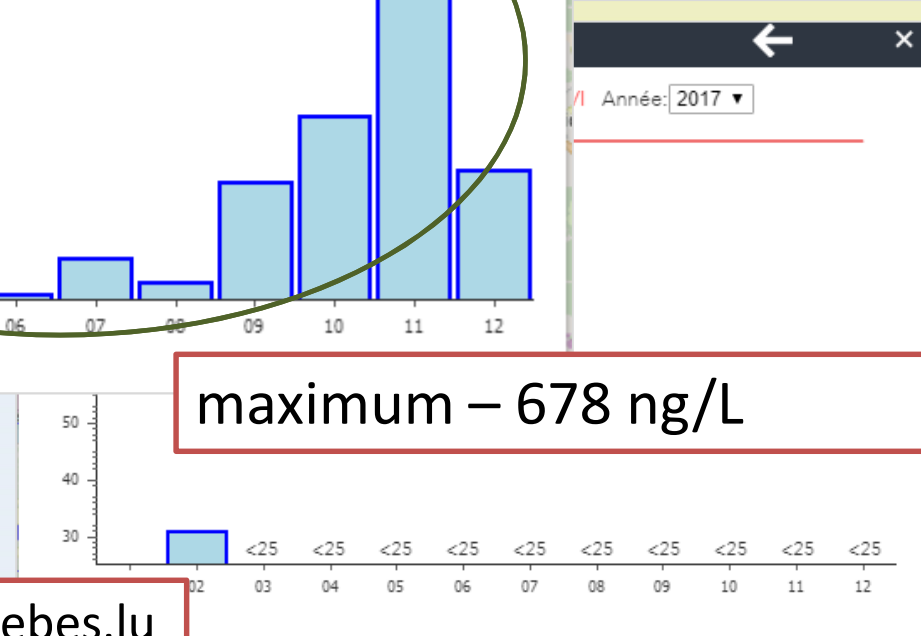
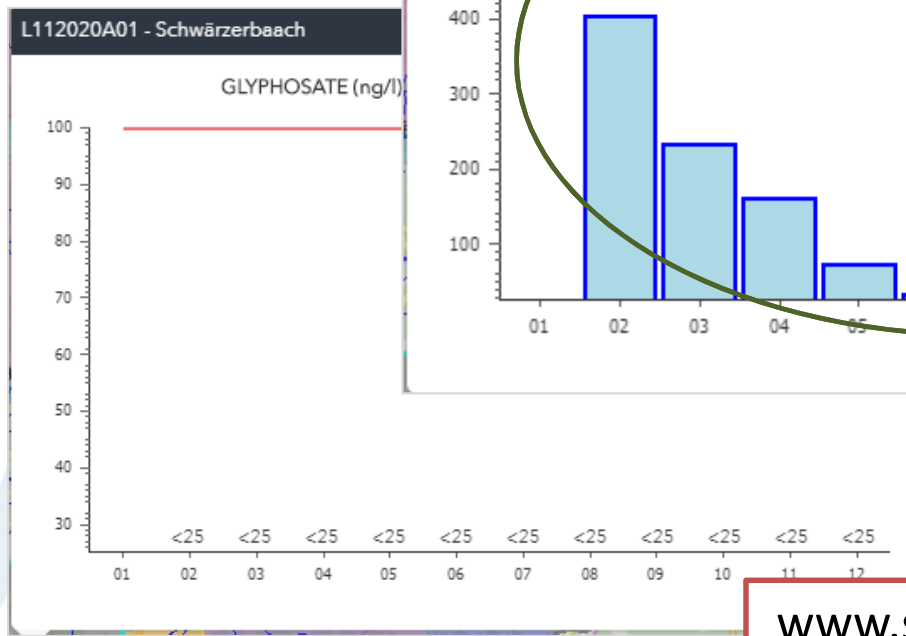
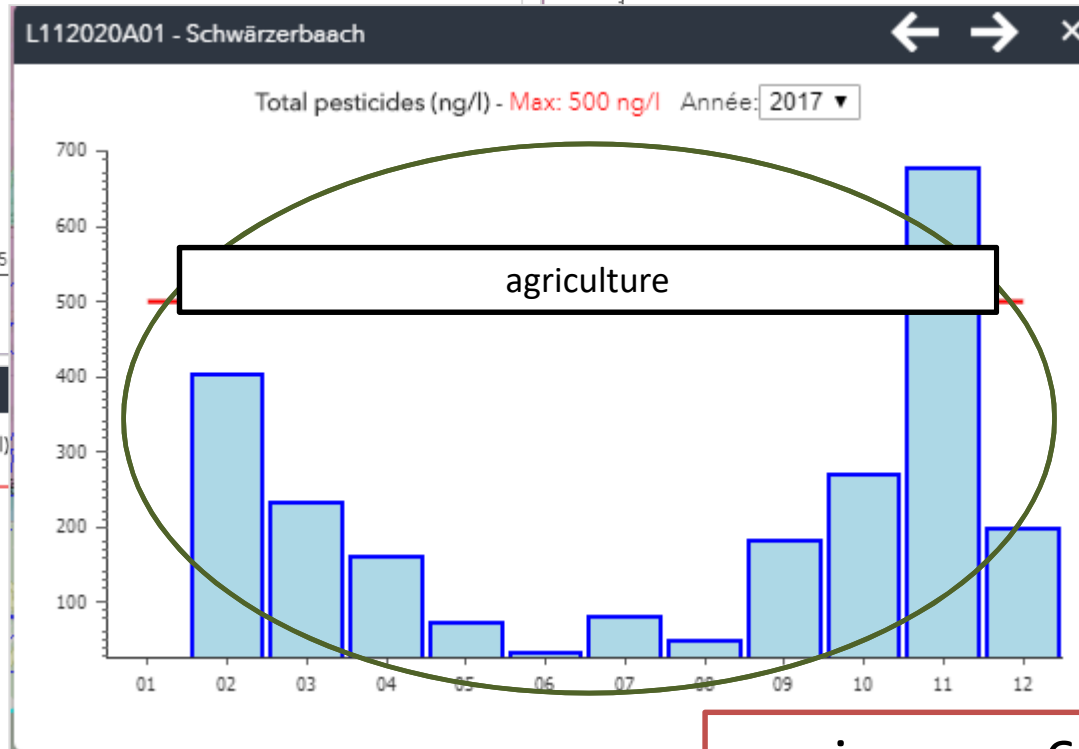
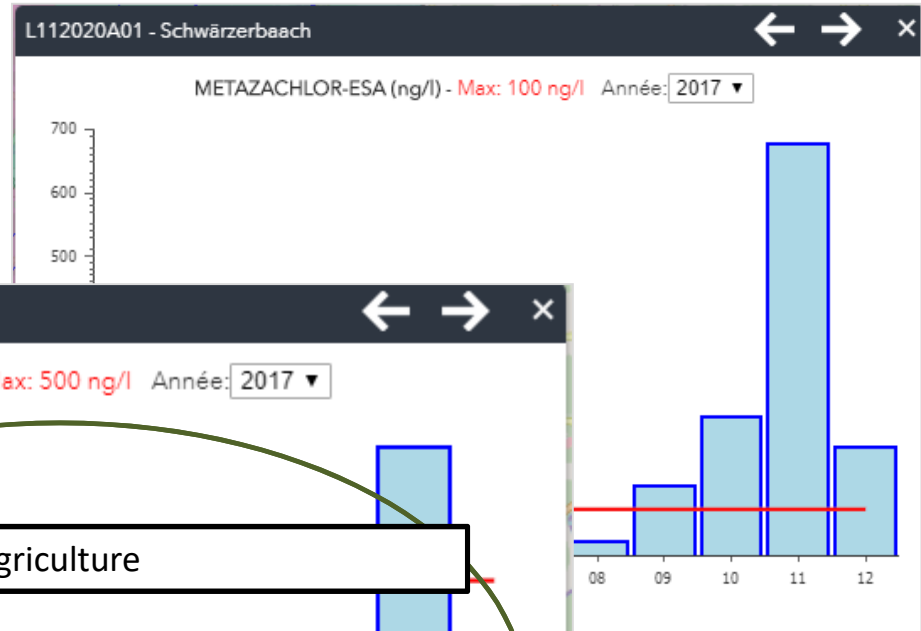
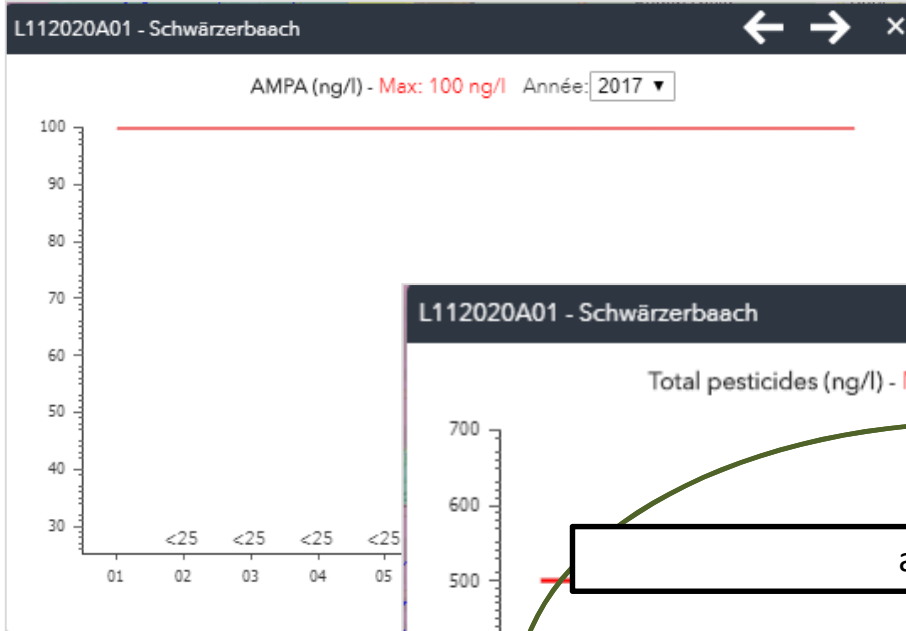
Pesticides and other compounds in the river Our



Single measurement once a month

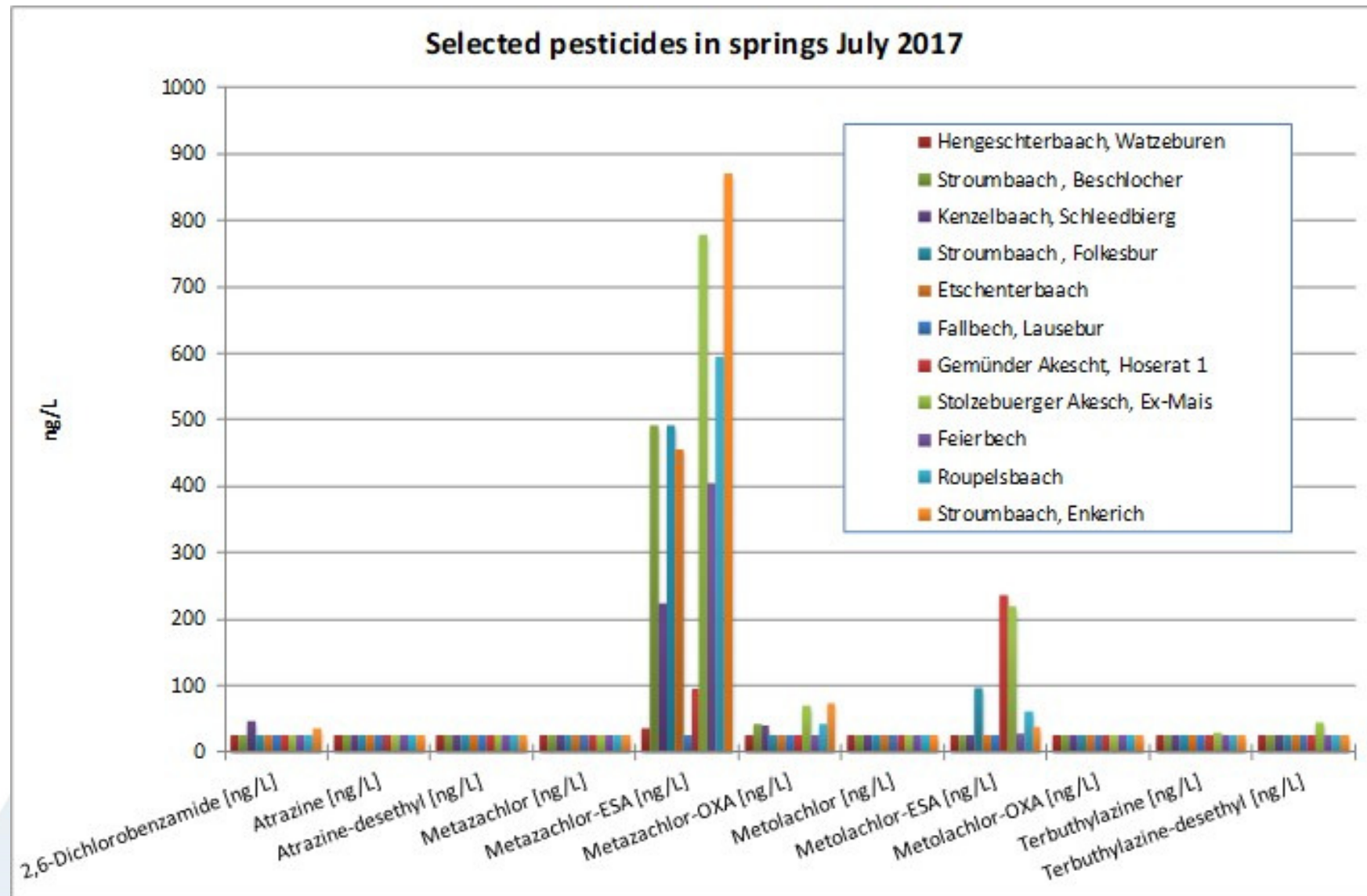
- No income of sewage water
- No intensive agriculture next to the stream

Schwärzerbaach (tributary of river Sauer)



maximum – 678 ng/L

www.sebes.lu



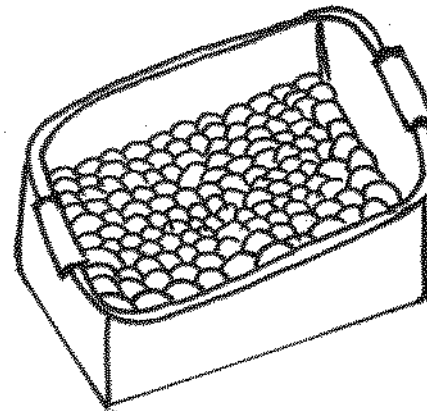
Pesticides and other compounds in springs



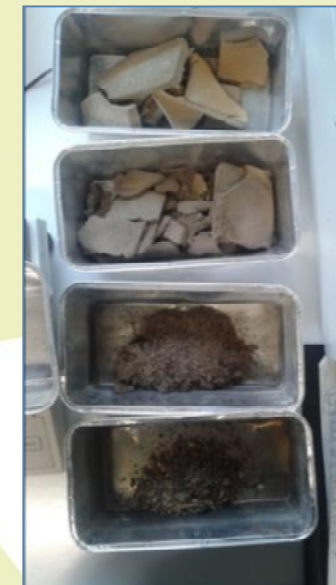
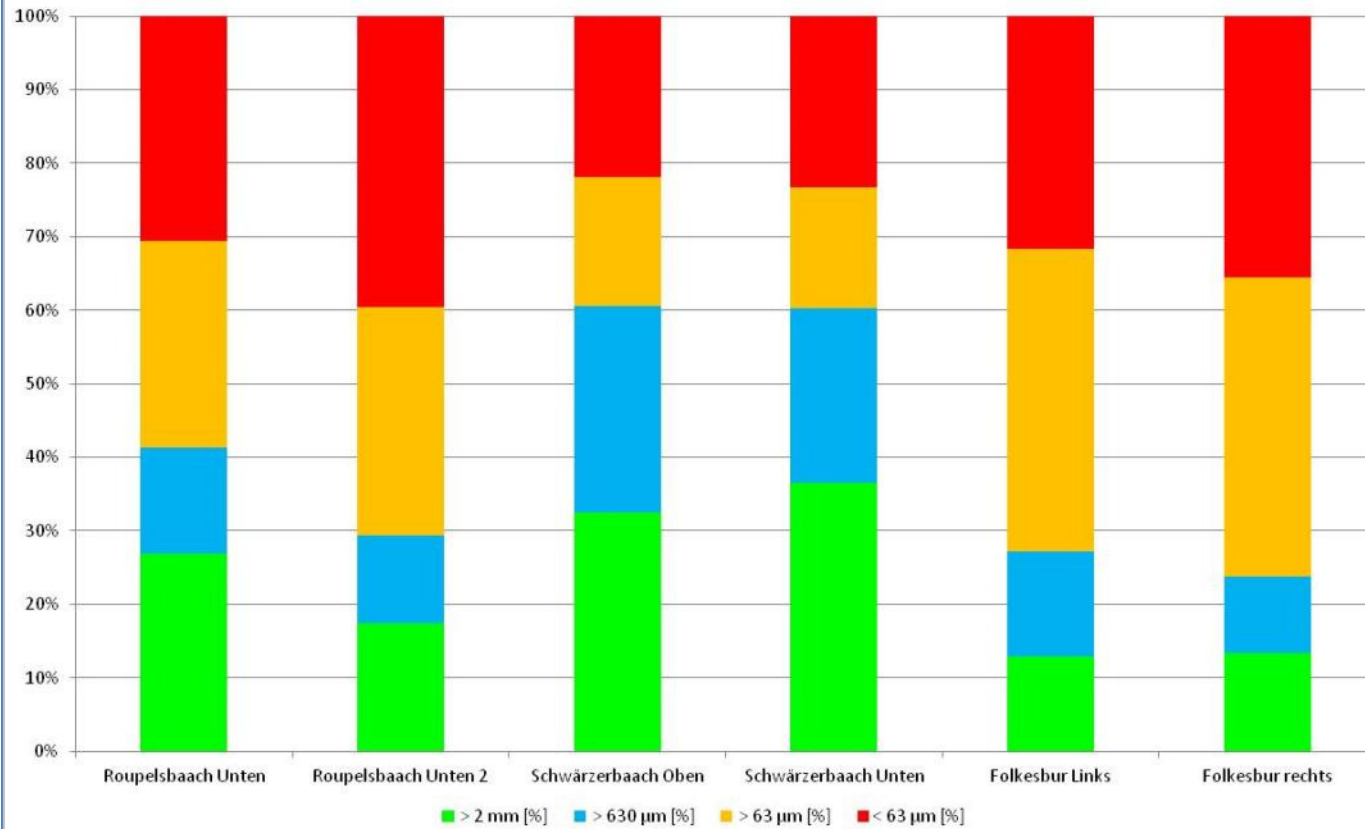
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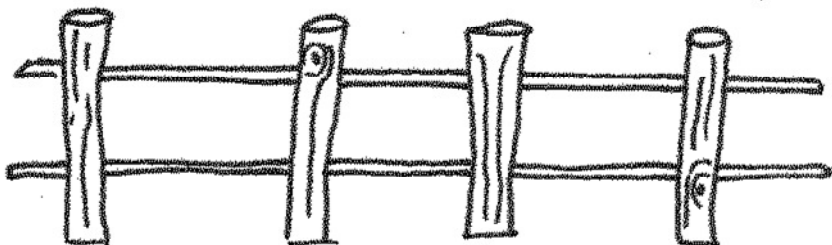
473

**Sediment traps
analysed**



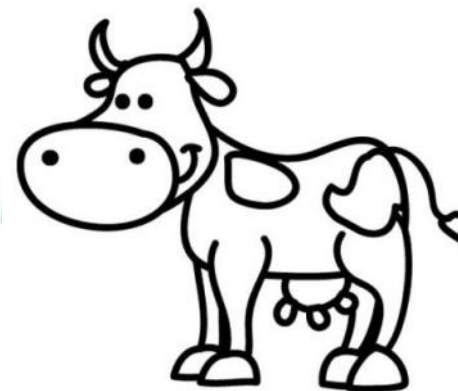
Distribution of different fractions in the sediment traps





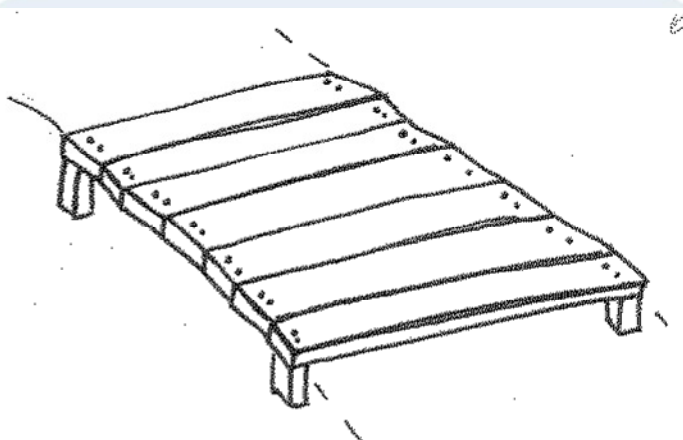
2.000 m

fences



8

cattle watering places



4

cattle passages

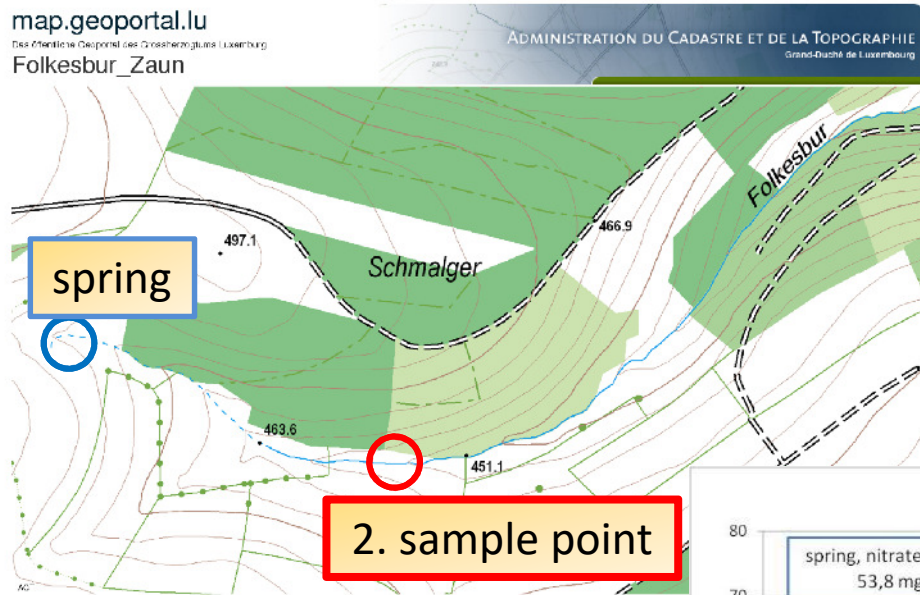


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Data about „Folkesbur“

map.geoportal.lu
Das Amtliche Geoportal des Grossherzogtums Luxemburg
Folkesbur_Zaun

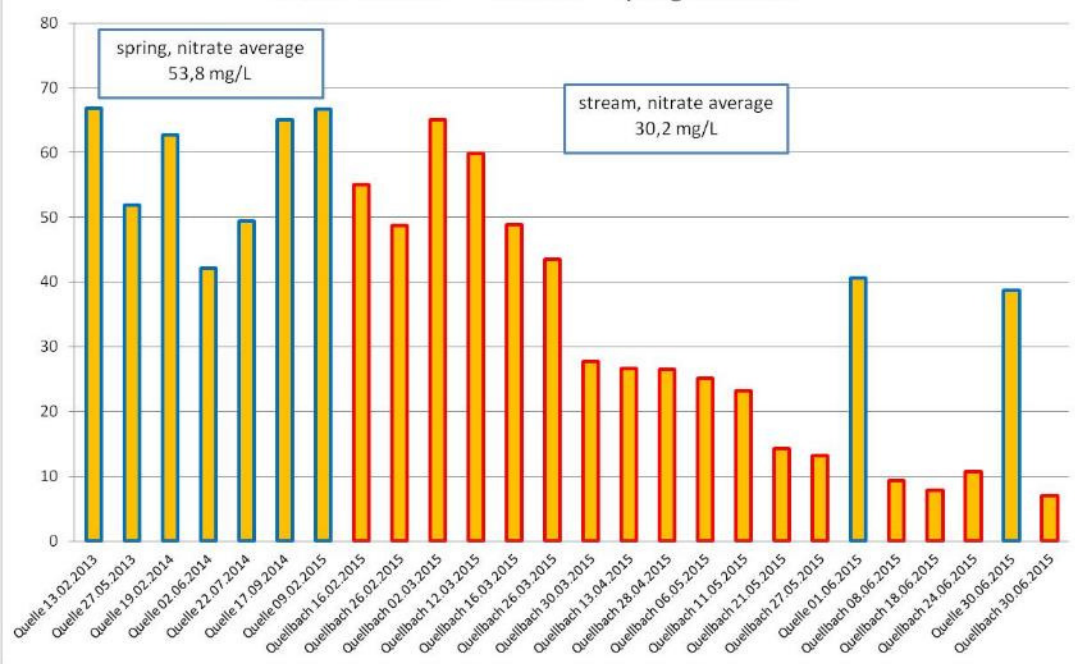


2. sample point

Distance : 250 m



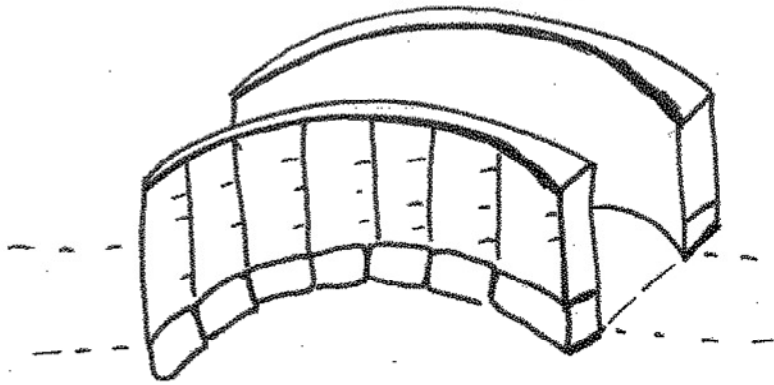
Nitrate in stream "Folkesbur" - spring and stream



High self purification capacity



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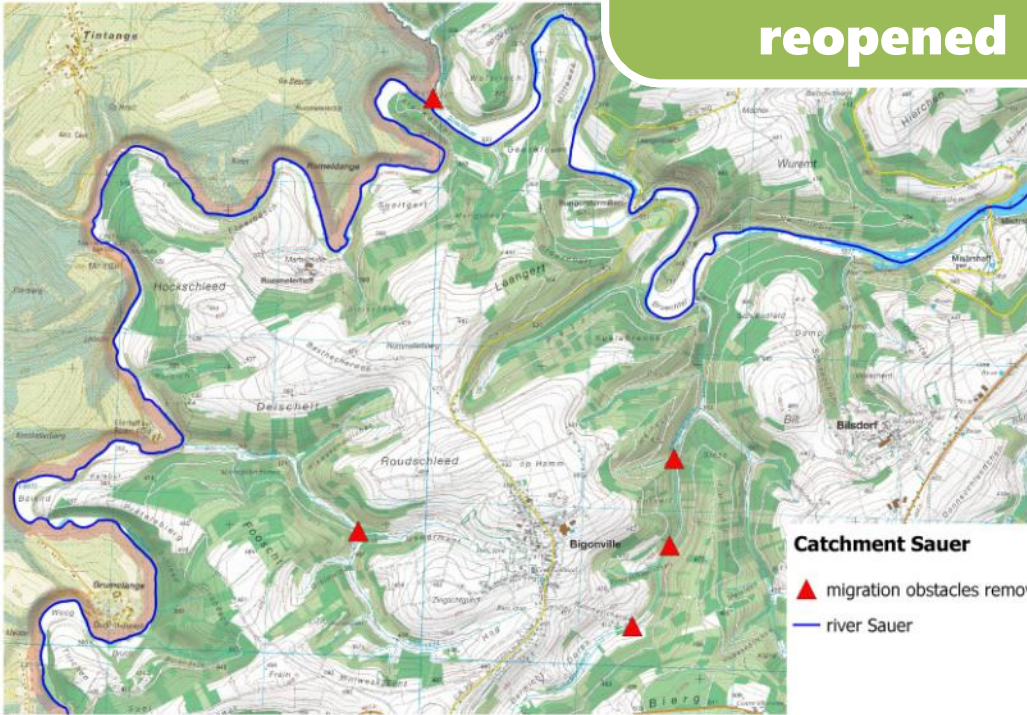


7

bridges built

- 7 obstacles were removed
- 1 ford restored

9,6 km
streams
reopened





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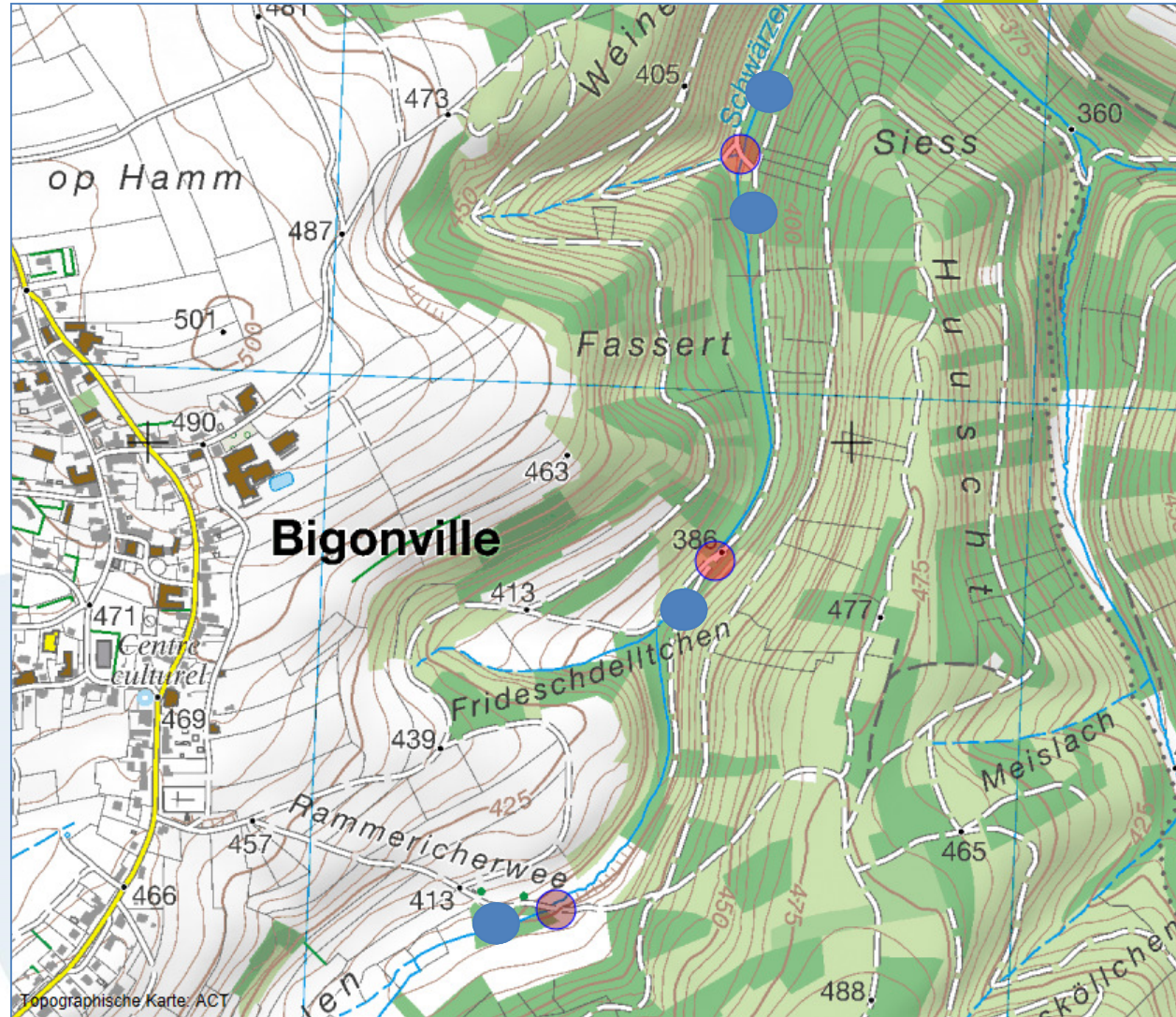






Electric fishing

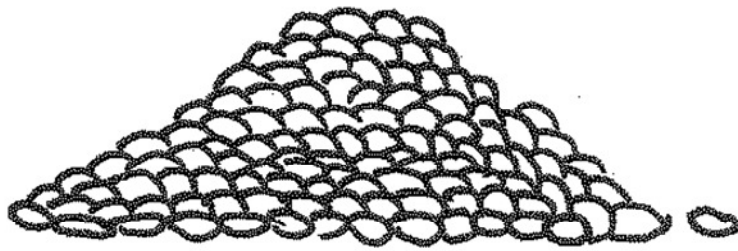
2016



Gravel input

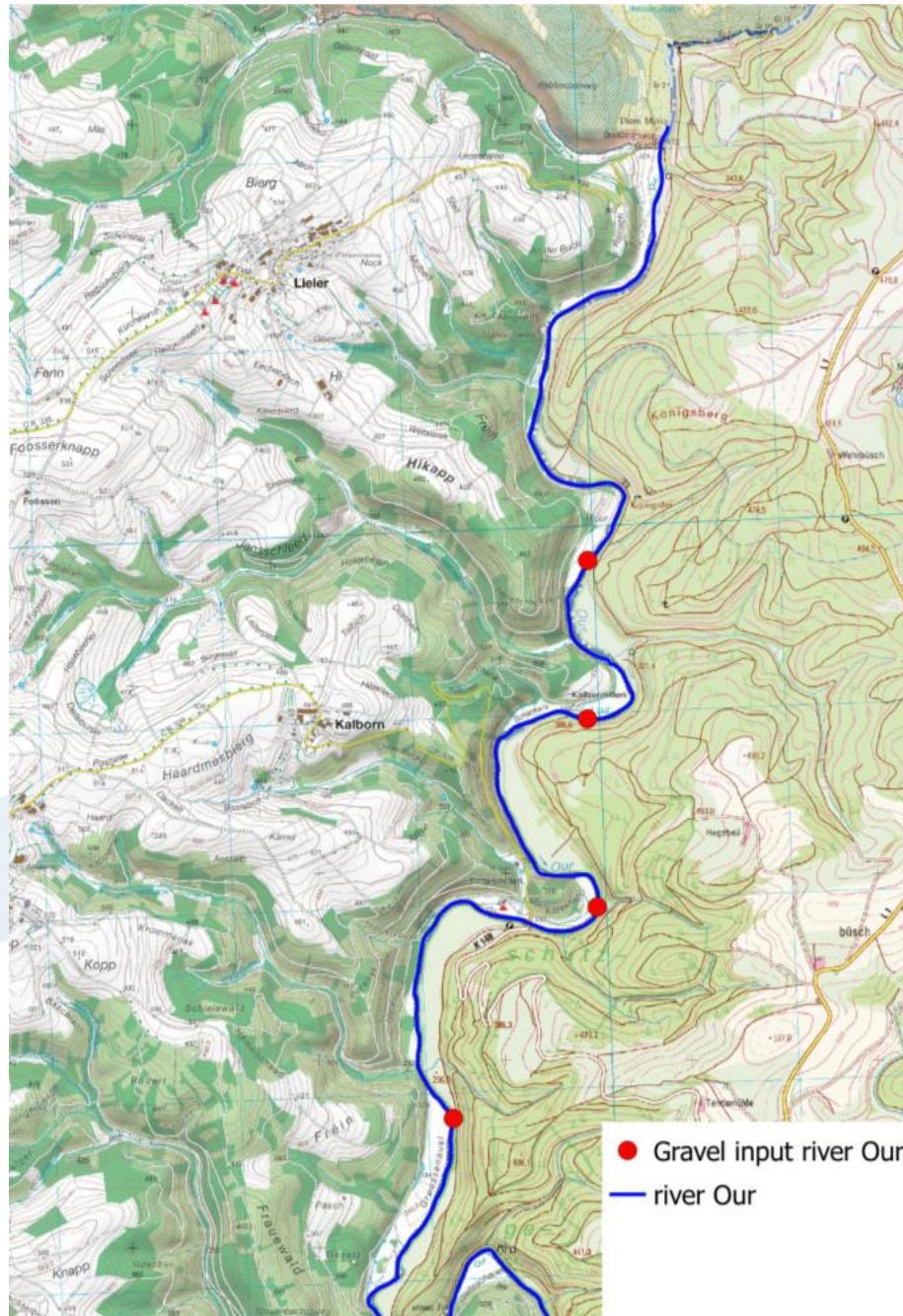


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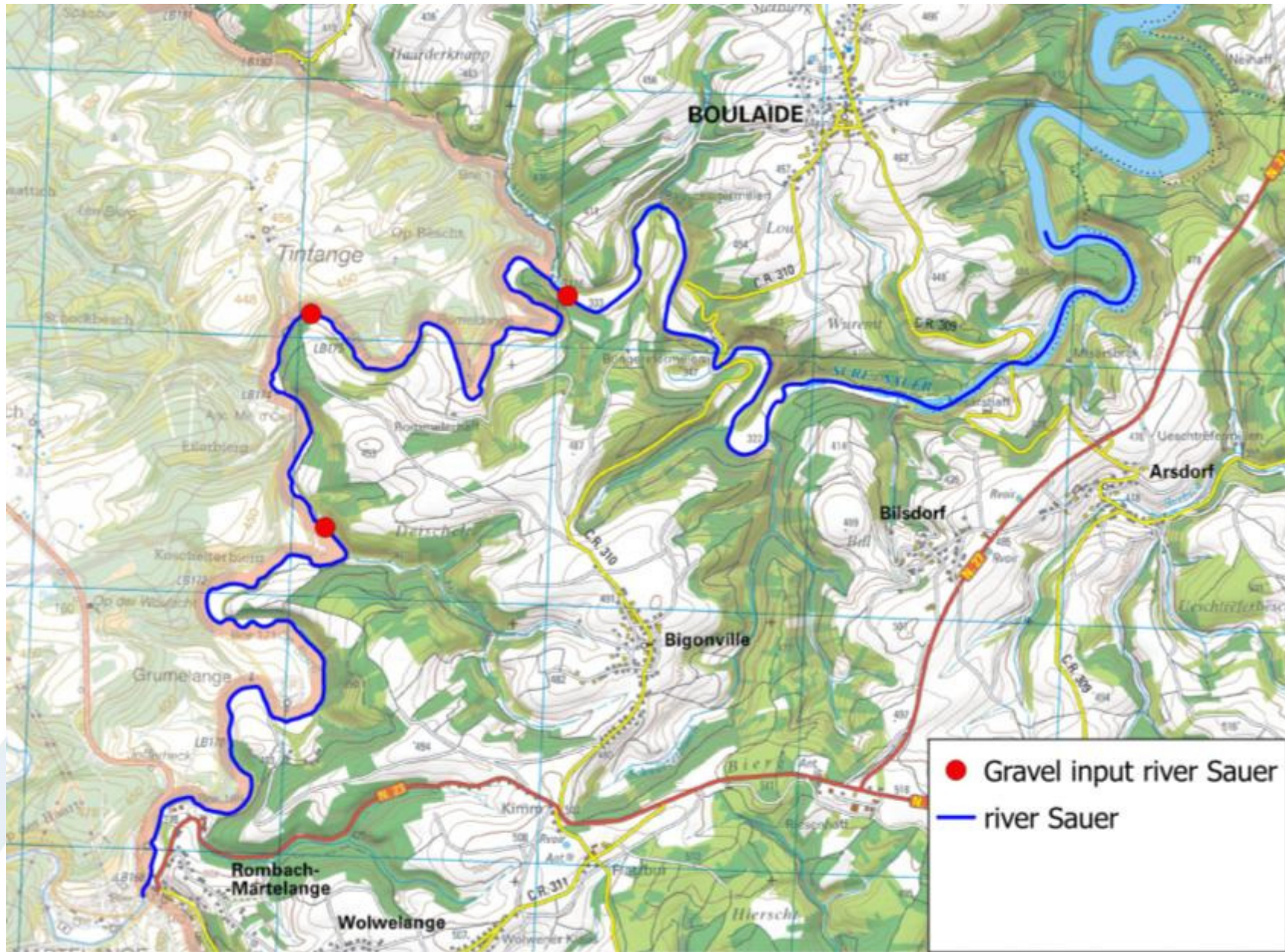


2.650 m²

new gravel banks



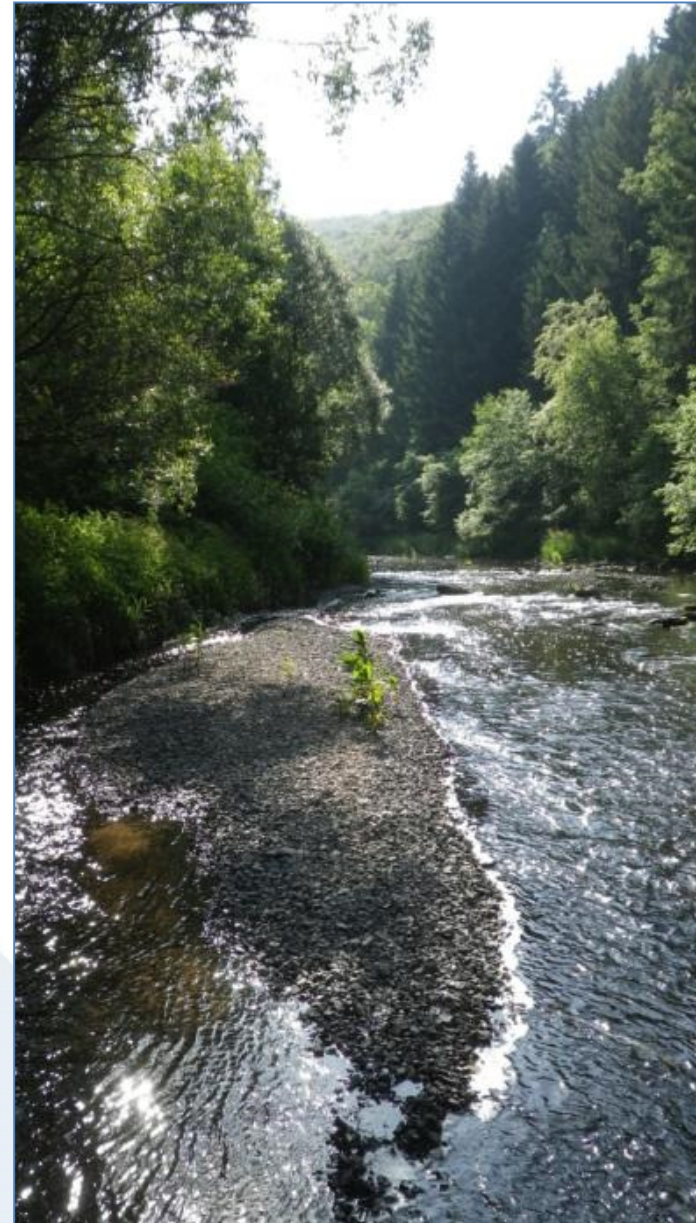
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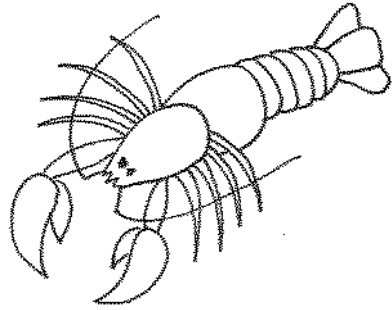




1.000 m² new bank



What else

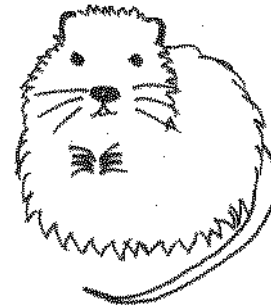


8.037

crayfish caught



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392

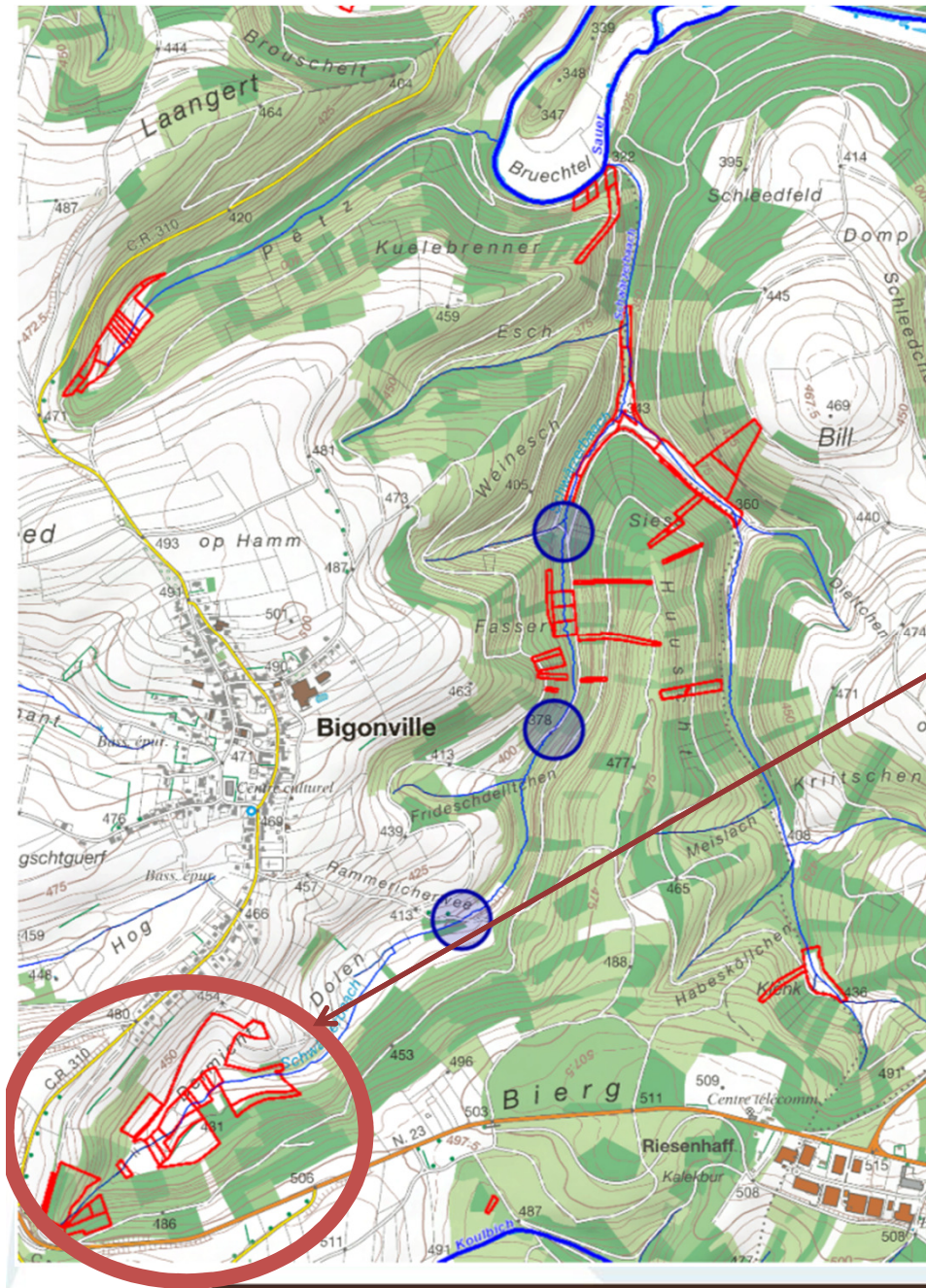
muskrats caught

20 ha

land bought



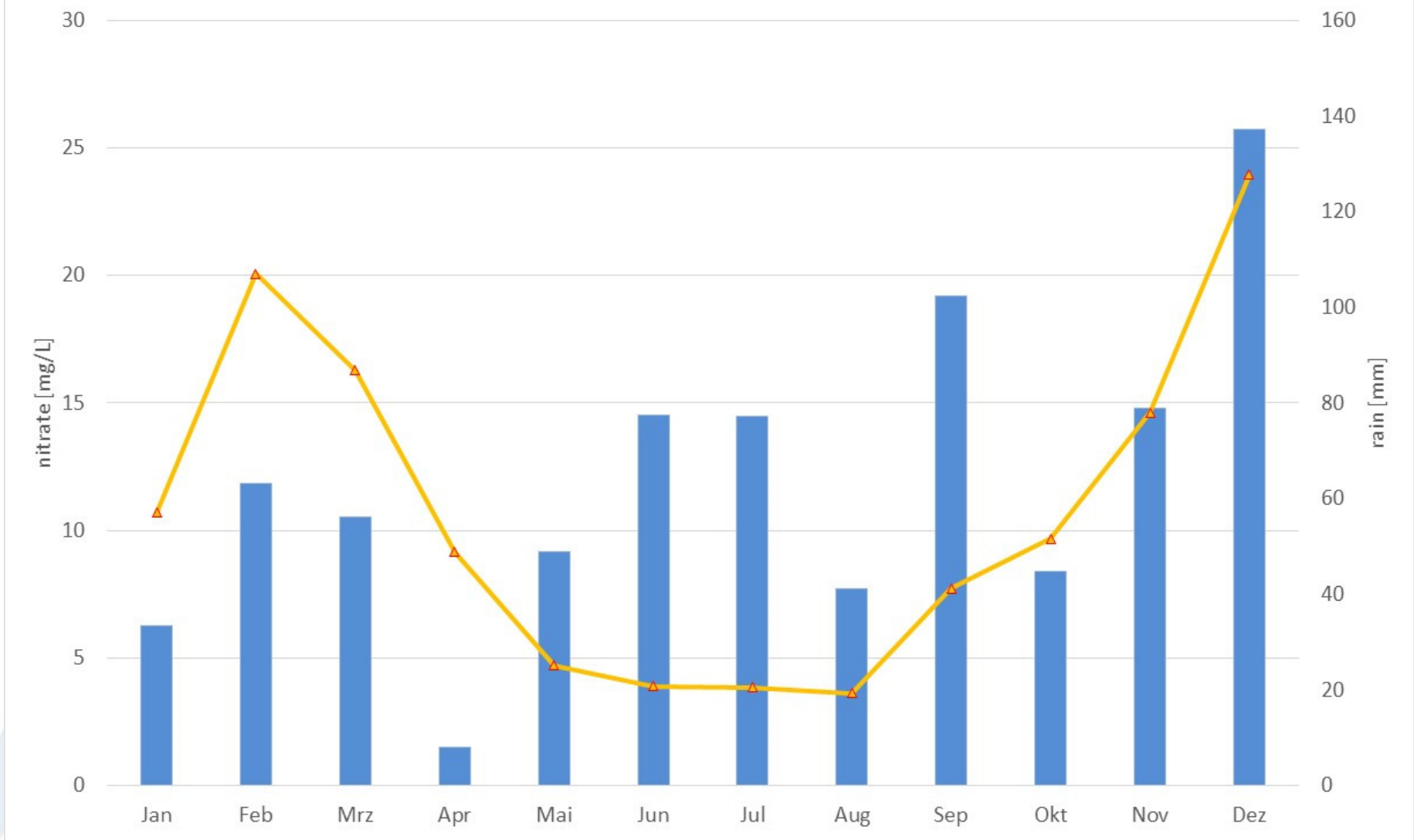


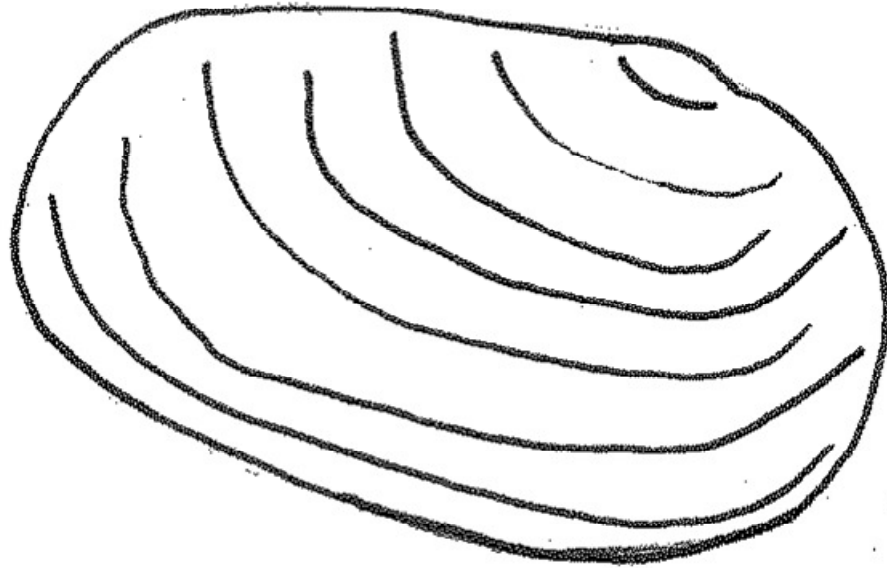


11 ha
land bought

Schwärzerbaach
Total length – 7,5 km
No income of sewage water
No intensive agriculture next to the stream

Nitrate - Schwärzerbaach 2017





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1.916

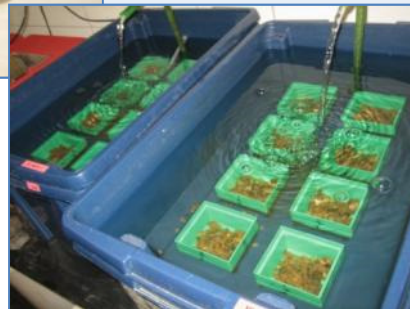
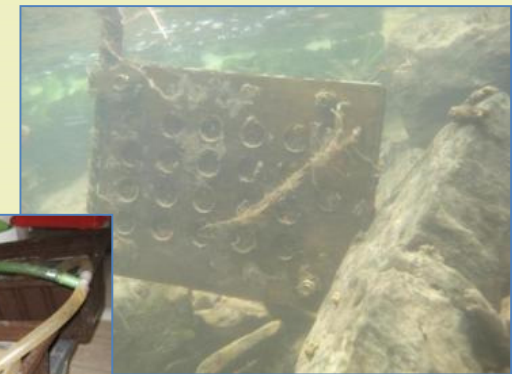
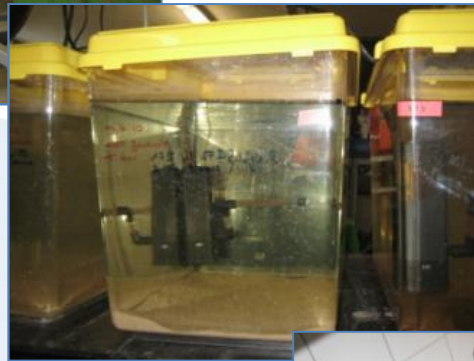
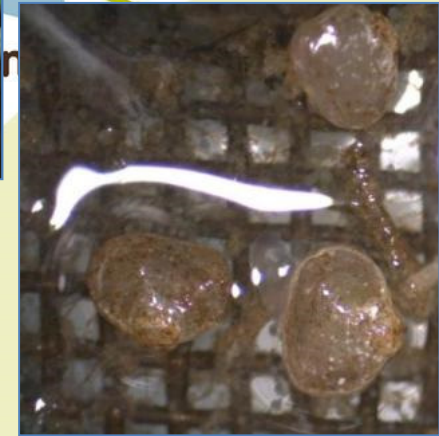
**mussels
released**

Mussel station





Rearing facility





Overview

1.000

***Phoxinus phoxinus* are infected**

Every year



20.000

***Unio crassus* are collected**

Every year



2.000

***Unio crassus* are released**

After 3 years

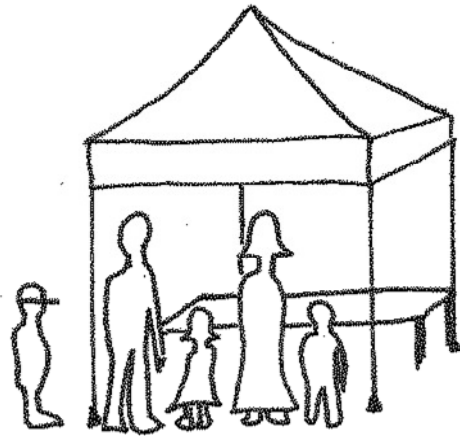




LifeUNIO

With the contribution of the LIFE financial instrument of the European Union





11

**information
events**



natur&emwelt



7.944

vistors



zesumme fir d'natur







<https://www.youtube.com/watch?v=8DLQ-S-S9-U&t=11s>

Conclusion

- **Monitoring of mussels**
 - Hotspots were found
 - Our – 15.000/ Sauer – 12.000
- **Monitoring of water quality**
 - High concentration of nitrate
 - Pesticides in springs and rivers
- **Measures**
 - Bridges, fences, ...
 - Everything takes time
- **Rearing**
- **Information**



Only what is known can be
protected

Impacts on *Unio crassus*



natur&emwelt

pollution with not treated waste water

crayfish

drugs

fine sediments

hydro peaking

pH value and oxygen peaking

microbiology

less amount of individuals



constructions at and in the river

increase of water temperature

less host fishes

pesticides

dry seasons – no dilution of pollution

muskrats

pollution with road waste water

Outlook

- Monitoring of mussels
 - *Unio crassus*
 - All other species in Luxembourg
- Management plan for
 - *Unio crassus*
 - All other species in Luxembourg
- Information
 - Water experience centre



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zesumme fir d'natur

ensemble pour la nature

together for nature

www.naturemwelt.lu

for your attention

<http://www.unio.lu>