Fondation
Hëllef fir d'Natur

LIFE05 NAT/L/000116

« Restauration des populations de moules perlières en Ardennes »

Technical Report: Action D5 Control and survey of the host fish population

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LE GOUVERNEMENT DU GRAND-DUCHÉ DE LUXEMBOURG
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1. Introduction

The fresh water pearl mussel *Margaritifera margaritifera* has a unique life cycle involving as intermediate host a salmonid fish species (Young & Williams, 1984). *M. margaritifera* is a dioecius species. The male release their sperm in late June into the water to inseminate the females. A few weeks later, depending on the water temperature, the eggs kept in a pouch on the gills of the mussel are fully developed and released as small larvae into the water. The larvae called glochidia have to encounter a suitable fish host where they fix themselves on the host's gill filaments (Hastie & Young, 2003). In European rivers the only suitable hosts known are the Atlantic Salmon *Salmo salar* and Brown Trout *Salmo trutta fario* (Hastie & Young, 2001).

Throughout Europe a dramatic decline in freshwater mussel is observed (Ziuganov et al., 1994). In most countries population are overaged and are, without conservation measures, no longer viable (reproducing). The major threats discussed are industrial and agricultural pollution, habitat degradation due to river engineering as well as low densities of fish hosts.

The only remaining population of fresh water pearl mussels in Luxembourg is located in the northern part of the country in the low mountain area called Ardennes. Here in the border river Our a typical nutrient-poor low mountain river the last old individuals of *M. margaritifera* can be found. As elsewhere in Europe the young age classes are missing and the population is about to disappear. Among many reasons also in this system a low host fish density during the last decades might be jointly responsible for the decline.

This technical report presents the first results of the Action D5 of the Life Project (LIFE 05 NAT / L / 00116) done on the tributaries of the river Our located in the project area. The ichthyofauna in the tributaries was analyzed by electric fishing giving a first inventory of the species present in these brooks. To check if the ongoing measures to restore the banks on the tributaries are positively affecting the fish fauna further electric fishing actions will occur in the brooks in the following years. Furthermore an overview of the ichthyofauna of the main stream Our is presented based on the results of electric fishing actions from the past.

2. Material and Method

Between the 15th of November and the 30th of December eleven tributaries (see Figure 1 and Table 1) from the river Our located in the project area were analyzed by electric fishing.
The electric fishing in all brooks, belonging to the epirhithral, was conducted by wading as the depth and wide of the streams were below 50cm respectively 3m. According to (Haunschmid et al., 2006) one anode was used and if possible in every stream three stretches of 50m length were analyzed covering the whole width of the stream. As equipment an ELT 62II GI –GC V135 carried as back pack was used.

All fish caught were transferred to a plastic tank containing river water and determined to species level. The individuals were measured (Total length) to the nearest mm and weighed to the nearest gram. Subsequently all fish were released in the same stretch where they had been caught. With the data collected the biomass/hectare as well as the number of individuals/hectare was calculated. The distribution of Brown trout into size classes was done according to Bagenal & Tesch, 1978.
In most brooks the pH, electric conductivity and water temperature was measured with a hand-held measuring device (WTW-350i).
In the following section the results are presented starting with the Reibaach located in the north of the Project Area close to the Belgium border (see Figure 1).

Table 1: Electric fishing dates in 2006

Date of fishing	Name of the brook	Number of stretch
30.12.2006	Reibaach	I/1
30.12.2006	Reibaach	I/2
06.12.2006	Reibaach	I/3
06.12.2006	Nivelsbaach	II/1
06.12.2006	Schelsbaach	III/1
01.12.2006	Jansschleederbaach	IV/1
01.12.2006	Jansschleederbaach	IV/2
01.12.2006	Jansschleederbaach	IV/3
01.12.2006	Roupelsbaach	V/1
06.12.2006	Feierbech	VI/1
06.12.2006	Feierbech	VI/2
06.12.2006	Feierbech	VI/3
06.12.2006	Hengeschterbaach	VII/1
06.12.2006	Hengeschterbaach	VII/2
15.11.2006	Stroumbaach	VIII/1
15.11.2006	Stroumbaach	VIII/2
15.11.2006	Stroumbaach	VIII/3
15.12.2006	Kenzelbaach	IX/1
15.12.2006	Kenzelbaach	IX/2
20.12.2006	Kenzelbaach	IX/3
20.12.2006	Ruederbaach	X/1
20.12.2006	Ruederbaach	X/2
20.12.2006	Ruederbaach	X/3
15.12.2006	Etschenterbaach	XI/1
15.12.2006	Etschenterbaach	XI/2
15.12.2006	Etschenterbaach	XI/3

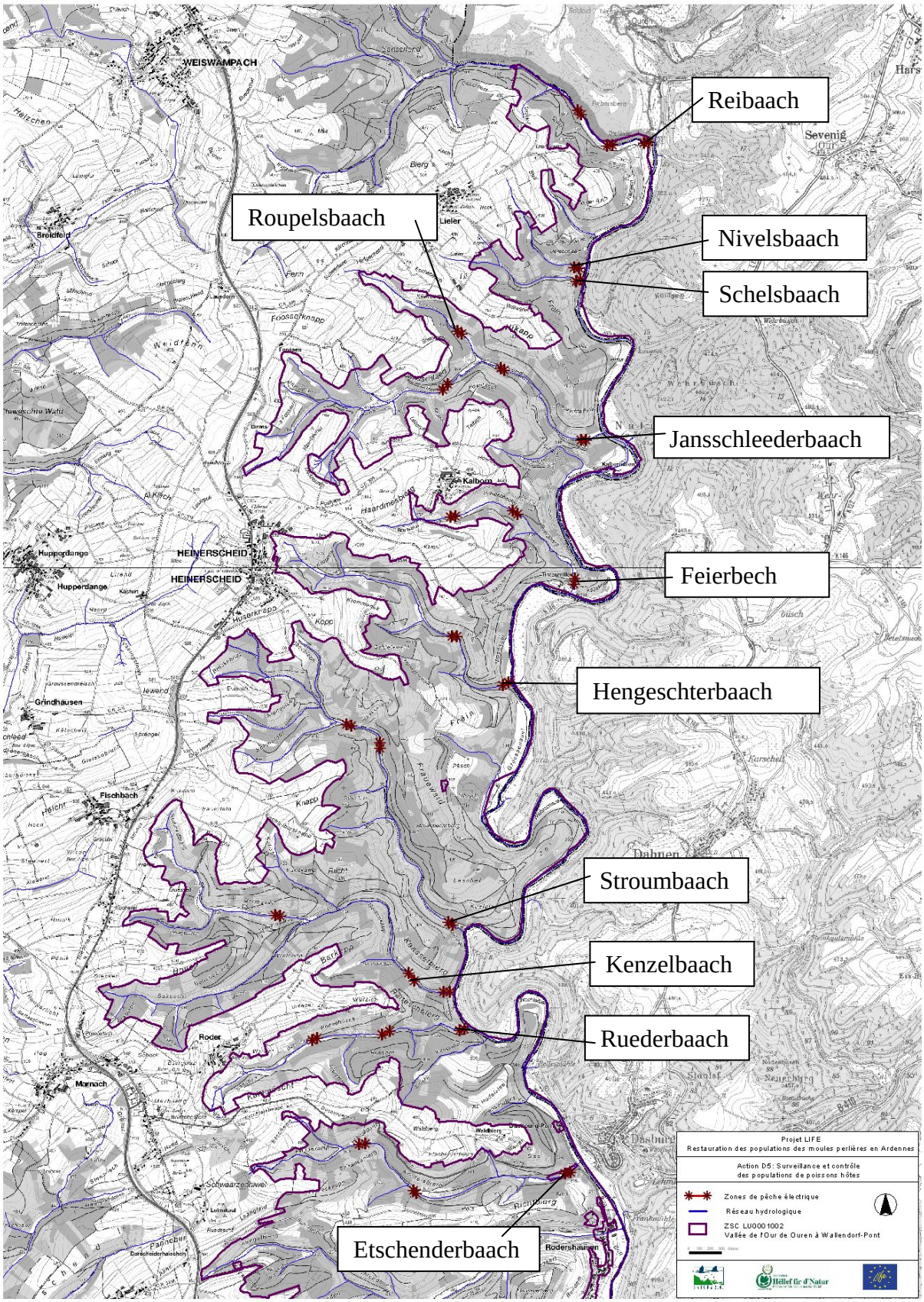

Figure 1: Location of the brooks with electric fishing actions in the project area

3 Results

3.1. Reibaach

Date of fishing:	06.12.2006 and 30.12.2006		
Zone:	Epirithral		
Number of stretches:	3 (I/1-I/3, location see Figure 2)		
Water level:	medium		
Water flow:	rapid		
pH:	Stretch 1: 7,37	Stretch 2: 7,46	Stretch 3: 8,16
Conductivity:	Stretch 1: 213 µS/cm	Stretch 2: 209 µS/cm	Stretch 3: 212 µS/cm
Temperature:	Stretch 1: 7,4˚C	Stretch 2: 8,1˚C	Stretch 3: 8,6˚C

Figure 2: Location of the 3 stretches (I/1-I/3 red lines) analyzed by electric fishing in the Reibaach

The Reibaach is still in a more or less natural condition and unspoilt. However in the upper two stretches the bank vegetation consisting of spruce is inadequate. In the lower stretch the riparian zone is covered with single trees and hedges (Figure 2). Two fish species belonging to the epirithral, Brown Trout (*Salmo trutta fario*) and Bullhead (*Cottus gobio*) were present in the Reibaach. Brown Trout was observed in all three stretches whereas the Bullhead was missing in the first section (I/1). Overall 96 Brown Trout, representing 86% of the ichthyhofauna and 16 Bullhead (14%) were caught in the Reibaach. Figure 3 shows the length distribution of all trout's from the Reibaach. The 0+ age classes are well represented suggesting that a natural reproduction took place in the year 2006. Trout's exceeding in length more than 20 cm were rare. The two larger individuals caught were probably migrating upstream to their spawning grounds. The length of *Cottus gobio* ranged between 2.5 and 10 cm indicating that this species also reproduces in this brook. The calculated biomass and density achieved 52 kg/hectare respectively 3733 Ind./hectare (see Table 2).

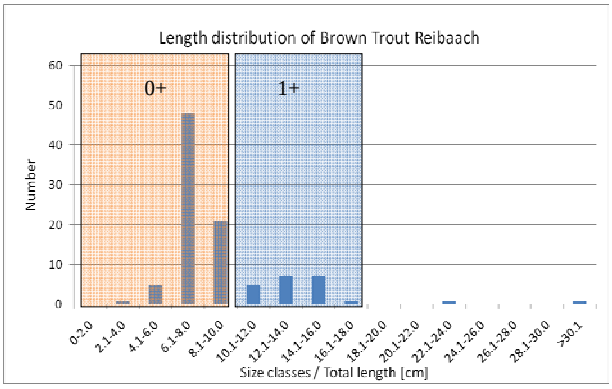

Figure 3: Length distribution of Brown Trout in the Reibaach. First year trout (O+) and second year trout (1+) are highlighted by colored rectangles.

3.2. Nivelsbaach

Date of fishing:	06.12.2006
Zone:	Epirithral
Number of stretches:	1 (II/1, location see Figure 4)
Water level:	medium
Water flow:	rapid
pH:	not measured
Conductivity:	not measured
Temperature:	not measured

Figure 4: Location of the 2 stretches (red lines) analyzed by electric fishing in the Nivelsbaach and Schelsbaach.

No fish species was detected by electric fishing in the Nivelsbaach. The stretch sampled was located above a pipe construction making the migration of fish species impossible (Figure 4, middle, right). The riparian zone of the section analyzed was planted with spruce (Figure 4, top, right). The stretch below the pipe construction was not analyzed. However as for the Schelsbaach (see 3.3) one can assume that in this section Brown Trout was present in low numbers.

3.3. Schelsbaach

Date of fishing:	06.12.2006
Zone:	Epirithral
Number of stretches:	1 (III/1, location see Figure 4)
Water level:	medium
Water flow:	turbulent
pH:	not measured
Conductivity:	not measured
Temperature:	not measured

Only one section localized downstream of a pipe construction was analyzed by electric fishing in the Schelsbaach. The only species detected was brown trout with 21 individuals. The length distribution is comparable to the Reibaach (Figure 5) and the 0+ and 1+ classes are well represented. In this small section of the Schelsbaach a natural reproduction took place in 2006. However in a test fishing above the pipe (Figure 4, bottom, right and bottom, left) no fish was caught. The calculated biomass and density for this section can be found in Table 2. The riparian zone of the section analyzed was planted with single trees and above the tube spruce and deciduous forest was present.

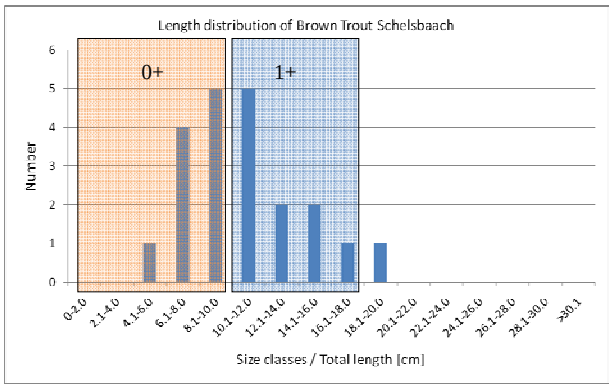

Figure 5: Length distribution of Brown Trout in the Schelsbaach. First year trout (O+) and second year trout (1+) are highlighted by colored rectangles.

3.4 Jansschleederbaach

Date of fishing:	01.12.2006		
Zone:	Epirithral		
Number of stretches:	3 (location see Figure 6)		
Water level:	medium		
Water flow:	rapid, turbulent		
pH:	Stretch 1: 7,78	Stretch 2: 7,60	Stretch 3: 7,71
Conductivity:	Stretch 1: 225 µS/cm	Stretch 2: 232 µS/cm	Stretch 3: 232 µS/cm
Temperature:	Stretch 1: 7,9˚C	Stretch 2: 8,3˚C	Stretch 3: 8,6˚C

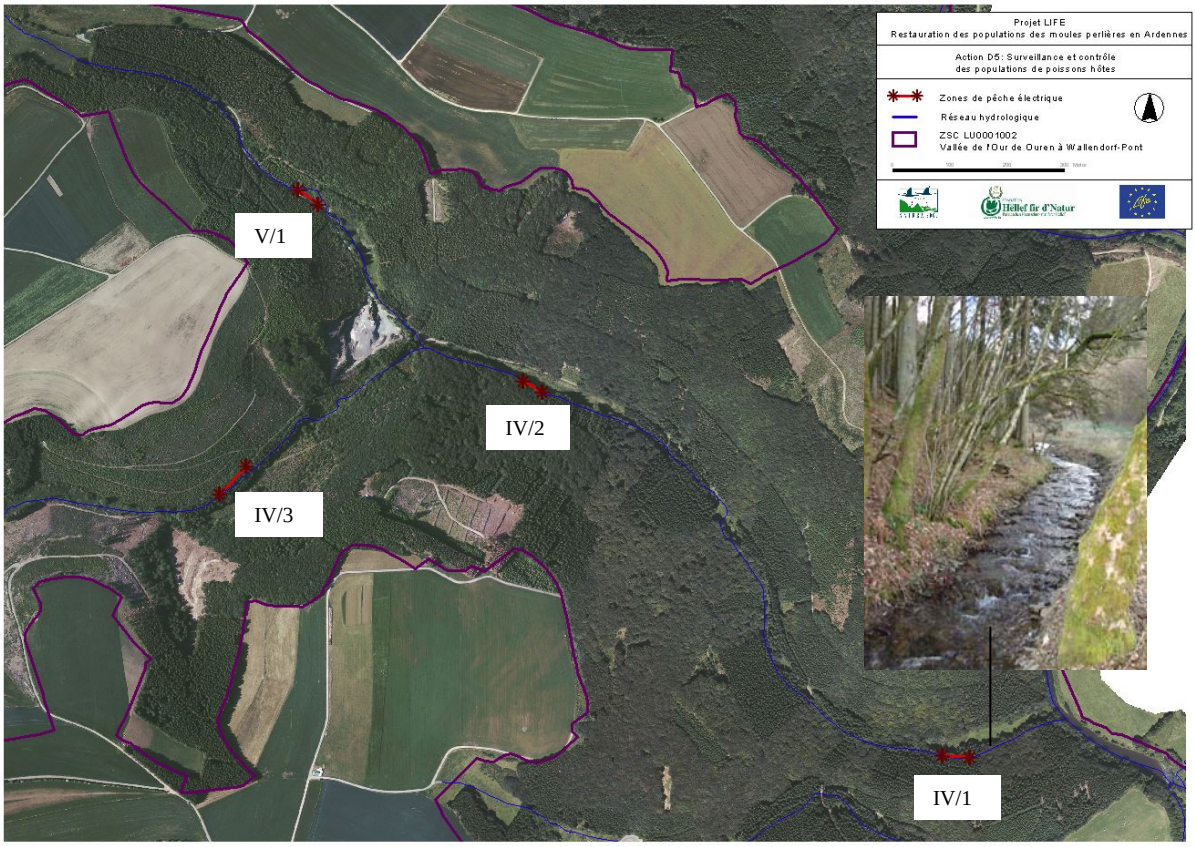

Figure 6: Location of the 4 stretches (red lines) analyzed by electric fishing in the Jansschleederbaach and Roupelsbaach.

In the Jansschleederbaach three stretches were analyzed by electric fishing (IV/1 – IV/3, see Figure 6). Overall 53 *Salmo trutta fario* were observed from which 44 were weighed and measured. The length of the trout ranged between 5.5 and 13 cm. As can be seen in Figure 7 the 0+ class was well represented whereas larger trout's were nearly completely missing. The high number of 0+ fishes indicates that a natural reproduction occurred in the winter 2005/2006 but it seems that the year before the reproduction success was much lower. Within the INTERREG III A-Program (NatOur) migrating obstacles were removed in this brook in 2005 and 2006. Thus before 2005 it was impossible or difficult for large trout to spawn in this brook,

which explains the missing 1+ class. Beside the trout population a local, reproducing population of *Cottus gobio* was also present in the Jansschleederbaach. Thirty-four individuals ranging between 3.5 and 8.5 cm were detected by electric fishing in the three stretches. Due to the presence of small fishes the biomass was with 17.6 kg/ha low but the number of individuals/hectare was with 4400 high (Table 2). In the sections analyzed the bank structure was natural and unspoilt however in section three the bank vegetation was with spruce again inadequate.

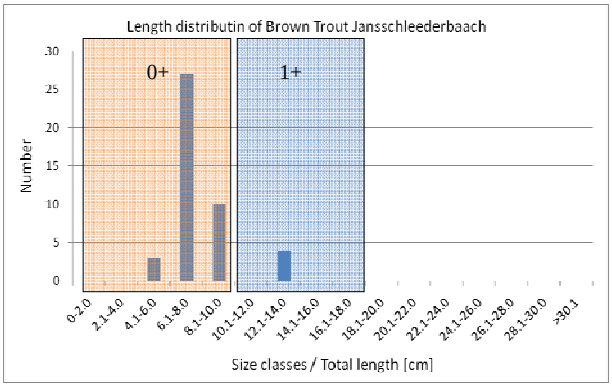

Figure 7: Length distribution of Brown Trout in the Jansschleederbaach.
First year trout (O+) and second year trout (1+) are highlighted
by colored rectangles.

3.5 Roupelsbaach

Date of fishing:	01.12.2006
Zone:	Epirithral
Number of stretches:	1 (location see Figure 6)
Water level:	medium
Water flow:	rapid, turbulent
pH:	Stretch 1: 7,61
Conductivity:	Stretch 1: 243 µS/cm
Temperature:	Stretch 1: 8,6˚C

The Roupelsbaach is a tributary of the Jansschleederbaach. Until 2006 a large pipe construction in the area of the confluence inhibited fish migration from the Jansschleederbaach into the Roupelsbaach. This obstacle was removed in 2006 within the INTERREG III A-Program (NatOur). Thus, it is not surprising that only seven Brown Trout were observed in the section V/1 (see Figure 6). Before 2006 no reproduction occurred in the Roupelsbaach as the length distribution (ranging between 11.5 and 17 cm) of the trout caught in this section indicates. The Bullhead was missing in this sector. The riparian vegetation and the bank structure were more or less natural.

3.6 Feierbech

Date of fishing:	06.12.2006
Zone:	Epirithral
Number of stretches:	3 (location see Figure 6)
Water level:	medium
Water flow:	rapid
pH:	Stretch 1: 7,67
Conductivity:	Stretch 1: 211 µS/cm
Temperature:	Stretch 1: 9,1˚C

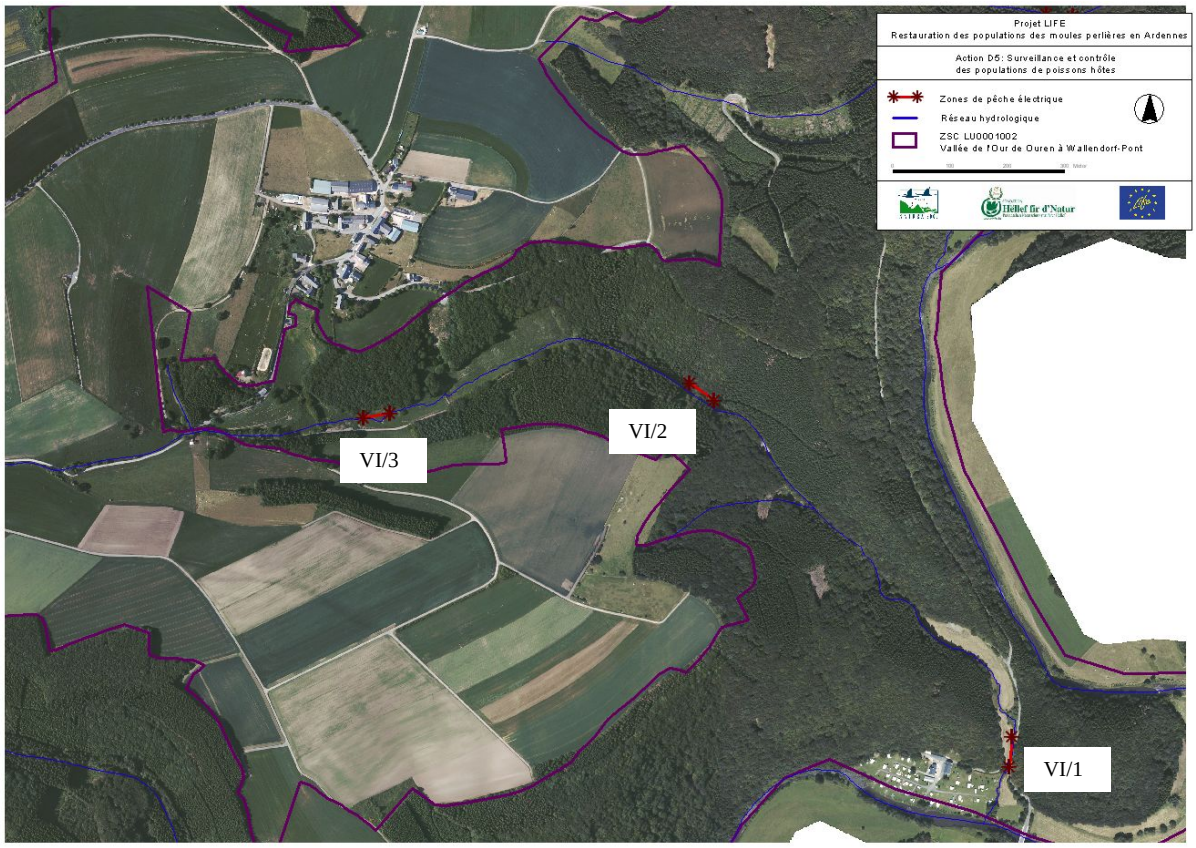

Figure 8: Location of the 3 stretches (red lines) analyzed by electric fishing in the Feierbech

The Feierbech was used as runoff ditch for the waste water from the village Kalborn. In 2006 the sewage treatment plant Tintesmühle started operating and the waste water is now directed by pipes to the station. Furthermore a pipe construction is located downstream near the camping site Tintesmühle close to the confluence with the river Our. Consequently, considering all these problems, it is not surprising that no fish species were caught in this brook in the three sections analyzed (see Figure 8). However it is also known from local people (personal communication Armand Dichter) that the Feierbech sometimes runs dry during the summer. It is therefore difficult to judge the state of the Feierbech as fish habitat at the moment, as no data from former electric fishing actions are available.

3.7 Hengeschterbaach

Date of fishing:	06.12.2006
Zone:	Epirithral
Number of stretches:	2 (VII/1 and VII/2, location see Figure 9)
Water level:	medium
Water flow:	rapid
pH:	Stretch 2: 7,74
Conductivity:	Stretch 2: 205 µS/cm
Temperature:	Stretch 2: 8,4˚C

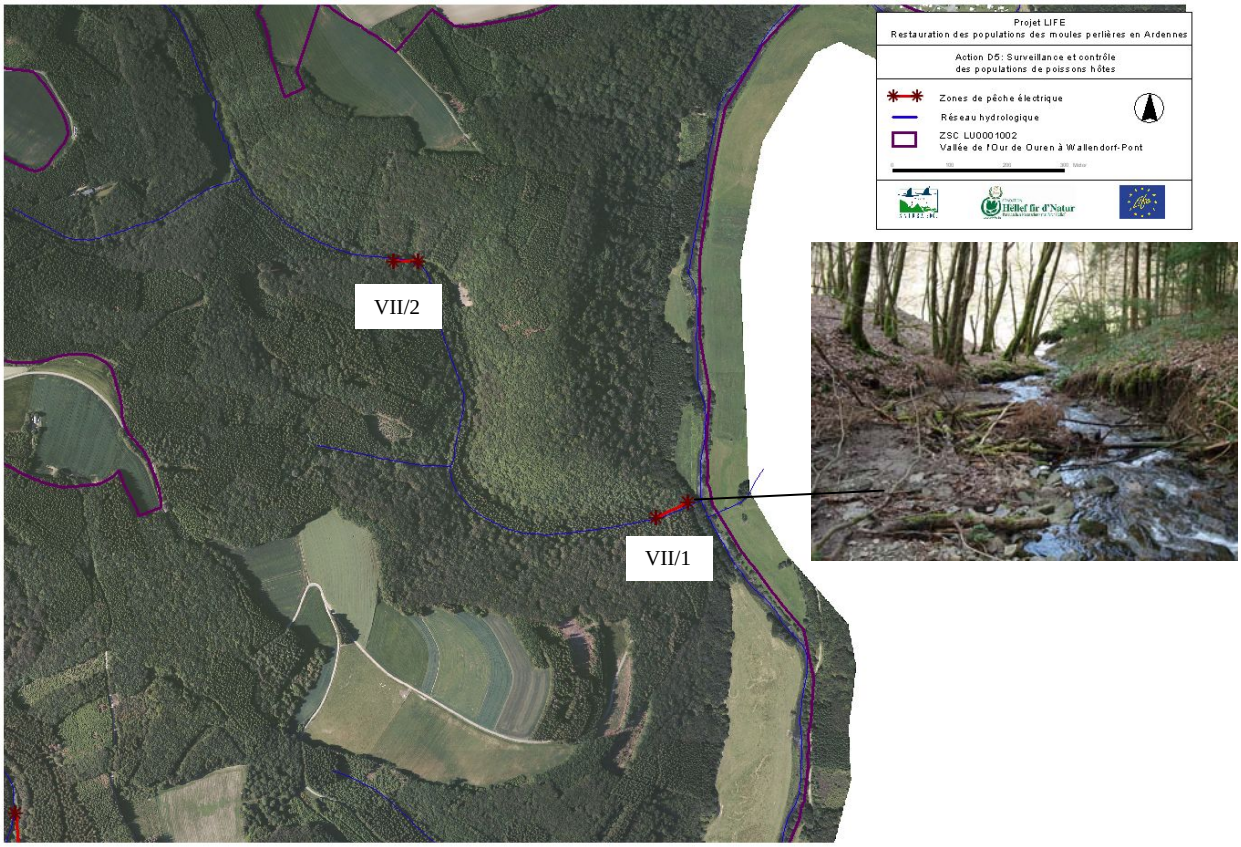

Figure 9: Location of the 2 stretches (red lines) analyzed by electric fishing in the Hengeschterbaach

As the Feierbech also the Hengeschterbaach was used as runoff ditch for wastewater but this time from the village Heinerscheid. Since 2006 the waste water from Heinerscheid is also treated in the sewage plant at Tintesmühle and thus allowing the Hengeschterbaach to recover. However during the electric fishing action in winter 2006 only two Brown Trout (9 cm and 11 cm) were caught in the section VII/1 (see Figure 9) whereas no fish species were caught in section VII/2. With the improvement of the water quality the two expected fish species (*Cottus gobio* and *Salmo trutta fario*) will probably recolonize this brook in the future. Already in 2007 the local anglers made restocking by the installation of brood-Boxes with Brown Trout eggs.

3.8 Stroumbaach

Date of fishing:	15.11.2006
Zone:	Epirithral
Number of stretches:	3 (VIII/1-VIII/3, location see Figure 10)
Water level:	medium
Water flow:	rapid
pH:	not measured
Conductivity:	not measured
Temperature:	not measured

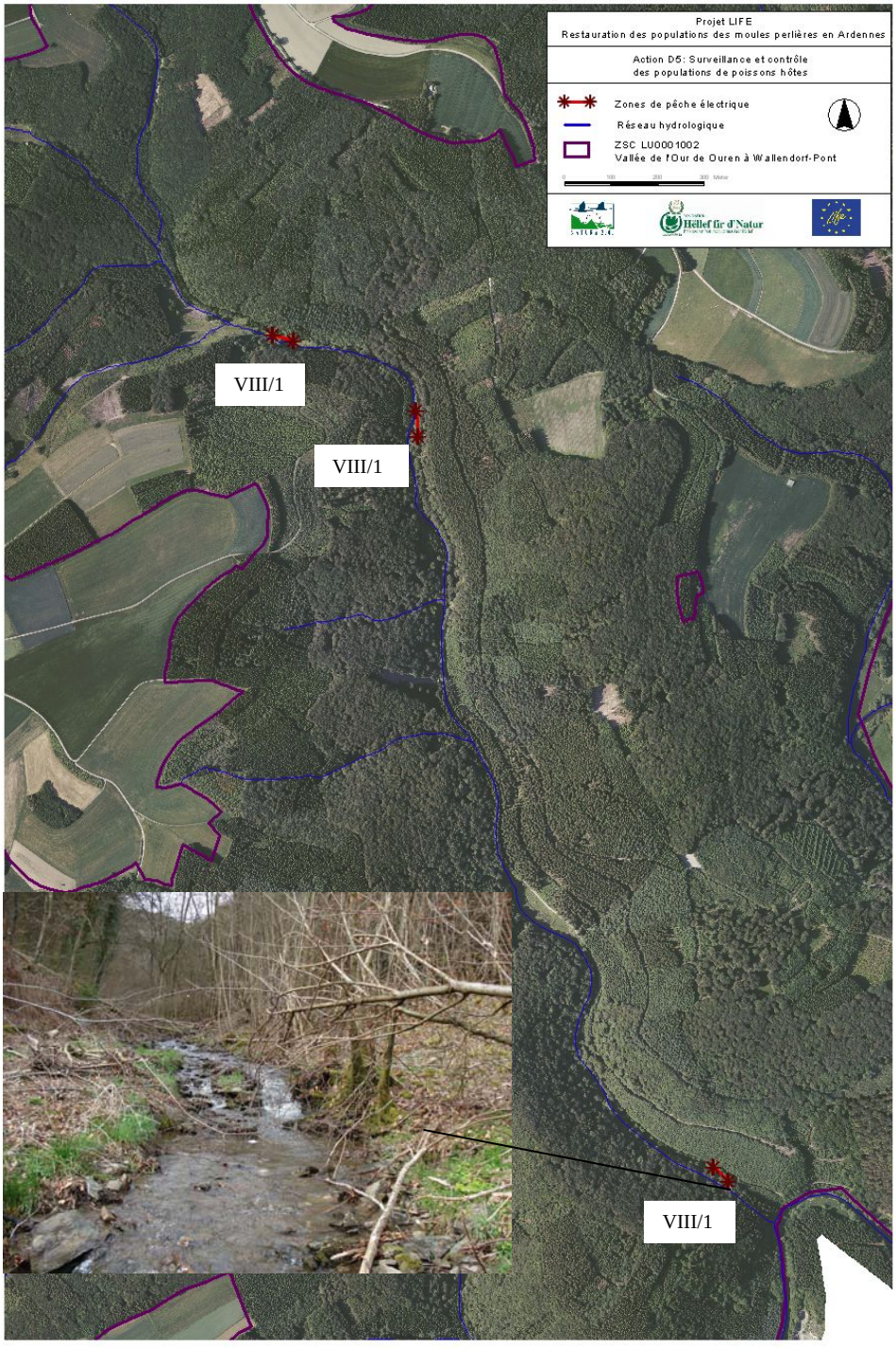

Figure 10: Location of the 3 stretches (red lines) analyzed by electric fishing in the Stroumbaach

In contrast to the upper stretch where the banks were planted with spruce, the lower stretch was naturally planted with deciduous forest. In the middle section the brook was flowing through a wet meadow. Overall 69 Brown Trout representing 74% of the fish fauna and 24 Bullhead representing 26% of the ichthyofauna were caught. The biomass reached with 162 kg/hectare the highest value in this investigation whereas the calculated number of individuals per hectare was with 5188 the second highest (Table 2). The 0+ and 1+ class are well represented. However stocking with Brown Trout was done by the local anglers in this river in 2006 and therefore a distinction between natural reproduction and stocked trout's is difficult. This is also visible in the length distribution diagram (Figure 11) where the 8-10 cm class and 10-12 cm class separating the 0+ and 1+ trout contain the highest numbers. The 0+ class and 1+ class seem to overlap. The eleven trout caught in the Stroumbaach above 20 cm were probably migrating individuals trying to reach their spawning grounds. This demonstrates the high potential of the Stroumbaach to act as spawning ground for trout. Therefore it is questionable if stocking of trout is still necessary in the future. The length of the Bullheads caught ranged between 3.5 and 8 cm, indicating also natural reproduction of this species.

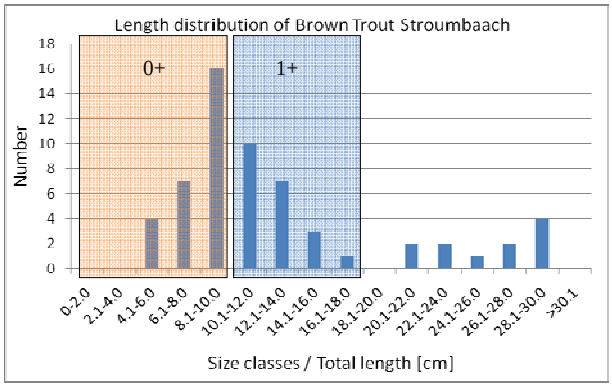

Figure 11: Length distribution of Brown Trout in the Stroumbaach. First year trout (O+) and second year trout (1+) are highlighted by colored rectangles.

3.9 Kenzelbaach

Date of fishing:	15.12.2006 and 20.12.2006		
Zone:	Epirithral		
Number of stretches:	3 (IX/1-IX/3, location see Figure 12)		
Water level:	medium		
Water flow:	rapid, turbulent		
pH:	Stretch 1: 7,92	Stretch 2: 7,52	Stretch 3: 7,59
Conductivity:	Stretch 1: 210 µS/cm	Stretch 2: 211 µS/cm	Stretch 3: 225 µS/cm
Temperature:	Stretch 1: 6,3˚C	Stretch 2: 6,3˚C	Stretch 3: 4,0˚C

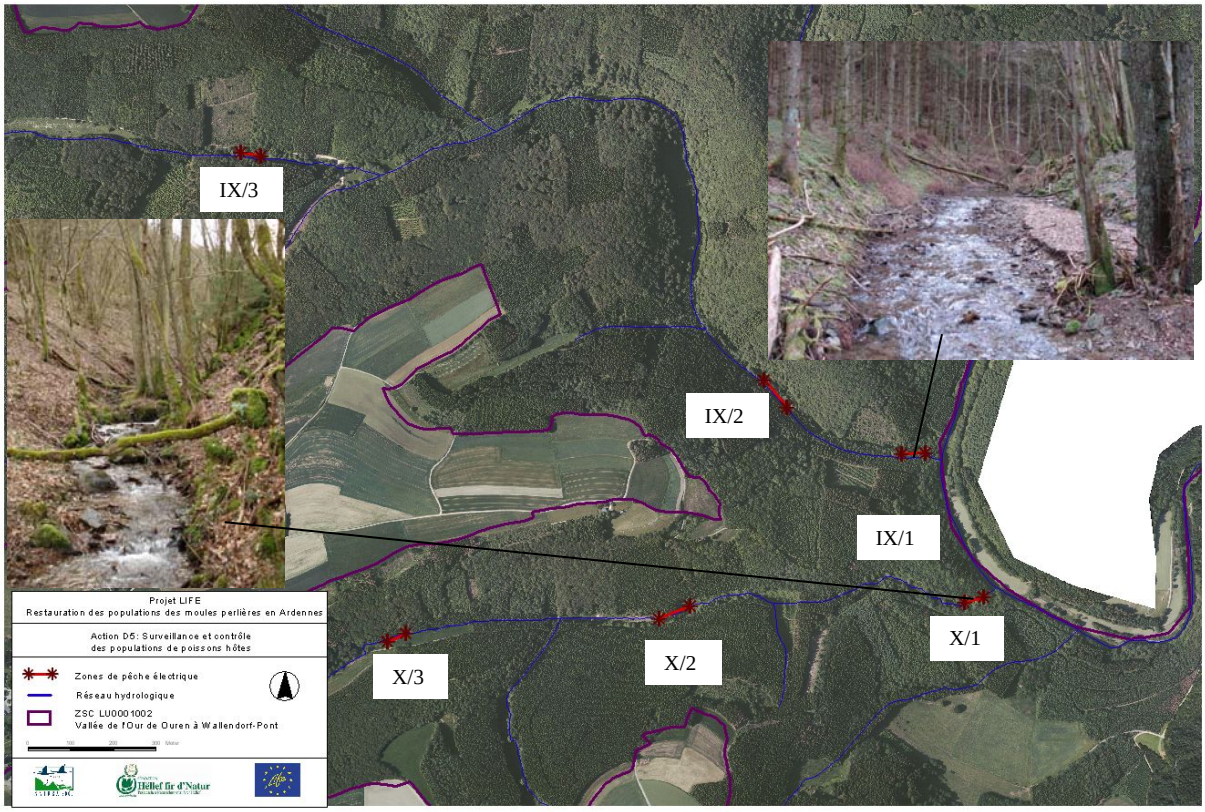

Figure 12: Location of the 3 stretches (red lines) analyzed by electric fishing in the Kenzelbaach and Ruederbaach

The Kenzelbaach harbored with 5760 the most fish/hectare. Most of the fish species detected in the three stretches (IX/1-IX/3) were Brown Trout (154 individuals, 99%) and only two Bullheads were found. The majority of the Brown Trout belonged to the 0+ age class (Figure 13) and thus the biomass/hectare was with 47kg/ha much lower than in the Stroumbaach (Table 2). As in the Stroumbaach also in the Kenzelbaach stocking of Brown Trout occurred in 2006 so that not all trout's of the first year were the results of natural reproduction. The riparian vegetation was again consisting of spruce and hence not appropriate. The banks of the brook were however unspoilt and natural.

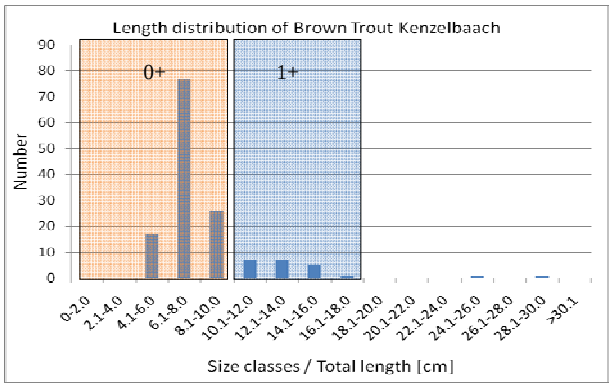

Figure 13: Length distribution of Brown Trout in the Kenzelbaach. First year trout (O+) and second year trout (1+) are highlighted by colored rectangles.

3.10 Ruederbaach

Date of fishing:	20.12.2006
Zone:	Epirithral
Number of stretches:	3 (X/1 – X/3, location see Figure 12)
Water level:	medium
Water flow:	rapid
pH:	Stretch 1: 7,62
Conductivity:	Stretch 1: 212 µS/cm
Temperature:	Stretch 1: 6,3˚C

Like for most tributaries in the Our valley the bank vegetation was consisting on all three stretches mainly of spruce. Brown Trout was the only fish species detected. The calculated biomass and number of individuals per hectare reached 20 kg/ha respectively 1333 Ind./ha (Table 2). Compared to the adjacent Strombaach or Kenzelbaach the fish population is rather low. However in this brook no stocking of Brown Trout occurred. The length distribution diagram (Figure 14) indicates that natural reproduction took place in winter 2005 and winter 2006.

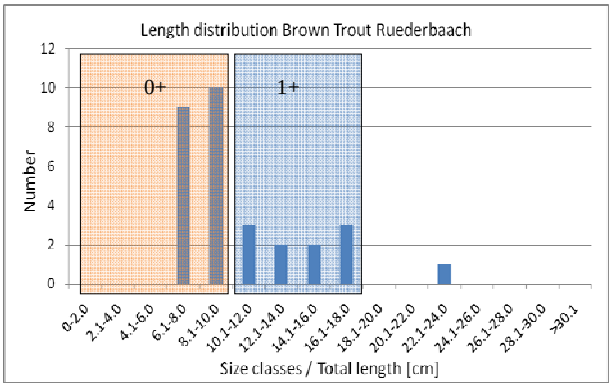

Figure 14: Length distribution of Brown Trout in the Ruederbaach. First year trout (O+) and second year trout (1+) are highlighted by colored rectangles.

3.11 Etschenterbaach

Date of fishing:	15.12.2006		
Zone:	Epirithral		
Number of stretches:	3 (XI/1 – XI/3, location see Figure 15)		
Water level:	medium		
Water flow:	rapid		
pH:	Stretch 1: 7,58	Stretch 2: 7,67	Stretch 3: 7,34
Conductivity:	Stretch 1: 183,5 µS/cm	Stretch 2: 183,2 µS/cm	Stretch 3: 176 µS/cm
Temperature:	Stretch 1: 7,9˚C	Stretch 2: 5,9˚C	Stretch 3: 6,3˚C

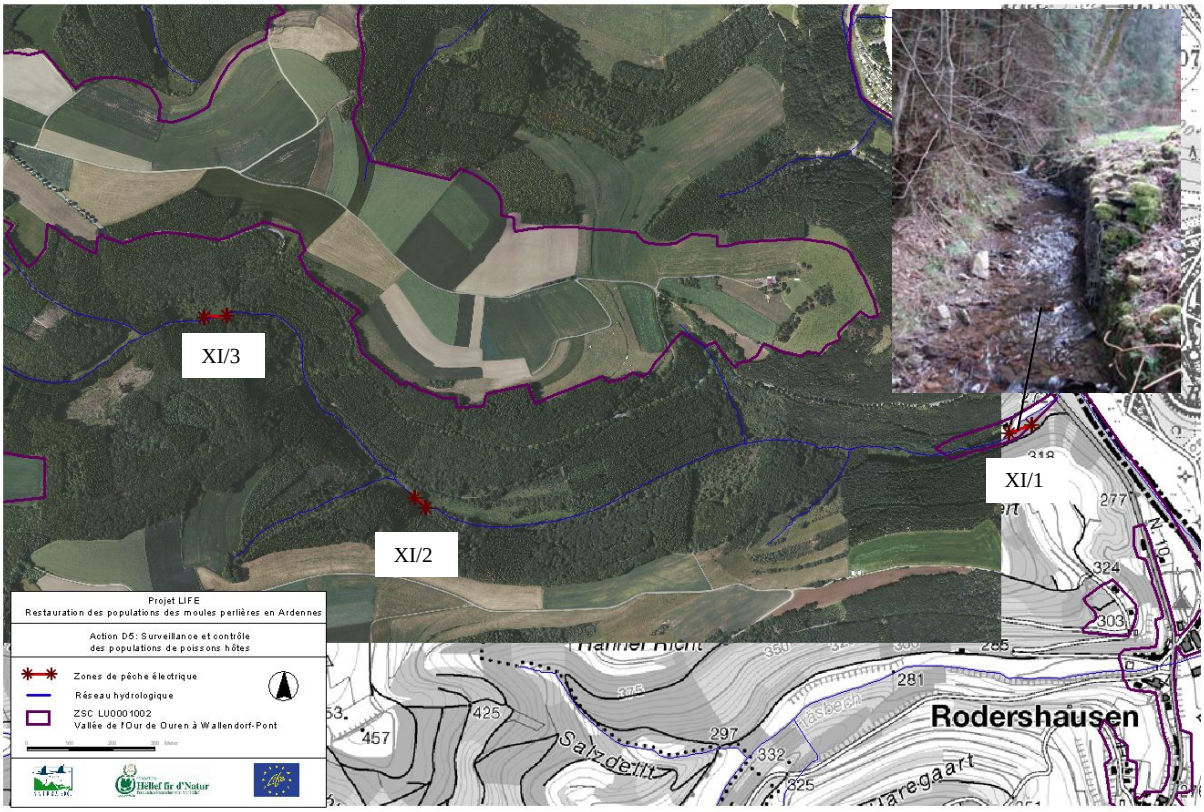

Figure 15: Location of the 3 stretches (red lines) analyzed by electric fishing in the Etschenterbaach

With only 12.7 kg/ha and 900 Ind./ha the Etschenterbaach had a small Brown Trout population. In all three stretches only 19 *Salmo trutta fario* were caught, belonging mostly to the 0+ class and 1+ class (see Figure 16). Only one larger trout was caught in the lower section. As no stocking was done in the Kenzelbaach, the 0+ and 1+ trout seem to come from natural reproduction. The banks were partly planted with spruce and deciduous forest. As in the Ruederbaach no Bullheads were detected. A pipe construction located 10 m above the confluence with the river Our seems to be responsible for the lower trout population in this brook. At the beginning of 2007 however constructions on the road crossing the Etschenterbaach were done. During these works the pipe construction in the Etschenterbaach was changed and is now again passable for migrating fish species. Therefore the fish population might increase in the future.

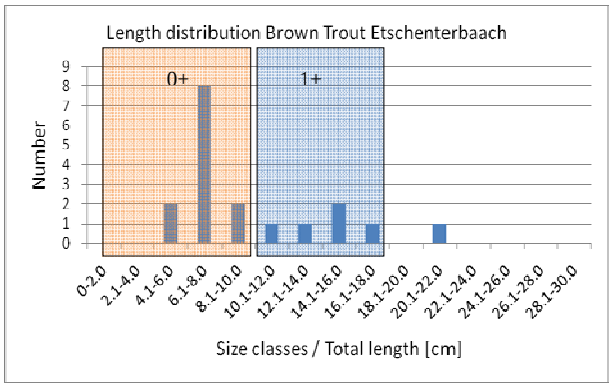

Figure 16: Length distribution of Brown Trout in the Etschenderbaach. First year trout (O+) and second year trout (1+) are highlighted by colored rectangles.

3.12 Overall fish population

The total fish catch and the calculated biomass and number of individuals per 100 and hectare for all brooks are summarized in Table 2. Overall 494 fish were caught belonging to two species (*Salmo trutta fario* and *Cottus gobio*). Table 3 summarizes the length distribution of Brown Trout for all tributaries sampled.

Table 2: Fish population in the brooks analyzed. (Ind. = Individuals; ha=hectare)

Brook	Individuals	Species	Ind./100m	kg/100m	Ind./ha	kg/ha
Reibaach	112	2	74,7	1	3733	52,1
Nivelsbaach						
Schelsbaach	21	1	42	0,8	2100	40,2
Roupelsbaach	7	1	14	0,3	2333	52,8
Jansschleederbaach	77	2	51,3	0,2	4400	17,6
Feierbech						
Hengeschterbaach	2	1				
Stroumbaach	83	2	55,3	1,7	5187,5	162,2
Kenzelbaach	144	2	96	0,8	5760	47,3
Ruederbaach	30	1	20	0,3	1333	20
Etschenterbaach	18	1	12	0,2	900	12,7
Total	494	2				

Table 3: Length, frequency distribution of Brown Trout in the 11 tributaries

Size classes [cm]	Reibaach	Nivelsbaach	Schelsbaach	Roupelsbaach	Jansschleederbaach	Feierbech	Hengeschterbaach	Stroumbaach	Kenzelbaach	Ruederbaach	Etschenderbaach	Total
0-2.0												0
2.1-4.0	1											1
4.1-6.0	5		1		3			4	17		2	32
6.1-8.0	48		4		27			7	77	9	8	180
8.1-10.0	21		5		10		1	16	26	10	2	91
10.1-12.0	5		5	4			1	10	7	3	1	36
12.1-14.0	7		2	1	4			7	7	2	1	31
14.1-16.0	7		2					3	5	2	2	21
16.1-18.0	1		1	2				1	1	3	1	10
18.1-20.0			1									1
20.1-22.0								2			1	3
22.1-24.0	1							2		1		4
24.1-26.0								1	1			2
26.1-28.0								2				2
28.1-30.0								4	1			5
>30.1	1											1
Total	97		21	7	44		2	59	142	30	18	420

4 Discussion

All tributaries analyzed are located in the low mountain area of the Our valley and belong to the epirithral. Brown Trout (*Salmo trutta fario*) and Bullhead (*Cottus gobio*) are the typical fish species for this region (Gebhardt & Ness, 1997) and were the only two species detected during the investigation.
The brook lamprey (*Lampetra planeri*) (Gebhardt & Ness, 1997) could also be expected in this area. The larvae of this species live in organic detritus at the river bottom. As the flow velocity in all brooks is rather high, areas with fine sediments and detritus are scare in these streams and thus also habitats for brook lampreys. Furthermore none of these areas were explicit checked for lampreys by electric fishing. It cannot be excluded that lampreys are living in the brooks, but during this investigation none were detected. In the Our itself *Lampetra planeri* was nevertheless observed (personal observation: Mireille Molitor and Alexandra Arendt).
Except for the brooks with no fish at all (Nivelsbaach and Feierbech) the Brown Trout was present in all other streams analyzed.

Nivelsbaach

The main cause for the missing of trout in the Nivelsbaach is surely the pipe construction located above the confluence with the river Our. However it is still doubtable if trout use this brook as spawning ground as it is rather small. It cannot be excluded that this brook runs dry in a rainless summer. This might also be the reason that no trout or other fish species were observed in the short stretch located below the migration obstacle, before the confluence with the river Our.

Feierbech

In the Feierbech a pipe construction is present and the village Kalborn used this brook to discharge the wastewater. It is however known that this small brook runs dry in rainless summers (personal communication Armand Dichter). As no former data about the fish fauna in the Feierbech exist, it is not known if trout or other fish species were present in this brook before the construction of the migration obstacle.

The Schelsbaach, Roupelsbaach Hengeschterbaach Ruederbaach and Etschenterbaach harbored only Brown Trout and no *Cottus gobio*. Furthermore the biomass of trout and the number of individuals in these steams was rather low (Table 2).

Schelsbaach

A few years ago the Schelsbaach was used as discharge stream for the wastewater of the village Lieler. The waste water is meanwhile collected and treated, so that the water quality seems not to limit the presence of fish species anymore. In the stretch above the confluence with the Our 21 trout were caught. Furthermore young trout of the year were present in this stretch which indicates that reproduction took place. However about 50 m upstream from the confluence an obstacle inhibits the further migration of fish and no fish was caught beyond this point. The removing of this construction will surely improve the quality of this brook as fish habitat.

Roupelsbaach

Since the removal of the migration obstacle in the Roupelsbaach in the area of the confluence with the Jansschleederbaach only one year passed. Thus also the fish population in this brook might improve in the future and it might also been used by *Salmo trutta fario* as spawning ground. This will be checked by electric fishing actions in 2008.

Hengeschterbaach

The main problem for a missing fish population in the Hengeschterbaach was that this stream was used as discharge system for the wastewater of the village Heinerscheid. With the construction of the sewage plant at Tintesmühle this problem should now be solved. Electric fishing actions in the future will show if the Hengeschterbaach becomes again suitable habitat and spawning ground for trout and if the stocking of brood by the local anglers has any success. Also the Bullhead might recolonize this stream.

Ruederbaach

In the Ruederbaach no migration barrier was present in the past. This stream was used as spawning ground for trout as the length distribution diagram indicates (Figure 14). The fish biomass in this stream was low (Table 2). The Ruederbaach is a small brook which explains the smaller fish population compared to the larger brooks like the Jansschleederbaach or Stroumbaach. It is however not known why *Cottus gobio* is missing in this brook or if it was present in the past. The rampant section directly after the confluence with the Our might inhibit the upstream migration of Bullheads.

Etschenderbaach

As already mentioned in the result section a migration obstacle was responsible for the low fish biomass in the Etschenterbaach. The obstacle is however now passable and the next electric fishing in 2008 will show if the biomass increases and if other fish species appear.

Reibaach, Jansschleederbaach, Stroumbaach and Kenzelbaach

The other four brooks, Reibaach, Jansschleederbaach, Stroumbaach and Kenzelbaach harbored beside the Brown Trout also the Bullhead. In all these streams natural reproduction of both species occurred except for the Kenzelbaach where only two adult *Cottus gobio* were caught, but no juveniles.

In 2006 the Stroumbaach and Kenzelbaach were stocked by the local anglers with 5000 0+ Brown Trout respectively. This was still visible during the electric fishing action as both brooks harbored the highest number of individuals per hectare (see Table 2). However the biomass/ha was in the Stroumbaach much higher than in the Kenzelbaach, although the fish stock in 2006 was the same. The presence of larger trout in the Stroumbaach is responsible for this observation. The different electric fishing dates in both streams might explain this observation, but this is speculative.

The Reibaach and the Jansschleederbaach were not stocked with Brown Trout by the local anglers and the fish biomass was lower than in the Stroumbaach, especially in the Janasschleederbaach. In the Jansschleederbaach a migration barrier located below the stretch (IV/2) removed during the INTERREG Program NATOUR explains the lower biomass in 2006 and the nearly missing 1+ trout class in this stream. This brook is nevertheless a suitable spawning ground for Brown Trout, as the relatively high number of young of the year fish shows (see Figure 6). Also the Reibaach is used as spawning ground and the biomass and number of individuals is also among the highest found compared to the other brooks.

Overall view

Except for the two tributaries (Nivelsbaach and Feierbech) which might run dry in rainless summers, all other tributaries could act as habitat and spawning ground for fish species of the epirithral. The limiting factor for fish species is however not only the discharge level but also many other abiotic and biotic factors.
The problem with the waste water in the Schelsbaach, Feierbech and Hengeschterbaach is solved and the chemical water quality will surely improve in these brooks. If the sewage

treatment plants are well maintained the nutrient input into the river Our is reduced. Diffuse nutrient input from intensive used farmland is however still present especially in the upper reaches of the brooks. Also the fine sediment entry into the brooks due to intensive agriculture and wrong bank vegetation is still a problem. On the one hand suitable spawning grounds for fish species in the brook are lost due to siltation of the interstitial and on the other hand in the river Our siltation of the interstitial is the main cause for the missing of young age classes in the Fresh Water Pearl Mussel population. The missing of enough fine and clean gravel banks is thus one factor influencing the reproduction success of *Salmo trutta fario*. As a result the biomass per hectare is influenced by this factor. In most of the tributaries the biomass/hectare is with less than 50kg/ha rather low compared to other investigation in low mountain areas (see for instance Frenz et al., 2003; Wiesner et al., 2006). However the biomass is depending strongly on the size and nutrient level of the brooks. The brooks analyzed in this investigation are fairly small and mainly used by larger trout as spawning ground and young trout as growing habitat. It is therefore realistic to find a high number of small individuals per hectare rather than a high biomass per hectare. A further factor influencing the reproduction success for trout is the continuity of the watercourse. For some tributaries like the Jansschleederbaach a lot of progress was already done in this direction. There is however still a lot of improvement necessary for brooks like the Nivelsbaach, Schelsbach and Feierbech.

Overall the quality of the tributaries in the project area is quite different. For instance the Reibaach shows for its size an adequate biomass and length distribution of Brown Trout whereas in the larger Hengeschterbaach nearly no fish are present due to bad water quality. As no data from former electric fishing actions are available it is unfortunately not known how the natural fish stock of these brooks was in the past and how it developed until now. With the removing of some of the migration obstacles and the building of sewage stations a lot of work was already done in direction to improve the overall state of several brooks. Further electric fishing actions in the following years will hence show if the measures done during the LIFE Project helped to improve the quality of the tributaries to act as fish habitat.

Literature

Bagebal, T.B. & Tesch, F.W. (1978) Age and growth.: 101-136. In: Bagenal, T.B. (Ed.): Methods for assessment of fish production in fresh waters. 3. Edition Blackwell Scientific Publications Ltd., Oxford 365pp.

Frenz, C., Pater, M., Darschnik, S., Engelberg, K. & Klinger, H. (2004) Fischbestände der Forellenregion in Nordrhein-Wetfalen, Routinedurchgang der rhithralen Gewässerabschnitte 2003. Landesanstalt für Ökologie, Bodenordnung und Forsten ,LÖBF-Mitteilungen 4/04, 29-33.

Gebhardt, H. & Ness, A. (1997) Fische. Die heimischen Süßwasserfische sowie Arten der Nord- und Ostsee. BLV Naturführer, München, Wien, Zürich. 127pp.

Hastie, L.C. & Young, M.R. (2001) Freshwater pearl mussel (*Margaritifera margaritifera*) glochidiosis in wild and farmed salmonid stocks in Scotland. Hydrobiologia 445, 109-119.

Hastie, L.C. & Young, M.R. (2003) Conservation of Freshwater Pearl Mussel 2. Realtionship with Salmonids. Conserving Nature 2000 Rivers Conservation Techniques Series No. 3. EnglishNature, Peterborough.

Haunschmid, R., Honsig-Erlenburg, W., Petz-Glechner, R., Schmutz, S., Schotzko, N., Spindler, T., Unfer, G. & Wolfram, G. (2006) Methodik-Handbuch, Fischbestandsaufnahmen in Fließgewässern. Bundesamt für Wasserwirtschaft, Institut für Gewässerökoöogie, Fischereibiologie und Seenkunde, Scharfling, Mondsee, 39pp.

Wiesner, C., Unfer, G. & Jungwirth, M. (2006) Fischbestandserhebung im Johnsbach. Studie im Auftrag der Nationalpark Gesäuse GmbH. 25pp. http://www.nationalpark.co.at/nationalpark/de/downloads/Life/Befischung_Johnsbach_2005.pdf

Young, M.R. & Williams, J.C. (1984) The reproductive biology of the freshwater pearl mussel *Margaritifera margaritifera* (Linn.) in Scotland. I. Field studies. Archiv für Hydrobiologie 99, 405-422.

Ziuganov V., Zotin, A., Nezlin, L. & Tretiakov, V. (1994) The Freshwater Pearl Mussels and Their Relationship with Salmonid Fish. VNIRO, Russian Federal Research Institute of Fisheries and Oceanography, Moscow, 104 pp.