International seminar
Monitoring and restoration of freshwater (mussel) habitats

Caracterisation of *Unio crassus* microhabitats in the Sûre River

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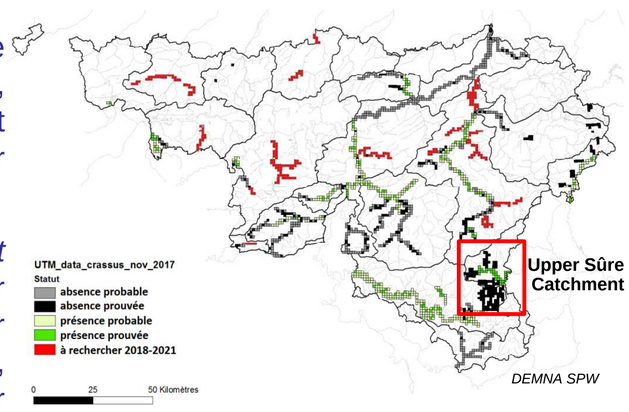
1. Context

Unio crassus populations are currently declining worldwide, including in Wallonia. River habitat degradation is one of the major causes of its decline.

The *Parc naturel Haute Sûre Forêt d'Anlier* has undertaken several river rehabilitation projects (*e.g.* weir removal, remeandering channel, habitat rehabilitation) in the Upper Sûre River. These projects required to characterize the habitat of *Unio crassus.*



River characteristics (at Martelange gauging station):

- ***Drainage area: 209 km²***
- ***Mean annual discharge: 3.69 m³/s***
- ***Gravel bed river (D_{50}: 42 mm ; D_{90} 91 mm)***
- ***Width (at the bankfull stage): 13.4 m***
- ***Average slope: 2.2 ‰***
- ***Unit stream power (at the bankfull stage): 51 W/m²***

Site A | **Site B** | **Site C**

X: 242540 ; Y: 64671 | X: 243496 ; Y: 64142 | X: 245750 ; Y: 61083

Site A	Site B	Site C	
118	122	163	Drainage Area (km²)
8.4	10	14.6	Width (m)
29 - 60	31 - 64	32 - 77	D_{50} - D_{90} (mm)

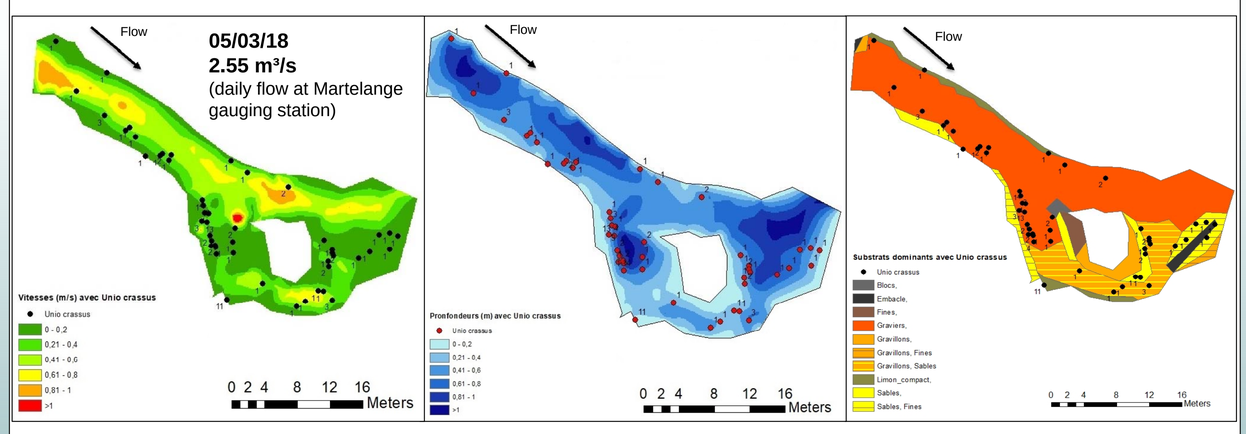
2. Cartography of microhabitats & population survey

Aim: Providing a cartography of *Unio crassus* microhabitats to identify suitable hydromorphological characteristics for the species in the Sûre River.

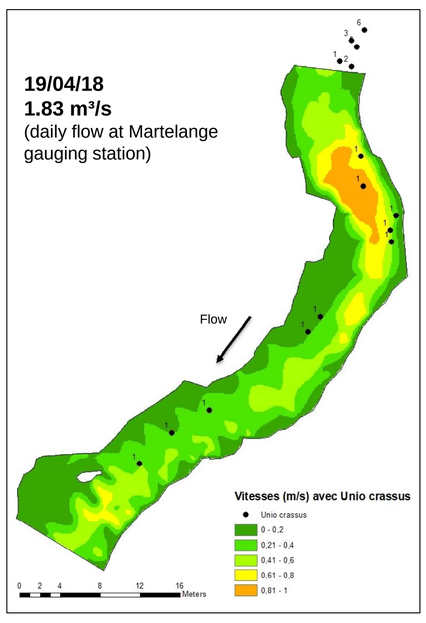
Microhabitats survey was adapted from the method used by Verniers and Peteers (2013), which is based on measures of flow velocities, water depths and dominant substrate classes. The results for the in 3 studied sites are presented.

a) Flow velocity | ***b) Bathymetry*** | ***c) Dominants substrate classes***

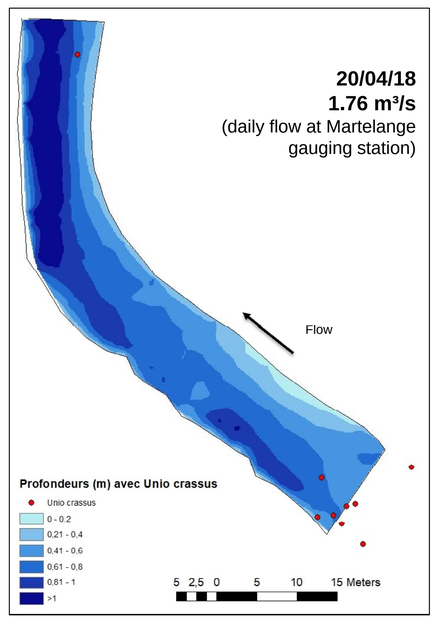
Site B



Site A

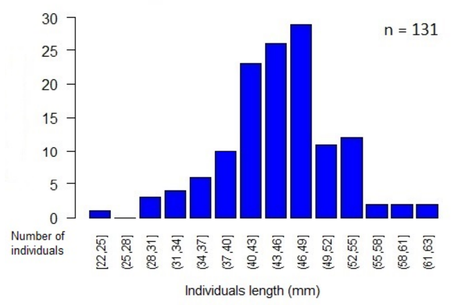


Site C



The population survey of *Unio crassus* in the 3 studied sites took place in Spring after the microhabitats survey. We found 131 thick shelled river mussels in total.

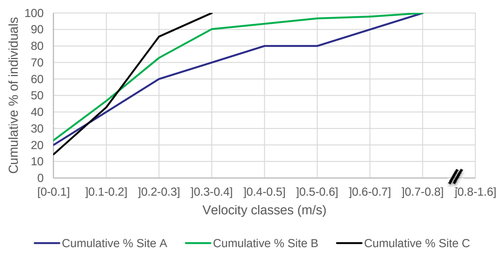
Distribution by lentgh classes of Unio crassus



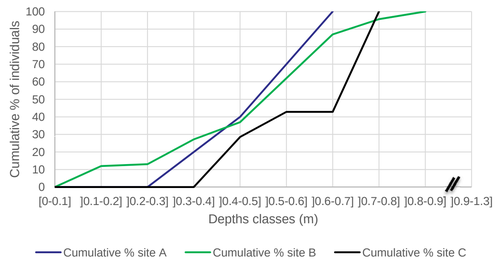
Flow velocity classes (m/s)	% individuals Site A (10)	% individuals Site B (92)	% individuals Site C (7)	% individuals 3 sites
[0-0.1]	**20**	23	14	22
]0.1-0.2]	**20**	**24**	**29**	23.9
]0.2-0.3]	**20**	**26**	**43**	26.6
]0.3-0.4]	10	17	14	16.5
]0.4-0.5]	10	3	0	3.7
]0.5-0.6]	0	3	0	2.8
]0.6-0.7]	10	1	0	1.8
]0.7-0.8]	10	2	0	2.8
]0.8-1.6]	0	0	0	0

Depths classes (m)	% individuals Site A (10)	% individuals Site B (92)	% individuals Site C (7)	% individuals 3 sites
[0-0.1]	0	0	0	0
]0.1-0.2]	0	12	0	10.1
]0.2-0.3]	0	1	0	0.9
]0.3-0.4]	20	14	0	13.8
]0.4-0.5]	20	10	**29**	11.9
]0.5-0.6]	**30**	**25**	14	24.8
]0.6-0.7]	**30**	**25**	0	23.9
]0.7-0.8]	0	9	**57**	11
]0.8-0.9]	0	4	0	3.7
]0.9-1.3]	0	0	0	0

Cumulative percentage of *Unio crassus* by flow velocities by sites

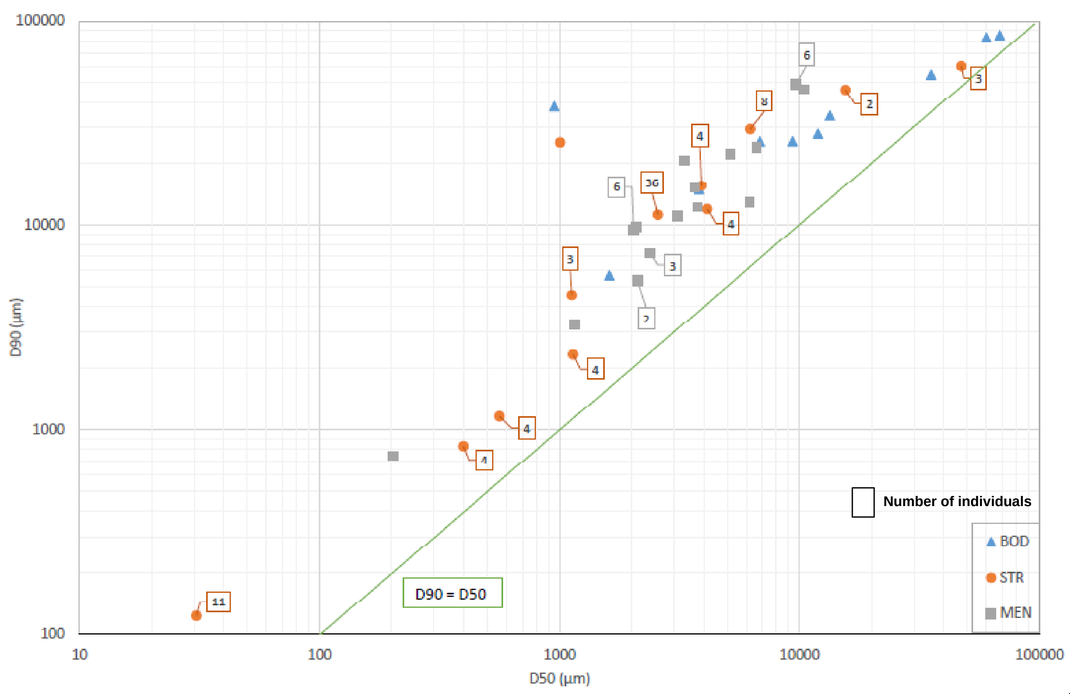


Cumulative percentage of *Unio crassus* by water depths by sites



3. Substrate granularity

Grain size analysis was carried out on substrate samples taken at the exact location of each *Unio crassus* (individual or group), which allows us to characterize the substrate (grain sizes) of *Unio crassus* in the 3 studied sites.
The results are shown on a modified Passega CM diagram (Passega, 1957, 1964), wherein the values of the D_{90} are plotted against the median (D_{50}). The results indicated that the substrate was moved by saltation, and is frequently transported and deposited. Moreover, *Unio crassus* seems to be able to inhabit within variable grain textures but shows preference for substrate characterized by median grain size around 3 mm (D_{50}) and with a D_{90} around 10 mm.



4. Outcomes of the project :

***Unio crassus* are mainly found (for a median flow) :**

- in low velocity zones (from 0 m/s to 0.4 m/s)
- in depths higher than 0.3 m
- mostly located at the bank toe of point bars (inside of stream bend)
- in a gravel type substrate with sandy matrix (D_{50}: 2.6 mm and D_{90}: 11.3 mm)