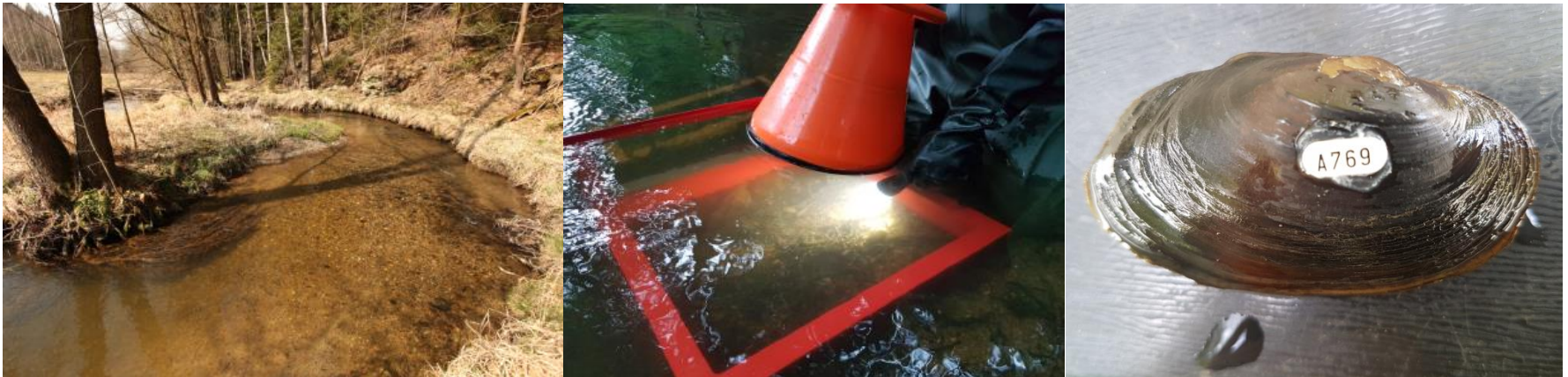


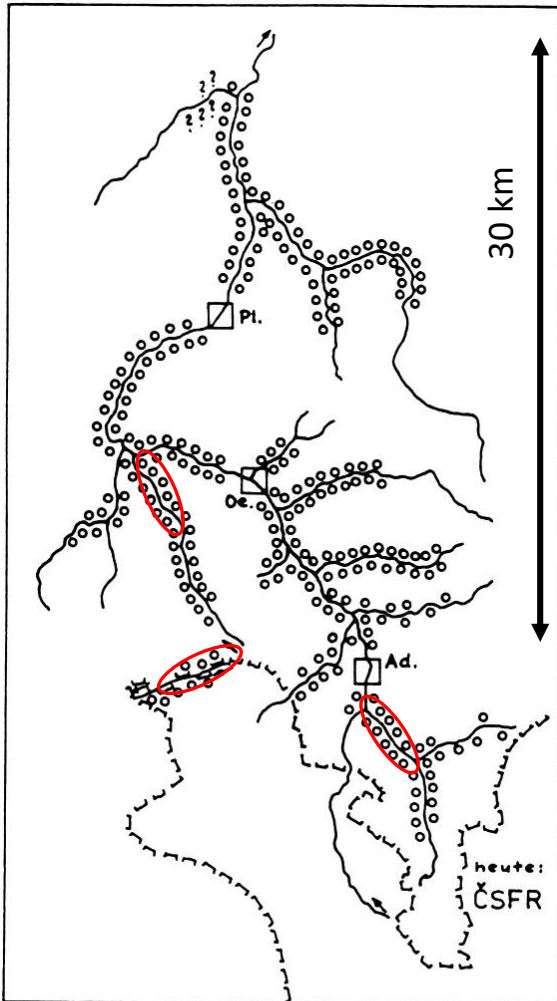
Evaluation of the success of captive-breeding activities in Saxon Vogtland, Germany: First monitoring of reintroduced juvenile river pearl mussels



Thomas Schiller, Albrecht Boenke, Felix Eisenhauer, Felix Grunicke, Sascha Krenek, Jana Schneider, Annekatriin Wagner & Thomas Berendonk

Technische Universität Dresden, Germany
Department of Hydrosociences
Institute of Hydrobiology

Situation, breeding and release of River Pearl Mussel in Saxony, Germany



- Around 1800, the entire „Weiße Elster“ river system was settled with pearl mussels
- Decline and distinction of populations in 19th century
- Around 2000, only three relict populations with a few hundred individuals were left
- since 2002 successful captive breeding program
- 2009-2013 reintroduction of ~ **5000 mussels**
- First evaluation of success of reintroduction



Juvenile 1-3 mm



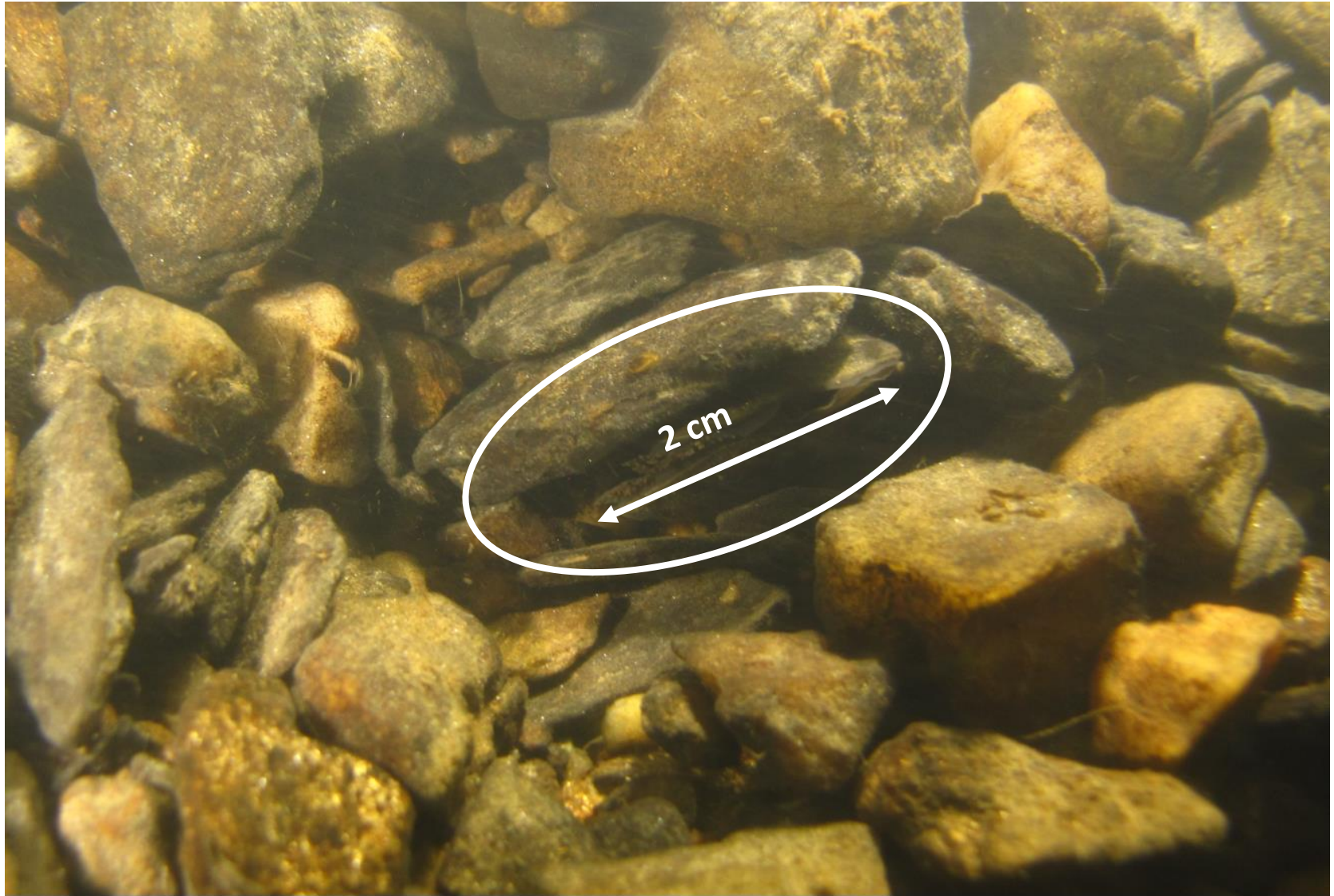
3-20 mm



10-20 mm

Abb. 4: Vogtländische Vorkommen der Flußperlmuschel um 1800. Pl Plauen, Oe Oelsnitz, Ad Adorf. Nach FIEDLER (1937) und HERTEL (1959).

Many problems to find them

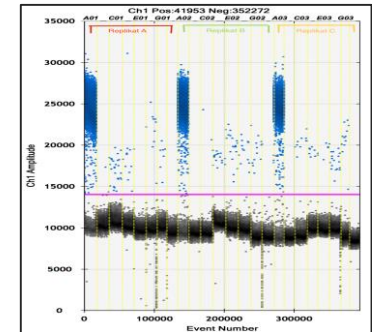


Three steps of monitoring

1. Analysis of environmental DNA in water samples
 (Mitochondrial 16S rDNA, according to Stoeckle et al. 2015,
 Droplet-Digital PCR for absolute quantification of DNA copies
 per sample):

a) downstream of a stretch with a known number of caged captive bred juvenile river pearl mussels

b) within a reintroduction stretch, respectively 100-300m downstream of introduction points (A-D)



2. Visual search for mussels in Transects (2 of 10 m stretch) of at least 100 m each reintroduction site



3. Combined search for mussels on the sediment surface as well as in the river bed sediment



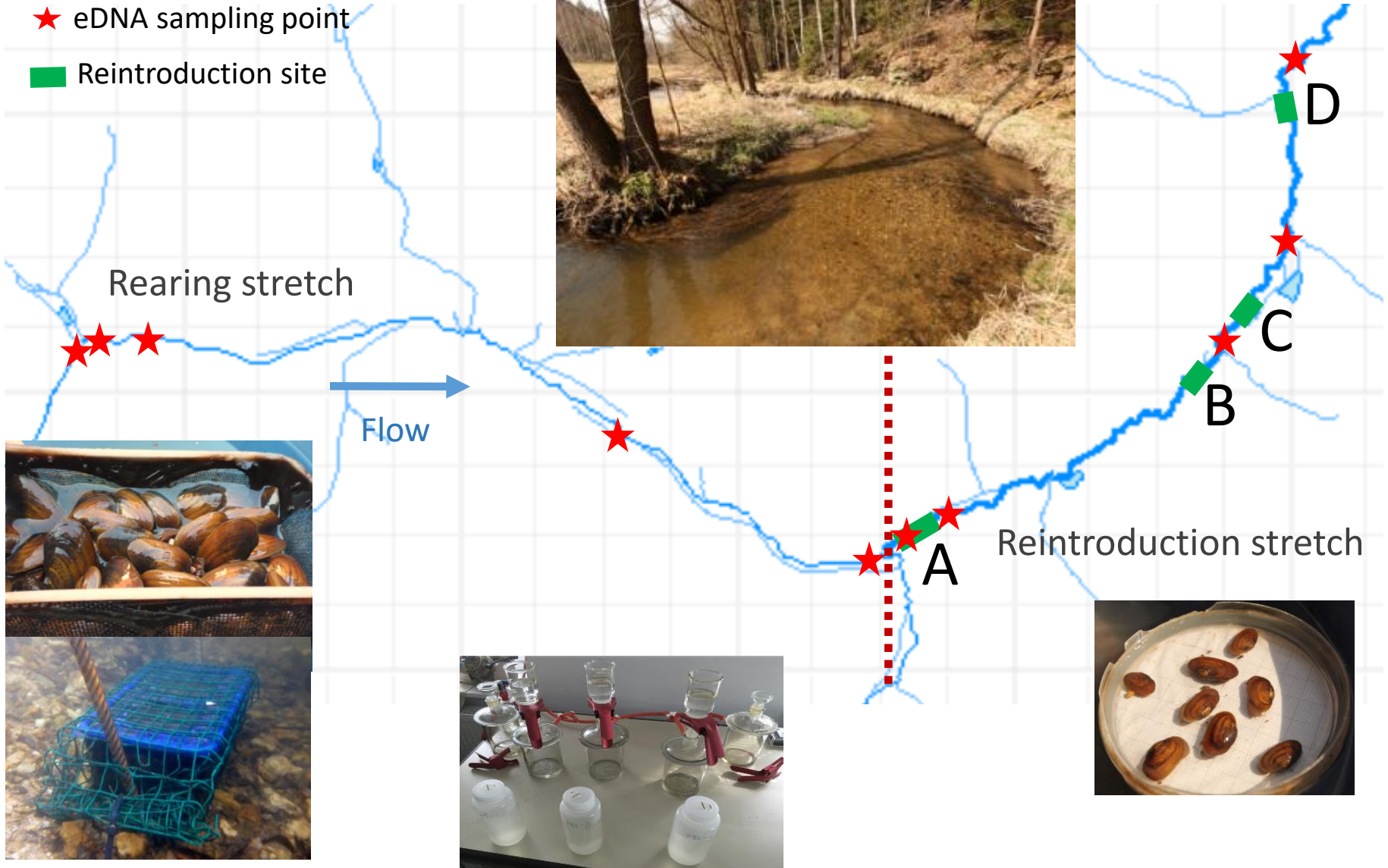
Hypotheses

- H1** Analysis of eDNA in water samples is usable to distinguish introduction stretches with different mussel abundances

- H2** Reintroduced mussels survived at similar rates in different reintroduction sites

- H3** A certain number of mussels is undetectable by visual search on the sediment surface

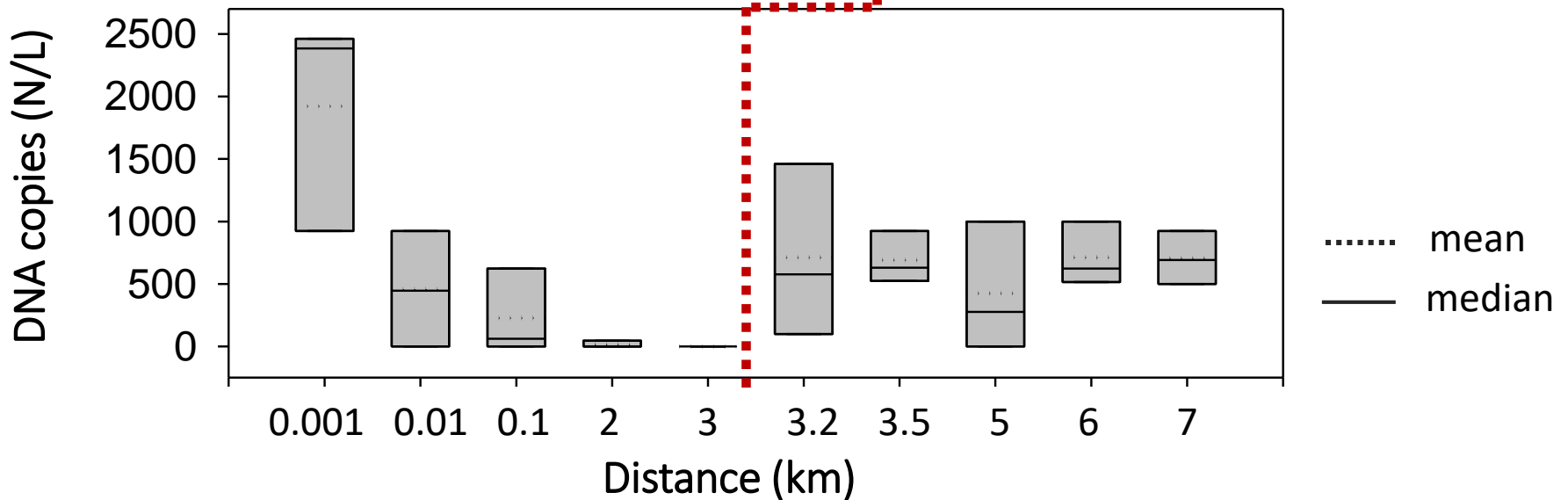
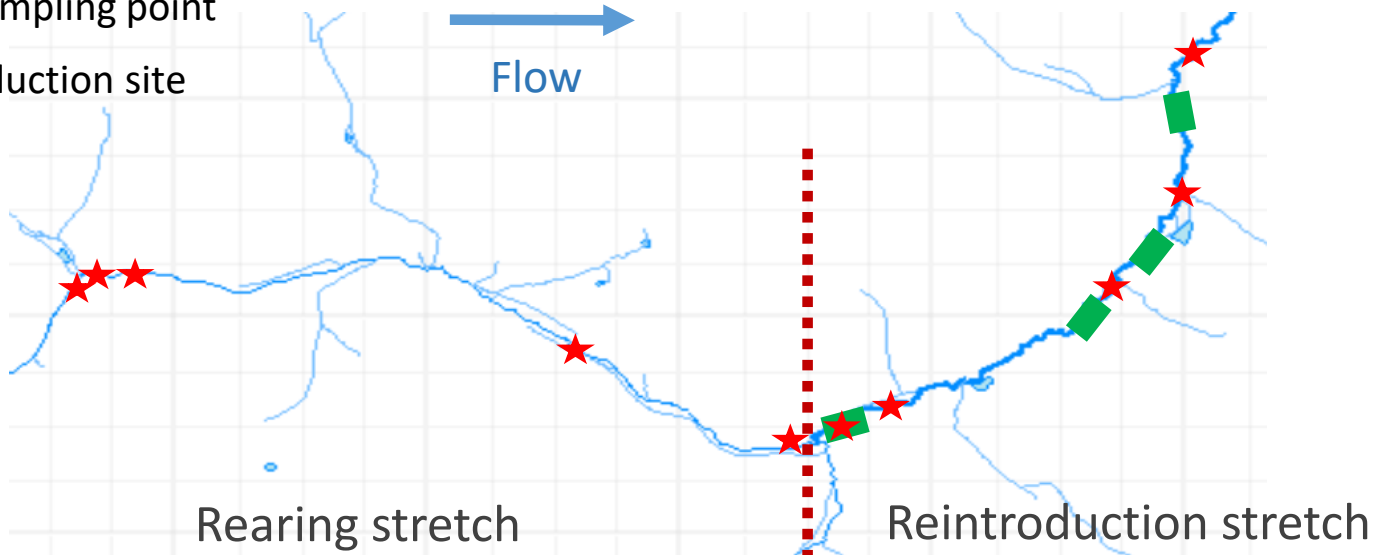
eDNA-analysis in Rearing- and Reintroduction-stretches



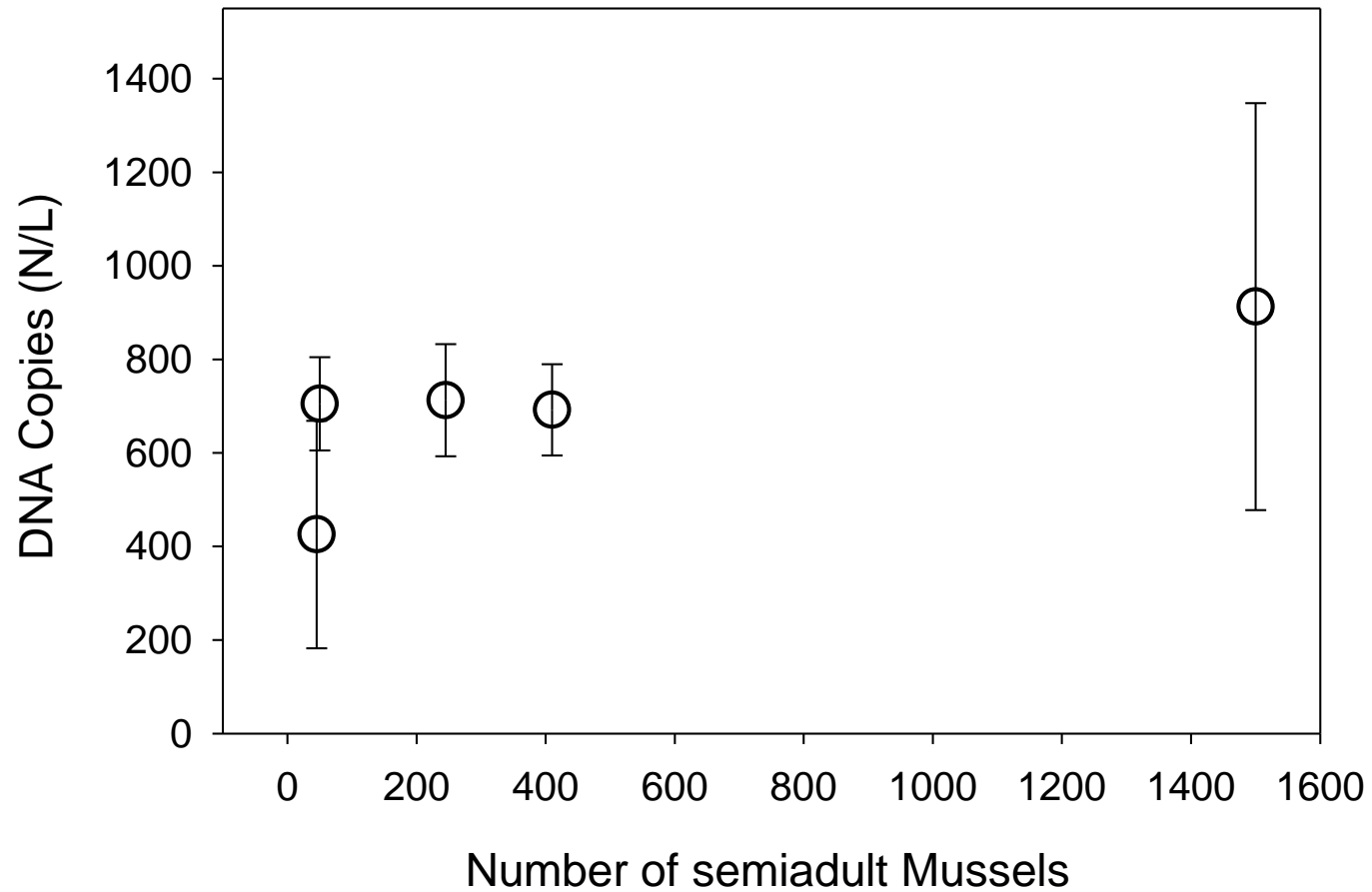
eDNA-analysis in Rearing- and Reintroduction-stretches

★ eDNA sampling point

■ Reintroduction site

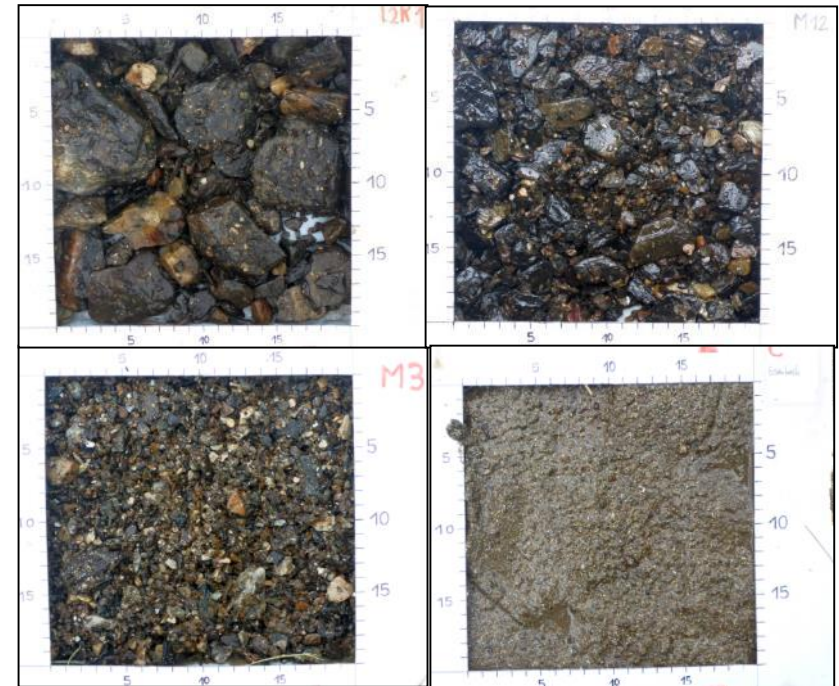


No effect of mussel abundance on eDNA in Reintroduction-stretch



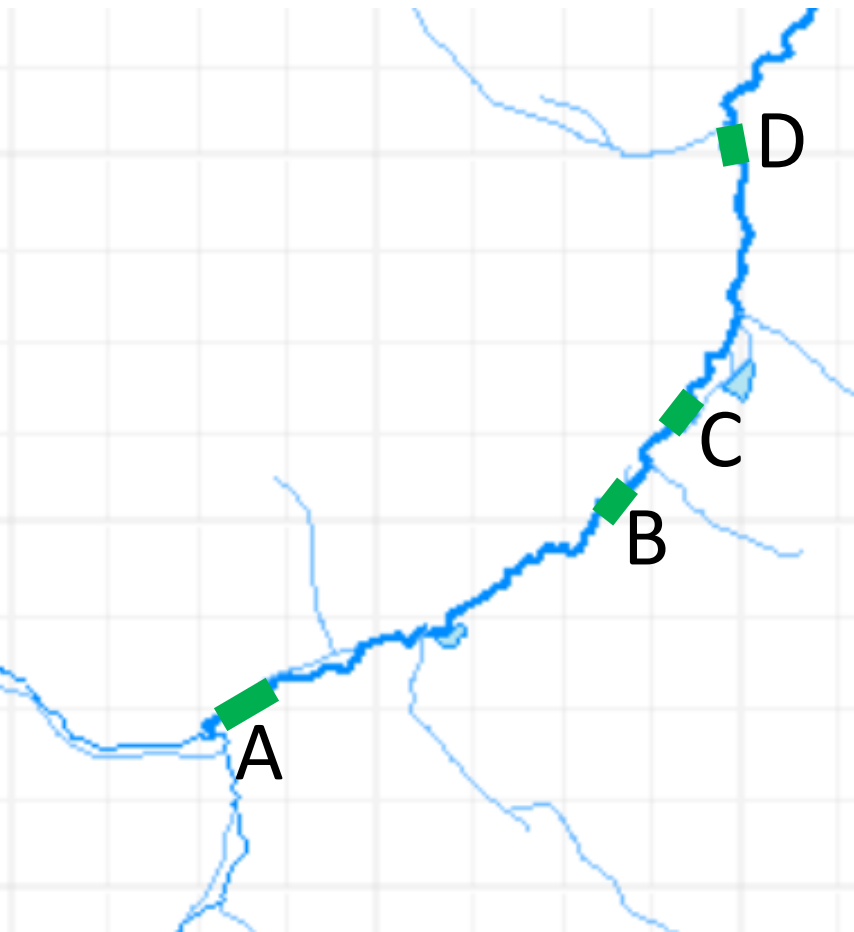
Visual search on sediment surface

- Transect (2m) every 10m, 100m in total for each reintroduction site
- Recorded parameters:
 - Flow velocity, redox potential, width, depth,
 - Grain size of surface substrate (pebbles, coarse gravel, gravel, sand/clay, organic matter - estimated percentages)



Visual search on sediment surface

■ Reintroduction site



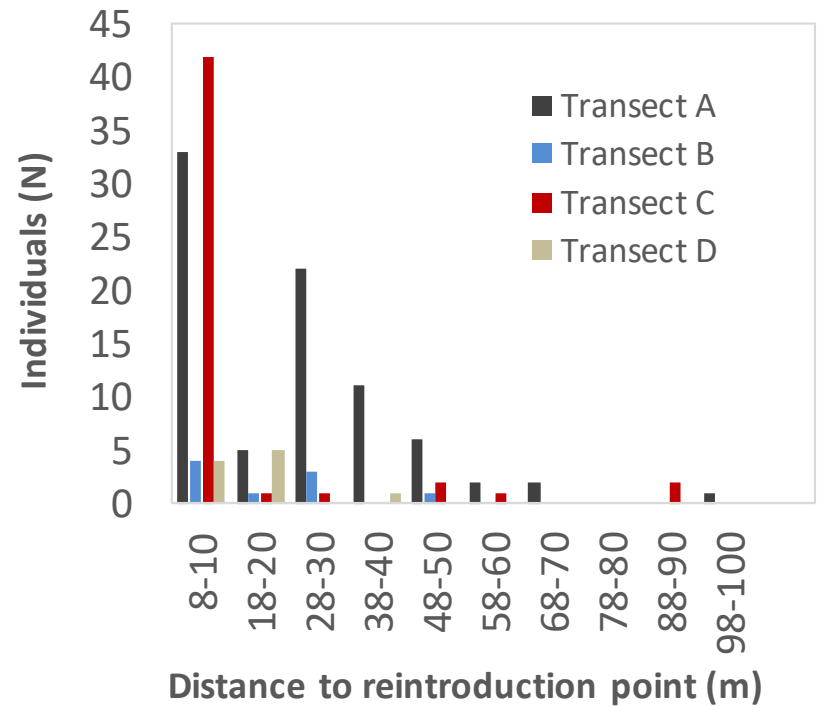
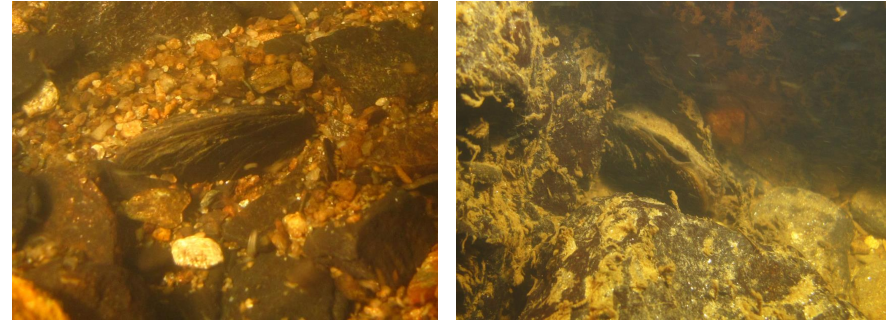
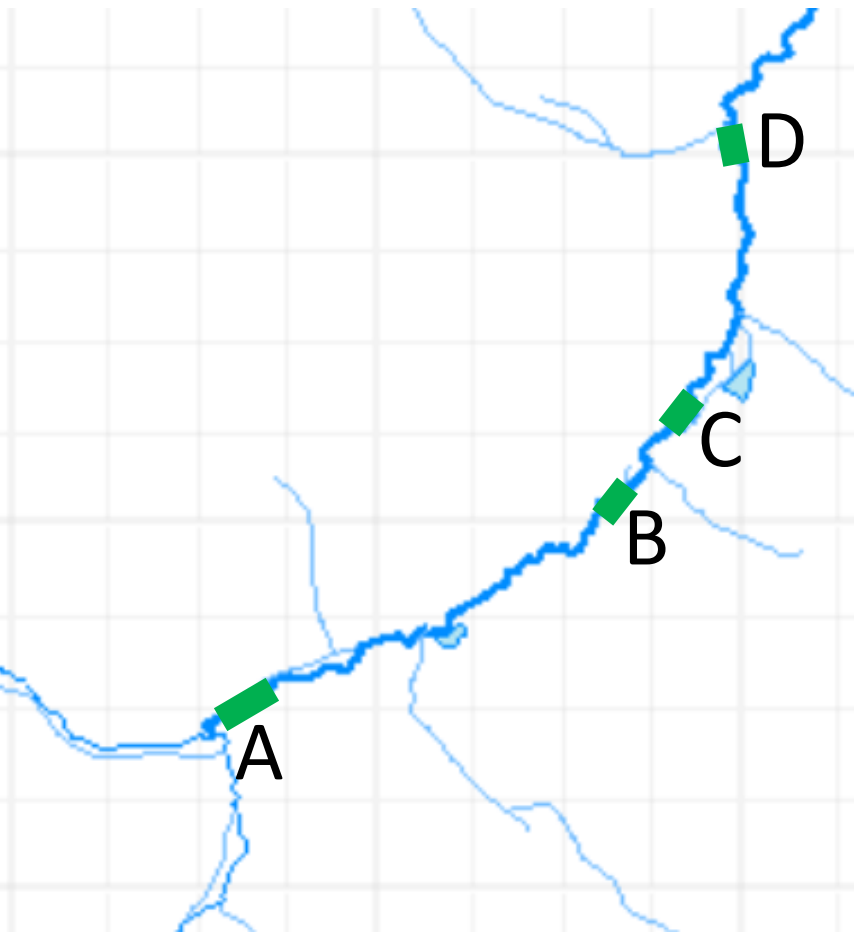
Transect	reintroduced	recovered	extrapolated
D	673	10	50
C	903	49	245
B	789	9	45
A	1801	82	410



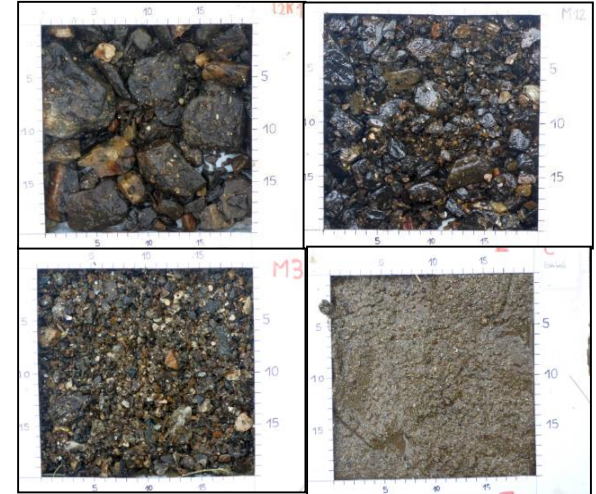
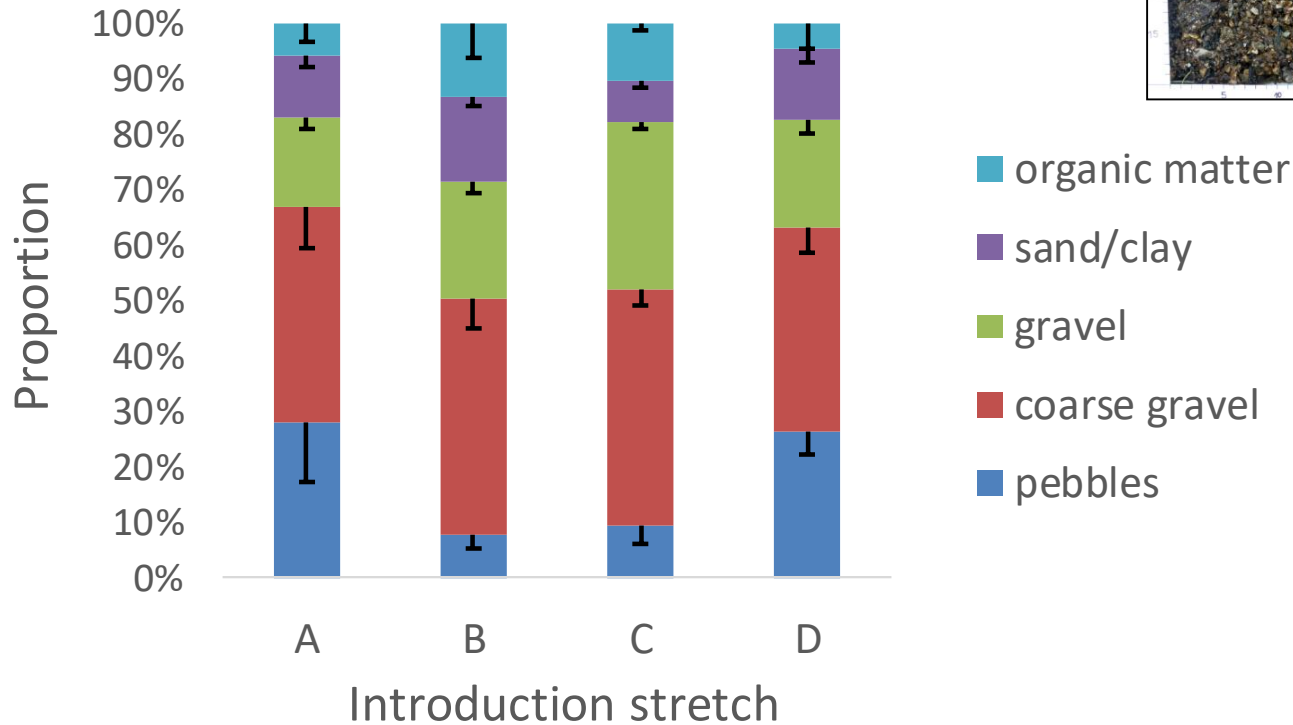
- 150 freshwater pearl mussels (32-74mm, 8-15 years old)
- Extrapolated total stock: 750 Ind.
- **18%** of reintroduced mussels found

Visual search on sediment surface

■ Reintroduction site



Sediment type distribution

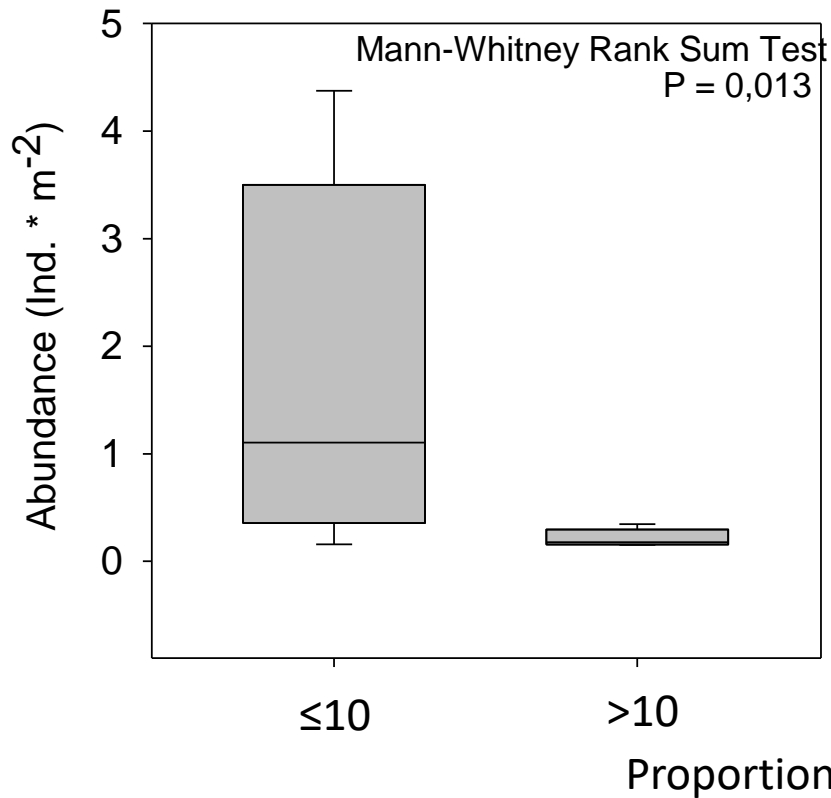


Most findings in pebbles and gravel

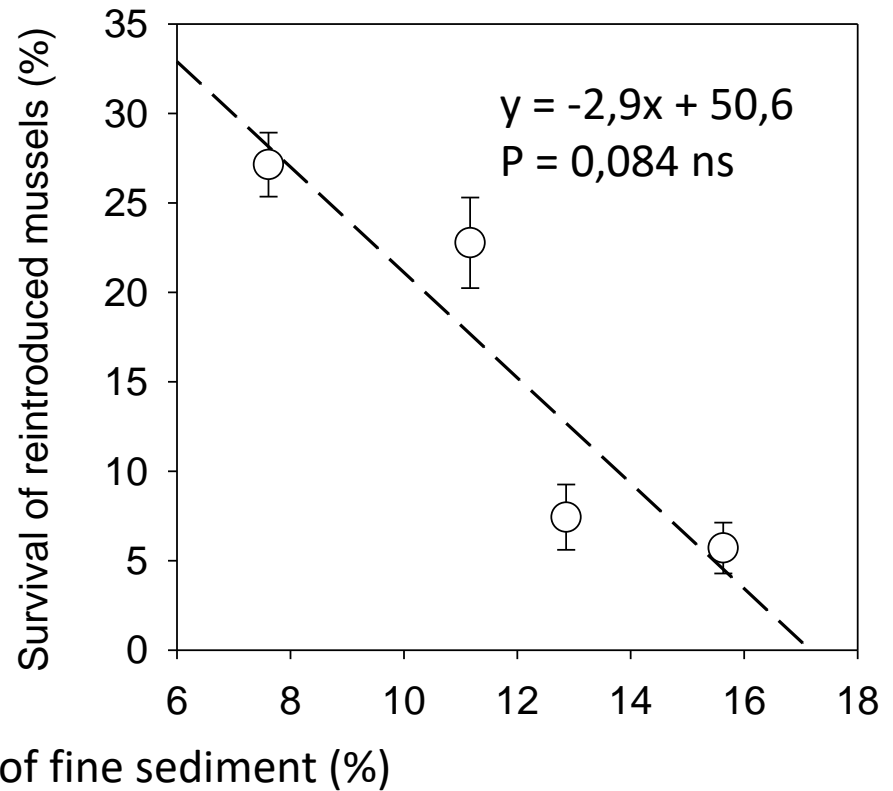


Effect of fine sediment on mussels

abundance



survival



Sediment search

How many mussels dug in sediment?

- Metal frame (50*50 cm)
 1. Visual surface monitoring
 2. Visual monitoring after removal of uppermost sediment layer (2 cm)
 3. Sediment removal up to 10 cm depth → 25L sediment



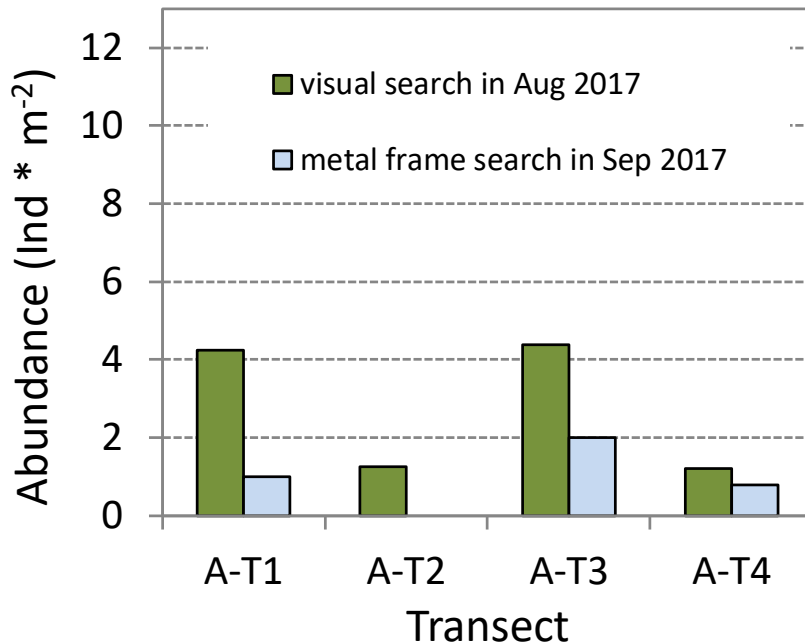
Sediment search

How many mussels dug in the sediment?

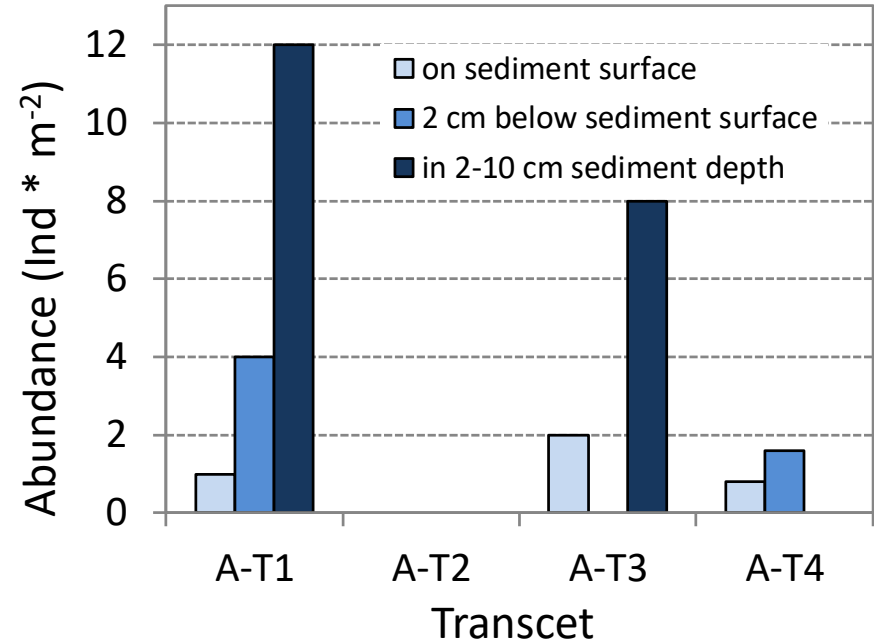
- Effected by timing and temperature



Surface search



Surface and Sediment search

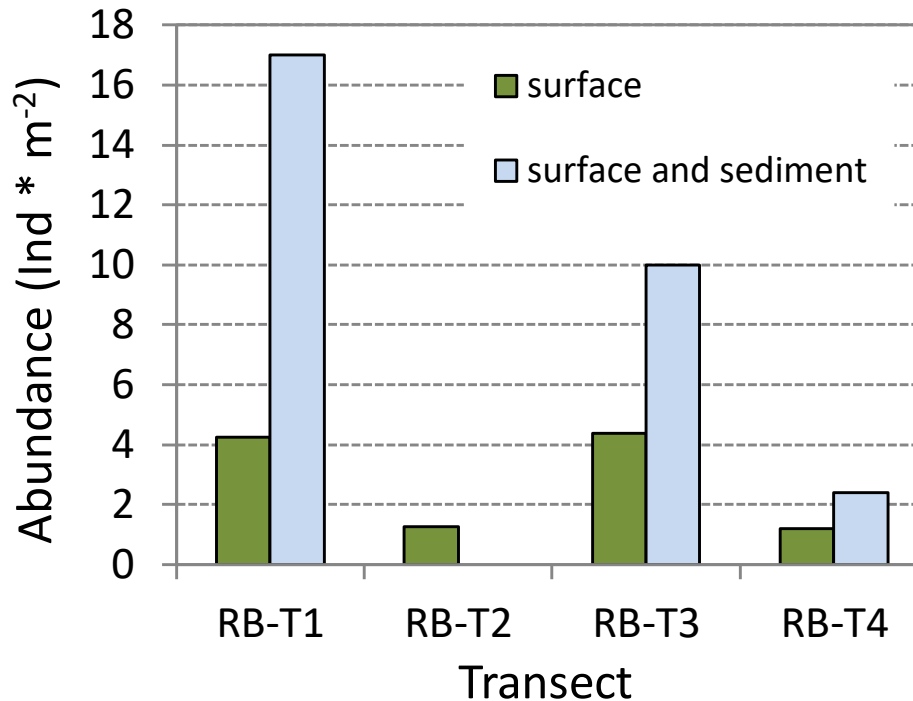


Surface Monitoring : Surface and Sediment Monitoring

1 : 2.18

Survival **18 %** = 750 mussels : Survival **39 %** = 1633 mussels

estimation of overall survival ~ 30 %



H1 Analysis of eDNA in water samples is usable to distinguish introduction stretches with different mussel abundances

Falsified; Although a strong decline of eDNA signal downstream rearing stretch was detected, no differentiation of reintroduction sites with diverse mussel abundance was possible

H2 Reintroduced mussels survived at similar rates in different sites of same reintroduction brook

Falsified; Survival was between 5 and 27 % with strong indication of negative fine sediment effect on mussels

H3 A certain number of mussels is undetectable by visual search on the sediment surface

Confirmed; 5-70 % of mussels are completely in the sediment, strong effect of timing, temperature and sediment type



ArKoNaVera-Project

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International Workshop

Freshwater mussels: Search for resettlement habitats and evaluation of protection measures

(Keynote speakers Evelyn Moorkens, Martin Österling, Marie Capoulade, Rafael Araujo
and Yulia V. Bespalya)

Details and registration: <http://www.flussmuscheln.de/en/>

Monday 25th March – Wednesday 27th March 2019
Dresden, Germany

