

Training school about freshwater mussel breeding

Due to their frequently strong imperilment, more and more freshwater mussels become target species of conservation programs. These conservation programs often include breeding projects as a short term conservation method in order to prevent total extinction of target populations, preserve genetic diversity of species or restock extinct populations.

Implementation of breeding programs is complex and requires profound background knowledge and a „toolbox“ including various methods and skills from selection of target populations, breeding work steps like collection of larvae or rearing of host fish and juveniles up to releasing and monitoring juveniles and populations.

The training school about freshwater mussel breeding is directed towards all newcomers to mussel breeding and mussel conservation providing a thorough introduction on the topic with a strong focus on enabling practical experiences of all working steps.

The program is split in two courses taking place in June and September 2023 at the Kalborn mill in Luxemburg and the city of Passau in Germany. Detailed information is provided below.

Registration	<p>For part 1 in Luxemburg until Thursday May 15th 2023 at f.thielen@naturemwelt.lu</p> <p>For part 2 in Germany until Thursday May 15th 2023 at marco.denic@landkreis-passau.de</p>
Maximum number of participants	Fifteen (15) people
Trainee grants	Participants will get further information about possibilities on reimbursement of travel costs by the COST program after registration.

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Part 1: from selection of populations to rearing of juveniles

In the year 2007 the old mill of Kalborn, directly located at the river Our (Luxembourg), was renovated and transformed into a rearing facility for freshwater mussels. Since then a lot of experience was gained on how to culture the highly endangered freshwater pearl mussel (*Margaritifera margaritifera*) and the thick shelled river mussel (*Unio crassus*). Both species are currently cultured at the facility for the Eifel-Ardenne region from Belgium, Germany and Luxembourg. First experiments to culture the painter mussel (*Unio pictorum*) have also been conducted. The staff at the mill of Kalborn consists of Clemens (Mussel technician), Michel (Pisciculturist & Mussel technician), Sonja (Water chemistry) and Frankie (Ecology, Fish parasitology, Fish & Mussel biology).

Date	Monday 19th June – Friday 23th June 2023
Venue	<p>Mill of Kalborn in northern Luxembourg</p> 
Accommodations	<p>Clervaux, a small touristic town, 15km away from the rearing facility offers a variety of different accommodations. Further possibilities are a hotel in Heinerscheid or Fischbach. Please contact the local organizer if you need help.</p> <p>A shuttle bus between Clervaux (Heinerscheid/Fischbach) and the rearing facility will be arranged.</p>
How to get there	<p>Clervaux and the mill of Kalborn are both situated in the northern part of Luxembourg.</p> <p>Mill of Kalborn: https://goo.gl/maps/XnD69TtyD84eAsmaA</p> <p>Clervaux: https://goo.gl/maps/X7xfVpWQwV52</p> <p>Closest airport is Luxembourg City. Regular train connection to Clervaux are operated from Luxembourg City (Gare de Luxembourg CFL). Public transport in Luxembourg is free.</p>

Topics of the training school
and preliminary program:

Sunday 18th June 2023

Arrival in Clervaux

Departure of the of shuttle bus from Clervaux (Market place) always at 08:30 -> Arrival at rearing facility at 09:00

Monday 19th June 2023: Mussel and host fish populations

Theoretical exercise (2-3 hours):

- General introduction of the site Kalbermillen.
- Why start captive breeding and background on how to select mussel and host fish populations.

Practical exercise (4-5 hours):

- Search of mussels in a river using an Aquascope (Bathiscope).
- Catch of host fish by electric fishing.

Tuesday 20th June 2023: Fish and infestation

Theoretical exercise (1-2 hours):

- Fish husbandry (transport, diseases, treatment, glochidia infestation).

Practical exercise (4-5 hours):

- Host fish husbandry & water chemistry.
- Collection of Glochidia and host fish infestation.

Wednesday 21st June 2023: Collecting & feeding mussels

Theoretical exercise (1-2 hours):

- Collecting & feeding juvenile mussels and different holding systems.

Practical exercise (4-5 hours):

- Collecting juveniles / Different holding systems.
- Maintenance of different holding system.
- Feeding, preparation and feeding.
- Use of coulter counter.

Thursday 22nd June 2023

Theoretical exercise (1-2 hours):

- Semi natural and outdoor caging systems.

Practical exercise (4-5 hours):

- Visit of outdoor caging systems & their maintenance (gravel cages, floating cages...).

	<p>Evening Program: Dinner in Clervaux and visit of the festivities in Clervaux, the evening before the Luxembourgish national holiday.</p> <p>Friday 23rd June 2023</p> <p>Travel Home</p>
Contact	<p>natur & ëmwelt / Fondation Hëllef fir d'Natur 14, Hauptstrooss L-9764 Marnach Luxembourg Email: f.thielen@naturemwelt.lu Tel. +352 26 90 81 27 42</p>

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Part 2: releasing and monitoring of mussels and their potential habitats

In the early 2000's first steps for a comprehensive conservation of freshwater pearl mussel populations in the southern Bavarian Forest were taken, comprising the establishment of a breeding program and the restoration of suitable habitats. Since 2015 conservation work started to include the selection of suitable release habitats comprising deficit analysis and optimization of microhabitats for release of juvenile mussels. In 2018, first juvenile mussels were tagged, released and their performance in the natural habitats has been monitored. In recent years, other mussel species, such as *Unio crassus*, *Unio pictorum* and *Anodonta* sp., occurring in the region of Lower Bavaria have been integrated in conservation efforts mainly focused on habitat conservation.

Date	Monday 11th September – Friday 15th September 2023
Venue	<p>Region of Passau with different venues within a range of 30 km of the city of Passau</p> 
Accommodations	<p>The pitoresque city of Passau situated at the confluent of the three rivers Danube, Inn and Ilz offers a variety of different accommodations. See:</p> <p>https://tourismus.passau.de/uebernachten/uebernachten-passau-stadt/</p> <p>A shuttle bus between Passau and the field venues will be arranged.</p>

How to get there	<p>Passau is situated in the southeastern part of Germany close to the borders of Austria and the Czech Republic.</p> <p>https://goo.gl/maps/wmwphyVi1nEZ3U4W7</p> <p>Closest airports are Munich (GER) and Linz (AUT) with regular train connections to Passau and travelling time of 1.5 -2.5 hours.</p>
Topics and course of the training school	<p>Sunday 10th September 2023 6 pm: get together with city tour through Passau and dinner</p> <p>Monday 11th September 2023: Habitat assessment Block 1 (2 hours):</p> <ul style="list-style-type: none"> - General introduction and theoretical background to analysis of (release) habitats - Introduction to field mapping of (release) habitats <p>Practical exercise (2 hours):</p> <ul style="list-style-type: none"> - pre-selection of potentially suitable river stretches for juvenile release according to available monitoring data and map based landscape analysis <p>Block 2 (4 hours): Practical exercise:</p> <ul style="list-style-type: none"> - field mapping of microhabitats - habitat deficit analysis - Development of a concept for habitat improvement <p>Tuesday 12th September 2023: Monitoring methods Block 1</p> <ul style="list-style-type: none"> - Introduction to monitoring of mussels (2 hours) - Introduction to population genetics of mussels and fish (2 hours) <p>Block 2</p> <ul style="list-style-type: none"> - Practical exercise: Genetic sampling in the field (2 hours) - Marking and tagging mussels (2 hours) <p>Wednesday 13th September 2023: eDNA Block 1:</p> <ul style="list-style-type: none"> - Introduction to eDNA Metabarcoding applications for conservation (2 hours)

	<ul style="list-style-type: none"> - Laboratory sampling design, DNA extraction, Library prep, and NGS (2 hours) <p>Block 2: Practical field exercise</p> <ul style="list-style-type: none"> - Fieldwork sampling design for eDNA capture with example field session (4 Hours) <p>Thursday 14th September 2023: eDNA and monitoring methods part 2</p> <p>Block 1: eDNA</p> <ul style="list-style-type: none"> - Bioinformatic procedures and pipelines (2 hours) - Taxonomic assignment and data curation (2 hours) <p>Block 2: Monitoring methods, Practical exercise:</p> <ul style="list-style-type: none"> - Application of various on site mapping methods in different habitats of Anodonta and Unio species (4 hours) <p>Friday 15th September 2023</p> <p>Practical exercise: Releasing mussels (4 hours)</p> <p>Summary and closing of the training school (1 hour)</p> <p>Approximate end at 2 pm</p>
Contact	<p>Landschaftspflegeverband Passau e.V.</p> <p>Dr.-Ernst-Derra-Straße 4</p> <p>94036 Passau</p> <p>Marco.denic@landkreis-passau.de</p> <p>Tel: +49 851 379 386 16</p>

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