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News Release

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Genetic diversity in rivers –

Mussels and brown trout need an integrated conservation approach

Once cherished for its precious pearls, the freshwater pearl mussel, one of the most finicky inhabitants of European rivers, has become the subject of study for ecologists. Its larvae evolve on the gills of brown trout. Pearl mussels require extremely clean water and a silt free riverbed. Thus so it is not surprising that the freshwater pearl mussel has become nearly extinct. Water ecologist Prof Jürgen Geist from the Technische Universität München (TUM) is conducting Europe wide research on the genetics and ecology of this niche species. His conclusion is that an integrated conservation strategy is indispensible.

The freshwater pearl mussel (*Margaritifera margaritifera*) lives to the ripe age of over 200 years and thus belongs to the Methuselahs of the animal kingdom. Where it thrives and reproduces, river ecosystems are intact. This mussel is therefore an important environmental indicator used by ecologists to assess flowing waters. Intact pearl mussel populations have become rare nowadays. Silting often “clogs” riverbeds where the young mussels live. Prof Jürgen Geist from the Center of Life and Food Sciences at the Technische Universität München (TUM) is conducting research on the genetics and ecology of the freshwater pearl mussel together with Adj Prof Ralph Kühn and Prof Karl Auerswald, thereby making an important contribution to the conservation of this endangered Red List species.

The demanding freshwater pearl mussel not only requires the right riverbed and clean water. It is also completely reliant on another inhabitant of the river ecosystem: the brown trout (*Salmo trutta fario*). The miniscule pearl mussel larvae die unless they manage to attach to the gills of a brown trout within hours of their release by the female mussel. There the larvae, also known as glochidia, grow to small mussels of about 0.4 mm over a period of up to ten months. They then detach from the gills to sink to the bottom of the river, where they burry themselves completely in the sediment. They do not reappear for another four to five years.

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Prof Geist has now studied the parasite–host relationship of mussel and trout on a genetic level. For this purpose water from middle, west and north Europe was examined and DNA samples of brown trout and freshwater pearl mussels analyzed. The surprising result was published in the journal *Molecular Ecology* (*Mol. Ecol. 17; 997-1008*): The correlation between the genetic diversity of parasite and host is negative. Wherever the freshwater pearl mussel is genetically particularly variable, the brown trout populations tend to be more uniform. This results from the different strategies that host and mussel use to adapt to their environment.

This leads to a whole new perspective on the conservation of biodiversity in rivers and streams: The genetic diversity of individual species does not provide a sufficient basis for identifying regions in particular need of conservation because of their genetic diversity. Instead species with very different survival strategies must be considered. Integrated conservation approaches for brown trout and freshwater pearl mussel need to consider the entire ecosystem in order to preserve maximum biodiversity.

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- feldforschung.jpg: The freshwater pearl mussel is an indicator for highest water quality. (TUM / Jürgen Geist)
- flussperlmuschel.jpg: With good living conditions the freshwater pearl mussel can live to over 200 years. (TUM / Jürgen Geist)
- glochidien.jpg: The mussel larvae are visible as white dots in the gill of a brown trout. (TUM / Michael Lange)