

Science for Environment Policy

Fragmentation of brown trout habitat threatens freshwater pearl mussels in Sweden

The fragmentation of brown trout (*Salmo trutta*) habitat indirectly affects the threatened freshwater pearl mussel (*Margaritifera margaritifera*), a new study has shown. Dams and weirs, which affect the migration of the fish, also have a knock-on effect on the mussels, because they rely on brown trout during the larval stage of their lives.

Habitat fragmentation is a major cause of the decline and extinction of species. For migratory fish, building dams and weirs can prevent them from reaching spawning areas, and isolate breeding populations from each other. It also indirectly affects other parts of the ecosystem, including parasites which feed on these fish.

The freshwater pearl mussel, listed as endangered by the [IUCN Red List](#), goes through a stage of life when it is a parasitic larvae, developing on the gills of juvenile brown trout (*Salmo trutta*).

The habitat of the brown trout in the River Ljungan, Sweden, has been fragmented by a total of eight hydroelectric power plants, dividing it into to a number of separate tributary-resident populations and sea-migratory populations. Such habitat fragmentation has caused a decline in migratory brown trout strains and several are at threat of extinction.

This study investigated how the freshwater pearl mussel is affected by the fragmentation of tributary brown trout, compared to migratory trout. The researchers collected two groups of tributary brown trout from the Maljan and Linån tributaries of the Ljungan River. Each group was mixed with mussel larvae from its own specific tributary. Migratory sea-trout were divided into two groups and mixed with larvae from either Maljan or Linån. They measured the number, mass and size of larval cysts that formed in the trout gills at two time points, roughly one month apart.

Tributary trout showed a decrease in the number of cysts over time, whereas migratory sea-trout showed no decrease. Migratory sea-trout also showed a higher number of cysts overall.

The researchers say it is possible that the mussels are better adapted to parasitising migratory sea-trout. It is also possible that migratory sea-trout are more susceptible to parasites because they must switch between living in salt and freshwater, which may dampen their immune responses. As a result of this, mussels are likely to rely more on migratory sea-trout, and are therefore more affected by habitat fragmentation.

The researchers also compared the population sizes of tributary trout and migratory sea-trout. There were fewer tributary trout than migratory trout in autumn, when mussels infest the fish. There were also fewer tributary trout during the summer, when cysts leave the fish to take up residence in the sandy river bottom. Both factors could cause a decline in mussel numbers.

The authors conclude that restoration activities to mitigate habitat fragmentation should focus on creating pathways through obstacles, such as dams and weirs, for host fish to return upstream, rather than sustaining isolated fish populations by re-stocking them. This approach would also increase the abundance of other species such as the threatened freshwater pearl mussel, which are indirectly affected by such habitat fragmentation.



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