

Gut feeling essential for migrating fish

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Jeroen Brijs. Credit: Jeroen Brijs

Why do trout spend so much time in potentially dangerous estuaries before migrating to sea? In a new thesis published at University Gothenburg, Jeroen Brijs reveals that the answer may lie in the gut.

Trout migrate to sea to grow as much as possible before returning to the rivers to spawn. But they must undergo a wide range of changes so that they can survive in the salty waters of the sea. By investigating the essential physiological changes necessary for trout to maintain salt and water balance, we can now better understand how a [fish](#) prepares for a life at sea.

Get ready or die trying

A particularly risky section of the journey from freshwater to seawater occurs in the estuaries, as trout are bombarded from above by predatory birds. Mortality rates of trout in estuaries can be as high as 90%, yet they still choose to spend several days there.

"Why migrating fish choose to hang around in these dangerous areas for some time before entering the sea has been a bit of a mystery for researchers," says Jeroen Brijs.

So why? Are they searching for food? Are they learning the smells and signals of the environment so that they can find their way back to spawn? Or does it simply reflect the time it takes to prepare the body?

"Although all of these suggestions may be true, it is a fact that no fish living in freshwater will survive in the sea unless physiologically ready," says Jeroen Brijs.

Fish need "the right gut feeling" before migrating to sea

Over the last 5 years, Jeroen Brijs and his colleague have investigated the physiological changes that take place when fish move from freshwater to seawater, which allow them to survive at much higher salinities. Their findings reveal that adjustments in gut function, such as increased gut blood flow and movements, seem to play an important role for fish maintaining salt and water balance in seawater.

"These modifications are crucial for the survival of fish crossing the freshwater-ocean boundary because if the gut is not ready for high salinity waters the fish will die from dehydration," says Jeroen Brijs.

In the thesis, he also demonstrates that the length of time it takes for these physiological changes to be completed is very similar to the time trout spend in the estuaries before leaving for the sea.

"If we translate the findings from lab-based studies to life in the wild then it is likely that despite the increased risk of getting eaten, migrating fish are forced to stay in the estuaries until their guts can handle the high salinity waters of the sea," says Jeroen Brijs.

Migrating fish may struggle in a warmer world

By documenting the normal physiological responses of migrating individuals to changes in the environment, the consequences of other factors such as [global climate change](#) can also be better understood.

"This thesis provides a platform for future studies, and indeed some of my findings indicate that migrating fish may struggle in a warmer world, as their capacity to osmoregulate at higher temperatures may be limited," says Jeroen Brijs.

More information: Gastrointestinal motility and blood flow in teleosts

during digestion and osmoregulation, hdl.handle.net/2077/49977

Provided by University of Gothenburg

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