# Pharmaceuticals impact juvenile salmon migration, study finds



Juvenile Atlantic salmon embark on a critical migration from freshwater habitats to the sea each spring, a journey fraught with challenges, including navigating predators and human-made structures like dams. A recent study led by the Swedish University of Agricultural Sciences has highlighted the impact of pharmaceutical contaminants on this ancient migration, suggesting that even trace amounts of human medications, such as the anti-anxiety drug clobazam, can significantly influence the migratory success of these fish.

The global proliferation of pharmaceuticals has resulted in the contamination of freshwater ecosystems, with over 900 active pharmaceutical ingredients detected in various bodies of water. These substances enter waterways through multiple channels, including human excretion, agricultural runoff, and inadequate disposal methods. Wastewater treatment plants often fail to completely eliminate these compounds, leading to their accumulation in aquatic environments. This presents potential risks for wildlife, as these drugs can alter behaviour and neurological function in aquatic organisms.

Co-author Dr. Marcus Michelangeli, an ecology lecturer at Griffith University, noted the growing concern surrounding the impact of psychoactive substances. "Of particular concern are psychoactive substances like antidepressants and pain medications, which can significantly interfere with wildlife brain function and behaviour," he stated. The study specifically investigated clobazam, a benzodiazepine, and tramadol, an opioid; both are commonly found in rivers at biologically active levels.

In a comprehensive field study, researchers tracked 730 juvenile salmon, or smolts, across two migration seasons in Sweden's River Dal. The research employed slow-release drug implants that delivered doses mimicking real-world exposures, with the fish divided into groups receiving no drugs, clobazam, tramadol, or a combination of both. Acoustic telemetry tags attached to the fish allowed the team to monitor their movements over a distance of 28 kilometres, including transit through two hydropower dams.

The findings revealed that smolts exposed to clobazam exhibited increased success in reaching the Baltic Sea and demonstrated faster passage through the dams. Specifically, salmon treated with clobazam took an average of eight hours to navigate one dam, compared to up to 64 hours for those receiving the drug combination. However, there was no significant difference in overall migration speed, indicating that clobazam may have improved the effectiveness of fish as they navigated critical barriers rather than accelerating their swimming capabilities.

Contrastingly, exposures to tramadol did not result in similar benefits, as it performed comparably to control groups. The team noted that fish receiving clobazam displayed altered shoaling behaviour in laboratory scenarios, becoming less cohesive when threatened by predators. This change in behaviour, characterised by increased risk-taking, could render these salmon more susceptible to predation.

While the study’s results indicate that exposure to clobazam can facilitate migration, they also underscore a complex and potentially troubling ecological narrative. The increase in migration success could lead to trade-offs, such as altered synchronisation of group movements and potentially detrimental effects on reproductive timing. Dr. Michelangeli cautioned, “While the increased migration success in salmon exposed to clobazam might seem like a beneficial effect, it is important to realise that any change to the natural behaviour and ecology of a species is expected to have broader negative consequences."

The broader implications of these findings suggest the need for immediate action to address the rising levels of pharmaceutical contamination in freshwater habitats. Solutions may include advancing wastewater treatment methods to capture pharmaceutical residues more effectively, alongside initiatives in drug design aimed at reducing the environmental persistence of these substances.

Experts in the field emphasise the urgency for further field-based research to fully understand the long-term behavioural effects of pharmaceutical pollutants on wildlife populations and their ecosystems. The intricacies of how drug exposure interacts with environmental stressors and species interactions remain areas ripe for exploration, highlighting the competing demands of human health needs and environmental integrity.

Source: [Noah Wire Services](https://www.noahwire.com)

## References

* <https://phys.org/news/2025-04-pharmaceutical-pollution-migration-behavior-salmon.html> - This article corroborates the study's findings that pharmaceutical pollution, particularly clobazam, influences the migration behavior of Atlantic salmon. It highlights how clobazam enhances migration success by facilitating faster dam passage.
* <https://www.technologynetworks.com/drug-discovery/news/clobazam-alters-salmon-migration-in-swedens-river-dal-398383> - This piece supports the study's conclusions about clobazam's impact on salmon migration. It explains how clobazam increases migration success and alters social behavior, such as shoaling, potentially leading to increased risk-taking.
* <https://pubmed.ncbi.nlm.nih.gov/38721682/> - This study highlights the challenges faced by Atlantic salmon during migration, including navigating dams. It underscores the importance of river connectivity and the impact of human-made barriers on salmon migration.
* <https://www.vacourts.gov/courts/scv/rulesofcourt.pdf> - This document does not directly support the article's claims but is included as it was part of the initial search results. However, it pertains to legal procedures rather than environmental or biological research.
* <https://www.mass.gov/guide-to-evidence/article-xi-miscellaneous> - Similar to the previous entry, this URL does not support the article's environmental claims; it focuses on legal evidence procedures.