Study shows pollution affects the growth and behavior of aquatic organisms

August 28 2024

The study proved that long-term exposure to manganese sulfate hampers the growth, physiology and behavior of zebra fish. Credit: Johanna Hippeläinen

Research at the University of Jyväskylä, Finland, reveals that size-based selection, as happens in fishing, may impact the stress tolerance of fish, which in turn has a significant impact on the condition and coping of fish in changing environments.

The study proved that long-term exposure to manganese sulfate ($MnSO_4$), which is a common aquatic pollutant from mining, hampers the growth and alters the behavior of zebra fish. The study is published in *Ecology and Evolution*.

As we know, fishing is focused on middle-sized and large individuals through lower limits and fishing equipment restrictions, which often favors a fast life-cycle in target species. JYU researchers found that zebra fish with different life-history traits react differently to chronic exposure to manganese sulfate ($MnSO_4$).

"In our research, we concentrated on two life-history types: fast-growing fish characterized by rapid juvenile growth, early maturation, and smaller size, versus slowly growing fish characterized by slower juvenile growth, later maturation and greater size," explains Academy Research Fellow Silva Uusi-Heikkilä from the University of Jyväskylä.

Considering fish life-history types in conservation

The findings show that $MnSO_4$ exposure slows down the growth of zebra fish and lowers their condition factor, which is an indicator of well-being. However, the scope of impacts varies by life-history types.

Fish with the fast life-history strategy were more sensitive to $MnSO_4$, as they grew more slowly when exposed to high concentrations. In addition, they had a lower condition factor, and they ate less than their conspecifics with a slow life-history strategy.

"Our findings show that manganese sulfate may deteriorate the growth and stress coping of fish, and that variation in life-history traits may play a crucial role in modifying the stress tolerance of individuals," Uusi-Heikkilä says.

"This study underlines that it is important to take population life-history traits into account in environmental risk assessments and protection strategies and also to consider the combined effects of fishing and environmental factors on fish populations."

The study provides valuable information on how pollutants like manganese sulfate ending up in the aquatic environment can affect aquatic organisms in various ways based on their life-history strategies.

"These findings have significant effects when we wish to get insight into the viability and adaptability of fish populations in polluted habitats," Uusi-Heikkilä states.

More information: Silva Uusi-Heikkilä et al, Fish with slow life-history cope better with chronic manganese exposure than fish with fast life-history, *Ecology and Evolution* (2024). DOI: 10.1002/ece3.70134

Provided by University of Jyväskylä