Heavy metals present in snake livers raise environmental concerns

June 2 2020

Curtin PhD Candidate Mr Damian Lettoof holding a tiger snake. Credit: Curtin University

Tiger snakes living in Perth's urban wetlands are accumulating toxic heavy metals in their livers, suggesting that their habitats—critical, local ecosystems—are contaminated and the species may be suffering as a result.

Lead researcher Ph.D. Candidate Mr Damian Lettoof, from the

Behavioural Ecology Lab in the School of Molecular and Life Sciences at Curtin University, said that not only were the snakes' livers shown to contain moderately high levels of heavy metals, but sediment samples taken from some of the wetlands sites were found to have amounts of arsenic, lead, mercury and selenium that exceed current government guidelines.

"Urban wetlands are almost always polluted, commonly from contaminated storm water, past or present dumping of waste, and spill events," Mr Lettoof said.

"Wetlands areas are usually situated at low points in the landscape, so unfortunately, a lot of urban run-off ends up in them. Generally speaking, the longer the wetland has been urbanised, the higher the levels of pollution.

"It's important to note that many heavy metals exist naturally in the wetlands sediment and surrounding rocks, in low concentrations, which may cause some heavy metals to leach in to the wetlands environment.

"However, the high concentrations of heavy metals we found in the snakes' livers and sediment samples suggest urbanisation and human-induced pollution are the cause, and consequently could be affecting local snake populations," Mr Lettoof said.

The study found the metal concentrations in the snake livers were collectively highest in Perth's most urbanised wetland: Herdsman Lake in the north western suburbs.

"Snakes tested from Herdsman Lake also had the highest concentration of the metal molybdenum ever reported in a terrestrial reptile, in the world," Mr Lettoof said.

"Continuous, chronic exposure to contaminants can have a range of impacts on the health and behaviour of animals. The contaminated populations could be suffering poorer health conditions, leading to shorter lifespans, higher predation, and ultimately, local extinction with cascading consequences such as reduced local biodiversity."

Collectively, Lake Joondalup had the lowest levels of metals. The researchers also analysed samples from Bibra Lake and Loch McNess in Yanchep National Park.

Tiger snakes are a top predator in the wetlands environment, and most likely have bioaccumulated the heavy metals through eating frogs, which are very sensitive to accumulating contaminants.

The Curtin University study was the first of its kind in Australia to show that snakes are a good bio-indicator of wetland contamination, and highlights the use of monitoring snake populations as an important indicator species of environmental health.

The full research paper, "The Broad-Scale Analysis of Metals, Trace Elements, Organochlorine Pesticides and Polycyclic Aromatic Hydrocarbons in Wetlands Along an Urban Gradient, and the Use of a High Trophic Snake as a Bioindicator," was published in the *Archives of Environmental Contamination and Toxicology*.

More information: D. C. Lettoof et al. The Broad-Scale Analysis of Metals, Trace Elements, Organochlorine Pesticides and Polycyclic Aromatic Hydrocarbons in Wetlands Along an Urban Gradient, and the Use of a High Trophic Snake as a Bioindicator, *Archives of Environmental Contamination and Toxicology* (2020). DOI: 10.1007/s00244-020-00724-z

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Provided by Curtin University

Citation: Heavy metals present in snake livers raise environmental concerns (2020, June 2) retrieved 24 April 2024 from https://phys.org/news/2020-06-heavy-metals-snake-livers-environmental.html

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