Female sex hormones can weaken the ability of fish to protect themselves against environmental toxins

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African Sharptooth catfish were kept in concrete ponds at Sokoine University of Agriculture in Tanzania before exposure trials. Credit: Morten Sandvik

It is well known that female sex hormones (oestrogens) that end up in rivers and lakes, primarily via spillage from sewers and livestock farming, pose a threat to the environment.

Some environmental toxins can also have the same impact as oestrogens. One example of such substances are degradation products (metabolites) from the pollutant PCB. Marte Braathen's doctoral research project has developed methods for monitoring biological responses (biomarkers) in fish to pollution resulting from toxins present in African rivers and lakes.

Environmental toxins having a similar effect to oestrogens can lead to hormone imbalance in animals exposed to them. In addition to imitating the effect of hormones, it has also been shown that oestrogens and PCB metabolites lower organisms' resistance to other kinds of contaminants.

When developing methods for monitoring biological responses (biomarkers) to pollution in rivers and lakes in Africa, Marte Braathen studied the African sharptooth catfish and also cells from the liver of Atlantic salmon. The research was carried out in South Africa, Tanzania and Norway. Since toxins often end up in rivers and lakes, fish are fitting objects of study when it comes to environmental monitoring.

Whereas chemical analyses look for specific substances, biomarkers will uncover biological effects resulting from substances in the environment, which in turn can involve groups of substances with specific characteristics. Biomarkers can also be cheaper and less dependent on specialised personnel or facilities than traditional, chemical analyses. For these reasons, biomarkers are suitable for use in developing countries.

The methods that were developed using African sharptooth catfish were then tested on fish living wild in four different fresh-water systems in the vicinity of Morogoro, Tanzania. One of these is Mindu dam, which functions as a source of drinking water and as a fishing site for the local population. The other three fresh-water systems are part of sewer drainage systems, which are a natural habitat for the African sharptooth catfish.

Marte Braathen's research shows that the African sharptooth catfish is a species that is suited to the environmental monitoring of fresh-water systems in Africa. The biomarker responses she found were relatively unequivocal and corresponded with responses found in other species of fish. Her study of wild fish demonstrated that the biomarkers, which were developed and validated, were appropriate for detecting

contaminated sites in Africa.

Marte Braathen defended her doctoral research at The Norwegian School of Veterinary Science on 17th February with a thesis entitled: ”Fish biomarkers for environmental pollution monitoring: evaluation and application in tropical and temperature aquatic systems.”

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