Scientist identify candidate genes associated with albinism in Wels catfish

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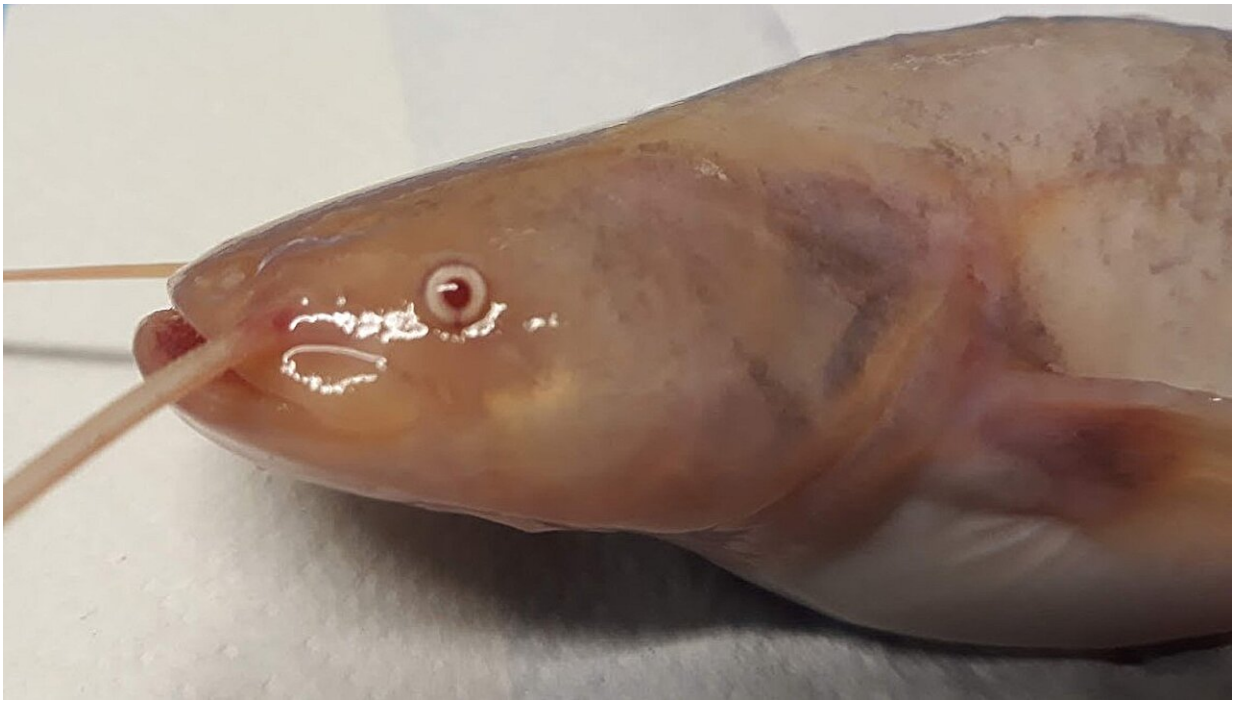


Albino Wels catfish. Credit: Anti Vasemägi, Riho Gross

An international research team from Estonian University of Life Sciences and Swedish University of Agricultural Sciences has discovered a set of candidate genes causing albinism in one of the largest freshwater fish, Wels catfish (Silurus glanis). The findings are published in the journal *Comparative Biochemistry and Physiology Part B: Biochemistry and Molecular Biology*.

Lack of pigmentation, a condition known as albinism, is a rare event which occurs occasionally across different taxa. It is usually caused by specific changes in the genome. Yet identifying exact molecular culprits for different species is not a simple task. This is because the melanin pigment synthesis and metabolism pathways, which are responsible for most types of pigmentation in animals, are relatively complex.

As a result, mutations in many different genes can cause albinism. "Essentially, albinism is a phenomenon where, as a result of a mutation, a gene no longer functions normally or is completely shut down," said Vasemägi, the leading scientist of the study.

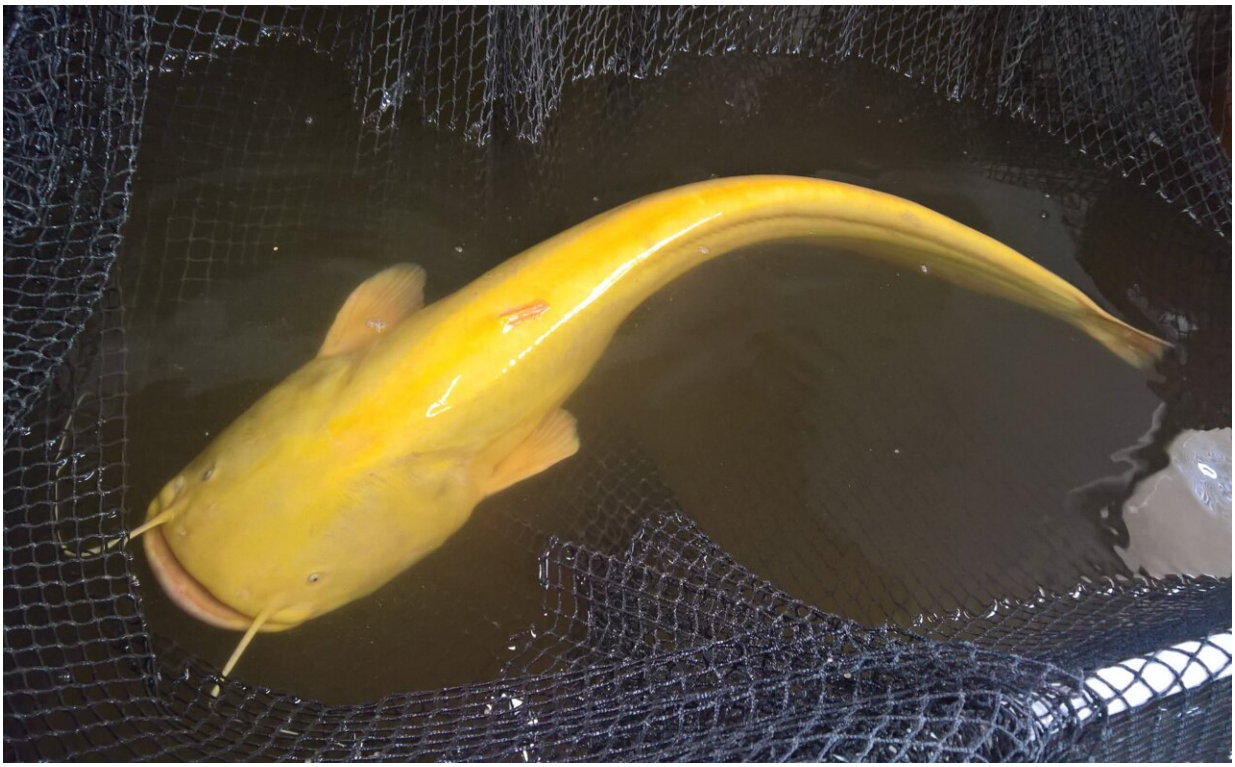
"The mechanisms of albinism can therefore be compared to an airplane that cannot take off due to unknown malfunction. Complex systems, such as metabolic pathways or airplanes, can become non-functional in many different ways from leaks in the fuel tank to the absence of a pilot. Therefore, the number of potential genes responsible for this loss-of-function trait causing albinism is relatively large, especially when we consider a broader evolutionary context beyond primates," he added.

"During the study, we analyzed the expression patterns and splicing variation of more than ten thousand genes in four different tissues, and discovered a plenty of differences between albino and normally pigmented catfish," explained Vasemägi.

"We identified several genes across multiple tissues as the most promising candidates, such as hps4, hsp90b1, raph1, uqcrfs1 genes, potentially causally linked to the albino phenotype in Wels catfish. Interestingly, these genes also cause albinism and pigmentation disorders in humans, channel catfish and mice. On the other hand, very few alternatively spliced genes showed consistent association with pigmentation, which indicates that the observed alternative splicing cases are most likely not causally linked with albinism in Wels catfish," he

added.

Normally pigmented Wels catfish. Credit: Anti Vasemägi, Riho Gross



Albino Wels catfish in fish hatchery. Credit: Anti Vasemägi, Riho Gross

"During the differential gene expression analysis, we also observed significant differences between albino and pigmented catfish related to general energy metabolism and the immune system, supporting previous physiological studies," said Professor Riho Gross, head of the Chair of Aquaculture at the Estonian University of Life Sciences, who participated in the study.

Prof. Gross has been leading an innovation project, the aim of which was to develop and optimize the technology of artificial propagation and breeding of Wels catfish in Estonia and to identify populations with the best fish farming characteristics and genetic indicators.

This work, "Differential expression and alternative splicing analyses of

multiple tissues reveal albinism-associated genes in the Wels catfish (Silurus glanis)," provides the first transcriptome-wide multi-tissue insights into the albinism of Wels catfish and serves as a valuable resource for further understanding the genetic mechanisms of pigmentation in fish.

More information: M.Y. Ozerov et al, Differential expression and alternative splicing analyses of multiple tissues reveal albinism-associated genes in the Wels catfish (Silurus glanis), *Comparative Biochemistry and Physiology Part B: Biochemistry and Molecular Biology* (2024). DOI: 10.1016/j.cbpb.2024.110941

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