

Enlarged fins enable Tibetan catfish to adapt to high plateau

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With the uplift of the Tibetan Plateau, large mountains and rivers were created in Eurasia that significantly altered its geomorphology and climate. Since they are largely restricted to river systems, fishes are more

likely to be affected than other organisms.

A group of catfish that lives on the Tibetan Plateau and is subject to rapid water flow has evolved greatly enlarged [pectoral fins](#) with more fin-rays to form an adhesive apparatus. It remains unclear, however, what [genetic basis](#) underlies these [adaptations](#) in Tibetan catfishes.

A study led by Prof. He Shunping from the Institute of Hydrobiology (IHB) of the Chinese Academy of Sciences recently found that Tibetan catfish evolved faster to better adapt the extreme environments of the Tibetan Plateau. The study was published in *Science China Life Sciences*.

The researchers first generated a chromosomal-level genome of *Glyptosternum maculatum* (*G. maculatum*), which is significantly better than earlier genome version from other researchers.

Using [whole genome](#) comparative analyses, the researchers found that the evolutionary rate of *G. maculatum* is significantly faster than that of other low-altitude fishes, suggesting that the *G. maculatum* lineage accelerated protein evolution to better adapt to the harsh environments of the Tibetan Plateau.

The researchers further performed functional assays by knocking out the *Hoxd12a* gene in zebrafish. They discovered a potential role for this gene in shaping the enlarged fins of these Tibetan catfishes, with shorter pectoral fin in *hoxd12a*^{-/-} zebrafish.

Functional assays of TRNA 5-methylaminomethyl-2-thiouridylate methyltransferase (TRMU) revealed that the *G. maculatum* TRMU allele generates more mitochondrial Adenosine Triphosphate (ATP) than the ancestral allele found in low-altitude fishes. Furthermore, functional assays of von Hippel-Lindau tumor suppressor (VHL) alleles suggested that the *G. maculatum* allele has lower transactivation activity than the

low-altitude forms.

This study represents the first example of investigating phenotypic adaptation to the Tibetan Plateau by integrating genomic and functional evidences in fishes.

More information: Liandong Yang et al, Enlarged fins of Tibetan catfish provide new evidence of adaptation to high plateau, *Science China Life Sciences* (2023). [DOI: 10.1007/s11427-022-2253-7](https://doi.org/10.1007/s11427-022-2253-7)

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