

# Study provides novel evolutionary insights into unisexual reproductive success

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Amphidiploid and amphitriploid. Credit: IHB

Unisexual reproduction lacks meiotic recombination, resulting in the accumulation of deleterious mutations and hindering the creation of genetic diversity. Thus, unisexual taxa are commonly considered an evolutionary dead end.

Intriguingly, some unisexual fishes and reptiles have outlived their predicted extinction time and exhibit high [genetic diversity](#) and strong environmental adaptation, yet evolutionary mechanisms underlying unisexual reproductive success generally remain unclear in these

vertebrates.

Researchers led by Prof. Gui Jianfang from the Institute of Hydrobiology (IHB) of the Chinese Academy of Sciences and their collaborators recently revealed the evolutionary puzzle of unisexual reproductive success in hexaploid gynogenetic gibel carp (*Carassius gibelio*).

This study was published in *Nature Ecology & Evolution* on July 11.

In this study, the research team sequenced the genomes of sexual tetraploid crucian carp (*C. auratus*) and unisexual hexaploid gibel carp (*C. gibelio*) and assembled their haplotypes to the chromosome level. Both haplotypes have 50 chromosomes, which comprise two subgenomes (25 chromosomes in subgenome A and 25 chromosomes in subgenome B).

Sequencing coverage analysis reveals that tetraploid *C. auratus* is an amphidiploid (AABB) with two diploid sets of chromosomes and hexaploid *C. gibelio* is an amphitriploid (AAABBB) with two triploid sets of chromosomes.

Based on the resequencing data from different strains of *C. auratus* and *C. gibelio*, the research team demonstrated that amphitriploid *C. gibelio* originated from ancestral amphidiploid *C. auratus* via autotriploidy about 0.82–0.96 million years ago. The amphitriploid *C. gibelio* overcame the meiotic obstacle caused by three [homologous chromosomes](#) through unisexual gynogenesis.

Through [comparative genomics](#), the researchers identified intensive expansion and alterations of meiotic cell cycle-related genes and an oocyte-specific histone variant in *C. gibelio*. They found that most of these expanded genes showed high expression in ovaries and oocytes.

In addition, the research team found that *C. gibelio* produces unreduced oocytes by suppressing meiosis I. However, sporadic homologous recombination and a high rate of gene conversion were revealed during oogenesis of *C. gibelio*. These genomic changes might have facilitated purging deleterious mutations and maintaining genomic stability in amphitriploid *C. gibelio*.

**More information:** Xiao-Dong Fang, Comparative genome anatomy reveals evolutionary insights into a unique amphitriploid fish, *Nature Ecology & Evolution* (2022). DOI: [10.1038/s41559-022-01813-z](https://doi.org/10.1038/s41559-022-01813-z).  
[www.nature.com/articles/s41559-022-01813-z](https://www.nature.com/articles/s41559-022-01813-z)

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