Genetic breeding of fast-growing autotransgenic mud loach, *Misgurnus mizolepis*

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Generation of transgenic fish acquiring the ability to express desirable phenotypes offers new possibilities for addressing fundamental biological questions, and can also attribute to enhanced aquaculture productivity. I describe here the recent research progress in my laboratory with particular emphasis on the development of fast-growing autotransgenic fish and its chromosome-set manipulation using our experimental organism, the mud loach, *Misgurnus mizolepis*. Transgenesis of mud loach growth hormone gene driven by mud loach beta-actin promoter made it possible to get dramatically fast-growing autotransgenic mud loach without any use of heterologous genetic materials. Transgenic mud loach clearly laid outside of normal distribution of body weight, their growth rate was significantly accelerated, and revealed extraordinary heavier body weight and longer length even than those of 10-year-old normal broodfish. The sizes of transgenic fish were ranged from 2-fold to 35-fold those of their non-transgenic siblings. Transgenic mud loach displayed also the significantly improved feed conversion ratios up to 1.5-1.8 fold when compared to that of non-transgenic counterparts.

By combining the chromosome-set manipulation with transgenic technologies, transgenic polyploidy (3N and 4N) and transgenic isogenic homozygous lines were developed. Sterility was successfully achieved in transgenic triploid with persistent gigantism and growth stimulation. Furthermore, complete homozygosity in transgenic locus was demonstrated in androgenetically developed transgenic lines and these fish transmitted consistently the transgene to subsequent generation at the frequency of 100%. This advance should make the utilization of genetically improved transgenic fish population in fisheries science and aquaculture possible, and also expand the usefulness of fast-growing transgenic fish.