Resources Management Strategy of Gymnocypris Przewalskii (Naked Carp) in Qinghai Lake Based on Matrix Population Model

Chubin Weng , Fakai Lei , Mengzhen Xu

Department of Hydraulic Engineering, Tsinghua University

*Beijing, China*

*Gymnocypris przewalskii*, the only commercially important fish species in Qinghai Lake, is crucial to the biodiversity of Qinghai Lake and nearby wetlands. A series of ecological pressures such as long-term overfishing, drying up of inflows, and decrease of spawning ground let its total amount decline from 320000 tons before 1950 to only 3000 tons by the end of the 20th century, and let its average age shift from 10 to 5. However, the mechanism of how its population evolves under ecological pressures has yet to be quantitatively analyzed. To provide a scientific basis for the restoration and protection of *Gymnocypris przewalskii* resources, we used a matrix population model to simulate the evolution of the *Gymnocypris przewalskii* population from the 1960s to 2020s and identified which life stages were the most critical for the population restoration based on the results of elasticity analysis. The results show that the hatching rate of eggs and the survival rate of juveniles to 1-year-old could be artificially enhanced by nearly 0.5 times. Improving the survival rate of the juveniles and ensuring the success of migration and spawning of the adults could be two major approaches to restoring the population. The total amount of *Gymnocypris przewalskii* could be recovered to the initial 320000 tons in about 30 years with the current protection measures, after which the fish could be harvested sustainably if only fish older than age 11 were caught.