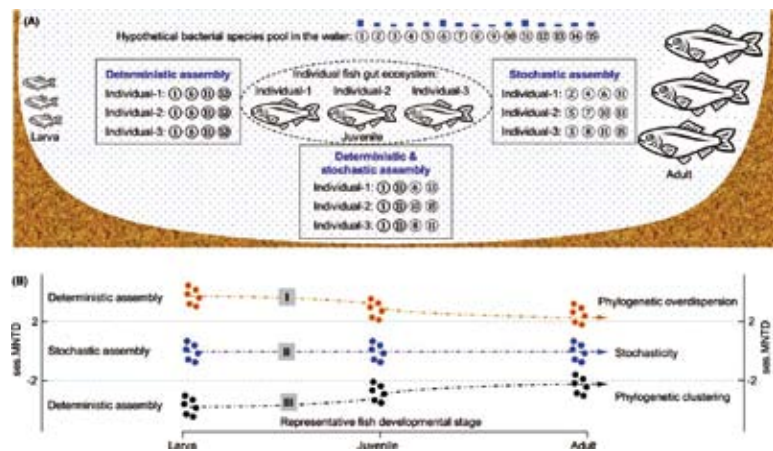


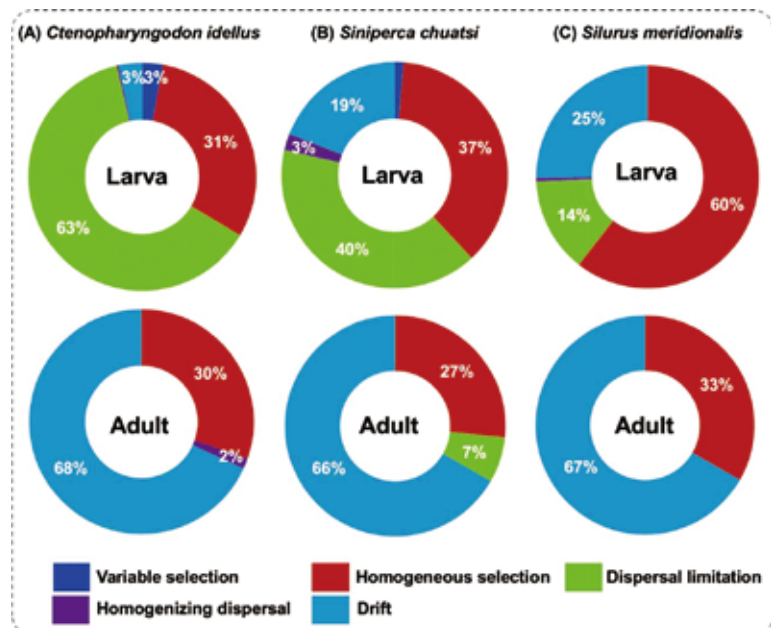
# Environmental Filtering Governs Fish Gut Microbiota

How environmental microbes colonize the fish gut “island” ecosystem, and which ecological processes are driving the microbial community assembly have remained unclear to scientists for long. Dr. YAN Qingyun and coworkers from the CAS Institute of Hydrobiology and their collaborators from the University of Oklahoma recently revealed that environmental filtering is the major process governing the fish gut microbiota, and its contribution to the community assembly decreases with host development. The study not only expanded scientists’ understanding of the fish gut micro-ecosystem, but also shed new light into community assembly studies in mammalian gut ecosystems.

To understand community assembly in the fish gut ecosystem, the researchers studied three major aquaculture fish species in China (herbivorous *Ctenopharyngodon idellus*, carnivorous *Siniperca chuatsi*, and *Silurus meridionalis*) from their larval stage to the adult stage. They used high-throughput sequencing to assess the taxonomic compositions and phylogenetic diversity of gut microbiota across host development. Then, the major ecological processes and their contributions to the microbial



Schematic representation of how ecological processes govern the assembly of a local community in the fish gut ecosystem.



Contribution of ecological processes that determines the microbial community turnover in the fish gut ecosystem.

community assembly and turnover were determined by null model test, phylogenetic-based mean nearest taxon distance (MNTD), and  $\beta$ MNTD in combination of Bray-Curtis-based Raup-Crick ( $RC_{\text{bray}}$ ) distance analyses.

It turned out the taxonomic diversity of gut microbiota in the three examined freshwater fish species demonstrated clear stage-specific patterns. Further phylogenetic analyses suggested that host gut environmental filtering led to the assembly of microbial communities in the fish

gut “island” ecosystem. However, the phylogenetic clustering of local communities and deterministic processes driving community turnover became less distinct as the fish developed. The relative importance of ecological processes that governed the community turnover of gut microbiota was also found to be different in larva and adult. Determinism (selection and dispersal) levels in the larvae (especially in the carnivorous *S. chuatsi* and *S. meridionalis*) were stronger than those found in the adults, whereas stochasticity (drift)

levels significantly increased in the adults.

This study was a joint research effort by Dr. YAN, Prof. YU Yuhe and Prof. WANG Yaping’s groups from the Institute of Hydrobiology, and Prof. ZHOU Jizhong from the Institute for Environmental Genomics, University of Oklahoma.

Their paper has appeared online in *Environmental Microbiology*. The work was supported by the National Natural Science Foundation of China and the Youth Innovation Promotion Association of the Chinese Academy of Sciences.