

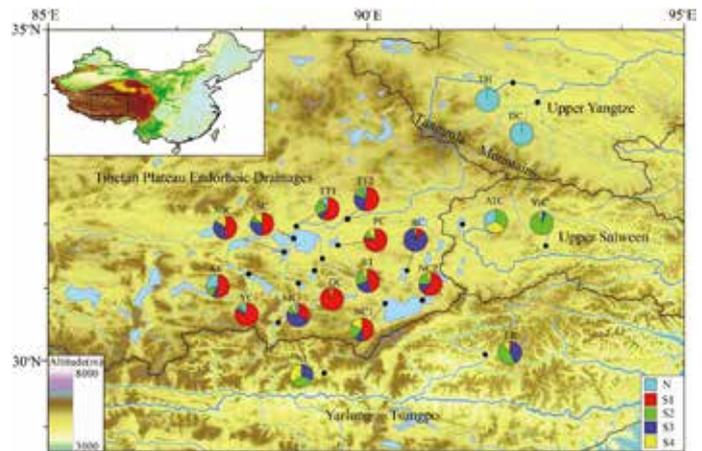
Study Reveals Highest Known Glacial Refugee for Fish

The advances and retreats of glaciations through the Pleistocene, especially most recent the Last Glacial Maximum (19-26 thousand years ago), have significantly affected the demographic history, abundance and distribution pattern of modern species. During these glaciations, many species were excluded from large parts of their ranges and forced into refugia by the expanding ice sheets, followed by recolonization and population expansion as the glaciers retreated.

The Qinghai-Tibet Plateau and adjacent mountains are the largest glaciated tracks outside the polar region. Freshwater fishes are regarded as ideal subjects in exploring the effects of glaciations because of their restriction in glacial refugia that are peripheral to ice sheets and the restrictive aquatic requirements for postglacial dispersal.

To investigate the effects of past climatic shifts – particularly the Last Glacial Maximum – on plateau fish, a group of researchers from the CAS Institute of Hydrobiology in Wuhan analyzed the phylogeographic structure and demographic history of five closely related taxa of the subfamily Schizothoracinae – a representative endemic taxon of the Qinghai-Tibet Plateau, from nine endorheic lakes on the central Qinghai-Tibet Plateau and three peripheral exorheic rivers using the mitochondrial control region (D-loop) sequence and 12 microsatellite markers.

Results showed that endorheic populations possess high genetic diversity and a unique genetic structure. For all endorheic lakes, the most interior Siling Co harbored the highest genetic diversity and all four ancestral haplotypes. Besides, the most recent population growth of Siling Co began approximately 100 kya, corresponding to the last interglacial period and much earlier than other endorheic lakes.



Location and haplotype composition of each sampling site in this study. Pie charts exhibit the frequency of lineages or sublineages in each population. Five colors (cyan, red, green, blue and yellow) correspond to one North lineage (N1) and four South sublineages (S1, S2, S3 and S4) in the D-loop phylogram, respectively. The boundaries of the main drainage basins are also shown by black lines.

Phylogeographic structure, together with species distribution modeling, supports the scenario of multiple glacial refugia on the Qinghai-Tibet Plateau during the LGM and suggests that Siling Co (4540 m asl) is a cryptic glacial microrefugia for plateau fish, which would be the highest glacial microrefugia known.

This research was supported by the National Natural Science Foundation of China, the Strategic Priority Research Program and Knowledge Innovation Program of the Chinese Academy of Sciences, and the Ministry of Science and Technology of China.

This work has been published online in *Scientific Reports* with the title “Phylogeographic studies of schizothoracine fishes on the central Qinghai-Tibet Plateau reveal the highest known glacial microrefugia.”