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South American freshwater fish diversity shaped by Andean uplift since the Late Cretaceous

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South America is home to the highest freshwater fish biodiversity on Earth. The hotspot of species richness is located in the western Amazon Basin, and richness decreases downstream along the Amazon River towards the mouth at the Atlantic coast. This pattern contradicts the commonly observed positive relationship between stream size and biodiversity in river systems across the world. We investigate the role of river capture events caused by Andean mountain building and repeated episodes of flooding in western Amazonia in shaping the modern-day richness pattern of freshwater fishes in South America. To this end, we combine a reconstruction of river networks since 80 million years ago with a model simulating dispersal, allopatric speciation and extinction over the dynamic landscape of rivers and lakes. We show that Andean mountain building and consequent numerous small river capture events in western Amazonia caused freshwater habitats to be highly dynamic, leading to high diversification rates and exceptional richness. The history of marine incursions and lakes, including the Miocene Pebas megawetland system in western Amazonia, played a secondary role. This study is a major step towards the understanding of the processes involved in the interactions between the solid Earth, landscapes, and life of extraordinary biodiverse South America.