

One of the most fundamental questions in biology is why some groups of organisms are more diverse than others. Classic hypotheses for explaining differences in diversity consider distinctions in time, place, resources, and competitors as the staging grounds for differential diversification. Freshwater and saltwater environments have similar levels of diversity despite significant differences in size, so studying transitions between the two systems can provide insights into evolutionary processes. Despite the challenges associated with this transition, stingrays have invaded freshwater habitats multiple times across different continents, making them useful for better understanding these systems. In this study, we evaluated the frequency of saltwater-freshwater invasions in stingrays, examined three types of diversification among freshwater and saltwater stingrays, and assessed the degree of convergence among freshwater stingrays. We found that, like nearly all other aquatic taxa, stingrays overwhelmingly only transition from saltwater to freshwater. After independent freshwater invasions, river rays did not demonstrate a pattern of increasing morphological or lineage diversification. However, the phenotypic disparity of saltwater stingrays did not follow the Brownian prediction and appeared to spike around two extinction events. Despite not being morphologically distinct from saltwater stingrays, freshwater stingrays do push the boundaries of morphological diversity. Diet guilds did demonstrate morphological differences, with piscivores and molluscivores being distinct from other diet guilds. Freshwater stingrays did not appear to converge morphologically, which may be because there has not been enough time for this to occur among more ancient and more recent freshwater lineages.