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Developmental bias facilitates trophic diversification in Amazonian electric fish

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The Neo-Darwinian view of adaptation by natural selection assumes that phenotypic variation is produced randomly with respect to function. However, developmental pathways are often buffered against the effects of mutations such that small changes in the timing of gene expression may generate non-random, functionally viable phenotypes. Phenotypes produced as a result of these developmental biases should exhibit a wide range of adaptability in order to persist at higher frequencies than alternative phenotypes. Here we explore the role of developmental biases in the production of ontogenetic variation and phylogenetic diversity in the neurocrania of Neotropical electric fishes (Gymnotiformes: Teleostei). We examine the role of developmental biases on the evolution of convergent phenotypes and use stable isotope analyses to examine the ecological and functional implications of convergent evolution via developmental biases in seven species of brachycephalic gymnotiform fishes. We find multiple trophic ecologies associated with very similar brachycephalic skull shapes and a diversity of lower jaw morphologies. These findings suggest that the brachycephalic skull is widely adaptable for a variety of trophic functions, due in part to the diverse array of lower jaw structures within which it can be adorned.