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Water as a driver of evolution: the example of aquatic snakes

Animal-environment interactions are determinant in driving the evolution of phenotypic variation. Most aquatic animals have developed adaptations to overcome the physical constraints inherent to an aquatic lifestyle. The aim of this project is to evaluate the role of water as a potential driver of evolution by focusing on morphological and behavioral convergence during prey capture in water. Snakes are a good model as an aquatic life-style has originated independently in different genera. However, aquatic snakes did not develop a suction feeding system in contrast to most aquatic vertebrates. Prey-capture under water is constrained by the physical properties of the fluid and thus morphological and/or behavioral convergence is expected. By comparing the head shapes and the behavior of different species, we will evaluate the impact of water on the evolution of head shape and strike behavior in aquatic snakes. By using computational and experimental fluid mechanics approaches, we will quantify the physical constraints involved in prey-capture and evaluate the nature of the evolutionary response in response to these hydrodynamic constraints. This interdisciplinary approach will allow us to bring novel data to our understanding of functional constraints as drivers of phenotypic evolution.