(Talk)

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The diversity of shapes and structure of aquatic amniote flippers

Romain Cottereau*[1], Alexandra Houssaye[2] & Valentin Fischer[1]

*cotterom@gmail.com

[1] *Evolution & Diversity Dynamics Lab, Université de Liège, Allée du 6 Août 14, 4000 Liège, Belgique*

[2] *CNRS, UMR 7179 Mécanismes Adaptatifs et Evolution, Muséum d'Histoire Naturelle de Paris, France.*

Moving from a terrestrial to an aquatic environment is a major anatomical challenge. Yet dozens of amniote lineages have taken the plunge. These independent transitions resulted in a plurality of ways to swim using locomotor appendages, as limbs evolved into flippers. However, no study has quantified the external shape and the structural diversity of these limbs in extant and extinct reptiles and mammals. Here, we quantify this diversity in a comparative framework by (i) studying two-dimensional foreflipper external shape using elliptical Fourier analysis in combination with skeletal organisation; and (ii) testing for relationships between these features and body proportions, swimming styles, and phylogenetic distances. Our results show that distantly related taxa share convergent external flipper shapes, likely due to strong constraints imposed by the aquatic realm. These similarities are, however, counterbalanced by the broad range of locomotor patterns and varied internal flipper anatomies characterising different amniote lineages. Surprisingly, some species with comparable flipper morphologies swim very differently. The functional implications of such similarities across species with distant evolutionary histories and different swimming styles continue to elude our understanding.