Something's fishy in the tree of life: New discoveries rechart fish phylogeny

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Fishes account for over half of vertebrate species, but while groups such as mammals, birds and reptiles have been fairly well understood by scientists for decades, knowledge about relationships among many types of fishes was essentially unknown – until now.

A team of scientists led by Richard Broughton, associate professor of biology in the College of Arts and Sciences at the University of Oklahoma, published two studies that dramatically increase understanding of fish evolution and their relationships. They integrated extensive genetic and physical information about specimens to create a new "tree of life" for fishes. The vast amount of data generated through large-scale DNA sequencing required supercomputing resources for analysis. The result is the largest and most comprehensive studies of fish phylogeny to date. Broughton notes, "The scope of the project was huge in terms of the number of species examined and the number of genes analyzed, and the new patterns of relationships among fish families result in what may be the broadest revision of fish systematics in history."

While some of the findings provide new support for previously understood fish relationships, others significantly change existing ideas. Many different groupings are proposed in this new tree. For example, tunas and marlins are both fast-swimming marine fishes with large, streamlined bodies, yet they appear on very different branches of the tree. Tunas appear to be more closely related to the small, sedentary seahorses, whereas marlins are close relatives of flatfishes, which are

bottom-dwelling and have distinctive asymmetric heads.

Beyond a better understanding of fishes themselves, the potential implications of this research are wide reaching, said Edward Wiley, curator of ichthyology at the University of Kansas.

"Our knowledge about one group can be extended to closely related species, if we understand those relationships," Wiley said. He noted that knowledge of evolutionary relationships among fishes improves scientists' ability to predict how closely related species might react to environmental factors such as climate change. It helps identify and target potential biomedically beneficial substances, and has broader applications related to exploring disease-causing genes and developmental processes shared with humans.

More information: The work is published in two papers in the open access journal PLOS Currents – Tree of Life: currents.plos.org/treeoflife/a … tion-of-bony-fishes/

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