The Visual Opsin Gene Repertoires of Teleost Fishes: Evolution, Ecology, and Function

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Visual opsin genes expressed in the rod and cone photoreceptor cells of the retina are core components of the visual sensory system of vertebrates. Here, we provide an overview of the dynamic evolution of visual opsin genes in the most species-rich group of vertebrates, teleost fishes. The examination of the rich genomic resources now available for this group reveals that fish genomes contain more copies of visual opsin genes than are present in the genomes of amphibians, reptiles, birds, and mammals. The expansion of opsin genes in fishes is due primarily to a combination of ancestral and lineage-specific gene duplications. Following their duplication, the visual opsin genes of fishes repeatedly diversified at the same key spectral-tuning sites, generating arrays of visual pigments sensitive to the ultraviolet to red spectrum of light. Species-specific opsin gene repertoires correlate strongly with underwater light habitats, ecology, and color-based sexual selection.
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