Review of: "Damsels in a Hidden Colour: Development of Ultraviolet Sensitivity and Colour Patterns in Damselfishes (Pomacentridae)"

Mohd Yunus Abd Shukor[1]

1 Universiti Putra Malaysia, Malaysia

Potential competing interests: No potential competing interests to declare.

1. Novelty and Relevance

The study addresses a poorly characterized area: the development of UV sensitivity and color signals across different life stages of damselfish. While UV sensitivity in adult fish has been studied, the paper's focus on ontogenetic changes in both UV sensitivity and color patterns is a novel contribution. This is relevant because it reveals how juvenile fish can communicate via UV signals, which could be crucial for feeding and predator avoidance in coral reef ecosystems, which this group has studied for many years.

2. Comprehensive Methodology

The combination of UV photography, phylogenetic reconstructions, and differential gene expression (DGE) analyses strengthens the methodological approach of the study. The use of UV photography to study the spatial distribution of UV patterns adds depth to traditional spectrophotometry, which only measures spectral reflectance. By also utilizing comparative transcriptomics, the paper links gene expression changes to the development of UV color patterns, offering a robust multi-level analysis.

3. Ontogenetic Focus

One of the key strengths of the paper is its focus on ontogenetic stages—larval, juvenile, and adult—in damselfishes. The discovery that UV color patterns emerge primarily in the juvenile stage and correlate with gene expression changes adds to the understanding of visual system evolution in reef fishes. This ontogenetic perspective could be critical for ecological studies, particularly in identifying how fish behavior and communication strategies evolve over time.

4. Phylogenetic Insights

The paper provides valuable phylogenetic insight into opsin gene duplications, particularly the sws1 gene, which enables UV sensitivity. By investigating the evolutionary history of these duplications, the study shows that Pomacentrus species express two sws1 opsin genes, which likely allow for UV color discrimination. This evolutionary analysis strengthens the paper’s merit by connecting molecular evolution with functional adaptations in damselfish.

5. Ecological Implications

The paper makes substantial contributions to understanding UV communication as a secret channel that allows damselfish to communicate without detection by UV-blind predators. The ecological implications of these findings are broad, particularly for predator-prey dynamics and social interactions on coral reefs.

Potential Areas for Improvement

Probably a future suggested use of CRISPR-Cas9 to delete UV-sensitive opsin genes in damselfish may be included in the study to prove that this increases the vulnerability to UV-blind predators. CRISPR technology has been successfully used to knock out specific genes in various organisms, including fish species, making it plausible for opsin gene manipulation in damselfish.

See

Urban S, Gerwin J, Hulsey CD, Meyer A, Kratochwil CF. The repeated evolution of stripe patterns is correlated with body morphology in the adaptive radiations of East African cichlid fishes. Ecology and Evolution. 2022 Feb;12(2):e8568.