

# ***Fundulus* Melanophores: From Physiology to Cell Biology**

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Background color adaptation in lower vertebrates is a great subject for investigative physiology laboratory classes. The complete color change is relatively fast and reversible. Moreover, the control mechanisms for this physiological color change are complex and diverse among species, allowing many follow-up studies. Dermal melanophores in the killifish (*Fundulus heteroclitus*), in particular, are responsible for darkened dorsal skin against a black background and can be easily observed for indexing under low magnifications. To complement these animal observations, isolated scales can be studied in vitro addressing questions about cell signaling and cytoskeletal motor proteins. For the workshop, we propose to conduct three experiments; 1) Differential time course for darkening and paling of dorsal skin in fishes subjected to black or white background, 2) Observation of dermal melanophores in dorsal scales from dark or pale fish, and 3) Effects of K<sup>+</sup> rich saline on melanosome movement in dermal melanophores. The observed data will be analyzed and discussed in regards to possible regulatory mechanisms for physiological color changes in this species. In addition, the conclusions and implications will be transformed into research questions as well as possible experimental designs for future studies. These experimental approaches correlate phenomena observed in the whole organism with microscopic events taking place at the cell level, and present students with opportunities to investigate a variety of regulatory mechanisms at the interface of physiology and cell biology.

In this session, we will begin each experiment with prediction exercises in which the participants have an opportunity to think ahead and write as a group activity the expected outcome of the experiment based on the previous literature. Then we will conduct the experiment in groups. The last component of the session will be a reflection exercise in which we analyze the experimental data and propose possible future studies for independent research projects.

The best way to experience this study is to perform the three experiments in sequence. However, there is a possibility that the whole process might take longer than 3 hours depending on the number of the participants as well as the facility situation. In that case, we will assign each group an experiment as a group project and conduct the experiments simultaneously. Also we will work on prediction and reflection exercises as a class activity possibly led by each group.