Optical Properties of Cephalopod Skin

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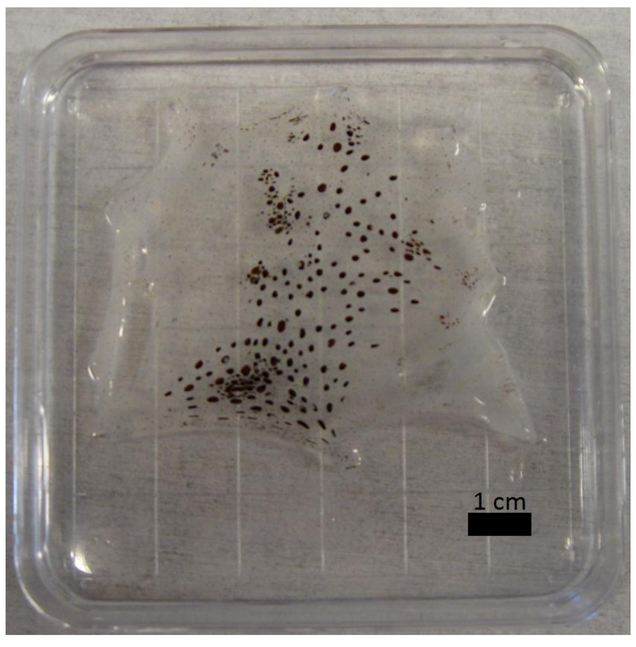
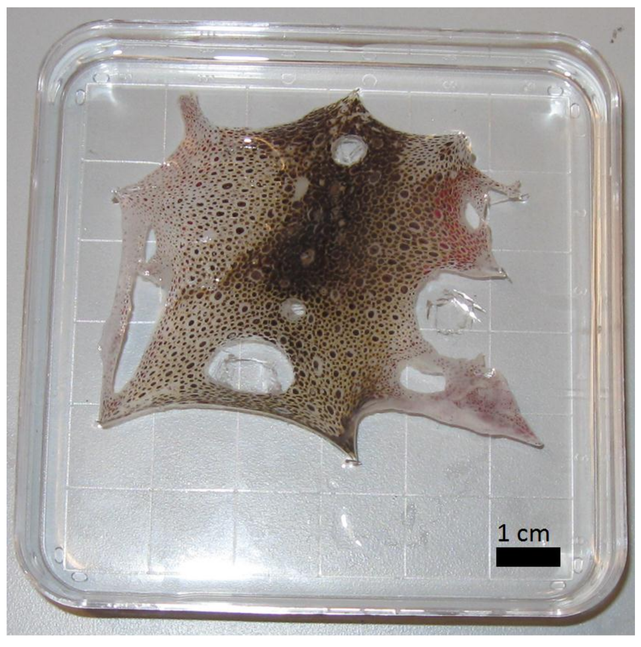
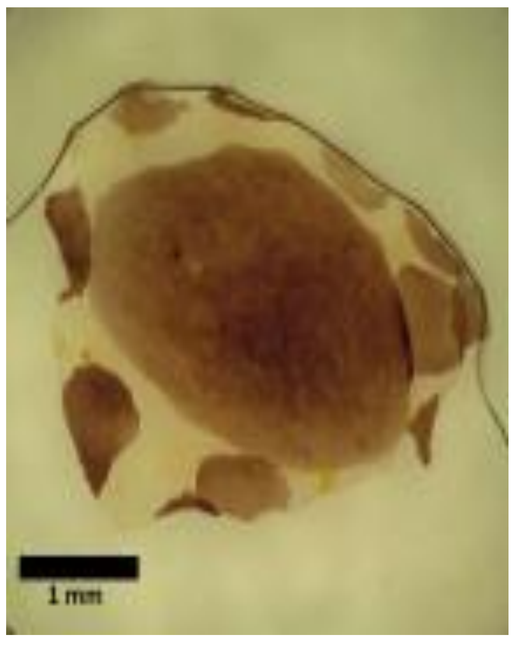
Cephalopods have the remarkable ability to quickly and effectively change their color to camouflage themselves using sacs of pigment in their skin called chromatophores. Because these chromatophores are dynamic, the organism is able to expand or contract them at will, allowing it to alter its coloration almost instantly. While this mechanism has been extensively examined from a biological standpoint, relatively little research has examined it from an optical perspective. Our research seeks to characterize the optical properties of cephalopod skin, such as absorption and fluorescence, which may aid its capacity for disguise. This characterization of the skin will expand our understanding of it as a material, and may lead to further insight into how to harness its unique properties for new adaptive optical technologies.



A fresh skin sample from the squid *Loligo opalescens*



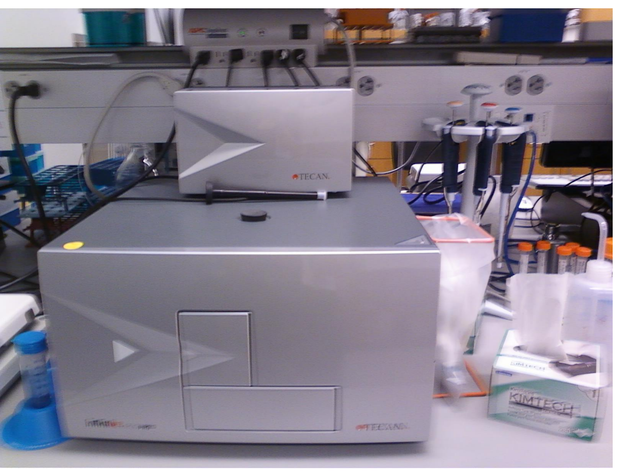
Squid skin dosed with KCl (potassium chloride)



Photograph of Mounted Chromatophore (Scale Bar = 1mm)

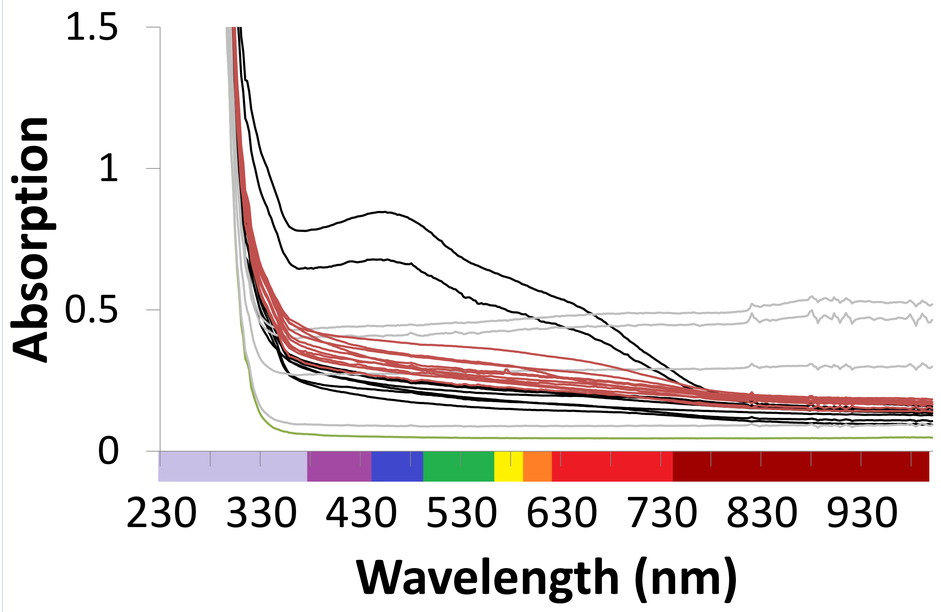
The data collected and charted below comes from a variety of types of samples. These are color-coded as follows:

- Squid Sample A + KCl
- Squid Sample B
- Artificial Sea Water (Blank)
- Artificial Sea Water + KCl (Blank)

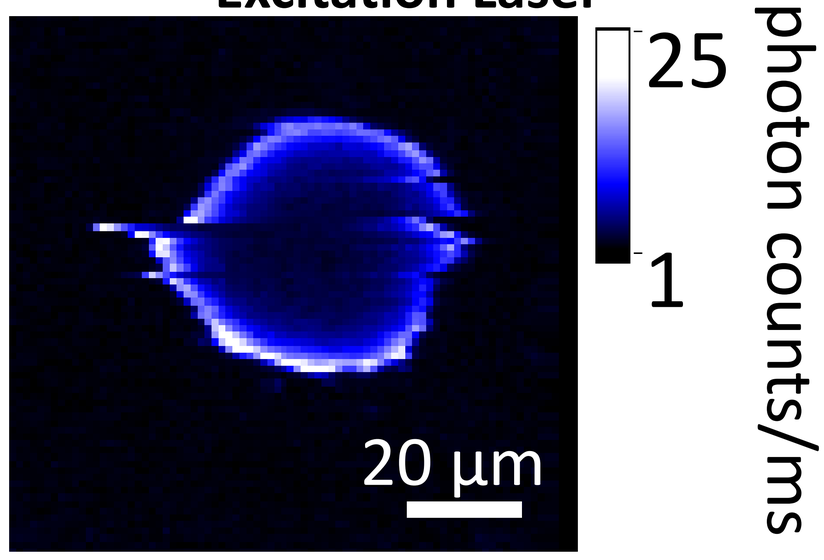


The Tecan plate reader can measure absorption as well as fluorescence at a range of excitation wavelengths.

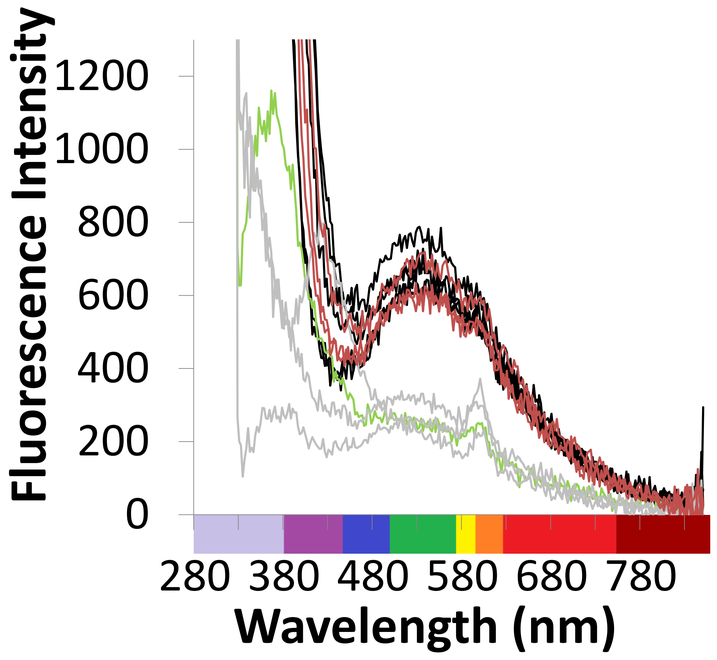
Absorption of Squid Samples vs. Blanks



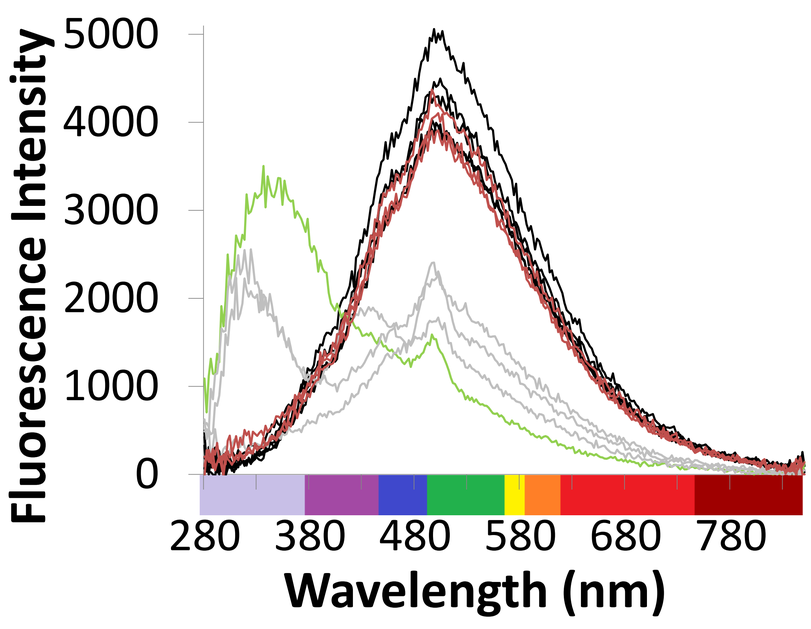
Confocal Photoluminescence of Chromatophore using 532nm Excitation Laser



Fluorescence with Excitation at 300nm



Fluorescence with Excitation at 250nm



Conclusions

- Squid skin shows unique emission patterns when excited at 300nm and 250nm
- Chromatophores appear to fluoresce more than the rest of the skin when excited at 532nm

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