Behavioral Responses to Pulses of Light in the Longfin Inshore Squid, *Doryteuthis pealeii* (Lesueur, 1821)

by

Stavros P. Hadjisolomou

Advisor: Israel Abramov

The coleoid cephalopods (octopus, squid, and sepia) are masters of rapid, adaptive camouflage. Unlike the slower hormonal chromatophore control of flatfish and chameleons, coleoid mollusks can change body patterns in milliseconds. Visual camouflage in coleoids is driven by a sensorimotor system consisting of visual input of their surroundings, a sophisticated central nervous system for information processing, and a neuromuscular control for body patterning. Motor neurons selectively activate millions of muscles, alternately expanding and reducing the pigmented chromatophores to generate visible brown, red, orange and yellow patterns on the skin. Below the chromatophore-layered skin are two types of reflecting cells, iridophores that diffract wavelengths and leucophores (in octopus and sepia) which are broadband reflectors. Essentially, the body pattern visible on a coleoid at a given instant is the combined action of the different skin elements and the frequency of neural activation in space and time. The chromatophore sensorimotor system enables rapid dynamic displays with speed and resolution that are unparalleled in nature. The question of how cephalopods control their chromatophores has received detailed attention from the perspectives of pattern, color modulation, and contrast in ethology; there are excellent descriptions of the arrangement of the neuromuscular components of chromatophores and behavioral analysis of the sensory contributions of the visual system. However, the temporal dynamics underlying the information processing of the chromatophore control system that enables such behavior is still unknown. Recent findings described here demonstrate the effectiveness of employing a light stimulation method to study the spectral sensitivity of squid as well as to activate the chromatophore sensorimotor system to measure its spatiotemporal dynamics.