

ASPECTS OF COUNTERSHADING  
IN HAWAIIAN MESOPELAGIC SERGESTID SHRIMPS

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## Abstract

The response of chromatophores in three species of vertically migrating half-red sergestid shrimps to the presence or absence of overhead blue-green light and to their normal day and night temperatures was determined. Sergestes armatus was significantly darker when held in darkness than when held under light at both temperatures, and was significantly darker at the temperature prevailing in its night habitat (15-18°C) than at the day habitat temperature (5-8°C) under both lighted and dark conditions. Sergia fulgens was significantly darker in darkness than in light at both temperatures but showed no significant temperature effects. Sergestes erectus was significantly darker in darkness than in light at the cold temperature, and was significantly darker at the warm temperature than at the cold temperature under lighted conditions, but showed no significant differences between light conditions at the warmer temperature or between temperatures in darkness. There was no evidence of a pronounced day-night rhythm of chromatophore expansion and contraction in the absence of temperature and light stimuli.

Sergia fulgens reflected more light when transparent than when red. The approximate range of light intensities over which Sergestes armatus and Sergia fulgens expand or contract their chromatophores was determined. It is concluded that the chromatophores are important in concealing

a shrimp by enabling it to be largely transparent to light from the surface during the day or at full moon, creating less of a silhouette from the side and below. Under dark conditions at night the shrimp becomes red to avoid detection by bioluminescent flashes. In addition, expansion of the chromatophores may allow species such as Sergestes erectus to occur in deeper water than a transparent shrimp could safely inhabit.

Sergestes armatus and Sergia fulgens exhibited ventral counterillumination, turning their photophores on and off to match the overhead illumination. Sergestes erectus was not observed to luminesce.