



New lights on echinoderm's bioluminescence

Mallefet Jerome¹

¹Marine Biology Laboratory, Earth and Life Institute, University of Louvain - UCLouvain, Belgium.

Jerome.mallefet@uclouvain.be

Abstract

Despite the reasonable number of luminous species, echinoderm luminescence is still poorly documented [1-2]. In this plenary, recent discoveries about echinoderms luminescence will be presented underlining what are new avenues for future research aiming to understand: (i) how many species of echinoderms glow; (ii) how echinoderms emit light; (iii) how can eyeless echinoderms perceive their light and finally (iv) why are echinoderms able to produce light in the abyss?

In Echinoderms, the first luminous compounds isolated by Shimomura in 1986 from a brittle star, *Ophiopsila californica*, was a photoprotein termed Ophiopsilin [3]. Fifteen years later, the first luciferin/luciferase system based on coelenterazine was reported in *Amphiura filiformis* [4-5]. Recent studies demonstrated that *A. filiformis* used a dietary acquisition of coelenterazine to maintain its luminous capability[5]. Works are in progress to understand this diet transfer to restock luminous substrate. Echinoderms have often been viewed to have poor visual abilities due to a lack of well-developed eyes. *A. filiformis* has also been used to demonstrate the existence of extraocular opsins using transcriptomic methods and it is now well accepted that brittle stars perceive and respond to light stimuli. New research will look at the possible interactions between photoemission and photoreception in this model species[7-8]. In 1977 a first study done on deep-sea echinoderms bioluminescence was produced [9]. Forty years later, "Sampling the Abyss", an expedition on the East coasts of Australia allowed systematic surveys of abyssal plains from Hobart to the Great Barrier Reef using bottom beam trawls. These brought back at the surface specimens allowing us to document for the first time some bioluminescent ability of rarely seen organisms using a sensitive camera, video recordings, and luminometer. Images and data from benthic abyssal echinoderms belonging to Asterozoa, Ophiurozoa, Crinozoa, and Holothurozoa revealed the diversity of bioluminescence, ranging from slow glow to brief flash, from blue to green emitters[10]. Deep-down spiny critters shine light but for what purpose, this remains a mystery. News collaborations and new expeditions will help to better understand echinoderm's bioluminescence.

Keywords: Bioluminescence; Echinoderms; luciferin 3; opsin; abyss

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