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Study of the luminescence in the black brittle-star *Ophiocomina nigra*: toward a new pattern of light emission in ophiuroids*

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Abstract

The black brittle star *Ophiocomina nigra*, common in the English Channel, is known to produce mucus when attacked. This mucus, already known for its antifouling capabilities and its role in the feeding and the locomotion behaviours of the brittle star, also emits weak light. We describe and characterize this emission of bioluminescence, thanks to a chemical triggering by hydrogen peroxide. It appears that the light emitted is 1000 times less intense than the light emitted by other brittle star species (*Ophiopsila aranea* and *Amphipholis squamata*). The luminous capabilities are homogeneously spread along the arms of the brittle star, what goes against the use of bioluminescence as a sacrificial lure. The mechanical stimulation of arms before chemical triggering strongly enhances the luminous capabilities of the brittle star. Luminous mucus emission can be associated with other defensive function, such as a smoke screen effect or a burglar alarm, but these two functions require intense light emissions. The fact that the luminous component is excreted outside the body might be in favour of the aposematic use of light, *i.e.*, as a signal to warn predators of the toxicity or unpalatability of its prey.

Key words: Bioluminescence, ophiuroid, *Ophiocomina nigra*, ethology, aposematism

Introduction

Bioluminescence, *i.e.*, the emission of light by living organisms, is widespread in the marine environment (for a review see Haddock 2010). Actually, luminous organisms exist in at least 13 phyla, from bacteria to fishes, encompassing cnidarians, annelids, molluscs or echinoderms. The abundance of luminous organisms and the diversity of light emissions patterns let suppose that this capacity has originated at least 40 times independently in the course of evolution (Hasting 1983), and confirms the important evolutionary advantage to posses this ability.

Patterns of light emission can be described in terms of duration or spectral characteristics. Emissions durations are commonly classified in three categories: bright short flashes, during less than 2 seconds, slow glows, during more than 5 seconds, and permanent emission (Morin 1983). Concerning the spectral characteristics, most of luminous marine organisms emit blue-green light, with peak of maximal intensity around 450–490 nm, which spreads well in the sea water whose spectral absorbance is around 460 nm. Benthic and coastal organisms tend to emit at higher wavelength, around 510 nm, in a greener coloration, probably due to the waters turbidity in these habitats (Herring 1983).

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