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# Ten years of shark luminescence study: a synthesis.

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## Abstract

Marine fishes are the only vertebrates able to produce visible light. For more than two centuries, bioluminescence has been documented in Osteichthyes and a large amount of experimental data are available for these bony fishes. On the contrary, until recently, luminescent sharks (10% of the shark species are luminous) were poorly investigated mainly due to the logistical difficulties to access and maintenance of the species in good physiological conditions. Since 2007 experimental studies on bioluminescent sharks were conducted by researchers of my laboratory. Data presented will summarize ten years of sharks luminescence studies from species belonging to two families : Etmopteridae and Dalatidae. Model species, used to understand how , why , with which structures and where sharks are emitting light, are: *Etmopterus spinax* (velvet belly lantern shark), *Etmopterus molleri* (slendertail lantern shark), *Etmopterus splendidus*, (splendid lantern shark) and finally *Squaliolus aliae*, (pigmy shark). We discovered that light emission is under hormonal control, luminescence control mechanism model was build which also involved neurotransmitters (neuromodulators). Difference in the control mechanisms of light emission between Etmopteridae and Dalatidae as well as recent phylogenetic analysis suggest a unique appearance of bioluminescence during evolution : Dalatidae being the first sharks to glow in the dark. Ontogeny, body pattern , organisation and densities of photophores as well as differential controls suggest that these light organs are involved in various functions such as countershading, aposematic warning, specific recognition, schooling and sexual mating. The nature of the luminous system used by sharks remains unsolved since none positive detections using classical cross-reactions with known luciferin/luciferase were observed; further research should be dedicated to this aspect in order to discover the structure of a putative " sharkline ". Work in progress on the physiology of luminous sharks will be presented during the congress by PhD students of the laboratory.

**Keywords:** Marine bioluminescence, sharks, physiology, ecology, morphology

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