

Biodiversity in a rapidly changing world

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ABSTRACT :

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Glow and see: extraocular opsin involvement in shark luminescence control

Luminous sharks are represented in three families, Etmopteridae, Dalatiidae and Somniosidae. Even structural differences in light organs (i.e. photophores) exist between these shark families, they are small and found in great number mainly on the ventral side. Dalatiidae and Somniosidae harbor photophores constituted of a single photocyte (i.e. light emitting cell) encapsulated in a pigmented layer, and topped by one or several lens cells. Etmopteridae photophores are more complex with many photocytes, cells forming an iris-like structure (ILS), as well as a reflector encapsulated within the pigmented layer. Conversely to luminescent bony fishes, shark luminescence is under a hormonal control. Recently, an extraocular opsin has been shown to be involved in the mechanical luminescence regulation through the pigment motion within the ILS. In the shark model, *Etmopterus spinax*, blue light (i.e. mimicking the shark bioluminescence) absorption has been shown to modify the IP3 concentration within photophores and trigger pathway regulating the ILS cells pigment motions.

By analyzing the photophore ontogeny of two luminous sharks (*E. spinax* for the Etmopteridae and *Squaliolus aliae* for the Dalatiidae), a similar photophore morphogenesis was highlighted. In parallel, the extraocular opsin, encephalopsin (i.e. Opn3), expression was followed during the photophore development through immunohistology. Opn3 immunoreactivity appeared concomitantly with the photophore final formation in both species, assuming an implication in shark luminescence perception. The similarity between the photophore morphogenesis, opsin expression site and timing of expression suggest that the mechanism involving the Opn3 in the bioluminescence regulation is conserved across luminous shark families during the evolution.