# Are luminous deep-water sharks faster swimmers?

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**Abstract**

Some deep-water sharks are known to produce a ventral blue light mimicking the environmental light above them. This light is used as camouflage to disappear from their underneath predators and preys: the counter-illumination hypothesis function. Knowing that luminous sharks adjust their light intensity with a slow hormonal control, they are not rapid counter-illuminators. It was then postulated that, to rapidly adjust their ventral luminescence to the down welling light, they should move up or down into the water column to adapt at the right depths light level. This vertical displacement from one isolume to another one is called the isolume-followers hypothesis. Although, in the literature, deep-sea sharks are described as slow swimmers as the result of two major phenomena: firstly, cold water effect on the metabolism of these ectotherm fishes which slow their muscular activity; secondly, the visual interaction hypothesis which suggests that declining light levels with depth decreases the selective pressure for high locomotor capacity in species with visual capabilities, because the reactive distances between predator and prey are reduced. However, all data about the deep-water sharks' velocity come from indirect measurements of their metabolisms. In this study, cruise and burst swimming speeds of eight different deep-water shark species were measured for the first time using stereo video footages. The analyses allowed us to reconstruct the shark's displacements in three dimensions. Results show that luminous deep-water sharks from Etmopteridae family have a higher cruise swimming speed than non-luminous counterparts. A higher cruise speed could allow the luminous deep-sea sharks to move continuously up and down in the water column hence being efficient counter-illuminators This result seems in favor to the isolume-followers hypothesis.

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