Bioluminescence in lanternsharks appears to help with reproduction

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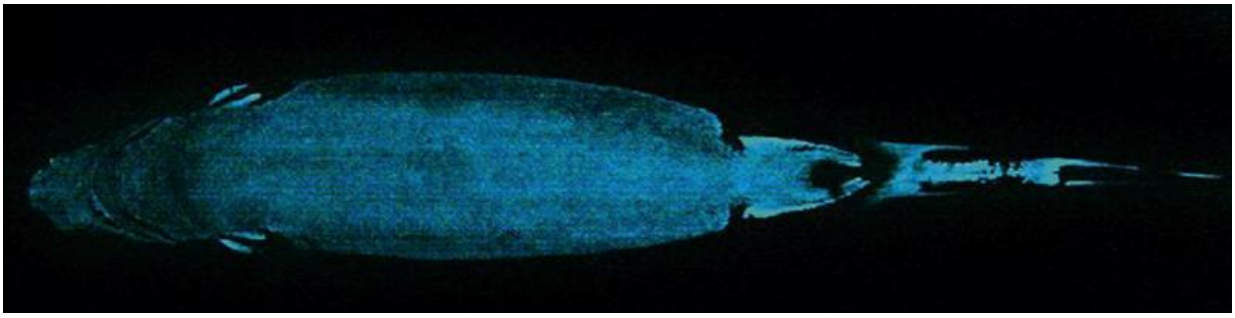

Etmopterus spinax. Credit: sharks.org

(Phys.org)—A small team of researchers with members from Belgium, Sweden and Germany has a found what they believe is a possible explanation for bioluminescence in lanternsharks. In their paper, Julien Claes, Dan-Eric Nilsson, Jérôme Mallefet and Nicolas Straube describe field experiments they conducted watching the sharks to learn if the luminescence was tied to their behavior, genetic testing they conducted and what they found in doing so.

Lanternsharks live in the ocean off the coast of Iceland and northern Europe all the way down to South Africa, generally in deep water—water so deep that there is no light. As the researchers report, most species of the small shark have developed bioluminescence, though until now, the reason for it has remained a mystery—it does not appear

to offer a means of attracting prey or warding off predators and it would seem counterproductive towards hiding from predators.

To find out, the team studied the sharks in their natural environment and also in large holding tanks—on the lookout for any behaviors that might be related to their ability to light up. They noted that males and females have light producing organs known as photophores on different parts of their bodies, and that both have the organs very near their external sex organs.

After the careful study of the sharks, the team determined that the purpose of the bioluminescence was to help with finding a mate—with light coming from different body parts it becomes much easier for the sharks to differentiate between genders in the dark. They also noted that the sharks shimmy as they swim, twisting their bodies back and forth which causes the light they emit to appear to flick on and off, which the team believes is meant to confuse predators—in some cases it might be mistaken for light matching the surroundings causing the shark to appear invisible.

Genetic testing of the sharks showed much more species diversity than was thought—they found 36 in all and suspect the bioluminescence was partly responsible, because it allows for maintaining reproductive isolation. But it also contributes to a slow reproductive rate, which the team notes, has led to them being classified as "near threatened" in northern waters.

More information: The presence of lateral photophores correlates with increased speciation in deep-sea bioluminescent sharks, DOI: 10.1098/rsos.150219

Abstract
The vast majority of species within the lanternshark genus Etmopterus

harbour complex luminescent markings on their flanks, whose functional significance has long remained obscure. Recent studies, however, suggest these enigmatic photophore aggregations to play a role in intraspecific communication. Using visual modelling based on in vivo luminescence measurements from a common lanternshark species, we show that etmopterid flank markings can potentially work as a medium range signal for intraspecific detection/recognition. In addition, using molecular phylogenetic analyses, we demonstrate that the Etmopterus clade exhibits a greater than expected species richness given its age. This is not the case for other bioluminescent shark clades with no (or only few) species with flank markings. Our results therefore suggest that etmopterid flank markings may provide a way for reproductive isolation and hence may have facilitated speciation in the deep-sea.