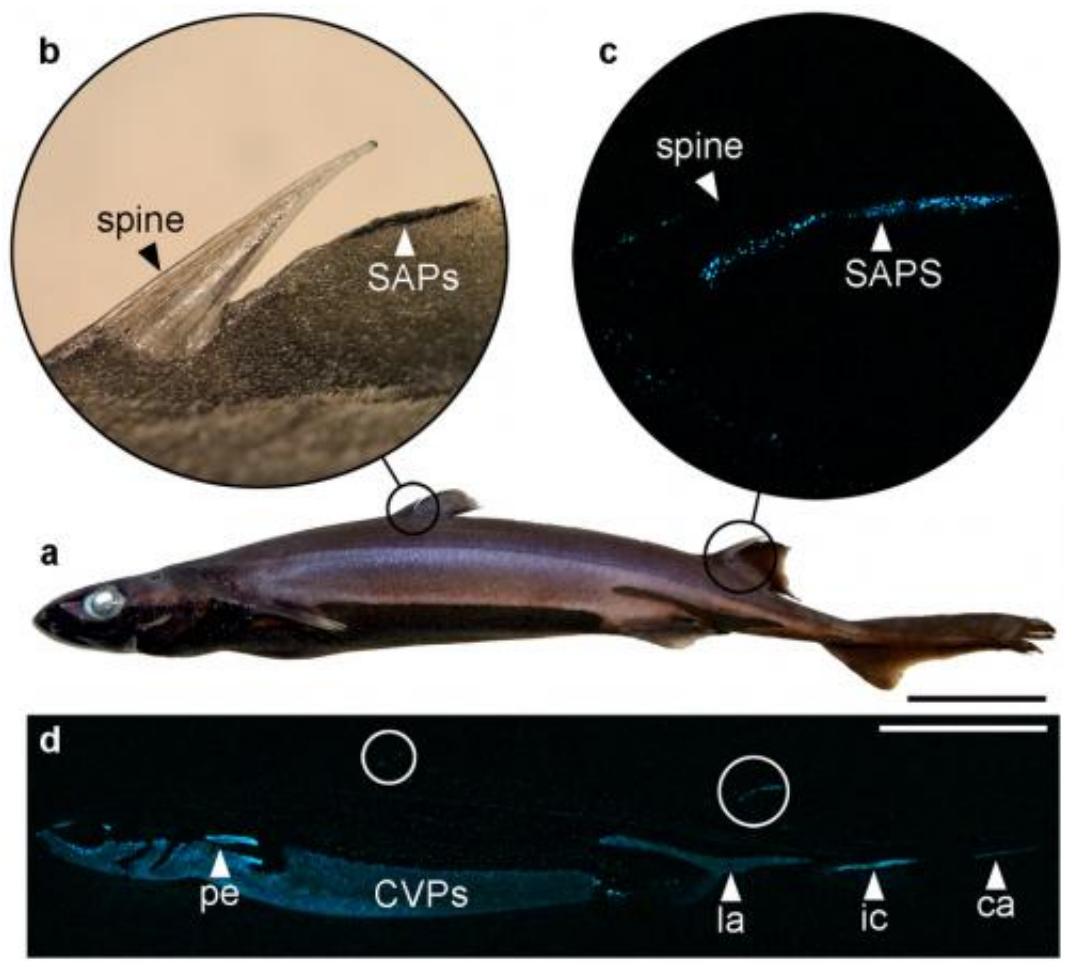
Shark found to have bioluminescence on both dorsal spine and belly

February 22 2013, by Bob Yirka



Spine-associated bioluminescent display. Credit: Scientific Reports, doi:10.1038/srep01308

(Phys.org)—A team of researchers studying velvet belly lantern sharks

has discovered that the species has bioluminescent cells on both its belly and near its dorsal spines. The team describes their surprising findings in their paper published in the journal *Nature*.

Velvet belly lantern sharks live in the Mediterranean Sea and the Atlantic Ocean, and are relatively small, growing to an average length of just two feet. Because of that, they are preyed upon by bigger fish. They typically swim at depths of more than 560 feet and sport bioluminescent cells on their bellies to prevent being seen by prey that swim beneath them (the light stops their shadows from appearing). What's surprising about them though, is that they also have the same light emitting cells just beneath spiny transparent protrusions on their backs. The researchers believe their purpose is to ward off predators by illuminating the thorny appendages—which would make it a first such use of bioluminescence for any type of fish.

Velvet belly lantern sharks haven't been studied nearly as well as larger sharks, and because of that, little is known about them. To find out more, the researchers caught several of them off the coast of Norway and brought them back to their lab for testing. As part of that analysis they discovered the dual bioluminescence, which is a novelty itself. Intrigued, they looked a little deeper and tested the response of other fish (using computer models) to the illuminated spines and found that predator fish were able to see them from several meters away. Interestingly, they also found that the kinds of fish the shark preys on were only able to see the spines once they were just one or two meters away, which would, of course, be too late to avoid being eaten.

The researchers note that other species of shark have dorsal spines to ward off predators, but this is the first instance of them being illuminated to make sure predators can see them clearly. They add that it seems likely that the sharks also use the spines to communicate with one another or even to help with identification.

More information: A deepwater fish with 'lightsabers' – dorsal spine-associated luminescence in a counterilluminating lanternshark, *Scientific Reports* 3, Article number: 1308 doi:10.1038/srep01308

Abstract

We report the discovery of light organs (photophores) adjacent to the dorsal defensive spines of a small deep-sea lanternshark (Etmopterus spinax). Using a visual modeling based on in vivo luminescence recordings we show that this unusual light display would be detectable by the shark's potential predators from several meters away. We also demonstrate that the luminescence from the spine-associated photophores (SAPs) can be seen through the mineralized spines, which are partially translucent. These results suggest that the SAPs function, either by mimicking the spines' shape or by shining through them, as a unique visual deterrent for predators. This conspicuous dorsal warning display is a surprising complement to the ventral luminous camouflage (counterillumination) of the shark.