

Feisty squid and fish fight back by dazzling attacking elephant seals

May 20 2020

Southern elephant seal mothers have only one thing on their mind after weeks marooned on beaches nursing their pups: getting back into the ocean to feast on lantern fish and squid. Yet, no one was sure how the ravenous predators locate victims in the inky depths. Pauline Goulet from the University of St Andrews, UK, and PI Mark Johnson suspected that the eerie bioluminescent glow produced by many creatures in the deep ocean might have something to do with it. 'Bioluminescent organisms are the main source of light (80%) in waters deeper than 500 m', says Goulet. These animals produce two forms of light—a continual dim glow for camouflage from beneath and dazzling flashes, possibly to distract predators—and the duo wondered whether ravenous seals might capitalise on the creatures revealing themselves. Or, could the feisty prey buy themselves time by dazzling their attackers to make a getaway? Curious to know how these games of cat and mouse play out beneath the waves Goulet, Christophe Guinet from the Centre d'Etudes Biologiques de Chizé, France, and Johnson decided to catch elephant seals in the act while pursuing their pyrotechnic victims. They publish their discovery that bioluminescent squid and fish flash at predatory elephant seals when under threat to disorientate the attacker to buy precious time to escape. The researchers publish their discovery in *Journal of Experimental Biology*.

First, Goulet and Johnson assembled a tag that could log the seals' movements as they hunted, in addition to recording flashes of light when the mammals encountered bioluminescent snacks. 'Because the bioluminescent flashes are so short, typically less than a second, the tags

required a very fast light sensor', Goulet explains. Then, Guinet travelled to the Kerguelen Islands in the Southern Ocean to attach the new tags and GPS trackers to five elephant seal mothers, with the help of Julie Mestre and Hassen Hallegue. 'There is always one person on watch for other seals when you are equipping them, because you are completely focused on what you are doing and unaware of an aggressive individual coming to bite you', he recalls. In addition, Johnson joined Guinet and Julieta and Claudio Campagna in Argentina to tag two more seals.

Retrieving four tags when the seals returned 2 months later, the team could see that most of the animals had headed off on a 3000 km odyssey deep into regions of the ocean packed with fish. However, one intrepid Argentinian seal circumnavigated Cape Horn, eventually travelling 2300 km before locating fish off the coast of Chile. Then, after months of scrutinising the seals' manoeuvres while painstakingly analysing more than 2000 bioluminescent flashes over depths ranging from 79 to 719 m, Goulet and Johnson realised that the flashing animals were trying to scare off their attackers. 'The prey always emits a [flash](#) the second the seal launches an attack, which suggests that the flash is a defensive reaction when the prey realises it is being attacked', says Goulet. In addition, the seals quickly snapped up fish that failed to light up while they had a harder time capturing dinner when their snack dazzled them unexpectedly. However, one seal seemed to have turned the tables on its daring diet by tricking its victims into giving themselves away with a subtle twitch of the head that triggered a revealing flash.

It seems that bioluminescent fish fight back by attempting to startle their elephant seal pursuers, but their attackers can also learn to exploit their prey's bioluminescent betrayal. Goulet and Johnson also hope to identify which species are on the seal's menu from the animals' distinctive flashes when they next return to the Southern Ocean.

More information: Pauline Goulet et al, Flash and grab: deep-diving

southern elephant seals trigger anti-predator flashes in bioluminescent prey, *The Journal of Experimental Biology* (2020). [DOI: 10.1242/jeb.222810](https://doi.org/10.1242/jeb.222810)

Provided by The Company of Biologists

Citation: Feisty squid and fish fight back by dazzling attacking elephant seals (2020, May 20) retrieved 3 May 2024 from <https://phys.org/news/2020-05-feisty-squid-fish-dazzling-elephant.html>

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