

High UV sensitivity in hooded seal eyes improves polar bear detection

July 3 2015, by George Wigmore



Researchers have shown that hooded seals native to the Arctic Ocean and North Atlantic have eyes that are extremely sensitive to ultraviolet (UV) light, enabling them to spot polar bears that would usually be camouflaged as UV is reflected by snow and ice but absorbed by white fur.

The study - which is published in the journal *Biology Open* is a collaboration between City University London, UCL (University College London), Moorfields Eye Hospital and the University of Tromsø - also shows that this also enables the seals to see their own species on land and also improves underwater vision, where they spend the vast majority of their time.

Speaking about the study, Professor Ron Douglas from the Division of Optometry and Visual Sciences at City University London and one of the authors of the study, said:

"Our study shows that the Hooded Seal displays an unusual sensitivity of [ultraviolet light](#), as the make-up of its eye enables it to magnify the UV component of light. We think that this affords the seals an advantage in deep ocean environments while also enabling them to easily spot their young when hauled out on the ice, which is important when they are born in March and the sun is low on the horizon. It also helps identify predators such as [polar bears](#) who would normally be camouflaged against the snow."

For most mammals, such as humans, the visual wavelengths of light are between approximately 400–700 nm, with blue and red light corresponding to the shorter and longer ends of the spectrum respectively. The additional part of the spectrum detected by the seals (UVA), appears between 315 and 400nm.

In contrast to most mammals the pelagic hooded seal's (*Cystophora cristata*) eye has an unusual make up enabling it to improve its sensitivity to UV and blue wavelengths of light, as unlike other carnivores they have a special adaption to a part of their eye known as the tapetum lucidum (TL).

Existing as a reflective layer behind the central retina, the TL normally occupies 20 to 30 per cent of the central retinal area and reflects light back through the retina improving the eyes' sensitivity. Commonly golden in reflection in carnivores on land the TL is often observed reflecting a camera's flash during photography of pets such as cats and dogs, and can confer improved night vision.

When the team examined the eye of the hooded seal, they instead found

a very different and unusual composition, with the TL being white in colour and covering the entire retina as it almost completely lacks the melanin that provides the golden colour in other mammals. This special mechanism enables the TL to act as a large mirror, enhancing the reflectance of UV and blue components of [light](#) more than 10 times compared to other wavelengths. This not only improves their sensitivity to those parts of the spectrum and helps them spot potential predators, but also improves underwater vision where blue [wavelengths of light](#) travel deeper than others.

Provided by City University London

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