

Shedding light on the senses fish use for navigation

April 25 2013



Rainbow Trout (*Oncorhynchus mykiss*). Image: Knepp, Timothy - U.S. Fish and Wildlife Service

(Phys.org) —New research conducted at Queen's University has discovered that polarized light vision, which is used for navigation and orientation by rainbow trout, changes with age.

Young fish can navigate relative to the polarized light field in the sky, yet older fish performing intricate orientation tasks seem to lose their ability to navigate using the polarized skylight field. A research study led by Shai Sabbah in the laboratory of Craig Hawryshyn (Biology) at Queen's may help solve this mystery.

"We found that young fish use only the bottom half of their eyes to detect polarized [light signals](#). Remarkably, we also found that the [eye](#)

[region](#) that detects polarized light signals switches during development," says Dr. Sabbah. "Older fish lose their ability to detect polarized light signals in the bottom half of their eyes but gain the ability to detect them in the top half of their eyes."

The switch from bottom-half to top-half sensitivity allows older fish that swim in deeper water to use the underwater polarized light field, which allows for more accurate navigation. Owing to this switch, [rainbow trout](#) are therefore able to navigate effectively throughout their development.

Polarized light vision is the ability to distinguish between different angles of polarized light. Many invertebrates and vertebrates use this type of vision to find their way on land and through air and water.

To determine what eye region the fish were using, Dr. Sabbah and colleagues measured the [neural signals](#) from the [optic nerve](#) of the fish in response to shining light at different angles of polarization on their eyes.

These findings can help solve long-standing questions regarding the senses used by salmonid fish (including rainbow trout and salmon) for navigation. These fish show one of the most complex navigation behaviours known in the [animal kingdom](#).

The research appeared in the April 24 edition of the *Journal of Neuroscience*.

More information: www.jneurosci.org/content/33/17/7428.abstract

Provided by Queen's University

Citation: Shedding light on the senses fish use for navigation (2013, April 25) retrieved 17 April

2024 from <https://phys.org/news/2013-04-fish.html>

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