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Catch more fish by seeing things from their point of view

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By John Hayes / Pittsburgh Post-Gazette

Those lures sure look good in the tackle box. But on the other end of the line, the fish see something quite different.

Like humans, fish use a variety of senses to perceive their environment. Most use sight, smell, touch and sound received through internal ears and external lateral lines, and some make use of disruptions in the electrical field surrounding them. With Pennsylvania trout fishing underway, panfish on fire throughout the region and the bass harvest season opening June 16, it's helpful for anglers to see their baits from a fish's point of view.

To understand sight, it helps to first understand the nature of color. At the atomic level, color doesn't exist. Light waves bounce off molecular configurations in different ways, changing their form. The altered waves are absorbed by structures within the eye. Rod-shaped photoreceptors in the retina send signals distinguishing degrees of lightness and darkness to the brain. Cones direct specific ranges of frequencies to the brain, which interprets those signals as colors.

Human visual acuity covers a short segment of a very long spectrum of light wave frequencies.

When light traveling through air enters water, its velocity slows, its direction changes slightly and its wavelengths are incrementally absorbed by the water. As the light travels deeper into the water, more wavelengths are absorbed, or disappear. The longest wavelengths with the least energy, those interpreted by the brain as red, are the first to be absorbed. Degrees of orange are next to disappear, followed by the yellows and greens and finally blues and purples. The colors disappear underwater in the same order as they appear in the color spectrum.

The eyes of fish and humans are structurally similar. No one knows exactly what animals see, but by counting the rods and cones in the retina and determining which frequencies they transmit, scientists believe fish of various species perceive different ranges of light and see objects differently at various water depths.

John Arway, a fisheries biologist and former director of the Pennsylvania Fish and Boat Commission, suggested that fish spending most of their lives in deep waters that filter out most light frequencies are probably genetically equipped with better perception of light and dark.

"Fish ... see colors or variants of colors depending on where they live. Fish in deeper water can't tell color differences as well as fish in shallower water because of less available light," he said.

Human eyes have three types of color receptors. Specialized cones allow us to see reds by responding to light frequencies of 565 nanometers. Other cones set for 535 nm let us see greens, and blues and violets are detected at 440 nm.

Coldwater trout have four types of color receptors. They see the reds, greens and blues seen by humans but with some variation. What an angler sees as a dark red lure is perceived as bright red by the trout. With the fourth set of color receptors, trout can sometimes detect ultraviolet frequencies as low as 355 nm, below the spectrum visible to humans. Curiously, those ultraviolet cones are only active when trout are young and during spawning runs.

Largemouth, smallmouth and spotted bass are deceptively named. Not true bass in the family of striped bass, they are more closely related to panfish. Behavioral research conducted as early as 1937 determined that largemouths can distinguish between red and green. More recent research confirmed the study's findings and explored how well bass can differentiate between closely related colors.

"Bass possess single cone cells maximally sensitive at 535 nanometers, twin cone cells maximally sensitive at 614 nm, and rod cells maximally sensitive at 528 nm," stated researchers in the journal Current Zoology. "A simple model of visual perception predicted that bass should not be able to discern between chartreuse yellow and white nor between green and blue. In contrast, bass should be able to discern red from all [gray scale] stimuli. These predictions were partially upheld in behavioral trials."

The study showed that bass can distinguish between red and green, but dark colors such as blue and black look the same to bass. Bright colors such as chartreuse and white look the same.

Little research has been done on the visual acuity of panfish including bluegills and crappies. It has been noted, however, that the taxonomic relationship of crappies and bass suggests parity in color perception. Unlike bass, crappies are careful inquisitive predators, nipping at still or slowly moving prey. The eyes of white and black crappies are among the largest relative to body size of all freshwater fish, and both species feed extensively at night in all seasons. Their big eyes may gather more low-level light, giving crappies an advantage over their prey. And the position of a crappie's eyes, forward and upward, suggests the preferred direction of attack.

Joe Fazio of Mount Washington, publisher of the "Crappie Crushin' TV" YouTube channel and Facebook page, said color choice is vital when targeting crappies with lures.

"I know crappies are able to differentiate color groups as well as most other freshwater fish. Water clarity, light penetration, depth and even temperature affect how a fish sees certain colors," he said. "Opaque lures tend to hold color in more stained water and are more visible at greater depths. Red fades fairly quickly as depth increases, while purples and blacks are among the last to disappear at depth. Chartreuse and white, if opaque, offer good visibility in lightly stained to very dingy water."

In the week since a series cold fronts passed the region, Mr. Fazio said crappies have moved into shallower water, where their color perception is better.

"I almost always lean towards a black and chartreuse split-tail [plastic] grub on a 1/32-ounce jig head under a slip bobber," he said. "It simply gets the job done, hands down."