Blind Cave Fish Research

Blind cave fish research may lead to new applications.

By David Alderton

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Blind cave fish.
Photo courtesy JohnstonDJ.Blind cave characins (Astyanax mexicanus) have long fascinated fishkeepers, thanks to their apparent ability to “see,” even though they are totally blind. These blind cave fish occur only in the San Luis Potosi cave system in Mexico, where their ancestors became cut off by changes in the water level thousands of years ago.

The appearance of the blind cave fish has been modified, as a result of their isolation in this subterranean world. They rely on a remarkable sensory system to guide them when swimming, which scientists at the Georgia Institute of Technology in Atlanta have recently been studying.

Blind cave fish have tall, plate-like structures called cupulae along their bodies, which sense changes in water movement in their vicinity. These connect to bundles of specialized cells which in turn convey the information to the brain. This means that as a fish swims past an object, it can instantly detect its position by the water flow around its body helping it to gauge its distance and avoid a collision, or escape from a predator.

Professor Vladimir Tsukruk, who leads the research team, built corresponding cupulae by using droplets of a polymer applied to flow sensors. He discovered that these modified sensors were far more sensitive than the basic sensors currently in use. This means they could have applications in many different areas, ranging from tsunami detection to port security. “It’s a simple but robust demonstration of the potential of bio-inspired design in solving difficult engineering problems,” he said.

These modified sensors may also be valuable as a replacement for sonar in some situations, helping to protect marine life. More widespread underwater use of sonar by the world’s navies is believed to be the major reason as to why whales are now beaching themselves in increasing numbers.

The next step is to develop sufficient computing power to interpret the data coming from groups of these sensors. This, of course, is something that the blind cave fish already does as it swims through its dark environment.