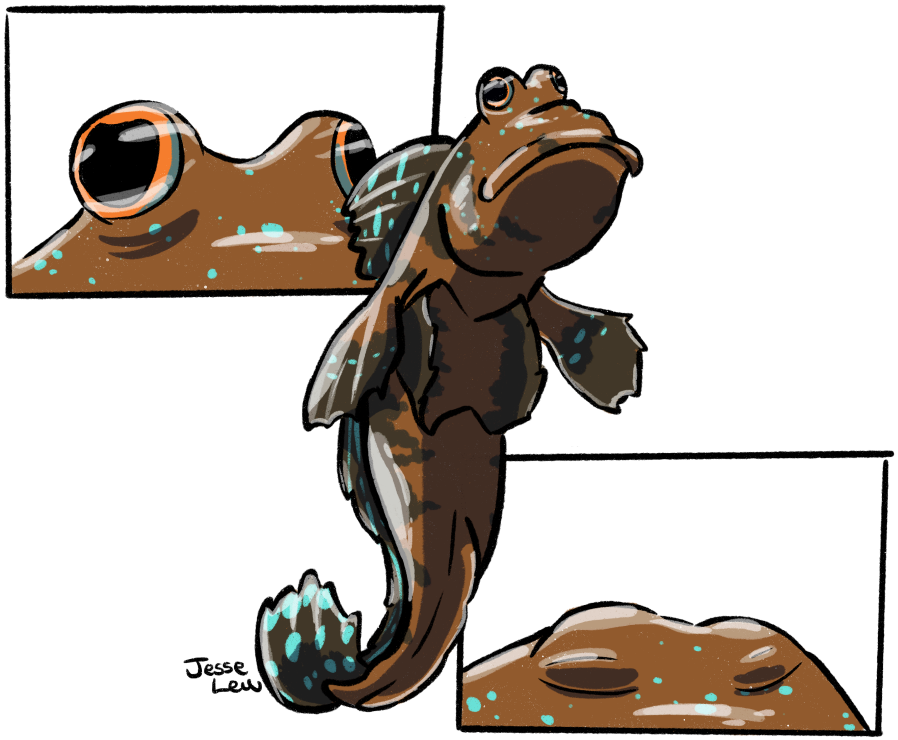

News

Sage Hill School

A fish that blinks: What mudskipper behavior tells us about human evolution

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A team of researchers at the Georgia Institute of Technology have zeroed in on an amphibious fish species to better understand the evolutionary pressures that molded blinking in land-dwelling creatures.

The April study titled "The origin of blinking in both mudskippers and tetrapods is linked to life on land" bolsters the idea that many organisms evolved to blink in response to the new pressures that came with living on land, an idea which fossils alone couldn't provide sufficient evidence to support.

The study of mudskippers, an amphibious fish that blinks, was a very productive addition to the discussion. Though the mudskipper blinks in a manner different to land-dwelling animals, by retracting its eyes into its head, by testing how it would respond to terrestrial pressures, researchers gained profound insights into why tetrapods, four-limbed animals like

humans, began to blink and its method of doing so may be precisely how they approached blinking in the first place.

“The ecosystems we see today are really different because animals were able to live on land, and if we can say blinking was one of the features that was involved, one of the behaviors that was involved in that transition, I think that’s also an important contribution to understanding the history of the Earth and the history of our own lineage,” said Thomas Stewart, study author and assistant professor of biology at Pennsylvania State University.

Beyond just insight into evolution, Stewart said that “[the study] is just the starting point for a whole new set of questions.” For example, further research could be conducted into the helpful fluid properties of the liquid on the eyes of mudskippers may also be useful for humans.

"[P]art of the reason that's exciting is that scientists can use examples like this, animals outside of humans, as inspiration for how to think about, perhaps someday, designing artificial tears or designing contact lenses," Stewart said.

With no evidence of blinking in closely-related aquatic species, researchers found that mudskippers blinked in the lab to wet, protect and clean their eyes — the same reasons tetrapods blink. It is unlikely that blinking had evolved aquatically in either mudskippers or tetrapods.

Moreover, *A. gunnari*, an early tetrapod and one of the first limbed animals, had two eye sockets adorning the top of its skull with room for a retractor muscle to attach to the eyes. From this evidence, the researchers concluded that tetrapods likely began to blink in a similar fashion to the mudskipper method of eye retraction, a very similar adaptation for their common journey onto land.

"[Mudskippers] were able to perform this new behavior without evolving any new muscles around the eye," Stewart said.

If tetrapods evolved to blink in the same way, then the blinks of humans and all other living tetrapods, which do have novel musculature, were likely to be further tweaks and adjustments of this base function. In addition to not having evolved new eye muscles, the mudskipper also lacks tear glands. The aquatic creature returns to water to keep its eyes moist. The innovation of tear glands in tetrapods was another addition to the blinking system which allowed for extended periods of stay on land.

"This project in particular brought together scientists from a lot of different disciplines," Stewart said. "We [had] paleontologists, developmental biologists, physicists, and engineers working together on this problem, and I think each of us is going to move forward in a new direction with our own interests and curiosities that come out of it."