# Advantages of living in the dark: The multiple evolution events of 'blind' cavefish

January 22 2012

This is the blind Mexican cavefish (*Astyanax mexicanus*) along with its sighted cousin the Mexican tetra. Credit: Professor Richard Borowsky

The blind Mexican cavefish (*Astyanax mexicanus*) have not only lost their sight but have adapted to perpetual darkness by also losing their pigment (albinism) and having altered sleep patterns. New research published in BioMed Central's open access journal *BMC Evolutionary Biology* shows that the cavefish are an example of convergent evolution, with several populations repeatedly, and independently, losing their sight and pigmentation.

The blind cavefish and the surface dwelling Mexican tetra, despite appearances, are the same species and can interbreed. The cavefish are simply a variant of the Mexican tetra, albeit one adapted to living in

complete darkness. A team of researchers from Portugal, America, and Mexico studied the DNA from 11 populations of cavefish (from three geographic regions) and 10 populations of their surface dwelling cousins to help understand the evolutionary origin of the physical differences between them.

While results from the genotyping showed that the surface populations were genetically very similar, the story for the cave populations was very different. The cave forms had a much lower genetic diversity, probably as a result of limited space and food. Not surprisingly the cave populations with the most influx from the surface had the highest diversity. In fact there seemed to be a great deal of migration in both directions.

It has been thought that historically at least two groups of fish lived in the rivers of Sierra de El Abra, Mexico. One group originally colonized the caves, but became extinct on the surface. A different population then restocked the rivers and also invaded the caves.

Prof Richard Borowsky, from the Cave Biology Group at New York University explained, "We were fortunate in being able to use A. mexicanus as a kind of 'natural' experiment where nature has already provided the crosses and isolation events between populations for us. Our genotyping results have provided evidence that the cave variant had at least five separate evolutionary origins from these two ancestral stocks."

Dr Martina Bradic who lead the research continued, "Despite interbreeding and gene flow from the surface populations the eyeless 'cave phenotype' has been maintained in the caves. This indicates that there must be strong selection pressure against eyes in the cave environment. Whatever the advantage of the eyeless condition, it may explain why different populations of A. mexicanus cave fish have

independently evolved the same eyeless condition, a striking example of convergent evolution."

**More information:** Gene flow and population structure in the Mexican blind cavefish complex (Astyanax mexicanus) Martina Bradic, Peter Beerli, Francisco García-de León, Sarai Esquivel-Bobadilla and Richard Borowsky *BMC Evolutionary Biology* (in press).

Provided by BioMed Central