

This Week's Citation Classic

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Avise J C & Selander R K. Evolutionary genetics of cave-dwelling fishes of the genus *Astyanax*. *Evolution* 26:1-19, 1972. [Dept. Zoology, Univ. Texas, Austin, TX]

Levels of genetic variation were measured in cave and surface populations of the fish *Astyanax mexicanus*. The project was designed to test prevailing hypotheses relating genetic variation to environmental heterogeneity. Cave populations did exhibit drastically reduced genetic variability, but several considerations argue that the effect was primarily attributable to genetic drift. [The *SCI*[®] indicates that this paper has been cited over 100 times since 1972.]

John C. Avise
Department of Molecular
and Population Genetics
University of Georgia
Athens, GA 30602

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"Our study was conducted shortly after multi-locus protein surveys were introduced as a means of estimating structural gene variation in natural animal populations. Evolutionary forces maintaining the surprisingly high levels of protein variation were then (and still are today) being hotly debated. One school of thought held most variation to be neutral with respect to adaptation. Other evolutionists suspected that natural selection often favored increased genetic variability. A prevailing selectionist hypothesis was that gene variability should be favored in and hence correlated with heterogeneous environments.

"I was introduced to these ideas in a graduate course offered by Robert Selander at the University of Texas. I was stimulated by the issues, and impressed with Selander who subsequently agreed to be my thesis advisor. We reasoned that if cave environments were in fact relatively stable and uniform temporally and spatially, their inhabitants might provide a test of the correlation between genetic and environmental heterogeneity. We chose the small fish, *Astyanax mexicanus*, for study.

"This was the most thoroughly enjoyable research I have ever conducted. I was introduced to the marvelous realm of speleology, and had the good fortune of visiting some of the most magnificent limestone caves in the New World, those of the Sierra de El Abra in northeastern Mexico. After one particularly arduous hike to a cave whose entrance had only recently been mapped by aerial survey, I remember entertaining the exciting possibility that we were the first people ever to enter the grandiose cavern. Such musings were thoroughly dashed when, as we pondered how to scale a particularly formidable precipice, we finally noticed that some earlier adventurer had stashed a rope ladder nearby for just that purpose! At any rate, the fish were obtained, and the laboratory results proved to be more interesting than we could have wished.

"One cave population appeared totally lacking in genetic variability, while surface populations were among the most genically variable vertebrates assayed by that time. Several features of the data strongly suggested, however, that the lowered variability was primarily attributable to genetic drift and/or founder effect in the small cavernicole populations.

"I am gratified that our paper has become a '*Citation Classic*' because it evidences a rapidly growing interest in the field of evolutionary biology. There are probably several reasons why the paper has been cited frequently. First, it came at a time when very few such multi-locus surveys were available, and it has been included in most reviews written since then. Second, it remains one of the most striking empirical examples of the profound influences of various evolutionary forces, including drift, on the organization of genetic variability within a species. The third reason for interest in the paper is the same reason that initially attracted me to the project. These small fish, blind, unpigmented, and living in recesses of perpetual darkness in the Mexican mountains, hold a fascination and awe which transcend the usual bounds of science."