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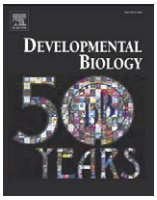

Abstract

Plenary session III: Past Presidents: What are they up to now?

Program/Abstract #75
Evolution of eye degeneration in cavefish
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Charles Darwin did not attribute all cases of evolutionary change to natural selection. In reference to blind cave animals, he remarked, As it is difficult to imagine that eyes, though useless, could in any way be injurious to animals living in darkness, I attribute their loss solely to disuse. The evolutionary mechanisms responsible for eye loss in cave animals are still poorly understood. We have approached this problem by studying development in the cavefish *Astyanax mexicanus*. Astyanaxis a single species with two forms, an eyed surface dwelling form (surface fish) and an eyeless cave dwelling form (cavefish). Eye primordia appear during cavefish development, but eventually degenerate, primarily due to lens apoptosis. Sonic hedgehog (shh) overexpression along the cavefish embryonic midline is responsible for lens apoptosis and eye degeneration. Pleiotropic activities of shh open the possibility that adaptive traits might be linked to eye degeneration via Shh signaling. Later in development shh overexpression spreads to the cavefish forebrain and oralpharyngeal areas, including the taste buds. Cavefish show larger jaws and more taste buds relative to surface fish, which could be employed to efficiently sample food from the bottom of cave pools. Several lines of evidence show that enhanced shh expression is responsible for increased oral size and taste bud number. For example, conditional shh overexpression in early surface fish embryos increases oral development at the expense of eyes, suggesting a developmental tradeoff based on pleiotropic Shh signaling. Thus, cavefish may have traded their eyes for increased feeding efficiency as an adaptation to life in perpetual darkness.

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