



The guppies of Trinidad

Explaining the distribution of organisms and the patterns and distributions of traits found in those organisms is simultaneously an ecological and an evolutionary question. The study of guppies in Trinidad provides an illustration of how ecology and evolution can be intimately entwined.

Guppies *Poecilia reticulata* from the Caribbean Island of Trinidad are a commonly kept tropical fish species, but are naturally found in streams on the island (Figure A). Guppies are found in sections of stream that have high and low predation, with differences in the predator species that the guppies experience. This pattern of low and high predation is repeated across streams in different parts of the island, and in many cases low and high predation can occur on the same stream in sections next to each other, but separated by a waterfall.

Studies of guppies have shown that those in high predation environments experience, as might be expected, much higher mortality rates. Interestingly, this is associated with the guppies becoming sexually mature earlier (in an attempt to reproduce before they are eaten), having a higher rate of investment in reproduction, and producing more and smaller offspring than members of the same species in low predation environments.



Studies have further shown that differences between guppies in different predation environments have a genetic basis and, therefore, are heritable. The system can be manipulated in the field by moving guppies and predators between environments, and these types of experiments have shown that guppy life history (when to reproduce, how much investment to allocate to reproduction versus growth, how many offspring to produce, and what size of offspring to produce) evolves in ways that can be predicted by evolutionary theory.

What is also interesting is that the rate of evolution (the rate of change) in this system is surprisingly fast. With strong selection pressures acting consistently locally on populations that cannot move away from them, evolution by natural selection can happen rapidly.

FURTHER READING

Background and details on Trinidad guppy evolution:

Magurran, A.E. (2005) *Evolutionary Ecology: the Trinidadian Guppy*. Oxford: Oxford University Press.

Online Case Study 2 Figure A Guppies *Poecilia reticulata* are brightly coloured fish. Here a female is shown.

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