The African fish that lives fast and dies young

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African annual fish take the adage 'live fast, die young' to a whole new level with the discovery that their short lifespan is accompanied by the most rapid sexual maturation of any vertebrate species. The find, reported in the open access journal *EvoDevo* as part of a series on extreme environments, adds to our knowledge of extremophile lifestyles.

Extreme environments can give rise to extreme adaptations. The tiny annual fish of Africa live in temporary puddles created by seasonal rainfall, and so must grow and reproduce quickly in order to lay their hardy eggs before the waters dry up.

African annual fish can grow up to 23% of their body length in a day, report Martin Reichard and colleagues, who studied wild-caught fish in captivity. One species, Nothobranchius kadleci started reproducing at 17 days old, at a size of just 31 mm, with a related species, N. furzeri maturing only one day later. The fish then produced eggs that developed to the hatching stage in as few as 15 days, making the time from one generation to the next as little as month – the most rapid sexual maturation time and minimum generation time of any known vertebrate species.

When the pools dry up, dormant embryos can survive in the dried mud for months, until the next rains come and the life cycle begins again. In the lab, half of embryos skipped dormancy when incubated on a peat substrate in a Petri dish. In the wild these individuals would populate secondary pools produced within a single rainy season after the primary pool desiccated. The findings suggest that rapid growth and maturation do not compromise subsequent fecundity.

Animals with a long life span can afford to take things slow. The tiny cave-dwelling salamander, olm (Proteus anguinus), which lives for over 100 years, takes 16 years to reach sexual maturity. But when the risk of mortality is high or lifespan shorter, animals reach sexual maturity earlier. The tiny goby, Schindleria, and females of house mouse lab strains (Mus musculus) become sexually mature at just 23 days old.

Earlier studies of a laboratory strain of an African annual fish suggested that it took the fish four weeks to mature, but this may have been an over-estimate. Previous reports of early maturation were based on anecdotal evidence, but this study is based on quantitative data and demonstrates that the rapid growth rate in the lab is still an underestimate compared to that in the wild.

More information: Rapid growth, early maturation and short

generation time in African annual fishes, Radim Blazek, Matej Polacik and Martin Reichard, *EvoDevo* (in press)

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