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Tadpoles rewarded for waiting until after winter to become frogs

Some tadpoles delay developing into frogs until an entire year after hatching, perhaps because they can gain advantages by waiting, a study suggests.

Researchers are investigating why some tadpoles – which normally hatch in spring and turn into frogs by autumn – are being seen to put off metamorphosis until the following spring. Studies of tadpoles in the lab suggests that seasonal conditions may not be the driving factor, but instead that they gain two distinct advantages by waiting until after winter.

Tadpoles that wait a long time before becoming frogs can grow bigger by the time they change, making them well equipped to find food and defend themselves. In addition, tadpoles that live through winter can become frogs early in the following spring, giving them a head start over that season's tadpoles in competing for resources on land.

Researchers from the Universities of Edinburgh and Glasgow studied hundreds of common European frog tadpoles in the lab. They reared the tadpoles under different temperature conditions and with varying amounts of available food, mimicking a range of natural environments. They found that food and temperature are important, but contrary to previous findings, these are not the only factors affecting the timing of metamorphosis.

Scientists found that those tadpoles kept in low temperatures with food in shortest supply were the most likely to wait until after winter to become frogs. However, wild tadpoles in cold environments are known to metamorphose before winter.

There is little evidence that tadpoles with food in short supply focus their energy on developing into frogs rather than growing bigger. In some cases, tadpoles were big enough to change by autumn, but did not. The research, published in the *Journal of Zoology*, was supported by the Carnegie Trust and the Glasgow Natural History Society.

Dr Patrick Walsh, of the University of Edinburgh's School of Biological Sciences, who led the study, said: "Reports increasingly point towards tadpoles surviving through winter in their ponds and becoming frogs the following spring. Our findings suggest that temperature and food are not the primary causes, and that tadpoles delaying metamorphosis have a double advantage of being more developed and arriving sooner than that year's tadpoles."

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