

# Explosive breeding in frogs

## linking phenology and priority effects



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### Summary

- Tadpoles showed compensatory growth after a delay in hatching
- Intra-specific priority effects prevented compensation in mixed-groups
- Strong priority effects may explain explosive early breeding in frogs

Many amphibians exhibit explosive breeding, with all the reproductive population concentrated in an area during a very short period. In time-constrained environments (i.e. high altitude or latitude), breeding also occurs as early as possible, normally as soon as ponds thaw. Early breeding should be beneficial, leading to a competitive edge (i.e. priority effects) and/or larger size at metamorphosis for offspring. However, early breeding could also cause egg freezing if cold weather strikes after laying. The balance of the costs and benefits of early breeding crucially influence larval life-history strategies.

### Key questions

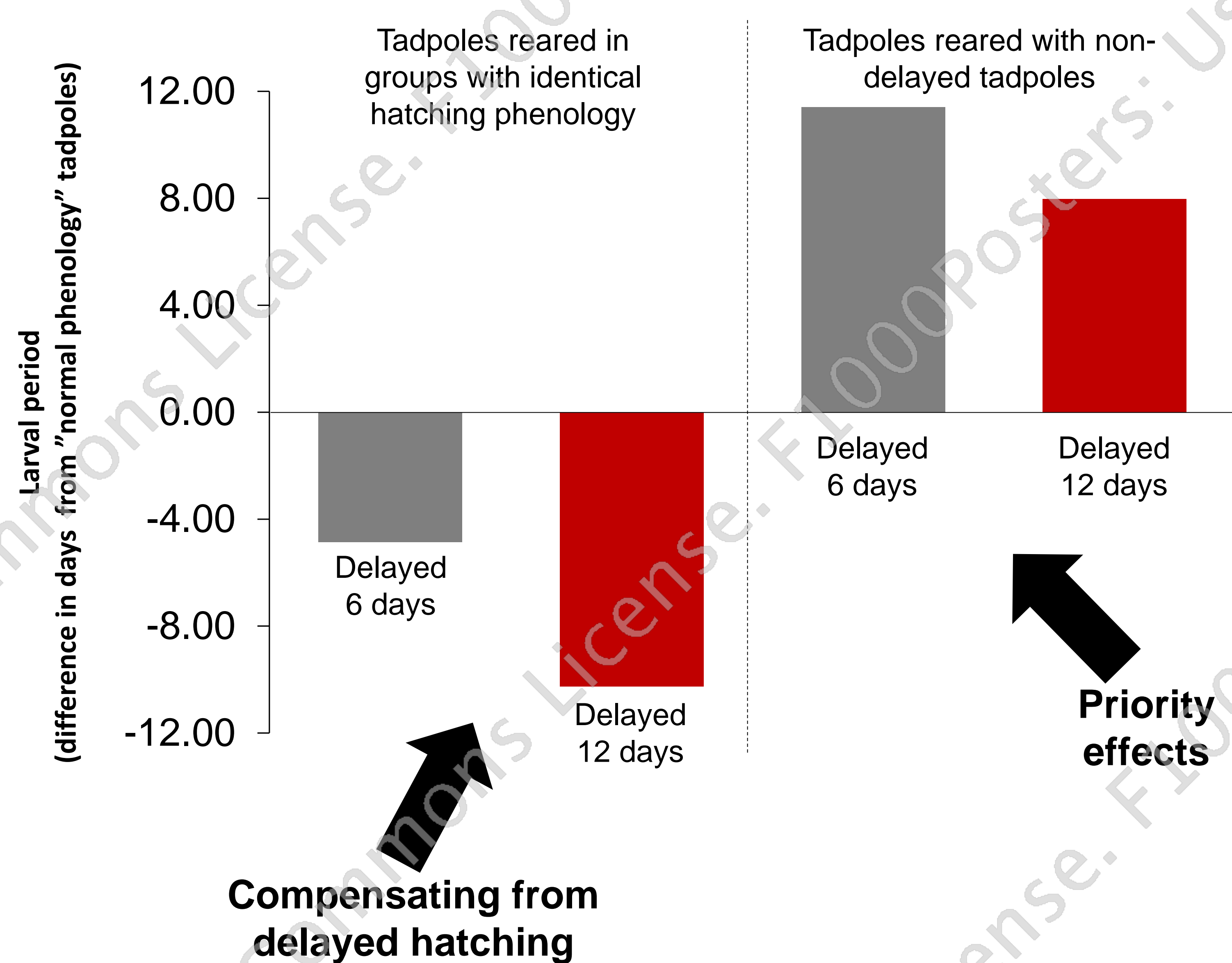
Can tadpoles speed up development and compensate for a delay in hatching time?

Differences in hatching time between tadpoles sharing the same environment, can lead to interference competition (i.e. priority effects), and affect compensatory responses?

### Methods

15 pairs of *Rana arvalis* were collected in the field in 2012 and artificially mated in the lab. Embryos were exposed to three phenology treatments: non-delayed hatching, and 6-day and 12-day hatching delay (both, induced by keeping the eggs at 4 °C during that time).

The larval part of the experiment consisted in five groups: 12 tadpoles from non-delayed hatching; 12 from 6-day delay; 12 from 12-day delay; 6 non-delayed tadpoles + 6 from 6-day delay, and 6 non-delayed + 6 from 12-day delay.



Larvae reared in groups with identical hatching phenology compensated for the hatching delay. On the contrary, delayed larvae in mixed groups experienced strong priority effects, with delayed tadpoles unable to compensate. Strong priority effects could explain explosive and early breeding in frogs, despite the potential costs.

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