

Female frogs modify offspring development depending on reproduction date

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Breeding male of *Rana arvalis* from the study area. Credit: / Germán Orizaola

Global warming is altering the reproduction of plants and animals, notably accelerating the date when reproduction and other life processes occur. A study by the University of Uppsala (Sweden), including the participation of Spanish researcher Germán Orizaola, has discovered that some amphibians are capable of making their offspring grow at a faster rate if they have been born later due to the climate.

Over recent decades many organisms, both plants and animals, have experienced a notable advance in the date when many of their life processes (like [reproduction](#), migration or flowering) occur, attributed to the impact of [climate change](#).

An article published in the journal *Ecology* examines the effects that these changes in the reproduction date have on the life cycles of the amphibians.

"We specifically examined whether changes in the reproduction date of a common amphibian species in the north of Europe, *Rana arvalis*, can condition the growth and development of their offspring," the Spanish researcher Germán Orizaola, from the University of Uppsala (Sweden) and co-author of the study, tells SINC.

Results revealed that female frogs have the ability to influence both the growth rate and the development of their offspring, and they adjust it depending on the date of reproduction.

According to Orizaola, "the mechanism by which the female frogs can condition the growth of their [larvae](#) could be due to the genes associated with the maintenance of their biological clock being transferred to the embryos and becoming active even before fertilisation. This would provide the larvae with the exact information regarding the progression of the growing season".

The later the birth, the faster the growth

One of the characteristics associated with climate change is an increase in the interannual variability of climatic conditions, so organisms are also exposed to greater uncertainty when it comes to determining the right time to reproduce. This explains why the existence of mechanisms adjusting growth and development rates depending on the variation in

the start of breeding is highly advantageous for many species.

In particular, as part of this study they observed that by delaying the date of reproduction (which simulated a time of environmental instability), the result was an equivalent reduction in the growth period for the larvae. "That means the later this species of frog breeds, the faster the larvae develop," explains the scientist.

An interesting aspect of the study is that the acceleration in [growth](#) is produced under constant lab conditions. "The larvae were not exposed to any outside sign that would indicate the progression of the growing season," adds Orizaola.

"This result is very novel and demonstrates that the acceleration in the development of the larvae is conditioned by the breeding females, which reveals the existence of a 'transgenerational effect' in which the breeding adults are capable of altering key aspects of the life cycle for the following generations, to better prepare them to survive the environmental conditions that they are going to experience," concludes the expert.

More information: Alex Richter-Boix, Germán Orizaola, and Anssi Laurila 2014. "Transgenerational phenotypic plasticity links breeding phenology with offspring life-history". *Ecology* 95, 2715-2722.
[dx.doi.org/10.1890/13-1996.1](https://doi.org/10.1890/13-1996.1)

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