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# Small scale spatial variation in the patterns of ageing in a wild population of the meadow viper (*Vipera ursinii ursinii*).

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## Abstract

### Summary:

Senescence, the inexorable and progressive deterioration of an adult organism with advancing age, has been found to affect many organisms and it was considered to be almost universal until recently (1). Under certain conditions, natural selection may be sufficient to delay or render undetectable this degradation with age (2). Snakes may be good candidates for the evolution of negligible senescence because reproductive output usually increases with age while some extrinsic causes of mortality can decline with adult size.

We use data collected during 38 years on a meadow viper (*Vipera ursinii ursinii*) population (3–5) to study if negligible senescence can be detected in the wild in this species.

The effects of age on reproduction have been studied by taking into account the effect of body length, which varies with age. The effect of age on adult survival has been studied using Bayesian survival trajectory analyses (6).

We found that most reproductive traits benefit from negligible senescence and found that senescence on survival was either negligible or positive depending on sex and small scale spatial variation of environmental conditions.

1. R. P. Shefferson, O. R. Jones, R. Salguero-Gómez, in *Introduction: Wilting Leaves and Rotting Branches Reconciling Evolutionary Perspectives on Senescence*, R. Salguero-Gómez, O. R. Jones, R. P. Shefferson, Eds. (Cambridge University Press, 2017),

2. J. W. Vaupel, A. Baudisch, M. Dölling, D. A. Roach, J. Gampe, *Theoretical Population Biology* **65**, 339 (2004).

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3. J.-P. Baron, J.-F. Galliard, R. Ferrière, T. Tully, *Functional Ecology* **27**, 173 (2013).
4. J.-P. Baron, T. Tully, J.-F. Le Galliard, *Oecologia* **164**, 369 (2010).
5. J.-P. Baron, J.-F. Le Galliard, T. Tully, R. Ferrière, *Journal of Animal Ecology* **79**, 640 (2010).
6. F. Colchero, J. S. Clark, *J Anim Ecol* **81**, 139 (2012).