

# Parasite carried by grey squirrels negatively impacts red squirrel behavior

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Research published in the *Journal of Animal Ecology* reveals a new mechanism of how grey squirrels affect native red squirrels in Europe through parasite-mediated competition.

An international team from universities in Italy and Belgium used a natural experiment of populations of native red squirrels (*Sciurus vulgaris*) co-inhabiting with alien [grey squirrels](#) (*Sciurus carolinensis*) to investigate the impact of a parasitic helminth (worm) transmitted by grey squirrels, *Strongyloides robustus*, on naive red squirrels' personality.

By comparing repeated measurements of red squirrel parasite infection and personality with those taken in sites where only the [native species](#) occurred, they demonstrated that infection by the alien parasite causes a significant reduction in red squirrels' activity and alters their relationship with native parasites.

Red squirrels normally carry only one species of gastro-intestinal helminth (*Trypanoxyuris sciuri*) that co-evolved with this arboreal mammal; therefore they might be sensitive to parasite spillover, the acquisition of new parasite species transmitted by another host, in this case the alien grey squirrel. Grey squirrels in Italy commonly harbour *Strongyloides robustus*, a helminth introduced from their native range, which they transmit to native red squirrel.

In their study, Dr. Francesca Santicchia and her co-authors found negative correlations between activity of red squirrels and infection with the alien parasite *S. robustus* in the sites invaded by grey squirrels. Activity was also negatively correlated with infection by its native helminth (*T. sciuri*) but only when grey squirrels were present, thus, not in the red-only sites. Moreover, individuals that acquired *S. robustus* during the study reduced their activity after infection, while this was not the case for animals that remained uninfected.

Their findings, which show that parasite-mediated competition is energetically costly and can also alter the "normal" relationships between native host and native parasite, are published today in the *Journal of Animal Ecology*. This new paper comes two years after the researchers

previous discovery that grey squirrels cause an increase in the concentration of stress hormones in co-occurring red squirrels, published in the same journal ([DOI: 10.1111/1365-2656.12853](https://doi.org/10.1111/1365-2656.12853)).

"That our red squirrel is threatened with extinction due to the introduction of an 'alien' species, the North American grey squirrel, has become [common knowledge](#)", say Dr. Francesca Santicchia and Dr. Lucas Wauters of the Guido Tosi Research Group at the University of Insubria in Italy. "But that one of the mechanisms involved is the reduction of activity, a personality trait that tends to be related to foraging intensity or efficiency, caused by the spillover of a parasitic helminth from grey squirrels is a new finding."

"This spillover is very similar to what occurs with the Squirrel Poxvirus in the UK and Ireland", add Dr. Claudia Romeo and Dr. Nicola Ferrari from the University of Milano, "although in this case of spillover of an endoparasite, the effect is much more subtle and does not lead directly to the death of the animal"

"For red squirrels, the 'natural' situation is being the only diurnal tree-dwelling mammal in our forests and woodlands", explain Dr. Lucas Wauters and Prof. Adriano Martinoli, also with the University of Insubria. "But when an alien species, such as the grey squirrel, colonizes these habitats, it acts as a true environmental stressor and carrier of potentially dangerous [parasites](#)."

In this study, the researchers produced compelling evidence that indicate that spillover of the alien helminth to naive red squirrels causes not only a reduction in activity, a behaviour that requires high energy expenditure, but also alters the relationships between red squirrels and their native, common helminth, *T. sciuri*.

"This is a subtle form of parasite-mediated competition, which may

exacerbate the effects of interspecific competition with grey squirrels for food, such as conifer seeds, hazelnuts, or chestnuts", underline Wauters and Romeo.

In fact, reduced activity could result in lower food intake and together with chronically increased concentrations of glucocorticoids can produce a reduction in body growth or reproductive success, or even decrease survival, among the red squirrels that are forced to share their habitat with the invaders. The combination of these interacting ecological and physiological processes will lead to the extinction of the red [squirrel](#) population in few years' time.

**More information:** Francesca Santicchia et al, Spillover of an alien parasite reduces expression of costly behaviour in native host species, *Journal of Animal Ecology* (2020). [DOI: 10.1111/1365-2656.13219](https://doi.org/10.1111/1365-2656.13219)

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