

# Competition favours shy tits

March 10 2016

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Great Tits have personality: They come as fast- and slow-explorers. Which type is more successful depends on the population density. Credit: Richard Ubels

Different personalities are maintained in the wild mainly because of changes in density. This is what researchers of the Max Planck Institute for Ornithology in Seewiesen and colleagues of the University Groningen found out for great tits. During four years, they observed that

slow explorers are more likely to survive if intraspecific competition increases due to an increase of density in a population. But although individuals are able to anticipate future breeding densities, they are amazingly bad in adjusting their exploratory behavior and therefore their chance to survive: Instead of slowing down, birds increased their speed of exploration when facing increases in density between years.

Exploratory behavior is a repeatable and heritable trait in West-European great tit populations and therefore underlies selection pressures in nature like all heritable differences in personality. Explorative individuals are more likely to take risks and to obtain higher social dominance ranks among territorial adults in the wild. It might seem that those birds are doing better in competitive environments, such as in high densities, as they are better in defeating limited resources when intraspecific competition increases in a population. When competition is relaxed, net benefits may instead decrease because risky behaviors require more energy.

Researchers of the Max Planck Institute for Ornithology Seewiesen and the University of Groningen, however, followed another prediction: Fast-exploring, aggressive phenotypes may survive less well when facing high densities as they are less able to anticipate and buffer changes in their social environment.

For their study, the researchers regularly controlled 600 nest-boxes in 12 woodlots over four years and calculated the densities within and between the populations. Fitness was calculated as survival probability and number of recruits. Exploratory behavior was assayed in a "novel environment room" where the total number of flights and hops within the first two minutes after arrival of an animal was counted.



In the so-called exploration room the scientists measure the explorative behaviour of the birds. Credit: Axel Griesch

"The [density](#) effect on the different personality types was amazingly strong", says Niels Dingemanse, research group leader in Seewiesen. Survival rates of fast explorers decreased with increasing density equally strongly as survival rates increased for slow explorers. These fluctuating selection pressures were mostly explained by year-to-year variation in density within rather than spatial variation among the 12 study plots.

## **Predicting the competition of next year**

The design of the study did not only allow the researchers to understand how the different personality types underlie density dependent selection, but also if an individual is able to adjust its exploration behavior depending on the population density. "Our data show that great tits are able to anticipate future breeding densities as they are able to change their exploratory behavior between years", says Marion Nicolaus, first author of the study.

In autumn, [great tits](#) may calculate the competition for breeding space in spring by the amount of beech seeds available: If there is a lot of food, chances to survive the winter are better. However, the birds were unable to appropriately adjust their [exploratory behavior](#) as they did not adaptively down-regulate their exploratory tendency with increasing density. According to the scientists, this explains why selection favors a mix of [personality types](#) rather than one single flexible type of individual.

Interestingly, psychologists also predict for human populations that competitive environments should favor sociable, shy, and non-aggressive individuals. In contrast, individuals with high levels of exploratory activity or aggression should perform relatively better in declining populations (e.g. because of habitat loss). "Whether this potential loss of personality variation affects the adaptive capacity of populations is currently unknown but represents an important question in both the social and natural sciences", says Niels Dingemans.

**More information:** Marion Nicolaus et al. Density fluctuations represent a key process maintaining personality variation in a wild passerine bird, *Ecology Letters* (2016). [DOI: 10.1111/ele.12584](https://doi.org/10.1111/ele.12584)

Provided by Max Planck Society

Citation: Competition favours shy tits (2016, March 10) retrieved 26 April 2024 from <https://phys.org/news/2016-03-competition-favours-shy-tits.html>

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