It's not enough just to get there: Dispersing species face social barriers, too

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Physical barriers are an obvious barrier to gene flow and to diversity within species—when populations can't get to each other to mix, their genes can't mix either.

But in a paper published in *Trends in Ecology and Evolution*, Macquarie University biologists Nicolette Armansin and Adam Stow, together with international colleagues, argue that social barriers are also important, and contribute significantly to the evolution of social species.

Physical features of a species' environment—mountains, deep waters, or unsuitable habitat—create barriers for individuals seeking to reproduce and thus disperse their genes. But the effort involved in overcoming physical barriers only pays off if the individual who enters the new patch can successfully mate and reproduce.

Doing this is by no means certain, and the more complex the species' social organization is, the lower an interloper's chances of reproductive success. Not all social systems are the same, even among populations of the same species—and social species may not know local customs. Features of the social system, like the way groups are organized, and the social hierarchies within them, can form barriers to both movement and breeding.

In societies where individuals have to navigate a more complex social landscape, the social barriers they face will be more challenging to overcome. A newcomer will encounter social complexity that arises from how persistent social relationships are, how related group members are to one another, whether parents give extended care to their offspring, or how promiscuous the mating system is.

In many animal populations individuals form enduring social bonds, and the number and quality of their relationships shape survival and reproductive success. This creates tight-knit communities, sometimes including coalitions, and such a social structure can be slow to accept immigrant animals. The need to form new relationships can make the social integration of immigrants a drawn-out process. In extreme cases, communities where members are highly related can be completely closed to immigrants and to new breeders.

The barriers introduced by social systems can mean that the places individuals can physically move to is not necessarily a place they can breed. This effect—social resistance—combines the barriers individuals

face when trying to enter a patch (entry resistance) and those they face in forming the social relationships necessary to reproduce within that patch (breeding resistance). Social resistance is a missing link between models of dispersal and gene flow. The hypothesis captures how social factors within patches can further affect dispersal through entry resistance and effective dispersal through breeding resistance.

But successfully overcoming social resistance can be an agent of selection. Immigrant animals which have overcome social resistance well enough to reproduce could be well placed to respond to selection pressure that includes strategies overcoming social resistance. Armansin, Stow and colleagues argue that social resistance can select for particular dispersal strategies, delayed reproduction, and parental care strategies that have an effect on how, and to what extent, connectivity is affected by social resistance.

Nicolette Armansin says, "I am hopeful that this hypothesis will generate a richer understanding of why social animals behave the way they do."

Adam Stow adds, "By acknowledging the effect of social behavior on connectivity we can now better predict what the consequences of human impacts on the environment might be."

More information: Nicolette C. Armansin et al. Social Barriers in Ecological Landscapes: The Social Resistance Hypothesis, *Trends in Ecology & Evolution* (2019). DOI: 10.1016/j.tree.2019.10.001

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https://phys.org/news/2020-04-dispersing-species-social-barriers.html