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Press release

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Family ties change with age and sex and determine how much animals help each other as they become older

The motivation to help conspecifics differs from species to species – and also between males and females. An international team of scientists with the participation of the Leibniz Institute for Zoo and Wildlife Research (Leibniz-IZW) now showed for seven group-living animal species that the degree of kinship of an animal to the other group members can change over its lifetime and that this change follows systematic patterns – in spotted hyena females, for example, it decreases over the course of life, whereas it increases in hyena males. These "kinship dynamics" profoundly influence the incentive of an animal to help its groupmates.

The results are published in the journal "Nature Ecology & Evolution" and contribute to a better understanding of social behaviour and the emergence of different social systems.

Passing on one's own genes to subsequent generations is a central evolutionary goal of every living being, including group-living, social animals. For those who live in a group of close relatives it might be in their best interest to help groupmates because helping individuals who share genes with each other such as offspring and siblings is like helping yourself. In contrast, for those who live among distantly related or unrelated individuals – say, second-degree cousins or total strangers – the best strategy may be to be selfish or even harmful to groupmates. A team of 21 scientists led by the University of Exeter examined how genetic relatedness (kinship) changes within groups over the entire lifetime in seven mammal species.

"We wanted to quantify how kinship among groupmates changes with age, and what consequences this has for their social behaviour," said lead author Dr Sam Ellis. "We built a theoretical mathematical model to predict changes in relatedness and compared our predictions to empirical data from decade-long field research projects on killer whales, chimpanzees, spotted hyenas, banded mongooses, badgers, rhesus macaques and yellow baboons." The team also tested whether patterns of kinship dynamics differed for males and females within the same species. Theoretical models of kinship dynamics were previously only available for females and for single species.

The team found that kinship dynamics vary from species to species, depending on whether male or female offspring (or both) leave the group into which they are born and disperse to new groups. In killer whales, for example, male and female offspring stay in the same pod as their mother, so females have a growing number of children and grandchildren around them as they age. In other animals, things are quite different. "In spotted hyenas, males usually leave their natal group after reaching sexual maturity and as a consequence, females usually live among fewer close relatives as time passes," said Dr Eve Davidian, co-author of the paper and member of the Leibniz-IZW Ngorongoro Hyena Project.

The empirical data from real animals matched well with the predictions of the mathematical model. "This is exciting because our model was built on only two features of social systems, dispersal and local mating. This allows us to predict more generally how and why social behaviour changes with age in group-living animals," said Ellis.

One of the animal populations included in the study is that of spotted hyenas in the Ngorongoro Crater in Tanzania. Leibniz-IZW scientists have been studying this population of eight clans for 26 years and compiled a unique genetic pedigree spanning more than 2000 individuals over nine generations. "Our long-term empirical data nicely matched the changes in relatedness predicted by the model – relatedness increased for males but decreased for females," said Dr Oliver Höner from the Leibniz-IZW and co-author of the study. "Using this new model, we can feed further models of helping or harming behaviour with data and make general predictions for group-living animals about when and to what extent males and females should be helpful and at which age."
The findings also suggest that incentives to engage in helping or harming behaviour differ from species to species and change across the lifespan of individuals. "The incentives to help or harm change with age depending on the social organisation and the mating system of the species," said Prof Darren Croft from the University of Exeter and senior author of the paper. "Across a wide range of species and social systems, the changes in helping and harming match the changes in relatedness between groupmates and these patterns often differ between the sexes, depending on where they mate and which sex disperses."

The study provides testable predictions to understand how key features of the social system of species shape patterns of helping and harming across the lifespan. "In spotted hyenas, it will be exciting to find out whether females reduce – and males increase – helping their groupmates with increasing age," said Höner. This research opens the door for future theoretical and empirical research on the evolution of animal societies.

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In spotted hyena societies, females have fewer family ties and males more family ties as they age. Such changes in kinship profoundly influence how much an animal helps other group members over the course of its life.
Oliver Höner
Oliver Höner/Leibniz-IZW