

How cooperation can trump competition in monkeys

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Two male gelada monkeys threaten an intruder while grooming with an infant.
Credit: Clay Wilton

Being the top dog — or, in this case, the top gelada monkey — is even better if the alpha male is willing to concede at times to subordinates, according to a study by researchers from the University of Pennsylvania, the University of Michigan and Duke University.

Alpha male geladas who allowed subordinate competitors into their group had a longer tenure as leader, resulting in an average of three more offspring each during their lifetimes.

The findings, collected from data during a five-year period ending in January 2011 through the University of Michigan Gelada Research Project, were published in the *Proceedings of The Royal Society B*.

The research was conducted by Noah Snyder-Mackler, then a graduate student in the Department of Psychology in Penn's School of Arts and Sciences. He collaborated with Thore Bergman, assistant professor of psychology at Michigan, and Susan Alberts, professor of biology at Duke.

Cooperation is surprisingly common among wild animals, the researchers said. While it makes evolutionary sense for animals to help their kin, it is harder to explain cases where competitors — especially unrelated adult males — join forces. This conundrum is particularly hard to explain because mating is generally a zero-sum game in which males can only reproduce by stealing mating opportunities from each other.

Why would an alpha male allow other males to be a part of his unit, if they will inevitably decrease the probability that he will pass on his own genes? The researchers felt there must be a reason since this kind of behavior is observed in many species.

"For example, in some species unrelated males will sometimes tolerate the presence of one another and, in rare cases, form bonds and even appear to cooperate," Snyder-Mackler said.



A follower male gelada monkey sits with an offspring that he may have sired.
Credit: Noah Snyder-Mackler

To understand why potential rivals might team up, researchers compared the fitness consequences for dominant male gelada [monkeys](#) living in single- or multi-male groups. They found that, although subordinate males father some of the offspring in multi-male groups, dominant males gain a lifetime fitness benefit because the subordinate aids in defense of the group from other males, thus extending the dominant male's reproductive career.

Even more tantalizing is evidence that the subordinate males that are allowed to mate stay around in the group for much longer.

"This suggests," Bergman said, "that the alpha males may allow the subordinate to reproduce as a 'staying incentive' for defending the group, a payment for their services."

While it is not yet clear that a willing exchange is occurring —

subordinate males may simply "steal" some chances at reproduction — the evidence is strong that subordinates confer some benefit to the leader.

"These findings demonstrate a benefit of forming multi-male groups in a predominantly single-male system, an important step in the evolution of sociality among unrelated competitors," Bergman said.

In studying wild geladas in the Simien Mountains National Park in Ethiopia, researchers identified the leader and follower males, noted the numbers of females in all units; tracked individuals involved in unit takeovers; and noted all new births. They used non-invasively collected genetic samples to conduct paternity analysis to determine the identities of the fathers.



Gelada monkeys, a leader and follower, fend off a bachelor. Credit: Noah Snyder-Mackler

Researchers saw that the dominant and subordinate males cooperatively

defended their females by fending off unattached bachelor males intent on taking their females, the likely mechanism leading to the increased tenure of the dominants.

Even though geladas primarily form single-male groups, researchers showed a benefit to forming multi-male groups. Multi-male units had fewer takeovers (a rate of 0.27) per year from other competitors and longer tenure (3.7 years as leader) compared with single-male units (0.35 takeovers per year and 2.86 years as leader.)

"Overall, this means that, just because animals appear to be in direct [competition](#) for a limited resource, they may still benefit from the relationship overall," Snyder-Mackler said.

Thus, cooperation can evolve among competitors through a variety of mechanisms. In the study, researchers chronicled how it can evolve in the context of reproductive sharing.

"More comparative research on other species will give us a better understanding of how and under what circumstances [cooperation](#) among unrelated individuals may have evolved," Snyder-Mackler said.

Provided by University of Pennsylvania

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