

Complex sex life of goats could have implications for wildlife management

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A new study of the mating habits of mountain goats reveals the vastly different strategies of males in different populations and could shed light on the unseen impacts of hunting.

A Durham University-led research team found that male chamois (a species of wild goat-antelope) adopt different strategies in different populations in order to succeed in the rut: some put a lot of energy in at a young age, while others wait until they are much older.

Researchers looking at neighbouring populations of chamois in Northern Italy found that males in one population delay their reproductive efforts until an older age when their size and experience allow them to dominate in the rut. They then put increasing effort into breeding until they die.

The study is the first to show clearly that this strategy of 'terminal investment', a pattern of higher reproductive effort in older age, is pursued by males in an animal population. The results, published in the journal [PLoS One](#), show that [reproductive strategies](#) in animals are complex and can show surprising variation across neighbouring districts.

It's not clear why there is such variation but the way that these populations are managed through hunting could be a factor, according to the researchers. At present, 32 per cent of the hunting quota is made up of older males, even though these males make up only 23 per cent of the population.

If too many larger, older males are taken out of a [population](#), younger males may be able to muscle in and start breeding. Years of rutting could exhaust these younger males, meaning that they are in poorer condition when they reach old age. If this reasoning is accurate, selectively hunting older males in populations such as this will have the effect of reducing the condition of older males in future.

This suggests that alternative hunting practices – such as hunting males in proportion to their age distribution – might be a better strategy.

Studies of bighorn sheep, a similarly hunted mountain species in America, have also suggested that selective hunting of older males can reduce genetic quality.

Researchers looked at three populations in detail and found that in neighbouring areas surprisingly different strategies prevailed; in one, the terminal investment strategy was dominant, in another, where older males were harvested at a slightly higher rate, the live fast/die younger strategy prevailed.

The group, led by Drs Stephen Willis and Philip Stephens, School of Biological and Biomedical Sciences, Durham University, in collaboration with ecologists at the University of Sassari, Italy, used data from 15,000 hunted male chamois, collected since 1973, to explore their breeding strategies. They looked at the amount of energy males of different ages expended during the annual rut at several sites in the Italian Alps and found unexpected variation across populations.

Co-author Dr Stephen Willis said: "It seems that chamois can have fun in their youth or enjoy their old age but they can't do both. In one valley, males left it until much later to get involved in the rut but, once involved, they showed a pattern of increasing effort, right up to the end of their lives."

The team was able to see how much energy was expended by rutting chamois by looking at how the body masses of males changed throughout the rut period. They were also able to establish the ages of shot individuals from the number of annual growth rings in their horns. The speed at which the [animals](#) lose body mass shows how much effort males put in to establishing and patrolling territories, and fighting to defend their harem.

At a site with more hunting and a 'faster' pace of life, the team found that male weight loss during the rut was high, that chamois began rutting at an earlier age and that life-expectancy was lower. By contrast, at a site with a 'slower' pace, lifespans were longer, the weight loss of males was less and males tended to increase the effort they put into reproduction as they got older.

Male chamois barely eat during the rut and use their non-rutting time for resting rather than foraging. They must put on weight prior to the rut in order to succeed and to survive the following winter months.

Co-author of the study, Tom Mason, a Durham University PhD student working on the project, said: "In most species, all males follow one or other of these strategies. It is intriguing that among chamois in different areas, males have different strategies, which might be related to resources, climate or competition."

Dr Philip Stephens added: "These patterns are consistent with two competing theories about how males should optimally allocate effort to reproduction during their lives, so you wouldn't normally expect to see them being displayed so differently by males in neighbouring populations of the same species."

Provided by Durham University

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