Deer study shows bigger brains in females lead to longer lives and more offspring

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Red deer (Cervus elaphus) hind, Glen Garry, Highland. There have been arguments about the future of red deer on the Scottish island of South Uist. Credit: Charlesjsharp/Wikipedia/CC BY-SA 4.0

(Phys.org)—A team of researchers working on the Scottish Isle of Rum

has found evidence of larger brains in female red deer conferring longer lifespans and more offspring raised to adulthood. In their paper published in the journal *Royal Society Open Science*, the researchers describe their study and what they found.

A lot of research has been done comparing brain size between species, but there are few comparisons of brain size between individuals of the same species or group. In this new effort, the researchers sought to learn more about what it means for a mammal to have a larger brain than others in its group. They focused on red deer living on the Isle of Rum because other researchers have been tracking them for approximately 40 years—a time span that has covered seven generations. The researchers were able to measure brain size by measuring the skulls of 1,314 deer that had died.

Surprisingly, the team found a 63 percent variation among the deer on the island. They also found that females with larger brains tended to live longer and produced more offspring that for unknown reasons managed to live to become adults themselves. Females also passed on the trait to their offspring. Perhaps even more surprising was that the team found no discernible differences between males with brains of different sizes. The team also reports that they were unable to find any downside to larger brains in deer of either gender. Theories have suggested large-brained individuals might have weaker immune systems or fewer offspring due to the higher energy demands of larger brains—but that did not seem to be the case with the deer.

The researchers suggest physical strength and agility might be the overriding factor leading to male success as a possible explanation for why larger brain size did not confer positive attributes. Larger brains in the females, on the other hand, might have made them smarter in the sense that they were better able to find new food sources when old ones dried up or when dealing with other stressful situations. On the other

hand, they note, it might be the case that it was simply coincidence—the researchers cannot say for sure.

The study was the first of its kind, which suggests that other studies need to be done with other species to learn more about why some individuals have larger brains and what it means for them.

More information: C. J. Logan et al. Endocranial volume is heritable and is associated with longevity and fitness in a wild mammal, *Royal Society Open Science* (2016). DOI: 10.1098/rsos.160622

Abstract
Research on relative brain size in mammals suggests that increases in brain size may generate benefits to survival and costs to fecundity: comparative studies of mammals have shown that interspecific differences in relative brain size are positively correlated with longevity and negatively with fecundity. However, as yet, no studies of mammals have investigated whether similar relationships exist within species, nor whether individual differences in brain size within a wild population are heritable. Here we show that, in a wild population of red deer (Cervus elaphus), relative endocranial volume was heritable (h^2 = 63%; 95% credible intervals (CI) = 50–76%). In females, it was positively correlated with longevity and lifetime reproductive success, though there was no evidence that it was associated with fecundity. In males, endocranial volume was not related to longevity, lifetime breeding success or fecundity.