NZ wild horse study reveals how to breed for a filly

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by Robin Marshall

Colt or filly? A mare from the study group in the Kaimanawa Ranges.

• Review backs theory on sex selection in mammals

A New Zealand study on wild horses has revealed that breeding specifically for a filly or a colt may be more than just a 50-50 chance for horse breeders.

In a six-year long study funded by the Department of Conservation, researchers Elissa Cameron and Wayne Linklater found that it was the change in condition of the mare around the time of conception, as opposed to her actual condition, that better predicted the sex of the foal.

The researchers, students in the Ecology Group of the Institute of Natural Resources at Massey University at the time, were studying wild horses in the Kaimanawa Ranges and surrounding areas in the central North Island, between August 1994 and 1999. Dr Cameron set out to test the expectation that more males should be born to better-conditioned mares. The study was the topic for her PhD thesis.

The primary reason for the research on the herd was to trial remotely delivered contraceptives to control herd

growth, Dr Linklater said.
The subpopulation in the Moawhango River basin area was the focus of the study and more than 400 horses were individually identifiable by either freeze brands on their rumps or natural markings. Some 186 of the horses were freeze branded.

Researchers Wayne Linklater and Elissa Cameron.

He said there were few difficulties locating the horses in the wild. "When we were up there, there was a decent number of horses there, and loyal to their home ranges. Once you know which area a group is in, it's actually pretty easy to find them," Dr Linklater said.
Body condition scores (BCS) based on the Huntingdon method were recorded with the aid of strong binoculars or a telescope every time a horse was seen, provided visibility was good. Only mares whose BCS had been recorded at least twice during each 20-day period were used in the analysis, and the sample size was 118 births. The body condition score of the mares ranged from 1 to 3.5, with an average of 2.5.
They found that 97% of mares losing condition when she conceived gave birth to a filly, and 80% of the mares who were gaining condition when they conceived gave birth to a colt.
The horses body condition scores were compared before and after conception to measure the change in condition in each mare. BCS was estimated by visual body fat distribution on the Huntingdon 11-point scale (0-5) with 0.5 gradations.
"Wild horses are a good species for this sort of study," Dr Linklater told Horsetalk. "The mares are not supplementary fed and go through annual condition cycles anyway. There's only one offspring - animals with multiple offspring make such a study very difficult. And horses don't hide their newborns. Cattle and deer tend to take their offspring into hiding but wild horses tend to be nervous in cover," Dr Linklater said, so the new foals were easy to spot.
"Visual body scoring also works well with horses as their fat is spread all over the body, unlike cattle and sheep, which tend to concentrate fat around their internal organs."

They found that mothers that conceived sons tended to gain condition, whereas mothers of daughters tended to lose condition. When mares were categorised by whether they were losing condition, maintaining their condition or gaining condition around conception, the results were striking; only three percent of females losing condition conceived a son, whereas 80% of those gaining condition conceived a son.

A wild mare and foal on the Kaimanawa ranges. © KWHWT

Previous studies into the variation in the production of sons and daughters have often produced inconsistent results. Of the many theories on the topic, one - the Trivers-Willard hypothesis - suggests that mothers in good condition with more resources to invest in the offspring would be advantaged by producing sons, as a son would out-compete a daughter - who produce fewer offspring a year; but mothers with less resources to invest would be advantaged by producing a daughter, as a daughter would out-reproduce an unsuccessful son.

"So our results were not surprising," said Dr Linklater. "The theory predicts what we found. It is delightful when that happens."

Dr Cameron has also hypothesized that glucose levels play a part in sex ratio, and a year-long study into the relationship between the sex of the offspring and glucose is about to start with sheep. The process is simple and non-invasive, with the glucose being inserted into the uterus via a catheter in the cervix.

Rich feed and stress can cause an elevation in the glucose levels in animals. Add to this the glucose-birth sex link and there could be major repercussions for all

livestock farmers, particularly horse breeders, many of whom feed rich supplements to their broodmares.
"If an early embryo gets too much glucose, it kills the females," Dr Linklater said. "We'd love to investigate what drives that relationship in horses. We're confident the pattern occurs, but why?"
With this glucose link established he theorises that a shift in the birth sex ratio by five to 10 percent may be possible, "by what you feed them, when you feed them."

Extreme sex ratio variation in relation to change in condition around conception,
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