

Quiet Bison Sire More Calves Than Louder Rivals

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(PhysOrg.com) -- During bison mating season, the quietest bulls score the most mates and sire the most offspring while studs with the loudest bellows see the least action, according to a surprising new study by researchers at University of California, Davis, and Point Loma Nazarene University in San Diego. The researchers also found that the volume of a bull's bellow was not related to its weight or age.

“We were expecting to find that the bigger, stronger guys — the high-quality males — would have the loudest bellows, because they can handle the costs of it,” said Megan Wyman, a graduate student in geography at UC Davis and the lead author of the study. “But instead, we found the opposite. My collaborator in San Diego wanted me to call the paper ‘Speak softly and carry a big stick.’”

The study is the first to examine how the amplitude, or loudness, of a mammal's vocalizations correlate with reproductive success. It was published in the November issue of the journal *Animal Behaviour*.

Most studies of vocalized sexual signals among animals have focused on the pitch characteristics, timing and duration of calls. Amplitude has received much less attention, Wyman said, largely because loudness is especially difficult to measure in the field. By the time a grunt or a roar reaches a sound-level meter, its amplitude may have been affected by the animal's distance from the meter, the direction the animal was facing when it called, wind conditions and a number of other factors.

Bison bellows are loud, low-frequency vocalizations performed by bulls during the rut. They are most commonly used when one male challenges another, typically when the two are within 45 to 90 feet of one another. Yet sometimes a bellow will attract bulls from further away, and this may be one reason that a herd's dominant bulls keep their voices down, Wyman speculates.

“It could be that bulls provide information about their high quality through other signals — for example, the frequency or the duration of their bellows. So they don't have to be louder, they just have to be heard,” she said. “If you bellow too loudly, it could bring in too many other bison to check you out.”

The bigger question raised by the study, Wyman said, is why lower-quality males don't turn down the volume of their bellows to emulate their more successful rivals.

“That's a lot harder to explain,” she said. “It could be that if you use a quieter volume, other bulls have to approach even closer to check you out, and any time you bring someone that close, there's a higher risk of attack. And that's the type of cost that these low-ranking bulls may not be able to bear.”

To learn how bison communicate with one another, Wyman and Michael S. Mooring of Point Loma Nazarene University, and a number of student interns spent two summers monitoring 325 wild bison in Fort Niobrara National Wildlife Refuge in the Sandhills region of north-central Nebraska. The animals were well habituated to the four-wheel drive vehicles the team used to shadow them, and each was easily identifiable by a unique brand it had been given as a calf.

Observing the herd for 14 hours each day during the two-month rut of July and August, the team was able to record each copulation and to

detail the tangled web of connections between males and females as bulls lost and gained cows during their intense competitions. To assess where each bull ranked in the herd's hierarchy of dominance, Wyman tallied outcomes of challenges between rivals, including threats that ended with an animal backing down in the face of combat, as well as full-blown, head-to-head fights. When calves were born the following spring, DNA samples were taken to determine parentage.

For measurements of amplitude, Wyman used a hand-held sound-level meter from the safety of her vehicle. With each reading, she also recorded specific behaviors of the bull, his female and any challenging rivals, as well as noting the factors that could affect the level of the reading such as the bull's head orientation, its distance from the meter and wind conditions. After selecting for accuracy and quality, she narrowed some 2,000 readings taken from 67 bulls down to 408 readings from 44 bulls.

Her analysis showed that, on average, the least successful bulls — those with the lowest number of copulations and offspring — bellowed at least 50 percent louder than their more successful rivals, corresponding to decibel readings averaging from 109 per bull down to 103. This drop in volume correlated with a rise in the number of times a bull copulated from none to five, and the number of calves it sired from none to nine.

These data are just a portion of the information the researchers collected in the field with the overarching goal of understanding how bison communicate vocally. Yet the results clearly indicate that loudness as a factor of animal communication should receive more attention, Wyman said. “We’ve shown a way of using simple, affordable instruments in the field that can give a good measure of amplitude,” she explained. “I’m hoping that researchers will now start looking at amplitude as something that matters.”

Provided by UC Davis

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