# Capturing and Tagging Free-ranging Bighorn Sheep

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# REPLY TO LETTER TO THE EDITOR . . .

## Capturing and Tagging Free-ranging Bighorn Sheep

Any technique to capture wild animals should strive to reduce stress, accidental injury, and mortality as much as possible. Consideration of the method to be used must also take into account such factors as manpower availability and time and budget constraints. In Jorgenson et al. (1990), we reported a technique that allowed a single researcher (even a "nonveterinarian wildlife worker") to capture and tag a large number of free-ranging bighorn sheep (*Ovis canadensis*). This method was inexpensive, safe, and resulted in a low mortality rate. No accidental deaths occurred once the antagonist, idazoxan, was available for trial. Our long-term research program (e.g., Festa-Bianchet, 1989) would not have been possible without this technique.

Kock (1991) stated that our bighorn sheep were not "really wild" and that our ability to approach within easy darting range was an unusual situation not likely to be duplicated anywhere else. We agree that the bighorns in our study were habituated to humans, and consider that a major asset of our study populations. This is certainly not, however, a unique situation. Our study involved three different populations and we have used the same ground darting technique to capture bighorns from six other populations. We also know of many other herds in Canada and the northwest United States where the technique is either used or feasible. Ground darting could be used for any species provided one could get within range and maintain contact with the animal following dart impact. The habituation of study animals is an old and well established technique for in-depth study of wildlife behavior and ecology. Examples of the use of habituated ungulates include studies on red deer (*Cervus elaphus*) (Clutton-Brock et al., 1982), Nilgiri thar (*Hemitragus hylocrius*) (Rice, 1988), moose (*Alces alces*) (Miquelle, 1990), chamois (*Rupicapra pyrenaica*) (Locati and Lovari, 1990), kudu (*Tragelaphus strepsiceros*) (Owen-Smith, 1990), our studies on bighorn sheep and mountain goats, and many others.

Kock (1991) criticized comparisons made between our study and the study by Kock et al. (1987). The comparison made in Jorgenson et al. (1990) was between ground darting and helicopter darting to immobilize bighorn sheep. It would have been invalid for us to make comparisons between the various drugs used. Our intent was to question the conclusion in Kock et al. (1987) that drugs should not be used to immobilize bighorn sheep by making a distinction between delivery systems. While not stated as such in Kock et al. (1987), it is obvious from Kock (1991) that he agrees with us that helicopters should not be used to dart sheep.

Kock et al. (1987) did not distinguish between problems caused by the drugs and those associated with the helicopter chase. We acknowledge that it would be difficult to determine the exact contribution of the helicopter to stress and accidental deaths, but a comparison of studies that have used helicopters to dart sheep (Jessup et al., 1985a; Kock et al., 1987) and ground darting studies (Festa-Bianchet and Jorgenson, 1985; Jorgenson et al., 1990) suggests that the helicopter chase contributes significantly to accidental mortality.

Kock offers his opinion that xylazine is only useful for the sedation of captive or confined wildlife species and should not be recommended as a sole immobilizing agent. We take note of his opinion and have used xylazine to immobilize 45 mountain goats, first captured in box traps, and reversed the immobilization with idazoxan, without any drug-induced deaths. Our success in capturing almost 400 (includes all sheep captured using xylazine or a combination of xylazine and ketamine) free-ranging bighorn sheep, however, appears to argue against Kock's opinion.

It was stressed in Jorgenson et al. (1990) that the effectiveness of using xylazine was dependent on administering the drug in a manner that would elicit the least excitement from target animals. If such could not be achieved, then alternate drugs or methods would have to be considered. It was pointed out that higher doses would be required if sheep were to be darted from a helicopter. We certainly did not recommend using xylazine to immobilize sheep, as Kock (1991) implies, if helicopter darting was to be the mode of delivery.

Under the circumstances described in Jorgenson et al. (1990), xylazine proved to be a very effective immobilizing agent. Negative side effects were offset by the use of idazoxan. Kock (1991) suggested that other drugs such as opioids should be used in place of xylazine. Opioids such as etorphine hydrochloride and carfentanil citrate have been used in bighorn sheep but not completely without adverse side effects (Jessup et al., 1985b; Jessup and Clark, 1986). Induction times were comparable to those reported in Jorgenson et al. (1990) when only xylazine was used. Helicopters were used to dart sheep in those studies and some of the side effects may not have occurred had drugs been administered by a less stressful method. There would have been no advantage to using narcotics in our situation, especially considering the high cost and extreme hazard to humans. We captured 10 sheep with etorphine and found no advantages over the use of xylazine.

Finally, we are intrigued by Kock's definition of "long-term survival" as 1 wk. Nevertheless, the minimum survival from recovery from immobilization to 10 days post-capture before the availability of alpha-2 antagonists was 98.8% ($N$ = 169) at Sheep River and Canmore, compared to 98.4% survival for sheep captured in a corral trap at Sheep River in 1981 to 1984.

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