Bienn. Symp. North. Wild Sheep
and Goat Counc. 7:171-175.

COMPARISON OF HELICOPTER-SUPPORTED CHEMICAL IMMOBILIZATION AND SKID-MOUNTED PROJECTILE NET CAPTURE OF DALL SHEEP IN ALASKA

WAYNE E. HEIMER, Alaska Department of Fish and Game, 1300 College Road, Fairbanks, AK 99701

FRANCIS J. MAUER, U. S. Fish and Wildlife Service, Arctic National Wildlife Refuge, 101 12th Avenue, Fairbanks, AK 99701

Abstract: Helicopter-supported darting to capture Dall sheep in Alaska has frequently failed. Because of serious wounding by drug delivery systems, unstandardized drug doses, long induction times in hazardous terrain, and stressful chases, reported mortalities associated with Dall sheep capture in Alaska have averaged 22%. Physical capture through use of projectile nets appears more promising. We experimented with a skid-mounted projectile net for capture of Dall sheep and found it to have advantages over helicopter-supported chemical immobilization. Fiscal costs appear to be somewhat lower and benefits to sheep considerably greater. We think this system also has human safety advantages compared with shoulder-fired projectile nets.

The need to capture mountain sheep for biological studies has produced a variety of capture methods. These methods are divided into physical capture and chemical immobilization. Dall sheep (Ovis dalli) are relatively small, not dangerous, and well suited to physical capture. Physical capture has been especially successful for Dall sheep at mineral licks (Heimer et al. 1980) and bighorn sheep (Ovis canadensis) at bait stations (Schmidt 1976). Similarly, use of drive nets for capture of mountain sheep has been successful (Kock et al. 1987). While these methods have been successful, they require concentrations of sheep and extensive logistic and personnel support. Also, these physical methods are not selective.

When selectivity is important in remote areas, chemical immobilization has been preferred. However, chemical immobilization of Dall sheep in Alaska has produced an unacceptably high (13 of 60 sheep darted) mortality rate (Heimer et al. 1980, Singer et al. 1984, this study). Drug delivery systems frequently cause severe wounds in Dall sheep (Heimer et al. 1980), and consistently effective dosages of the best drugs have not been determined. Incompletely immobilized Dall sheep have been common. These sheep are typically more difficult to restrain and handle than sheep not under the influence of immobilizing drugs. Finally, the ability of darted sheep to move into dangerous terrain during drug induction increases risks to both sheep and biologists.

Net-gun capture of individual sheep from helicopters has been developed to overcome these deficiencies (Jessup et al. 1988) and has been effective. However, human safety hazards have been evident in

shoulder-fired net-gun operations. The record of accidents involving net guns is not enviable (Clutton-Brock 1986). In response to this poor record, a skid-mounted net gun was developed in New Zealand. This apparatus may provide the benefits of net-gun capture without many of its attendant risks.

We experimented with this net-gun system in capturing Dall sheep in the Alaska and Brooks Ranges of Alaska in both summer and winter and compared its effectiveness with chemical immobilization in both areas. The purpose of this paper is to report on the efficacy of aerial darting and net-capture systems.

METHODS

A Hughes 500D helicopter equipped with the New Zealand-designed projectile net mounted on the left skid was used to capture 10 Dall sheep in April 1988. These sheep were captured at approximately 900-1,500 m elevation with ambient temperatures slightly below freezing in the Alaska Range. Once captured, sheep were blindfolded, an open airway was established, an intramuscular injection of acepromazine maleate (0.2-0.7 cc depending on size of sheep) was administered, and all 4 legs were bound together using a hobble of 2.5-cm nylon strapping secured with lightweight cam-jaw buckles. Sheep were then bled, radio-collared, and released. Typical handling time was 15 min. Flight time, other expenses, and sheep mortalities were recorded.

Sixteen sheep were darted from a Hughes 500D helicopter, 5 during June 1988 in the Alaska Range and 11 during August 1988 in the Brooks Range. Drugs were administered using a 5-cc dart fired from a standard Palmer Cap-chur gun with brown charges. Darts contained 4.5 cc etorphine hydrochloride and 0.5 cc of acepromazine maleate. These sheep were handled as described above even though they had been drugged with M99. Effects of M99 were reversed with intravenous and intramuscular injections of M50-50. Costs and sheep mortalities were recorded.

In August 1989, 12 Brooks Range sheep were captured using the skid-mounted projectile net and the same pilot and same procedures as used in the Alaska Range. Finally, 4 mature rams were captured using the skid-mounted projectile net in April 1990. We considered this a test of the ability to capture specific individuals using this technique. The same pilot and aircraft were used as in the previous trials, and sheep were handled by the same biologist using the same procedures as in the April 1988 capture effort.

RESULTS

Costs and mortalities associated with the skid-mounted projectile net were lower than those attending helicopter-supported chemical immobilization (Table 1).

Table 1. Costs of sheep capture using conventional chemical immobilization and skid-mounted projectile nets.

	Darting	Projectile net
Number of sheep caught	17	26
Mortalities	3	0
Drug costs	$86/sheep	$0.01/sheep
Helicopter cost[a]	$404/sheep	$370.00/sheep
Total capture costs	$490/sheep	$370.01/sheep

[a] Exclusive of fixed-wing spotter aircraft which averaged $150 per sheep captured when used in both operations.

Author's Note

During October 1990, the skid-mounted projectile net was used in the Brooks Range. The net was thrown 33 times; 19 sheep were captured; and the cost per sheep was $278. One capture-related mortality occurred.

DISCUSSION

A major cost-saving associated with the projectile net resulted from practically eliminating drug costs ($86/sheep). Sheep caught with the net were given an intramuscular injection of acepromazine at a cost of about 1 cent per sheep. Other cost-savings were realized because once a sheep was netted it was handled almost immediately. There was no necessity to pay for helicopter time during drug induction of ataxia. No comparisons between flight times in chasing sheep and maneuvering the helicopter have been made, but we think flight time required to establish capture position was less with the skid-mounted net.

Pilots familiar with a variety of helicopter-supported capture systems prefer the skid-mounted net to darting (C. Soloy and L. Larive, pers. commun.). They prefer having the capture target, as well as obstacles, in front of the helicopter, as opposed to positioning a biologist to deliver a dart to a target they cannot see. These pilots think being able to see everything allows them to fly more safely. Soloy and Larive also prefer having control of the capture apparatus and the aircraft even though they must assume responsibility for failed capture attempts.

Much of our cost-saving resulted from procurement, development, and maintenance of the capture apparatus by the helicopter charter operator. The helicopter operator estimated his company's investment in

this capture system at $10,000 (L. Larive, Soloy Helicopters, Wasilla, AK, pers. commun.).

Mortality was significantly less (no mortalities in 26 captures) using the skid-mounted projectile net (Table 1). In our sample, mortality associated with darting was 18% (Table 1). This was lower than the reported average of 22% for darting Dall sheep in Alaska (13 of 60), but we believe 18% is still unacceptably high. The higher mortality associated with darting probably results from wounds caused by the drug delivery and from the drug action. We suggest the use of M99 for capture of Dall sheep be discontinued.

The skid-mounted projectile net offers a viable alternative. If available, it is economically advantageous, and the low mortality associated with capture has been encouraging. Further development in the technology of skid-mounted nets for sheep capture will further reduce costs. This capture system works best for animals that run predictably and steadily in front of a pursuing helicopter. The apparatus is designed to throw the net so it encounters the least air resistance ("edgewise" instead of "flat"). When the helicopter matches the speed of an animal running in a predictable straight line, throwing the net ahead of the animal so it runs "into" the net has a high probability of success. Typical success for caribou netting has been 75-80% (C. Soloy, pers. commun.).

However, Dall sheep do not run predictably in front of a helicopter. They dodge, stop, and run back under the aircraft just as it approaches the net-launching position. Consequently, misses are common, with the net often overshooting the sheep. In our experience, capture success was about 20-25%. Increased efficiency in netting would reduce capture expense considerably. We suggest that putting a skirt on the trailing edge of the net may increase capture efficiency. Adding skirts to rocket-propelled projectile nets on the ground has increased efficiency of that technique for quick and elusive species. We think this capture technique is clearly superior to darting Dall sheep and that its promise is yet to be fully realized.

LITERATURE CITED

Clutton-Brock, T. H. 1986. Red deer and man. Natl. Geogr. Mag. 170:538-555.

Heimer, W. E., S. D. DuBois and D. G. Kelleyhouse. 1980. The usefulness of rocket nets for Dall sheep capture compared with other capture methods. Bienn. Symp. North. Wild Sheep and Goat Counc. 2:601-614.

Jessup, D. A., R. K. Clark, R. A. Weaver and M. D. Kock. 1988. The safety and cost-effectiveness of net-gun capture of desert bighorn sheep (Ovis canadensis nelsoni). J. Zool. Anim. Med. 19(4):208-213.

Kock, M. D., D. A. Jessup, R. K. Clark, C. E. Franti and R. A. Weaver. 1987. Capture methods of five subspecies of free-ranging bighorn

sheep: an evaluation of drop-net, drive-net, chemical immobilization, and the net-gun. J. Wildl. Dis. 23:634-640.

Schmidt, R. 1976. Baiting bighorn sheep with apple pulp and trapping with a drop net. Pp. 26-34 in E. T. Thorne, (Ed.), Proc. Bienn. Symp. North. Wild Sheep Counc., Wyoming Game and Fish Dept., Jackson.

Singer, F. J., K. R. Whitten and L. Nichols. 1984. Experiences in darting Dall sheep from helicopters in Alaska during 1983. Bienn. Symp. North. Wild Sheep and Goat Counc. 4:499-505.

NORTHERN WILD SHEEP AND GOAT COUNCIL

PROCEEDINGS OF THE SEVENTH BIENNIAL SYMPOSIUM

MAY 14 - 18, 1990

CLARKSTON, WASHINGTON

Edited by James A. Bailey

Northern Wild Sheep and Goat Council

Attention: Jon Jorgenson
Alberta Fish and Wildlife Division
200 Sloane Square
5920-1A St. S.W.
Calgary, Alberta, Canada T2H 0G1

Price $25.00

Check Payable to
Northern Wild Sheep and Goat Council

The Northern Wild Sheep and Goat Council is a nonprofit professional organization, developed in 1978 from the parent organization - The Northern Wild Sheep Council.