EXPERIENCES IN DARTING DALL SHEEP FROM HELICOPTERS IN ALASKA DURING 1983

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ABSTRACT

A total of 20 Dall sheep (Ovis dalli) were darted from a helicopter during June in the Brooks Range and another 6 in the White Mountains of Alaska during April, 1983. Experiences in darting sheep from the two herds were quite variable. No mortalities occurred in the White Mountains, chase times were shorter than 2 minutes, sheep were apparently easier to dart, initial dosages of M99 were only 2.5 mg. and all animals hit were completely immobilized. In the Brooks Range, on the other hand, sheep were more difficult to dart, chase times averaged 8.5 minutes, only 9 of 20 animals were completely immbolized, dosages for completely immobilized sheep were 4.6-6.0 mg of M99, and 3 animals died. The contribution of season, diet, escape terrain, human disturbance and reproductive status to the different capture experiences are discussed.

INTRODUCTION

Dall sheep have received considerably less aerial capture and handling than the other North American sheep, the bighorn (Ovis canadensis). This situation results primarily from their greater remoteness and better population health in comparison to the more southerly and depleted bighorns (Nichols 1975), which are frequently captured and transplanted. Most Dall sheep captures and handlings have occurred using ground techniques at licks or bait stations. Heimer et al. (1980) captured and collar-marked Dall sheep at large, natural mineral licks in Alaska using primarily drop-nets with a few sheep being darted from the ground. Bunnell (1980) captured 145 Dall sheep in baited corral traps on a heavily-used winter range in Yukon Territory.

More mobile methods for capture of Dall sheep are required in remote locales, where the sheep do not frequent natural licks or are not concentrated, where they could be baited. Few capture attempts have been made in these situations. Attempts at darting Dall sheep from helicopters for transplants were made in Alaska in the early 1960's but resulted in high mortality rates; the capture drug was succinyl-chlorine chloride (Burris and McKnight 1973; Nichols 1968). Two of 3 Dall sheep rams gun-netted died (Barrett 1982); however, more recent experiences with net guns in the Yukon have been more successful (G. Lortie, pers. comm.).

Darting of bighorn sheep from helicopters has been attempted more frequently (Jessup at al. 1983; Andryk et al. 1983), although occasional deaths due to capture myopathy persist. We report here on some recent attempts at darting Dall sheep from helicopters in Alaska.

METHODS

Six sheep were captured in the White Mountains, north of Fairbanks, and 20 were captured in the Noatak National Preserve in the Brooks Range of Alaska during 1983. Sheep were darted from a Bell 206B Jet Ranger helicopter with Cap-Chur darting equipment (Palmer Chemical and Equipment Co., Douglasville, Georgia). Only the helicopter pilot and one shooter were involved in most chases; 1-2 assistants were dropped off at a nearby vantage point after a group of sheep was sighted. The ground assistants recorded chase events and times and communicated with the helicopter through hand held transceivers (Motorola, Inc.) in the Noatak. The ground assistants in the White Mountains had no radios, but a Piper PA-18 150 Supercub was used there to help locate sheep, to follow darted sheep, and as a safety precaution. No back-up plane was involved in the Noatak, but the ground crew had radio contact with a base camp in the event of an aircraft failure.

M99 (Etorphine hydrochloride) in the concentration of 1.0 mg/ml (D-M Pharmaceuticals, Inc., Rockville, Maryland) was mixed with Acepromazine (acepromazine maleate, 10 mg/ml, AVECO Co., Inc., Fort Dodge, Georgia) in a ratio of 0.2 cc Acepromazine per 1.0 cc M99 (a ratio of 1:5 in volume and 2:1 in concentration) in the Noatak in 3, 4, 5 or 6 cc darts (2.6, 3.6, 4.6 and 5.6 mg of Etorphine per dart, respectively). In the White Mountains, only 3 cc darts were used (2.5 mg M99, 0.75 cc of Acepromazine). In the Noatak, barbs were shortened off 3/4 inch needles (needle No. NC1) as done for mountain goats (Nichols 1982), but the barbs were not shortened in the White Mountains. All darts were fired with brown (extra low range) propellant charges.

Sheep in the White Mountains were slowly approached and overtaken with the helicopter in all types of terrain and shot as the helicopter tried to match speed with them. Sheep could not always be safely approached on steep terrain in the Noatak. Instead they were slowly herded onto flat terrain, where they were either shot running straight-out across the flats or as they hesitated in tall willow stands. Distances for shots ranged from 2-10 m.

After a dart hit, the helicopter would land 300-700 m away or pick up the ground crew and wait until the drugs took effect. Sheep were rapidly sexed, aged by horn annuli, and instrumented with radio-collars (Telonics Inc., Mesa, Arizona). All animals were then revived with the antagonist M50-50 (2.0 mg/ml,

diprenorphone hydrochloride, D-M Pharmaceuticals), in an amount approximating the volume of M99 given. Induction time was the interval between a hit and immobilization, and recover time was the interval between injection of the antagonist and recovery.

RESULTS

CAPTURE SUCCESS

White Mountains

Six Dall sheep were captured in the White Mountains on April 21, 1983 with 7 hits and 7 darts missed (1 sheep captured per 2.3 darts shot) during 2.2 hours of helicopter time (1 sheep per 0.37 hours of flight time). Two multiple captures of 2 sheep out of groups were made. One sheep was hit in the shoulder and 5 in the hip. The sheep, all adult ewes, were aged at 3, 4, 4, 5, 5 and 9 years. No capture deaths occurred.

Chase sequences were similar to those described for mountain goats (Nichols 1982) with the best success obtained by a slow approach, hovering behind a sheep and only slowly overtaking it. Two sheep actually stopped almost immediately and were easily darted. All the misses were at rapidly running sheep after a rapid helicopter approach. Chase times were 0.5 to 2 minutes. Five ewes were hit once each with 2.5 mg etorphine and the sixth was hit twice. The first dart bounced out, but she was relocated and shot again 2 hours later. Induction times were 6-10 minutes in the first five ewes, but 25 minutes for the ewe darted twice.

Handling time was less than 10 minutes for all 6 ewes. Three cc of M50-50 (6 mg of Diprenorphine) were given as an antagonist, or about 120% of the volume of M99 initially injected. The antagonist was administered intravenously (IV) in the jugular vein. Recovery times were 2 minutes or less.

Noatak

Considerably more difficulty was encountered in capturing sheep in the lower Noatak River in June. Helicopter time totalled 5 hours on June 11, 12, 13, 14, 15, 18 and 21 (.75 hours per sheep capture). Twenty sheep were captured in 58 shots and 23 hits (1 sheep/2.9 shots). Three of the 20 sheep died of capture related causes which equals 1 successfully radio-collared sheep per 1.13 hours of helicopter time, or 1/3 the success of the White Mountains project. Six rams were captured, aged 3, 3, 6, 7, 8 and 8 years, and 14 ewes of which 11 were aged at 2, 2, 2, 3, 6, 7, 7, 7, 7, 9 and 14 years. Multiple captures of 2 sheep per group were made in 2 groups. Shots ranged from 3-10 m.

Helicopter approach time for the 9 sheep (where chases were recorded) that were chased until they had slowed or stopped and then darted was 11.7 $\pm$ 3.4 minutes. These figures include chases of 3 animals that died, which were the longest chases (14.3 $\pm$ 2.1 minutes). Approach times for 4 other animals shot on a full run was 1.3 $\pm$ 0.5 minutes. All of these latter animals were successfully immobilized and reversed in 0.5-4.5 minutes. However, hit success was much lower for the 4 running sheep (4 hits in 20 shots, 20% success versus 50% hit success in animals that slowed or stopped). Overall approach time in the Noatak was 8.5 $\pm$ 5.7 minutes.

Nine sheep in the Noatak were completely immobilized and 11 were partially immobilized. Some mobility and considerable thrashing of the hind legs occurred in the partially immobilized sheep; 3 of these 11 sheep died, but none of the 9 completely immobilized sheep died.

A large initial dose of etorphine was required to immobilize the Noatak sheep. Immobilization was complete in 8 of 9 ewes given the largest M99 dosages (4.6 mg of etorphine), but was complete in only 1 of 5 ewes given smaller dosages (2.5 -3.5 mg of etorphine). Immobilization was complete in 1 ram given 6 mg of etorphine but incomplete in 5 given 3-5 mg. Acepromazine was mixed with M99 in 4 of 8 dosages which resulted in partial immobilization and its presence did not appear to be a critical ingredient. Reaction time was much shorter ($X=5.8 \pm 3.6$ minutes, N=8 timed observations) for sheep that were completely immobilized than for those which were not ($X=14 \pm 10$ minutes, N=6).

Nine sheep were completely reversed and 11 were not (3 of these latter sheep died). Six of those 9 animals completed immobolized were also completely reversed. Intravenous (IV) injection of the antagonist M50-50 seemed to be critical to rapid and complete recovery and was more feasible in a quiet animals. Two animals that seemed to be recovering slowly were reversed in 1.5 and 2 minutes with additional dosages of M50-50. Rapid recovery time was typical of complete reversal. Reversal time was 1.6 ± 1.3 (N=8) minutes in completely reversed sheep, but 79.3 ± 85.3 (N=4) minutes in partially reversed sheep. A volume of M50-50 fully equivalent to the amount of M99 injected appeared critical in total reversal. M50-50 dosage as a percent of initial M99 dosages was 86% in 6 animals incompletely reversed that lived, 70% in 3 others that died, and 117% in 9 sheep completely reversed. The latter amounts over 100% included supplemental IV dosages to animals when the initial reversal was suspected to be intramuscular (IM) or subcutaneous. Handling time averaged 17.8 ± 12.6 minutes for 13 timed handlings. The difficulty in obtaining a full dosage of the antagonist IV resulted from struggling of partially immobilized sheep.

All 3 sheep that died in the Noatak were incompletely immobilized and each was in serious trouble after the reversal drug M50-50 was administered. The sheep all laid down and were unable to easily rise. One sheep stood for about 10 minutes but then laid down again. Each sheep laid its head far back on the ground and hyperventilated. One additional ewe was in this state and also remained bedded at her capture site for 24 hours yet later recovered. We attribute the deaths to some combinations of these factors: chases that were too long resulting in overheating and exhaustion, insufficient intial doses of M99 and insufficient or IM (rather than IV) administration of the antagonist M50-50 due to thrashing of partially immobilized sheep.

As of April 1984, 22 of the 23 sheep successfully captured were still alive and wearing functional radio-collars. One ewe in the White Mountains died, possibly from wolf (Canis lupus) predation. The Noatak sheep have been radio-located 12 times each and the White Mountain sheep 15 times each.

DISCUSSION

WHITE MOUNTAINS - NOATAK DIFFERENCES

Differences in chase times, etorphine dosages required, and overall drugging success (mortality, induction time, recovery time) were quite apparent between the two capture operations. Potential sources of capture variations included: 1) Reproductive status of ewes varied between the 2 herds; White Mountains ewes were pregnant, Noatak ewes were lactating; 2) The White Mountains sheep were on winter forage and Noatak sheep were on spring green-up and possibly their physical condition varied; 3) The White Mountains sheep are subjected to a small sport harvest but the Noatak sheep to both fall sport and late winter subsistence hunts. The winter hunt is often from snowmachines and that harrassment may have caused them to be more responsive to the capture aircraft as has been suggested for caribou that occupy the same general area (Valkenberg and Davis, pers. comm.); 4) Many ungulates require larger drug dosages after longer chases and in summer versus winter seasons; 5) Escape terrain in the Noatak is marginal and scattered, forcing sheep to feed far from safety. Stemp (1982) found a direct relationship between the distance from escape terrain and heart rate (stress) in bighorns. Thus, the Noatak sheep may have been living under more stressful conditions than those in the White Mountains; 6) Shortening of the barbs on the needles in the Noatak as recommended by Nichols (1982) for mountain goats likely did not contribute to the dosage differences since the darts were still retained; and 7) Air temperatures were higher in June during the Noatak capture operation and could have contributed to overheating.

COMPARISONS TO OTHER CAPTURE OPERATIONS

Noatak approach times were longer when compared to successful (no mortalities) darting of bighorn sheep from helicopters in Montana (Andryk et al. 1983). The White Mountains chases were briefer. Chases exceeding 10 minutes and handling times exceeding 20 minutes result in higher mortalities of bighorn sheep (D. Jessup, pers. comm.). Our experience in the Noatak indicated that long chases may contribute to Dall sheep mortality, as well.

Drug dosages for Dall sheep in the Noatak were in close agreement with those found successful for bighorn sheep, i.e. 4.5-5.0 mg of M99 for adult ewes and 5.5-6.0 mg for adult rams. Successful doses in the White Mountains were only 1/2 as large. Smaller required dosages of M99 in the White Mountains may have been due to some combination of different season, diet, excitement level, and/or reproductive status. Longer chase times required increased dosages but for the 6 shortest chases (<2 minutes) in the Noatak, the same high levels of M99 were required for immobilization.

RECOMMENDATIONS

We found that Dall sheep could be successfully captured through darting from a helicopter when certain precautions were taken. Chase times should be less than 10 minutes and preferably less than 5 minutes. Where sheep are nervous, and run and dodge a great deal, we recommend darting them rapidly even if they are on the full run, although this may result in high loss of darts. We achieved handling times of 18 minutes in the Noatak and less than 10 minutes

in the White Mountains and recommend the least amount of handling possible. Injuries due to poor dart placement should be rare when using extra low power propellant charges (brown) and short needles.

High initial dosages of M99 and also equivalent dosages of its antagonist M50-50 given IV appeared critical to survival of Dall sheep. Larger dosages (5-7 cc) would probably ensure rapid immobilization of Dall sheep under most circumstances. However, explosive injection of the drug from Cap-Chur darts causes tissue damage and can be fatal (Valkenburg et al. 1983). Therefore, the smallest darts that appear adequate should be used. More concentrated solutions of etorphine would permit smaller darts. We used Acepromazine in most darts at a rate of 0.2:1 to the M99 with the objective of reducing overall drug and dart size and calming sheep (D. Jessup, pers. corresp. B. Taylor, pers. corresp.). Our observations, however did not clearly verify its necessity. We utilized Jet Ranger II helicopters primarily because of their ubiquitousness across Alaska, however other helicopters such as the Hughes 500 C and D models might prove more maneuverable and enable quicker dart placement and shorter chases.

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