

Informational Leaflet 18

IMMOBILIZATION TECHNIQUE FOR SITKA BLACK-TAIL DEER IN SOUTHEAST ALASKA

By:

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September 10, 1962

STATE OF ALASKA
WILLIAM A. EGAN - GOVERNOR

DEPARTMENT OF
FISH AND GAME

WALTER KIRKNESS - COMMISSIONER
SUBPORT BUILDING, JUNEAU



Informational Leaflet # 10

ALASKA DEPARTMENT OF FISH AND GAME

WILLIAM A. EGAN, GOVERNOR - WALTER KIRKNESS, COMMISSIONER

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INTRODUCTION

During recent years the use of immobilizing drugs has become increasingly popular with wildlife biologists as a means of obtaining big game animals in hand for various purposes. Numerous methods of delivery and many drugs have been tested with varying degrees of success [Buechner et al. (1), Craighead et al. (2), Crockford et al. (3, 4), Hall et al. (5), Post (6), Talbot (7), Talbot et al. (8), Troyer (9)]. During the months of February and March, 1962, the writer set up an experimental project to determine the effectiveness of some of these methods and the feasibility of obtaining a large enough sample of Sitka black-tail deer to be of value for determining movements, an estimate of population size and a known age sample of deer jaws. This paper is a preliminary report of the work completed to date with further studies contemplated in the future.

Lindenburg Peninsula, located on Kupreanof Island, was selected as the study area because it is easily accessible from Petersburg, the authors duty station, and is located adjacent to protected waters which provide access from a small boat under most weather conditions. It is also a delineated area of a suitable size (approximately 75 sq. miles) for a population study and receives heavy enough hunting pressure to ensure a tag return.

Succinylcholine chloride was chosen as the immobilizing drug as it is relatively fast acting, safe to handle, and because more information was available on it than any other. It is especially adaptable for use on animals in poor condition, as is very likely to be the case with deer during the winter period when they are most available for capture, for recovery is usually complete with no residual effects. Succinylcholine chloride is a myoneural blocking agent and when injected, produces a brief relaxation of skeletal muscles. It is rapidly broken down in the body by the action of cholinesterases into natural metabolites of choline and succinic acid which accounts for its short duration of action and low toxicity. Thus it is not dependent on the liver or the kidneys for detoxication or excretion. The last of the skeletal muscles to be effected is the diaphragm. The most effective antidotes are oxygen and the maintenance of respiration and circulation. It is available under several trade names; however, Anectine (Burroughs Wellcome & Co., London and New York) was used exclusively in this study.

METHODS

The Palmer CO₂ powdered dart rifle was first tested using their explosive injector syringe. Under optimum conditions it performed satisfactorily up to about 40 yards, but when temperatures dropped below freezing, the range was reduced to the point of total ineffectiveness. Equally distracting was the fact that every miss meant the probable loss of a dart which cost approximately \$5.00 each.

Larson (10) reports on the use of a Palmer syringe attached to an arrow and propelled by a long bow. Several long bows, ranging from 30 to 65 pounds pull, were tested using a 2 cc Palmer syringe affixed to the end of an arrow. This arrangement showed definite possibilities; however too much depended on the ability of the archer and the weight of the syringe caused the arrow to wobble.

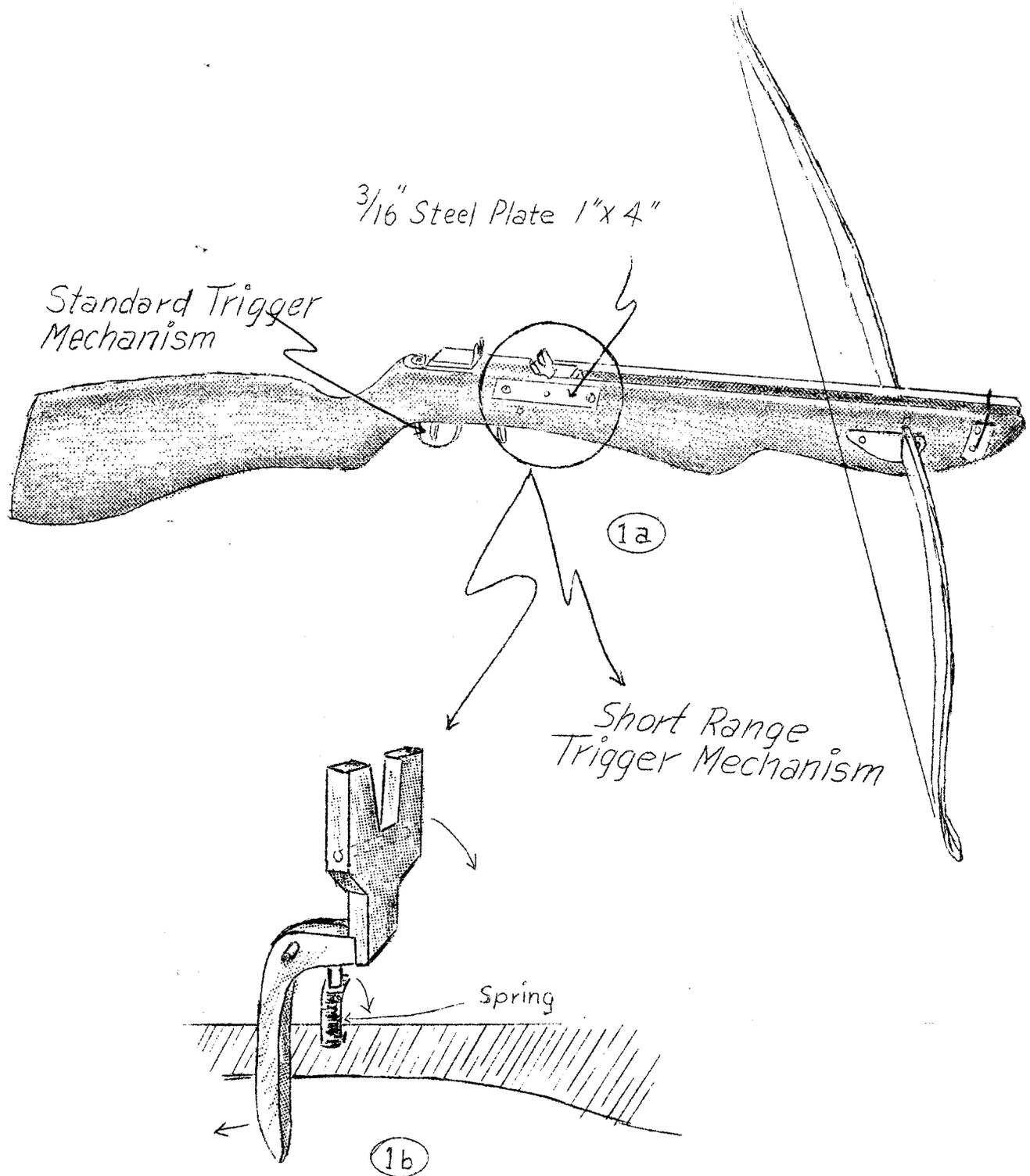
Carl Anderson (11), Oregon State Game Commission, found that a simple syringe could be made from a .357 magnum case which slipped over the end of an arrow. This was then tested and, with minor modifications, found to be quite satisfactory except that accuracy still depended too much on the proficiency of the archer. This arrangement was then adapted for use with a crossbow which proved the most efficient and economical of various methods tried (Figure 1a).

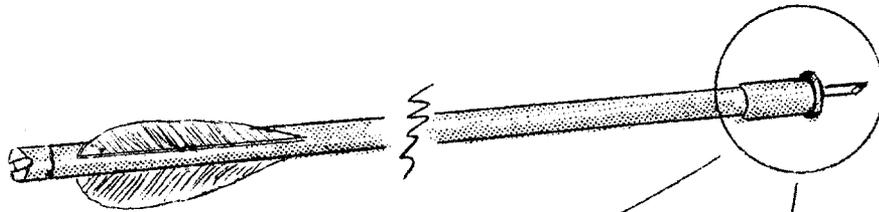
A crossbow with an 80 pound pull, obtained from the Whamo Manufacturing Company, was utilized throughout the project. This worked well at 25 to 40 yards, but hit too hard at close range and on occasion the body of the syringe would break through the skin and penetrate the muscle tissue. This was corrected by improvising a second trigger mechanism with a 40 pound pull which was efficient at ranges of 5 to 25 yards (Figure 1b).

Arrows are regular target bolts from which 1/4 inch of metal tip is cut, leaving a band of metal 1/4 inch wide on the tip of the arrow which prevents deformation of the arrow tip upon impact (Figure 1c). Rubber washers, 5/32 inches thick, are cut by chucking an empty .357 case in an electric drill. The washer is lubricated with silicone grease and must fit snugly in syringe body, but not so tight as to retard movement. Arrow shafts are painted fluorescent red to facilitate recovery.

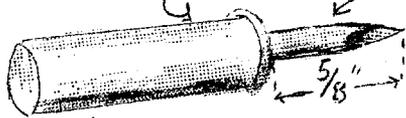
The syringe is made by silver-soldering a 5/8 inch length of .109 OD x .012 wall thickness needle stock over the primer hole of an empty .357 magnum case (Figure 1d). This provides an inexpensive but efficient syringe, with a 1 cc capacity, which injects the drug upon impact as the arrow shaft slides forward within the syringe. The drug is loaded through the needle of the syringe with another hypodermic needle. The shaft is then moved forward until the drug is visible at the tip of the needle to prevent possible air embolism.

During the winter months deer in Southeast Alaska concentrate in the beach fringe as snow accumulates at higher elevations. It is not uncommon to observe 30 to 50 or more deer on the beach in a day during this period. Deer were approached slowly by skiff from the water, delivering the dart when the craft grounded. Drug doses were determined immediately prior to dart delivery by visual estimation of the animals weight aided by 7x35 binoculars. After a hit was made, the shooter would remain within the skiff so as not to alarm the animal. If the deer became alarmed and ran after being hit, the observer would wait five minutes then follow the tracks to locate the animal. A dog proved a very useful aid in trailing animals which had been hit and departed the immediate area. When immobilization was accomplished, the animal was approached and placed in a position with its head elevated to prevent inhalation of rumen or stomach contents. Care was taken at all times not to needlessly alarm the animal and further aggravate the degree of shock. If respiration became depressed, artificial respiration was given. As soon as the animal





(1d)



Needle Stock .109 OD x .012 WT.
Silver Soldered in Primer Pocket

.357 Magnum Case



Arrow Shaft
Metal Band

Rubber Washer
5/32" Thick

(1c)

was sufficiently relaxed, it was weighed, the hind foot measurement taken and an orange numbered Hasco cattle tag placed in its ear.

RESULTS

Twenty-eight deer, 12 bucks, and 16 does, were successfully immobilized, tagged, and released. The most deer tagged in one day was five and the average number was 2.5. The drug dosages, sex, and size of animals and elapsed time for immobilization and recovery are given in Table 1.

Deer generally showed little alarm when approached from the water by skiff. They would usually lift their heads, watch the boats approach for a short interval and then continue feeding. The noise of the skiff grounding alerted the animal and it would stand with its head erect watching the shooter. When struck by the dart the animal would normally make two or three leaps, stop and look at the skiff, and then continue feeding. At other times it would walk at a normal rate along the beach or into the beach fringe where it could usually be located within 100 yards of the beach.

The first signs of drug effects were evidenced by aimless picking at food species. After about three minutes the animals footing would become unsure, causing it to stumble as it walked, and after an average of 5.6 minutes it would lie down. Under light doses the animal was able to retain control of its head and remain in a normal resting position. Under larger doses, control was lost of all skeletal muscles and breathing would become shallow and occasionally stop but, with the exception of two cases, the animals were saved by applying artificial respiration. An eye reflex was present as long as the animal remained alive.

As the effects of the drug began to wear off, the animal would first regain control of its head and then, after a few minutes, of its legs. It would usually make several attempts to gain its feet before successful; however once accomplished recovery was remarkably complete and the animal would depart the area at its normal gait. Complete recovery was effected in an average of 38 minutes from the time of injection, ranging from a minimum of 17 to a maximum of 65 minutes. After an effective dose was attained, further increasing of the amount injected did not appear to speed immobilization time, but did prolong recovery.

Placement of the dart was important. Hits made in the heavy musculature of the neck, back, and hip were very effective; whereas hits in the flank, rib cage, and lower legs usually had no effect. Effective doses ranged from 5.4 to 13.9 mg/cwt, the most satisfactory being about 6.5 mg/cwt. Many variables were encountered which made the determination of exact doses difficult. The weight of the animal must first be estimated. The drug loses its potency with age; the exact amount is not known, but probably 5 to 10 percent per month under field conditions. There may be some blow-out during delivery but, if so, it is slight as a syringe on which the needle becomes plugged on impact shows little loss of fluid. The condition and sex of animals may have an effect on the size of dose required; however, insufficient data is yet available to make valid conclusions. Quite often the syringe needle would strike a bone and only a portion of the drug be injected.

Table 1. Data for Sitka black-tailed deer immobilized using succinylcholine chloride.

No.	Sex	Weight	Total Dose		Time from hit to:	
			(Mg.)	Mg/cwt.	Collapse	Recover
2002	M	96	10	10.4	10	27
2003	M	90	12.5	13.9	0.5	17
2004	F	86	10	11.6	9	20
2005	F	82	10	12.2	6	30
2006	M	40	5	12.5	4	40
2007	F	82	8	9.8	2	20
2008	M	110	10	9.1	8	40
2009	F	90	12	13.3	5	65
2010	F	85	10	11.8	5	24
2011	M	100	10	10.0	6	61
2012	F	85	8	9.4	8	25
2013	F	90	8	8.9	5	38
2014	F	68	8	11.8	4	44
2016	F	98	7	7.2	9	41
2017	M	80	8	10.0	8	50
2018	M	110	6	5.4	6	27
2019	F	72	6	8.4	6	26
2020	M	64	4	6.3	8	26
2022	M	102	6	5.9	7	32
2023	M	74	6	8.1	9	39
2024	F	85	6	7.1	1	45
2025	M	64	6	9.4	2	38
2026	M	98	6	6.1	6	32
2028	F	80	6	7.5	4	54
2029	F	74	6	8.1	6	45
2030	F	88	6	6.8	6	65
2031	F	92	6	6.5	5	63
2032	F	104	6	5.8	2	25

Average dose - 9.0 mg/cwt.

Average time to collapse - 5.6 min.

Average time to recover - 37.9 min.

Two cases of mortality occurred during immobilization procedures, one an adult female and the other a yearling male. Both received doses of 7.5 mg/cwt. Both animals were recovering nicely, from all outward appearances, when suddenly they died. Death may have been partially due to shock.

CONCLUSIONS

The use of succinylcholine chloride as an immobilizing drug, delivered in a syringe mounted on an arrow and shot from a crossbow, appears to be an efficient and inexpensive method for obtaining live Sitka black-tailed deer in hand for biological investigations. The method is particularly applicable in Southeast Alaska where deer concentrate along the beach timber fringes during the winter months and are accessible from the water. Doses of 6.5 mg/cwt succinylcholine chloride were effective for yearling and adult deer. The average time required to collapse after injection was 5.6 minutes and the average recovery time was 37.8 minutes from time of injection. A dog which is proficient at trailing is a valuable tool to assist in locating animals which become alarmed and leave the beach area before immobilization is complete. A small portable oxygen tank with a face mask adapted to fit over a deer's nostrils would aid in treating for respiratory depression.

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