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MUSKOX TRANSPLANT

by

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Volume X
Annual Project Segment Report
Federal Aid in Wildlife Restoration
Project W-17-1, Work Plan Q

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(Printed March, 1970)

STUDY PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska
PROJECT NO.: W-17-1
STUDY PLAN: Q
JOB NO.: 3
PERIOD COVERED: July 1, 1968 - June 30, 1969

TITLE: Alaska Wildlife Investigations
Big Game Investigations
TITLE: Elk, Goat, Bison, Muskoxen
TITLE: Muskox Introductions

ABSTRACT

Fifty-two muskoxen were shipped from Nunivak Island to Barter Island during March and April, 1969, to effect the reintroduction of muskoxen to the Arctic Coast.

Animals were captured using both snow machines and lariats and immobilizing drugs, primarily succinylcholine chloride. Because of difficulties in capturing, handling, and holding adult animals, emphasis was placed on capturing only calves and subadult animals.

The Alaska Air National Guard furnished transportation for the muskoxen to Barter Island. Four trips were required.

Cost of the transplant was about \$35,000.

RECOMMENDATIONS

In future transplants emphasis should be placed on capturing calves by providing ground transportation for snow machines. There may be no reason to continue scheduling transplants during this time of year if only older animals are to be transplanted. The animals would be in much better physical condition and we would not have to contend with winter weather conditions, particularly snowed-in runways.

A mechanical respirator should be experimented with to determine the feasibility of resuscitating animals receiving overdoses of succinylcholine chloride.

Other immobilizing drugs should be experimented with. M-99, in particular, appears promising and an attempt should be made to obtain a supply for use during the next transplant.

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OBJECTIVE

The objective of the 1969 transplant was to reintroduce muskoxen to historic muskox range on the Arctic coast, where they disappeared during the 1850's. As a result of several muskox range evaluation trips, the Camden Bay area was chosen for the reintroduction. Barter Island, 35 miles to the east, was selected for the actual release site due to the availability of its runway and the proximity of suitable muskox habitat. Released animals were to be herded by snow machine over the one-half mile of ice separating Barter Island from the mainland.

TECHNIQUES

The muskox transplant began March 9 when Jerry Hout of the Bureau of Sport Fisheries and Wildlife and I arrived at Mekoryuk, Nunivak Island. The helicopter to be used in the transplant, a Hiller 12E supplied by Merric, Inc. of Fairbanks, arrived the same day.

The plan was to utilize local natives and snow machines to capture 11-month-old calves by roping them with lariats. We paid \$35 per day for man and machine, and we furnished gas and oil. All older animals were to be captured by a syringe delivered from a powder-propelled gun with the gunner riding in the helicopter. Two immobilizing drugs were to be used, sernylan (phencyclidine hydrochloride) and powdered anectine (succinylcholine chloride).

The natives began capture operations on March 12 when six men went to Nash Harbor and ten went to the south end of the Island near Duchikthluk Bay. Unfortunately, because of helicopter starter failure, capture of older age class animals was delayed until March 14.

On March 13 the first loads of calves arrived from the native crews at Nash Harbor and the south end of Nunivak Island, 13 animals in all.

The calves were placed unrestrained in the Fish and Wildlife Service's "barn," a 16 x 32-foot structure used for storing supplies, with a 16 x 20-foot room used for holding captured calves.

I experimented with sernylan dosages on these animals, determined that 0.25 mg./lb. body wt. appeared adequate, and decided to use that dosage in combination with tranvet (propiopromazine hydrochloride), 12 mg./100 lbs. body weight. The tranvet was to minimize convulsions which reportedly sometimes occur when sernylan is used.

On March 14 the helicopter starter arrived, and we began capturing operations that afternoon. Three adult bulls were captured using the combined sernylan-tranvet dosages (Appendix IV). All animals dropped in 10-12 minutes. The immobilized animals were sledged to Mekoryuk and crated immediately upon arrival. The animals began to regain control of their heads about three hours following initial immobilization, and were given another injection of sernylan to expedite loading into crates. The desired degree of immobilization was achieved, and the animals were then ear tagged and crated.

All three animals were dead the next morning. All carcasses were bloated, but this may have occurred after death since the animals appeared to have been dead for several hours. Field autopsy failed to disclose any obvious reasons for death. Suffocation may have been a factor since the crates were so short the animals were jammed inside the crate. No supplementary air holes were provided. Needless to say, crate modification began immediately.

The next animals taken with sernylan were a two-year-old (35 mos.) bull and an adult cow. The same dosage rate was used as earlier. The bull went down in about 20 minutes, but the cow required an additional 50 mg. before she went down. Both animals were sledged back to Mekoryuk and crated.

The next day the cow appeared alert but was unable to regain her feet although numerous attempts were made. The bull appeared completely recovered and showed no ill effects. The cow was released the day after capture but was still unable to stand. She was dead the following morning. In retrospect, I believe the cow was probably injured during transport by sled to Mekoryuk and was unable to regain her feet due to this injury. She was pregnant, and the calf appeared to be near term.

Sernylan was abandoned, and we reverted to use of succinylcholine chloride. Succinylcholine chloride was used during the rest of the transplant with fairly good success once the proper dosages were established. Dosages successfully used this year were much lighter than those used in the past, presumably because of the relatively poor physical condition of the animals. The animals weighed approximately 15 per cent less than similar aged animals weighed in the past, and skinned carcasses appeared definitely emaciated. Several animals were killed before new dosages were established. Appendix IV shows the dosages and reactions of drug-captured animals in 1969.

Succinylcholine chloride was prepared for use by mixing a 500 mg. flask of drug with 25 cc of a solution of water and 20 per cent ethyl alcohol (by volume), resulting in 20 mg. succinylcholine chloride per cc of solution. The alcohol served to prevent the drug charges from freezing and not injecting properly.

While correct dosage was computed to be approximately .18 mg./lb. body weight, the weights of the animals could only be estimated and dosages

administered were as follows:

| Animal's age | Approx. wt. | Dosage |
|--------------|-------------|--------------|
| 23 mos. | 300 - 325 | 3 cc (60 mg) |
| 35 mos. | 350 - 400 | 3 cc (60 mg) |
| 47 mos. | 425 - 500 | 4 cc (80 mg) |
| 47 mos. + | 600 lbs. | 4 cc (80 mg) |

While these dosages resulted in dosage ratios varying from .15 mg./lb. to .20 mg./lb., most animals went down between 8 and 15 minutes following injection. No attempt was made to make follow-up injections of animals which failed to become immobilized. We found that animals so treated frequently died from respiratory failure resulting from the combined injections.

The animal tranquilizer Tranvet was given to animals after immobilization to prolong the immobilization time and especially to maintain tractability of the animal. Rates given are as follows:

| Age | Dosage |
|-----------|--------|
| 11 mos. | 50 mg. |
| 23 mos. | 65 mg. |
| 35 mos. | 75 mg. |
| 47 mos. | 75 mg. |
| 47 mos. + | 75 mg. |

Dosage rates for Tranvet are not critical, and any reasonable dose apparently is effective.

After the problem of proper drug dosage was solved, no difficulty was experienced with drugs.

Following capture, the best procedure was to immediately crate the subadults and adults, while the calves were kept uncrated in the barn. The animals were fed brome hay and snow (for water) and they seemed to thrive. Salt was offered, but little or none was used, although they appear to seek out natural salt near the beaches during early spring.

Lack of reliable communications hampered our operation considerably. Plans regarding sex and/or age composition of the transplant were changed at least twice, and sometimes several days passed before we were made aware of the changes. Originally all animals transplanted were to be adult or subadults. A subadult is defined as any animal prior to growing adult-size horns. Muskoxen, for the purpose of this report, are considered adult after reaching 4 years. Moreover, each aircraft load was to be of at least ten adult bulls. The transporting aircraft was later calculated to have room for only nine bull crates.

Lack of communications made it difficult to know when the Air Guard was to arrive, and often several days were wasted while waiting for the aircraft. We usually did not know when the plane was due until a few hours before its actual arrival.

The Mekoryuk runway probably offered the most frustrations of the whole project. It was a constant struggle to keep it clear of snow. The Air Guard requested 3000 feet to be cleared but settled for 2700 feet after all runway clearing equipment broke down and runway clearing funds were depleted. The last load of 15 muskoxen was shuttled from Mekoryuk to Bethel via Wien Consolidated Airlines' Skyvan on April 12-13 after snow drifts prevented the C-123 from landing and thawing conditions threatened to entirely close the runway. We used hand shovels to clear the runway of snow drifts for the last load.

The helicopter performed as well as could be desired after the starter was repaired, and only poor flying conditions (low visibility and "white-outs") prevented us from flying. Below 0° F, a "Herman Nelson" was necessary to preheat the helicopter to insure starting. Small catalytic heaters definitely would not do the job.

The pilot provided by Merric, Inc. proved to be a very capable individual and no "close calls" were experienced due to pilot error or incompetence.

In contrast with past muskox transplants, a native foreman was hired to select and supervise the capture crews. Once instructions regarding the day's plans were explained to him, he supervised the capture crews thus eliminating explaining daily plans to every member of the capture crew. This procedure worked very well and is heartily recommended for future operations of this type.

Although the natives generally did a good job of capturing calves, and in one instance several yearlings, they tended to be somewhat rough on the animals. Most calves had one or both horns broken and bleeding from rough handling; the horns at this age are still soft and easily damaged. The older animals were also frequently mishandled.

The muskox barn seemed to work well for holding calves for extended lengths of time. A corral of some sort would be desirable so that the animals could be kept outdoors if desired. Some animals were held in the barn for nearly three weeks with no apparent ill effects.

An improved method of holding older animals would be desirable. Hobbling did not seem to work well since either the animal was too mobile or was so restrained it was unable to stand. Hobbling for extended periods (over one week) was undesirable, so animals were crated soon after capture. Some

animals were kept crated for nearly two weeks with no apparent problems, but this is probably not a good way to hold animals. The crates were purposely made small to allow as many on the plane as possible, and the animals were cramped.

All crates were constructed of 5/8 inch plywood with outside 2 x 4 bracing. Additional bracing was provided by two or three steel bands placed around the sides of the crates. The calf crates were 3 feet high, 1 1/2 feet wide, and 4 feet long. Subadult crates were 4 feet high, 2 1/8 feet wide, and 5 1/2 feet long. Adult crates were 4 feet high, 2 1/2 feet wide, and 7 feet long. Although some crates were of different dimensions, the above sizes proved to be optimum. Doors should be constructed of at least 3/4 inch plywood and preferably thicker since the larger bulls tended to batter and break down the doors when they were disturbed. We nearly had a runaway muskox at Bethel when a bull battered the door of his crate nearly in two. Another crate was placed in front of the broken door thus preventing an embarrassing situation.

Three persons were injured at various times during the transplants, all involving snow machines. Two men were evacuated to Bethel for medical treatment, the third managed to recover in Mekoryuk. Fortunately, no serious or permanent damage was done to any of the injured individuals.

The Alaska Air National Guard provided free transportation for muskoxen to Barter Island resulting in the savings to the Department of more than \$15,000 compared to commercial transportation. However, it is suggested that in future transplants a private carrier be utilized, at least in part. At least one, and possibly two, weeks would have been saved on the transplant had the Air Guard been willing to fly weekends. On two occasions weekend weather was excellent; by Monday when the Air Guard was scheduled to arrive, the weather had deteriorated to unflyable conditions resulting in several days delay getting the animals shipped.

An alternative to using the Air Guard exclusively is to ship the crated animals to Bethel via Wien Consolidated Airlines' Skyvan, and have the Air Guard or other carrier pick up the shipment there. Bethel's weather and aircraft navigational aides are superior to Mekoryuk's, making aircraft landings and departures more dependable. The Skyvan service to Mekoryuk is fairly reliable due partly to this aircraft's short field capabilities. When enough animals were accumulated in Bethel, the transporting agency could be notified and a trip scheduled to fly the animals to their ultimate destination. This procedure probably would not be necessary for a summer operation.

All but two animals shipped were ear tagged with numbered metal tags. Colored plastic streamers were attached to the ears with the tags. The streamers denoted the sex and age of the animal. Red streamers were placed in the right ear on cows and in the left ear of bulls. The streamer placed in the opposite ear indicated the age. White streamers indicated calves (11 month), pink streamers yearlings (23 months), red streamers 2-year olds (35 months), and

yellow-green streamers indicated animals 3 years old (47 months) and older.

Therefore, if an animal were tagged with a red streamer in the left ear and a pink tag in the right, it was a yearling bull. Age streamers were not necessary for animals older than 23 months because horn development usually indicates age well enough, however, they were used.

Muskox ears are quite hairy, and it was difficult to fasten to the ear cartilage rather than to the hair. As a result, some tags and streamers were lost, especially when handling the animals, such as during crating procedures.

Efforts to obtain blood samples were abandoned because the thick coat of the muskox made locating the veins virtually impossible. Blood samples obtained from dead animals apparently froze since the serum failed to separate after standing several days.

The proposed sex and age composition of the muskoxen scheduled to be transplanted was:

| | <u>11 mos.</u> | <u>23 mos. - 47 mos.</u> | <u>Adults</u> |
|---------|----------------|--------------------------|---------------|
| Males | 5 | 5 | 2 |
| Females | 25 | 10 | 3 |

The sex and age composition of the muskoxen actually moved was:

| | <u>11 mos.</u> | <u>23 mos.</u> | <u>35 mos.</u> | <u>47 mos.</u> | <u>Adults</u> |
|---------|----------------|----------------|----------------|----------------|---------------|
| Males | 10 | 3 | 9 | 4 | 1 |
| Females | 15 | 2 | 8 | 0 | 0 |

One female, 35 months of age, died enroute to Barter Island.

Appendix V lists the complete breakdown by sex, age, and tag number of all animals handled.

All dead animals were skinned for full-bodied museum mounts, weighed and measured, and the gastro-intestinal tracts salvaged for later examination (Appendix VI). Reproductive tracts from females were recovered and preserved.

Considerable difficulty was experienced capturing and holding adult bulls. Dosages of succinylcholine chloride appear to be very critical with older animals (over 4 years) and a slight miscalculation can result in either no reaction or death. Respiratory depression from drugs combined with physical respiratory depression caused by the animal lying on its chest when immobilized often results in asphyxia and death. I plan to experiment with a mechanical respirator in future transplants to combat respiratory failures.

After several older bulls were killed, efforts to capture this age class animal were terminated and emphasis was placed on capturing 35 to 47-month-old bulls. No problems were experienced in capturing bulls of this age group.

Thirty-five to 47-month-old bulls probably provide more herd protection than mature bulls because younger bulls tend to remain with the herd and are not so inclined to form separate bachelor groups. Horn development in the younger bulls is sufficient for defense against predators. Even the horns of 35-month-old cows are formidable and would be adequate predator defense.

Capturing and transplanting adult animals is both impractical and extremely difficult. The sub-adult animals are much more desirable for transplanting purposes.

All cows killed in the 35-month age class were pregnant, so it is probably safe to assume that most of the cows 35 months and older which were transplanted were also pregnant. Only single fetuses were observed.

OBSERVATIONS

Jerry Hout and I observed ten muskoxen on Nelson Island during a chartered 180 flight on March 9. These animals were transplanted to Nelson Island during 1967 and 1968. On March 17, Dr. Peter Lent of the University of Alaska Cooperative Wildlife Research Unit observed one herd of 18 muskoxen on Erchaktuk Mountain on Nelson Island. Later that day a Bethel charter pilot observed 19 animals in the same location. These observations account for all but four of the 23 muskoxen transplanted to Nelson Island. This is considered excellent survival.

Subsequent to the transplant to Barter Island, several observations of the transplanted animals have been made.

During mid-April, Mr. Ave Thayer, U.S. Fish and Wildlife Service Game Management Agent, reported seeing 27 animals in the vicinity of Barter Island. Six of the animals were dead, most of them being seen near the coast. Twenty-one of the animals were in the foothills of the Sadlerochit Mountains over 20 miles from the coast.

On June 10 Mr. Thayer saw one animal in the bluffs on the upper Aichilik River approximately 30 miles inland from the coast.

On June 24 Thayer reported seeing four muskox in a narrow deep canyon on the upper Sadlerochit River.

Five dead muskoxen have been salvaged and autopsied. Three appear to have died from a respiratory disorder, one from a broken pelvis and one for reasons unknown.

Appendix I

EXPENSES INCURRED DURING
1969 MUSKOX TRANSPLANT

Salary

| | |
|---|----------|
| 4 weeks Game Biologist IV @ \$ 1100 per month | \$ 1,100 |
| 6 weeks Game Biologist III @ 1074 per month | 1,600 |
| 3 weeks Game Biologist II @ 913 per month | 684 |

Per Diem

| | |
|-------------------------|-------|
| 91 days @ \$ 21 per day | 1,911 |
|-------------------------|-------|

| | |
|--|--------|
| Labor at Nunivak (including crate building) | 1,231 |
| Helicopter charter | 14,000 |
| Snow machine rental (Nunivak) | 8,800 |
| Snow machine rental (Barter Island) | 712 |
| Drugs | 180 |
| Darts, charges | 240 |
| Crate material | 800 |
| Miscellaneous items (tags, hay, phone calls) | 200 |
| Air freight (including muskox Nunivak to Bethel) | 1,100 |
| Aviation fuel | 900 |

| | |
|-------|----------|
| TOTAL | \$33,458 |
|-------|----------|

Approximate cost per animal - \$ 650

Appendix II

PERSONNEL PARTICIPATING IN TRANSPLANT, NUNIVAK PHASE

| Name | Agency | Position |
|----------------|----------------------|----------------------------|
| Larry Jennings | Dept. Fish & Game | Project Leader |
| Jerry Hout | Fish & Wildlife Ser. | Assisting Project |
| Robert Dunbar | Merric, Inc. | Pilot |
| Mel Buchholtz | Dept. Fish & Game | Escort Muskoxen to Barter |
| Scott Grundy | Dept. Fish & Game | Escort Muskoxen to Barter |
| Amos Burg | Dept. Fish & Game | Photographer |
| Rae Baxter | Dept. Fish & Game | Communications & Logistics |
| Cal Lensink | Fish & Wildlife Ser. | Communications & Logistics |

Appendix III

MEKORYUK RESIDENTS EMPLOYED
DURING THE TRANSPLANT

| Name | Time Employed | Position |
|-------------------|---------------|---|
| Rex Mathlaw | 19 Days | Foreman |
| Joe David | 20 Days | Assistant foreman |
| Henry Ivanoff | 18 Days | Capture crew |
| Charlie Spud | 15 Days | Capture crew |
| Edward Shavings | 15 Days | Capture crew - gas dispenser |
| David Hendrickson | 10 Days | Capture crew |
| John Jones | 8 Days | Capture crew |
| Larson King | 13 Days | Capture crew |
| Palmer Olrun | 20 Days | Capture crew |
| Hultman Joshua | 15 Days | Capture crew and specimen preparation |
| Larry Float | 22 Days | Capture crew and feeding of animals |
| Clarence Kalreek | 3 Days | Capture crew and feeding of animals |
| Daniel Olrun | 17 Days | Capture crew |
| Dale Smith | 15 Days | Capture crew |
| Lincoln Shavings | 7 Days | Capture crew |
| Harry Shavings | 6 Days | Capture crew |
| Richard Davis | 12 Days | Capture crew and speciman preparation |
| Harry Wesley | 7 Days | Capture crew |
| George Whitman | 7 Days | Capture crew |
| Uncle John | 27 Hrs. | Crate construction |
| Kay Hendrickson | +94 Hrs. | Crate construction and specimen preparation |
| Henry Shavings | 28 Hrs. | Crate construction |
| Edward Kiokun | 27 Hrs. | Crate construction |
| Fred Don | 2 Days | Capture crew |
| George Williams | 44 Hrs. | Specimen preparation |
| Jerry David | 2 Days | Capture crew |
| Evan Williams | 1 Day | Aircraft loading and runway clearing |
| Leonard Revet | 22 Hrs. | Aircraft loading |
| George King | 1 Day | Aircraft loading |

Appendix IV

DRUG DOSAGE AND REACTION

| Date | Sex | Age | Dose and Drug | Reaction |
|---------|-----|--------|--|---|
| 3/14/69 | ♂ | Adult | 150 mg. Sernylan 2 1/4 cc. Tranvet | Down in 10-15 minutes, lost control of heads, no respiratory problems observed. |
| 3/14/69 | ♂ | Adult | 150 mg. Sernylan 2 1/4 cc. Tranvet | Animals injected with same dose of Sernylan two hours later (after gaining control of head) to expedite loading into crate. Dead next morning, apparently of bloat, as animals appeared to never regain ability to get on feet. Weight 600-650 pounds each. |
| 3/14/69 | ♂ | Adult | 150 mg. Sernylan 2 1/4 cc. Tranvet | |
| 3/15/69 | ♂ | 35 Mo. | 100 mg. Sernylan 1 1/2 cc. Tranvet | Down in 15 minutes, never lost control of head. Seemed okay next morning, able to stand, very alert. |
| 3/15/69 | ♀ | Adult | 100 mg. Sernylan 1 1/2 cc. Tranvet | Required additional 100 mg. Sernylan before it went down, partially lost control of head. Lived through next day but was unable to get to feet. Died 3/17/69. Weight 422 pounds. |
| 3/17/69 | ♀ | Adult | 60 mg. Succinylcholine Chloride 1 1/2 cc. Tranvet (3 minutes after going down) | Required second shot same dose to put down. Died ten minutes later. Skinned carcass showed much hemorrhaging under skin. Weight 348 pounds. |
| 3/17/69 | ♀ | 35 Mo. | 60 mg. Succinylcholine Chloride 1 1/2 cc. Tranvet (3 minutes after going down) | Down in four minutes. Seemed in good condition the next day. |
| 3/13/69 | ♀ | 11 Mo. | 1/2 cc. Sernylan (50 mg.) 1 cc. Tranvet | Animal down and hobbled, remained immobilized for at least two hours. Able to stand the next morning. |

Appendix IV continued

| Date | Sex | Age | Dose and Drug | Reaction |
|---|-----|--------|--------------------------------------|---|
| 3/22/69 | ♂ | Adult | 100 mg. Succinylcholine Chloride | Down in 8-10 minutes, animal died 10 minutes later as a result of exhaustion. |
| 3/22/69 | ♂ | 47 Mo. | 80 mg. Succinylcholine Chloride | Down in 10 minutes. |
| 3/22/69 | ♀ | 35 Mo. | 60 mg. Succinylcholine Chloride | Down in 4 minutes. |
| 3/22/69 | ♂ | 35 Mo. | 60 mg. Succinylcholine Chloride | Down in 15 minutes. |
| 3/26/69 | ♂ | Adult | 100 mg. Succinylcholine Chloride | Down in 4 minutes, died. Weight 564 pounds. |
| 3/26/69 | ♂ | Adult | 80 mg. Succinylcholine Chloride | Down in 10 minutes, barely lost control of head. Estimated weight 575 pounds. |
| 3/26/69 | ♂ | 47 Mo. | 60 mg. Succinylcholine Chloride | Down in 2 minutes, lost control of head. Estimated weight 450-500 pounds. |
| 3/26/69 | ♂ | 47 Mo. | 60 mg. Succinylcholine Chloride | Down in 10 minutes. |
| 3/27/69 | ♀ | 35 Mo. | 60 mg. Succinylcholine Chloride | Down in 10 minutes. Estimated weight 350 pounds. |
| Took five other, same sex and age, successfully same day using same drug and dosage as above. | | | | |
| 3/27/69 | | Adult | 80 mg. Succinylcholine Chloride Pwd. | Down in 7-8 minutes, died within 10 minutes. Estimated weight 400 pounds. |

Appendix IV continued

| Date | Sex | Age | Dose and Drug | Reaction |
|---------|-------|--------|---------------------------------------|---|
| 3/27/69 | ♀ | 35 Mo. | 60+ mg. Succinylcholine Chloride Pwd. | First dart bounced out discharging unknown amount into the animal. Ten minutes later shot with 60 mg. S.C., animal down in 4 minutes, died within 10 minutes. |
| 3/30/69 | ♀ | 35 Mo. | 60 mg. Succinylcholine Chloride | Down in 10 minutes. Regained control of her head. |
| 3/30/69 | ♂ | 47 Mo. | 60 mg. Succinylcholine Chloride | No effect. No attempt made to shoot again. |
| 3/30/69 | ♀ | 35 Mo. | 60 mg. Succinylcholine Chloride | Down in 15 minutes. Retained control of head. |
| 3/31/69 | ♀ & ♂ | 35 Mo. | 60 mg. Succinylcholine Chloride | Dosage barely adequate. (Captured on south end of the island.) |

Appendix V

EAR TAG NUMBERS, AGE AND SEX
OF MUSKOX CAPTURED DURING TRANSPLANT

| Number | Tag Number | Age | Sex | Date | Fate | Remarks |
|--------|--------------|--------------|----------------|------|------|--------------------------------|
| 1* | 7653 7641 | 7652 7643 | Calf (11 Mo.) | ♀ | 3/13 | Barter 4/3 |
| 2 | 7644 7655 | 7645 7654 | 11 Mos. | ♂ | 3/13 | Barter 3/25 Lost tag #7645 |
| 3 | 7646 | 7647 | 11 Mos. | ♀ | 3/13 | Released Nunivak |
| 4 | 7648 | 7649 | 11 Mos. | ♀ | 3/13 | Released Nunivak |
| 5 | 7650 | 7651 | Calf | ♀ | 3/13 | Released Nunivak |
| 6 | 7657 | 7656 | Adult (47 Mo.) | ♂ | 3/14 | Died |
| 7 | 7659 | 7658 | " | ♂ | 3/14 | Died |
| 8 | 7661 | 7660 | " | ♂ | 3/14 | Died |
| 9 | 7662 | 7664 | " | ♀ | 3/14 | Barter 4/3 |
| 10 | 7665 | 7674 | " | ♀ | 3/14 | Released Nunivak |
| 11 | 7666 | 7667 | " | ♀ | 3/14 | Released Nunivak |
| 12 | 7668 | 7669 | " | ♀ | 3/14 | Released Nunivak |
| 13 | 7671 | 7672 | " | ♀ | 3/14 | Barter 3/25 |
| 14* | 7675 | 7676 | " | ♀ | 3/14 | Barter 4/3 |
| 15 | 7677 | 7678 | " | ♀ | 3/14 | Barter 4/3 |
| 16 | 7680 | 7681 | " | ♂ | 3/14 | Barter 3/25 |
| 17* | 7682 | 7683 | " | ♂ | 3/14 | Barter 3/25 |
| 18* | 7684 | 7685 | " | ♀ | 3/14 | Barter 3/25 |
| 19* | 7687 | 7686 | " | ♀ | 3/14 | Barter 4/3 |
| 20 | 7688 | 7689 | " | ♂ | 3/14 | Barter 4/3 |
| 21* | 7630 | 7691 | " | ♂ | 3/14 | Barter 3/25 |
| 22 | 7693 | 7692 | 23 Mos. | ♂ | 3/15 | Barter 3/25 |
| 23 | 7695 | 7694 | 47+ Mos. | ♀ | 3/15 | Died |
| 24 | - | - | 23 Mos. | ♀ | 3/16 | Barter 3/25 |
| 25 | 7696 | 7697 | 35-47 Mos. | ♀ | 3/17 | Barter 3/25 |
| 26 | - | - | 35-47 Mos. | ♀ | 3/17 | Died |
| 27 | 7698 | 7699 | 35-47 Mos. | ♀ | 3/22 | Barter 3/25 |
| 28 | - | - | 47+ Mos. | ♂ | 3/22 | Died |
| 29 | 7827 | 7828 | 11 Mos. | ♂ | 3/22 | Barter 3/25 |
| 30 | 7829 | 7831 | 35-47 Mos. | ♂ | 3/22 | Barter 3/25 |
| 31 | 7832 | 7833 | Calf | ♀ | 3/22 | Barter 3/25 Lost tag #7833 |
| 32 | 7835 | - | Calf | ♀ | 3/22 | Barter 3/25 |
| 33 | 7836 | 7837 | Calf | ♀ | 3/22 | Barter 3/25 |
| 34 | 7838 | 7839 | 35 Mos. | ♂ | 3/22 | Barter 3/25 |
| 35 | - | - | 47+ Mos. | ♂ | 3/26 | Died |
| 36 | 7840 | 7841 | 47+ Mos. | ♂ | 3/26 | Barter 3/28 |
| 37 | 7842 | 7843 | 47 Mos. | ♂ | 3/26 | Barter 3/28 |
| 38 | 7844 | 7845 | 47 Mos. | ♂ | 3/26 | Barter 3/28 Lost tag # 7844 |

Appendix V continued

| Number | Tag Number | Age | Sex | Date | Fate | Remarks |
|--------|------------|------|-----------------------|------|------|--------------------------------|
| 39 | 7846 | 7848 | 11 Mos. | ♀ | 3/26 | Barter 4/3 |
| 40 | 7849 | 7850 | 23 Mos. | ♀ | 3/27 | Barter 3/28 |
| 41 | 565 | 567 | 35 Mos. | ♂ | 3/27 | Barter 3/28 |
| 42 | 568 | 569 | 35-47 Mos. | ♀ | 3/27 | Barter 3/28 |
| 43 | 570 | 571 | 35-47 Mos. | ♀ | 3/27 | Barter 3/28 |
| 44 | 573 | 574 | 35-47 Mos. | ♀ | 3/27 | Barter 3/28 |
| 45 | 572 | - | Calf | ♂ | 3/27 | Barter 3/28 |
| 46 | - | - | 35-47 Mos. | ♂ | 3/27 | Died |
| 47 | - | - | 35-47 Mos. | ♂ | 3/27 | Died |
| 48 | 7 | 8 | 35 Mos. | ♀ | 3/30 | Barter 4/3 |
| 49 | - | - | 35 Mos. | ♂ | 3/30 | Died |
| 50 | 9 | 10 | 35 Mos. | ♂ | 3/31 | Barter 4/3 |
| 51 | 12 | 11 | 35 Mos. | ♂ | 3/31 | Barter 4/3 |
| 52 | 13 | 14 | Yearling (23 Mos.) | ♂ | 3/31 | Barter 4/3 |
| 53 | 16 | 15 | 2 | ♂ | 3/31 | Barter 4/3 |
| 54 | 17 | 18 | 2 | ♀ | 3/31 | Died |
| 55 | 19 | 20 | 47 Mos. | ♂ | 3/31 | Barter 4/14 |
| 56 | 21 | 22 | 2 | ♀ | 3/31 | Barter 4/3 |
| 57 | 24 | 23 | 47 Mos. | ♂ | 3/31 | Barter 4/14 |
| 58 | - | - | 35-47 Mos. | ♀ | 3/31 | Barter 4/3 About to give birth |
| 59 | 25 | 26 | 35 Mos. | ♂ | 4/6 | Barter 4/14 |
| 60 | 28 | 27 | 35 Mos. | ♂ | 4/6 | Barter 4/14 |
| 61 | 31 | 30 | Calf | ♂ | 4/6 | Barter 4/14 |
| 62 | 32 | 29 | Calf | ♂ | 4/6 | Barter 4/14 |
| 63 | 34 | 33 | Yearling (23 Mos.) | ♂ | 4/6 | Barter 4/14 |
| 64 | 35 | 36 | Calf | ♂ | 4/6 | Barter 4/14 |
| 65 | 37 | 38 | 35 Mos. | ♂ | 4/6 | Barter 4/14 |
| 66 | 40 | 39 | Calf | ♀ | 4/6 | Barter 4/14 |
| 67 | 42 | 41 | Calf | ♀ | 4/6 | Barter 4/14 |
| 68 | 43 | - | Calf | ♀ | 4/6 | Barter 4/14 |
| 69 | 46 | 45 | Calf | ♂ | 4/6 | Barter 4/14 |
| 70 | 48 | 47 | Calf | ♀ | 4/6 | Barter 4/14 |
| 71 | 49 | 50 | Calf | ♂ | 4/6 | Barter 4/14 |

Total 52 animals transplanted.

| | <u>Male</u> | <u>Female</u> |
|-------------------------|-------------|---------------|
| Calves (11 months) | 10 | 15 |
| Yearlings (23 months) | 3 | 2 |
| 2 year olds (35 months) | 9 | 8 |
| 3 year olds (47 months) | 4 | 0 |
| 3 year + (47+ months) | 1 | 0 |

* Released and later recaptured

Appendix VI

MEASUREMENTS AND WEIGHTS OF
MUSKOXEN KILLED IN 1969 TRANSPLANT

| | Specimen Nos. | | | |
|---------------------|---------------|--------|-------|--------|
| | 2 | 3 | 4 | 5 |
| Age | Adult | Adult | Adult | Adult |
| Sex | Male | Male | Male | Female |
| Observer | P.L. | P.L. | P.L. | R.D. |
| <hr/> | | | | |
| <u>Measurements</u> | | | | |
| (inches) | | | | |
| Total length | 86 | 91 | 87 | 73 |
| Hind foot | 17 | 18 | 18 | -- |
| 1/2 girth | 47 | 36 | 44 | 29 |
| Ear | 5 3/4 | 6 | 5 1/2 | 5 1/8 |
| Shoulder hgt. | 43 | 43 1/2 | 47 | 40 1/2 |
| Tail | 2 3/4 | 2 1/2 | 3 | 3 |
| <hr/> | | | | |
| <u>Weights</u> | | | | |
| (lbs) | | | | |
| Heart | 4.0 | 4.5 | 4.5 | 2.0 |
| Liver & lungs | 19.5 | 19.5 | 21.0 | 20.0 |
| Stomach | 73.0 | 93.0 | 93.5 | 52.0 |
| G.I. tract | 24.0 | 26.0 | 28.5 | 20.0 |
| Skin w/hooves | -- | 72.0 | -- | 38.0 |
| Head | -- | 60.0 | -- | 20.0 |
| Skin w/head | 132.0 | -- | 115.0 | -- |
| Lungs | -- | -- | -- | -- |
| Heart & Liver | -- | -- | -- | -- |
| Fetus | -- | -- | -- | 33.0 |
| G.I., stomach | -- | -- | -- | -- |
| Liver | -- | -- | -- | -- |
| Carcass | 335.0 | 344.0 | 306.0 | 237.0 |
| Total weights | 587.5 | 619.5 | 568.5 | 422.0 |

Appendix VI continued

| | Specimen Nos. | | | | |
|---------------------|-----------------|--------|--------|-----------------|--------------------|
| | 6 | 7 | 8 | 9 | 10 |
| Age | Adult | Adult | Adult | Adult | 35 months |
| Sex | Female | Male | Male | Female | Female |
| Observer | R.D. | J.H. | R.D. | J.H. | J.H. |
| <hr/> | | | | | |
| <u>Measurements</u> | | | | | |
| (inches) | | | | | |
| Total length | 76 ¹ | 81 | 86 | 70 | 76 1/2 |
| Hind foot | 12 | 15 1/2 | 18 | 16 3/4 | 15 3/4 |
| 1/2 girth | 28 | 36 | 43 | 33 | 33 1/2 |
| Ear | 6 | 6 1/2 | 6 | 5 1/4 | 5 1/4 ₂ |
| Shoulder hgt. | 40 | 49 | 49 1/2 | 47 ₂ | 47 |
| Tail | 2 | 3 | 3 1/2 | 3 1/2 | 2 3/4 |
| <hr/> | | | | | |
| <u>Weights</u> | | | | | |
| (lbs) | | | | | |
| Heart | -- | -- | 4.0 | 2.0 | 2.0 |
| Liver & lungs | -- | -- | 16.0 | 18.0 | 19.0 |
| Stomach | 34.0 | -- | 78.0 | 38.0 | 44.0 |
| G.I. tract | 16.0 | -- | 22.0 | 11.0 | 11.5 |
| Skin w/hoooves | 42.0 | 62.0 | 80.0 | -- | -- |
| Head | 20.0 | 34.0 | 34.0 | -- | -- |
| Skin w/head | -- | -- | -- | 53.0 | 65.0 |
| Lungs | 10.0 | -- | 10.0 | 14.0 | 13.5 |
| Heart & liver | 10.0 | -- | -- | -- | -- |
| Fetus | 30.0 | -- | -- | 34.0 | 34.5 |
| G.I., stomach | -- | 80.0 | -- | -- | -- |
| Liver | -- | -- | 6.0 | 4.0 | 5.5 |
| Carcass | 202.0 | 236.0 | 330.0 | 197.0 | 213.0 |
| Total weight | 364.0 | 412.0 | 564.0 | 353.0 | 389.0 |

Appendix VI continued

| | 11 | Specimen Nos. 12 |
|----------------------|---------------------|---------------------|
| Age | Adult | 35 months |
| Sex | Female | Female |
| Observer | J.H. | J.H. |
| <hr/> | | |
| <u>Measurements</u> | | |
| (inches) | | |
| Total length | 75 | 71 |
| Hind foot | 15 1/2 | 13 |
| 1/2 girth | 34 | 35 |
| Ear | 5 | 5 |
| Shoulder hgt. | 46 1/2 ² | 44 ² |
| Tail | 2 | 2 1/2 |
| <hr/> | | |
| <u>Weight</u> | | |
| (lbs) | | |
| Heart | 2.4 | 2.0 |
| Liver & lungs | — | — |
| Stomach | 35.5 | 30.0 |
| G.I. tract | 13.5 | 11.0 |
| Skin w/hooves | 56.0 | — |
| Head | — | 19.0 |
| Skin w/head & hooves | 56.0 | — |
| Carcass | 213.0 | 205.0 |
| Fetus | 34.0 | 36.0 |
| Lungs | 10.0 | 18.0 |
| Liver | 7.5 | 8.0 |
| Total weight | 372.0 | 369.0 |

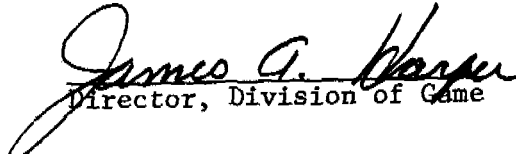
¹ Measured w/skin off

² Top of back to tip of hoof

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