Translocation of introduced reindeer from Hagemeister Island, Alaska

R. Stimmelmayr[1] **& L. A. Renecker**[2]

[1] Reindeer Research Program, Agricultural and Forestry Experiment Station, P.O. Box 757200, University of Alaska Fairbanks, Fairbanks, Alaska, USA 99775-7200 (FTRS1@aurora.alaska.edu).
[2] Renecker & Associates R.# 5. Stratford, Ontario, Canada N5A6S6.

Abstract: In 1992 and 1993, 411 live reindeer were shipped by air from Hagemeister Island to the Anchorage area, Alaska. Reindeer were either rounded up by helicopter and then corralled or captured by net-gun fired from a helicopter. Outcome of both capture events showed that helicopter corralling of reindeer was more successful than catching them with a net-gun and that post-rut rounding up was more successful than rounding up during the rut itself.

Key words: *Rangifer,* capture, air-shipment techniques, seasonal biology, mortality

Rangifer, 18 (1): 19–25

Introduction

The objectives of most wildlife translocations in the State of Alaska have been to increase recreational hunting, provide additional food supply, re-establish species, and/or preserve endangered species (Franzmann, 1988). In recent years, another objective has surfaced, namely the removal of introduced species for ecological reasons. With this shift in policy of wildlife agencies to a new general mandate of preservation of indigenous flora and fauna, it seems likely that these types of translocations will increase in the future. The success of these translocations will require more planning and preparation than "typical" re-locations of wildlife species as entire populations are involved. As a result, relocation of entire animal populations may not be feasible and need to be combined with slaughter and meat salvage operations.

Reindeer (*Rangifer t. tarandus* x *R. t. caribou*) were introduced to Hagemeister Island, Alaska in the 1960s (Stimmelmayr, 1994). The herd was managed by Native reindeer herders from the village of Togiak. In 1992, the U.S. Fish and Wildlife Service (US-F&WS) determined that continued grazing of reindeer on Hagemeister Island, part of the Alaska Maritime National Refuge, was incompatible with the purpose of the refuge. It was decided that the removal of the entire herd of approximately 1200 animals was necessary. Translocation of live reindeer combined with meat salvage operation was scheduled to take place in 1992 and 1993. This paper presents results comparing two alternative methods of capturing reindeer. Recommendations are provided for capture and shipment of reindeer.

Materials and methods

Study area

Hagemeister Island is located in Bristol Bay of the Bering Sea (Fig.1). The island is approximately 37

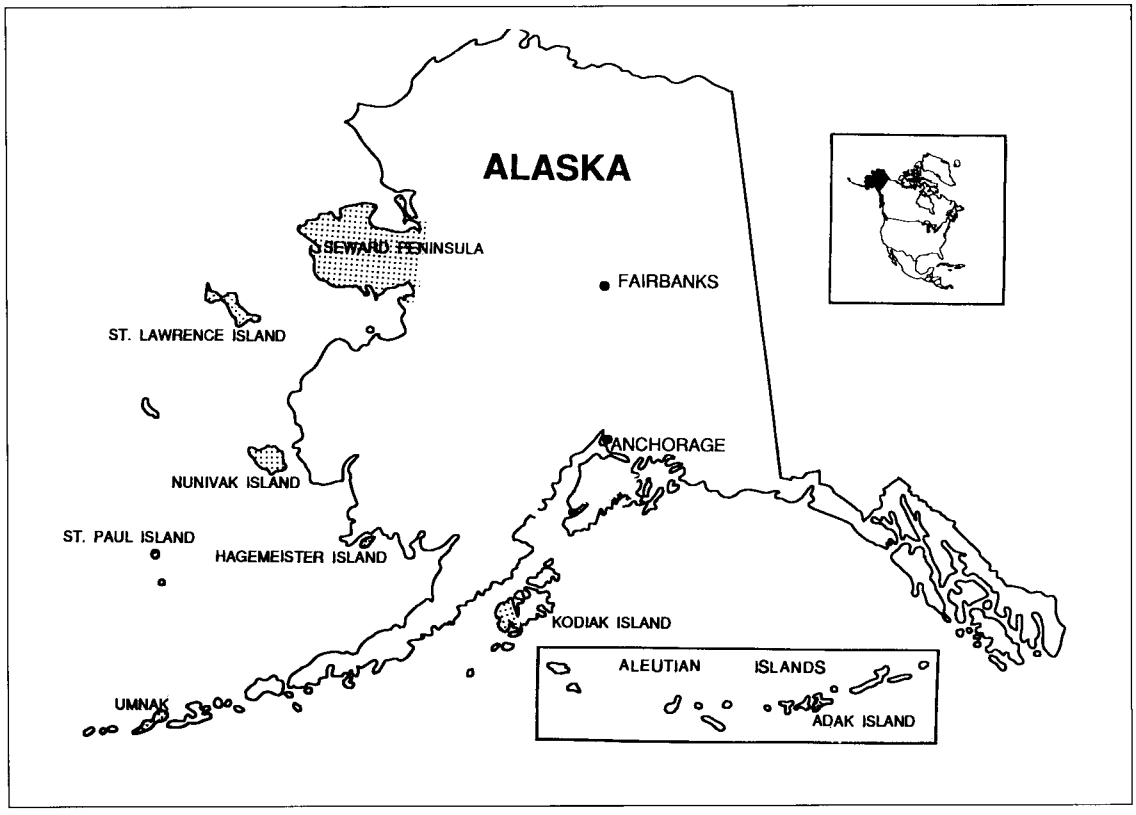

Fig. 1. Location of Hagemeister Island, Alaska. (Dotted areas denote locations of introduced reindeer).

km long by 11 km at its widest point and encompasses about 27 328 ha. Elevation varies from sea level to approximately 543 m at the south end of the island. There are no trees on Hagemeister Island and vegetation is typical of tundra communities throughout northwestern Alaska (Swanson & LaPlant, 1987). The climate is sub-arctic maritime with highly variable strong winds and frequent precipitation in the form of snow, rain, and freezing rain during the winter months.

Animal handling facility

A handling facility was set up on the eastern shoreline of the island. A temporary corral was built using steel fence posts (2.5 m height), wire cables (galvanized steel 0.5 cm diameter), and waxcloth fabric (typar). The corral system consisted of one wing fence (100 m length), a main corral (40 m diameter), two sorting pens (5 m diameter and 2.5 m diameter) with hinged gates, a V-shaped chute system, and one holding pen (12 m diameter).

Capture

In November, 1992 reindeer were rounded-up using either one or two helicopters (Robinson 22, Bell 206 Long Jet Ranger, and/or Bell 206 Jet Ranger). During September 1993, a Piper Super Cub PA 18/150 was used in conjunction with the helicopters to facilitate round up. Reindeer were driven in large groups (100-300 animals) along the beach to the corral.

Individual reindeer were captured with a Hughes 500 helicopter with a pilot-controlled skid-mounted double-barreled net-gun. A custom designed net with a net area of 7 m^2 and a 12 cm mesh size was used. Animals were blindfolded, hobbled (nylon straps with quick release buckles), before being flown to the corral in cargo nets (one animal per cargo net). Up to three animals were carried under the helicopter at a time. At the corral they were loaded onto a Honda 500 All Terrain Vehicle equipped with a trailer and transported to the holding pen. There animals were tested and prepared

for shipment while they were hobbled (this included removal of antlers, identifying animals with an ear tag, sexing, aging, and drawing a blood sample).

Handling and animal health

Groups of 10-20 animals were separated in the main corral and mustered into the first and then the second holding pen. Animals were restrained physically by one or two persons or with a manually-controlled reindeer crush (Finstad and Renecker, 1993) fitted with electronic weight bars (Tru-test Scales, P.O. Box 700407, San Antonio, TX, USA 78270). All reindeer were ear-tagged, sexed, and aged. Animals 5 years old were aged to the nearest year on the basis of eruption of incisor teeth and tooth wear patterns (Skjenneberg & Slagsvold, 1968). Animals > 5 years were classified as 5+ years old. Blood samples collected from the jugular vein of each animal were centrifuged, serum was removed, and tested the same day for brucellosis using a rapid card test (Buffered Brucella antigen (BBA) Veterinary Services APHIS, US. Dept. of Agriculture, Washington, DC 20005). Antlers were removed with a hand saw leaving 2-3.5 cm of hard antler above the coronet. In 1993, reindeer were treated with Ivermectin (Ivomec®, Merck & Co., Inc., Rahway, NJ USA 07065), probiotic® (Rumenoc, Star Labs, P.O. Box 81, St. Joseph, MO, USA 64506; Probios®, Hi-bred Intern., Inc., P.O. Box 258, Johnston, IO 50131), and vaccinated with a killed bacterin-toxoid containing clostridium chauvei-septicum-novyi-perfringens Type C and D. The animals were kept in the holding enclosure for up to 48 hrs. before being either shipped or released. Snow or fresh water was provided daily, in the morning and evening. Complete gross necropsies were performed on animals that died during capture following standard necropsy procedures (Jones & Hunt, 1972).

Loading and transport

Groups of two to five reindeer were run through a funnel-shaped race which led to a loading ramp into a DC-3 fixed-winged aircraft. Inside the aircraft the animals were separated according to body size and a maximum of 5 animals were placed in a wooden crate (1.5 x 2.0 x 2.5 m; carpeted crate floors). The aircraft catgo load was 35 animals per flight. Animals were flown to Goose Bay (11 miles N of Anchorage) and Palmer (50 miles N of Anchorage) in 1992 and 1993, respectively. The duration of the flights was approximately 3 hrs. Animals destined for Point Mackenzie (3.4 miles NW of Anchorage) were reloaded onto trucks and transported for an additional 1.5-2 hrs to their new location.

Results

Helicopter corralling

Post-rut

In November 1992, reindeer on Hagemeister Island were segregated into either large aggregations of cows with their calves or smaller mixed bands of young and adult bulls. Three round ups with a helicopter captured 276 reindeer. All bulls judged to be older than 3.5 years were either killed for meat or released. Handling time per animal was 5-6 minutes. All reindeer tested sero-negative for brucellosis. Altogether 122 live reindeer (92 calves, 25 cows, and 5 bulls) were shipped within 48 hours to Goose Bay. No animals died during capture, handling or within one month after transport.

Rut

In August-September 1993, reindeer on Hagemeister Island were distributed in 25-30 mating groups of approximately 10-70 animals each which were widely dispersed across the island Five helicopter round ups were required to capture 160 reindeer owing to their wide distribution, bad weather, and repeated scattering of already rounded up reindeer in smaller groups. Handling time per animal was 5-6 min. All bulls judged to be older than 3.5 years were killed. Animals displayed signs of distress and aggression including freezing, pawing, charging, and fighting. All reindeer tested sero-negative for brucellosis. A 150 live reindeer (60 calves, 77 cows, 13 bulls) were shipped. Ten animals escaped from the corral prior to shipment. One animal died after handling. Nine bulls died within one month of transport (Table 1). Gross necropsy of these animals showed extensive subcutaneous, muscular, and internal hemorrhaging and depletion of internal and external body fat stores (P. Meyers, pers. comm.).

Helicopter net-gunning

Rut

A total of 156 reindeer were captured with a helicopter net-gun in September-October, 1993. All reindeer tested sero-negative for brucellosis. Animals were net-gunned individually or in cow-calf pairs. The time required to pursue, capture, and restrain each animal ranged between 15-50 min.

Table 1. Distribution of capture-related morrality in reindeer selected for translocation during the 1993 operations on Hagemeisrer Island, Alaska.

Occurrence of death	Frequency	Comment
Holding pen	1/150 x 100 = 0.6%	adult female helicopter round-up; cause unknown
Helicopter netting	17/156 x 100 = 11%	15 calves 2 yearlings neck fractures
Post shipping	22/289 x 100 = 7.6%	17 adult males (17/22) 5 adult females (5/85) cause unknown

During the first 30 min after their release into the holding pen, net-gunned animals appeared to be disorientated and confused. A 139 live reindeer (50 calves, 8 cows, 9 bulls) were shipped. Seventeen animals died during capture (Table 1). Major cause of accidental death rate duting net-gunning were neck fractures. Thirteen animals (8 bulls and 5 females) died within the first month after shipment. Gross necropsy findings in these animals were identical to the ones described for the earlier shipments in August-September, 1993.

Discussion

Comparison of the 1992 and 1993 translocations show marked differences in success of capture, handling and mortality rate with respect to season and capture technique. Our results clearly indicate that helicopter corralling of reindeer was more successful than catching them with a net-gun and that post-rut rounding up was more successful than rounding up during the rut itself. Helicopters, 4-wheel drive terrain vehicles or snow mobiles are commonly used by Native Reindeer herders on the Seward Peninsula, Alaska, for the twice a year round-up of their reindeer herds (Dieterich, 1991; Chetkiewicz, 1993; Chetkiewicz & Renecker, 1994). Caribou have been captured with a net gun in several locations in Alaska (Valkenburg *et al.*, 1983; Taylor & Hotchkiss, 1989). Accidental mortality rate for caribou captured by net-gun were 12% (Valkenburg *et al.*, 1983; Barrett *et al.*, 1982). A similar rate of mortality (11%) was observed in this study. These mortality rates are much higher in

Table 2. Guidelines for caprure and shipment of reindeer.

Category	Comments and variables to consider
Time of shipment[1]	
Post rut (Nov.-Jan.)	-animals are sexually segregated; -bulls manageable, but in poor body condition; -females pregnant, but in good body condition; majority of calves are weaned.
Precalving (Feb.-April)	-not recommended; -high risk of abortion due to capture stress; -poor to fair body condition during early spring.
Post calving (June-Aug.)	-animals in large mixed groups but manageable; -adults are in good body condition.
Rut (Sept.-Oct.)	-not recommended; -animals in small mating groups; difficult to handle; -mature bulls are extremely poor candidates for successful shipment; -breeding success will be reduced.

Capture	
Helicopter round up and corralling	-time and cost efficient for large numbers; -low risk of mortality, if slow speed of travel is adopted (i.e. calves have difficulty keeping up with adults if the herd is moved too fast);
Net-gun	-efficient for individual animal capture; can be labor and cost intensive; -high mortality rate (11- 12%) in reindeer and caribou.
Corral	-corral should provide food, water, adequate space and security. -size of corral depends on number of animals to be captured (6 m^2 per animal); -corral designs should use the animal's behavior to your advantage (Thompson *et al.*, 1992; Thomphson & Dieterich, 1990) ; -pens should be oval and races curved; -fences should be at least 2 m high and animals should have no view of surrounding activities (Renecker, 1992); -type (temporary/permanent) depends on climate and animal behavior; -temporary corrals are cost efficient (1-2 days for set-up), however, require continuous maintenance; alternatives are prefabricated handling facilities used on game farms.
Handling and restraint	-good knowledge in animal behavior and recognize stress and aggression. -work small groups instead of a single animal; -keep visual or vocal stimuli to a minimum and have a small crew; -minimize restraint time and use a crush to restraint animals.
Animal health	-know the requirements for disease testing before the operation begins; -assign a health treatment plan to include antiparasite treatment, vaccination against clostridial diseases, and long-acting antibiotics; -offer water *ad libitum* during entire holding period; -pelleted feed for *Rangifer* is available (Staaland & Sletten, 1991), however, ruminal adaption to new diet takes at least 7 days (Trudell *et al.*, 1980); -thus, do not feed if animals are shipped within 48 hours after capture or feed natural forage such as lichens and willows; -heat stress is a serious problem in reindeer and should be minimized.
Chemical immobilization	-not recommended for shipment in general; most reindeer do not require sedation for shipment;
Shipment	-remove antlers prior to shipment; -leave 2-3.5 cm of hard antler above the coronet; -load in small groups; sort according to size and temperament; don't mix unfamiliar groups; -use single or communal, well-ventilated crates; a communal crate can hold 4-5 head; -secure crates to avoid load shifting; -provide bedding to absorb urine (most air cargo companies prefer wood shavings or sawdust); -ship at night to avoid high daytime ambient temperatures; -well ventilate the cargo hold of the aircraft; -water animals prior to shipment and during transport.
Post transport	-closely monitor animal health and behaviour (Stimmelmayr & Renecker, 1994); -convert animals slowly to the new diet and monitor feed intake; watch for excessive consumption of grain, (overload in reindeer has been observed and can be fatal); -if mortality occurs perform gross necropsy and collect tissues for histopathology.

[1] Breeding season will vary with latitude. Months given refer to timing of breeding events in Alaskan reindeer.

comparison to other capture studies with North American and New Zealand ungulates, where mortalirty rates are below 1% (J. Innes, pers. comm.). The difference in accidental mortality rate may be attributed to different levels of experience of capture crews and species differences.

The post-transport mortality rate of 7.6%, in 1993 is within the range reported for reindeer in shipment (Dieterich, 1989). Failure to adapt to captivity, to formulated rations, or poor body condition prior to shipment and severe stress during shipment resulting in capture myopathy appear to be the main causes of post transport deaths (Luick, 1977; Rehbinder, 1990; Dieterich, 1993). Gross necropsy findings in our study are suggestive that capture myopathy was the major cause of post transport death. The differential mortality of adult males (77%) versus adult females (5.8%) observed in this study further suggests that bulls during rut are more vulnerable to capture stress than females. Similar observations have been made in red deer (*Cervus elaphus*) in New Zealand (J. Suttie, pers. comm.) and the code of conduct for deer transports in New Zealand prohibits shipment of male deer (including yearlings) one month before or after the rut. Our results suggest that similar regulations for reindeer transports would be appropriate.

The Hagemeister Island translocations showed that large scale re-location of reindeer is feasible. However, the data also shows the importance of selecting the appropriate timing of shipment, method of capture and handling, handling facilities, and treatment of animals pre and post shipment. We recommend the following guidelines (Table 2) to help improve the success of reindeer capture and shipment.

Acknowledgments

Financial supporr for this project was provided by the Reindeer Research Program, University of Alaska Fairbanks, Fairbanks and rhe US-F&WS, Anchorage, Alaska. Materials to facilitate the private and government-managed shipments were supplied by the Bureau of Indian Affairs (BIA), Anchorage, Olson Air, Nome, US-F&WS, Anchorage, and Division of Agriculture, Palmer. We thank the US Department of Agriculture (USDA), Animal and Plant Health, in parricular John Leedka, D. Mulcahy, and B. Gore (with the Alaska Department of Environmental Conservation) for their assistance in the brucellosis resting. A special thank-you is extended to D. Witte, Alaska Division of Agriculrure because without his time, effort, and expertise nothing would have been possible. We acknowledge D. Tomlin (BIA) for his help and expertise during borh shipmenrs of reindeer. The authors would also like to extend their sincere thanks to the following people who have been involved in one or borh rranslocation operations on Hagemeister Island: A. Archibeque, K. Butter, G. Carlos, R. Doyle, J. Dyasuk, C. Evans, F. Goodhope, N. Gundlach, L. Jameson, H. Johnson, O. Jones, R. MacDonald, A. Marsh, S. McKinstry, J. Moran, S. Mosher, J. Noyakuk, K. Rock, E. Rock, T. Smith, P. Weyiouanna, and W. Wood.

References

Barett, M. W., Nolan, J. W. & Roy, L. D. 1982. Evaluation of a hand-held net-gun to capture large mammals. – *Wildl. Soc. Bull.* 10: 108–114.

Chetkiewicz, C. L. B. 1993. *Reindeer* (Rangifer tarandus) *calf productivity and survival on the Seward Peninsula, Alaska.* M.S. Thesis. University of Alaska Fairbanks, Fairbanks, Alaska. 139 pp.

Chetkiewicz, C. L. B. & Renecker, L. A. 1994. Reindeer calf productivity and survival on rhe Seward Peninsula, Alaska. *Circular No. 100, Misc. Public.* Agricultural and Forestry Experiment Station, University of Alaska Fairbanks, Fairbanks, Alaska, USA. 8 pp.

Dieterich, R. A. 1989. Air transport of Alaskan reindeer. *Circular No. 70, Misc. Public.* Agricultural and Forestry Experiment Station, University of Alaska Fairbanks, Fairbanks, Alaska, USA. 9 pp.

Dieterich, R. A. 1991. Reindeer management in Alaska. – *In:* Renecker, L. A. & Hudson, R.J. (eds.). *Wildlife Production: Conservation and Sustainable Development.* AFES Misc. Public. 91-6, Agricultural and Forestry Experiment Station, University of Alaska Fairbanks, Alaska, USA, pp. 213–217.

Dieterich, R. A. 1993. Management and medical aspects of reindeer farming. *Circular No. 96, Misc. Public.* Agricultural and Foresrry Experiment Station, University of Alaska Fairbanks, Fairbanks, Alaska, USA. 8 pp.

Finstad, G. & Renecker, L. A. 1993. Design of a portable reindeer crush. *Circular No. 94, Misc. Public.* Agriculrural and Forestry Experimenr Station, University of Alaska Fairbanks, Fairbanks, Alaska, USA. 11 pp.

Franzmann, A. 1988. A review of Alaskan wildlife translocations. – *In:* Nielsen, L. & Brown, R. D. (eds.). *Translocation of Wild Animals.* Caesar Kleberg Wildlife Research Institute and Wisconsin Humane Society, Kingsville, Texas, USA, pp. 210–229.

Jones, T. C. & Hunt, R. D. 1972. *Veterinary pathology.* 4th Edition, Lea & Febiger, Philadelphia, Pennsylvania, USA. 1792 pp.

Luick, J. R. 1977. Diets for captive reindeer. – *In:* Handbook Series in Nutrition and Food, Section G:

Diets, Culture Media, Food Supplements, Volume I: Rechcigl, M. (ed.). *Diets for Mammals.* CRC Press, Inc., Cleveland, Ohio, USA, pp. 279–294.

Rehbinder, C. 1990. Management stress in reindeer. – *Rangifer* Special Issue No. 3: 267–288.

Renecker, L. A. 1992. Game farm management. – *Agroborealis* 24 (1): 5–10.

Skjenneberg, S. & Slagsvold, L. 1968. *Reindeer husbandry and its ecological principles.* English edition. U.S. Department of the Interior, Bureau of Indian Affairs, Juneau, Alaska.

Staaland, H. & Sletten, H. 1991. Feeding reindeer in Fennoscandia: The use of artificial food. – *In:* Renecker, L.A. , & Hudson, R. J. (eds.). *Wildlife Production: Conservation and Sustainable Development.* AFES Misc. Public. 91-6, Agricultural and Forestry Experiment Station, University of Alaska Fairbanks, Alaska, USA, pp. 227–242.

Stimmelmayr, R. 1994. *Ecology of reindeer on Hagemeister Island, Alaska.* M.S. Thesis. University of Alaska Fairbanks, Fairbanks, Alaska, USA. 135 pp.

Stimmelmayr, R. & Renecker, L. A. 1994. Game farming: Concepts for medical management of large ungulates. – *In:* Smith, C.A.S. (ed.). *Proceedings of the 1st. Circumpolar Agricultural Conference.* Whitehorse, Yukon, Canada, pp. 49–52.

Swanson, J. D. & LaPlant, D. 1987. *Range inventory of Hagemeister Island.* Vol. I and II, USDA-SCS Rept., USDA-SCS, Anchorage, Alaska, USA. 64 pp.

Taylor, K. & Hotchkiss, L. 1989. Capture and translocation of caribou from the Alaska Peninsula to the Togiak National Wildlife Refuge. – *In:* Butler, C. & Mahoney, S. P. (eds.). *Proceedings of 4th. North American Caribou Workshop.* St. John's, Newfoundland, Canada, p. 515.

Thompson, B., & Dieterich, R. A. 1990. Construction and use of a farm separator for injury prevention. *Circular No. 74, Misc. Public.* Agricultural and Forestry Experiment Station, University of Alaska Fairbanks, Fairbanks, Alaska, USA, p. 7.

Thompson, B., Dieterich, R. A., & Renecker, L. A. 1992. Corral design and operation for improved handling efficiency and reindeer safety. *Circular No. 86, Misc. Public.* Agricultural and Forestry Experiment Station, University of Alaska Fairbanks, Fairbanks, Alaska, USA, p. 12.

Trudell, J., White, R. G., Jacobsen, E., Staaland, H., Ekern, E. & Kildemo, K. 1980. Comparison of some factors affecting the in vitro digestibility estimate of reindeer forages. – *In:* Reimers, E., E. Gaare & S. Skjennberg (eds.). *Proceedings of the 2nd Int. Reindeer/Caribou Symposium, Røros.* Direktoratet for vilt og ferskvannsfisk, Trondheim, Norway, pp. 262–273.

Valkenburg, P., Boertje, R., & Davis, J. L. 1983. Effects of darting and netting on caribou in Alaska. – *J. Wildl. Manage.* 47 (4): 1233–1237.

Manuscript received 25 January, 1995
accepted 18 February, 1997