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¹Hone, E. 1934. The present status of the muskox. *Special Publication of the American Committee for International Wild Life Protection*, No. 5. 87 pp.

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Abnormal Migratory Behaviour in Swedish Reindeer

Much information has been gathered on the biology of genus *Rangifer* during the last decades, largely as a result of comprehensive investigations of caribou in Canada and Alaska. However, we still know little of the factors which cause and control migration and orientation in reindeer and caribou. No experiments have been performed to elucidate the problem, present knowledge being based on observation of free-ranging herds. Among authors discussing the causes of migration are Jacobi¹ and Herre². Both stress escape from insect pests and summer heat, a necessary shift to new food supplies and changes in hormonal activity in the animals as likely causes for migration. As to the orientation problem, it is known that reindeer and caribou often use the same migratory routes year after year. This is shown in many of the studies on caribou mentioned above. Kelsall³ points to three important factors which may aid orientation during migration. These are topography along the routes, vegetation and snow conditions. A comprehensive survey is also given in Kelsall's work on what is known of migration and orientation in caribou.

Here I will present a case of disturbance in the migratory behaviour of Swedish rein-

deer, most likely caused by introduction of a new method of moving the animals from the summer area to the winter range. Instead of letting the reindeer migrate in their traditional way some Swedish reindeer farmers have moved their reindeer by trucks from the summer range in the mountains to the winter range. The method has been used in recent years when grazing conditions in the mountains, and along the migration routes were so poor that quick movement of the starving animals was regarded as necessary. Several tens of thousands of reindeer have been moved 150 to 300 km. by truck in autumn during the last four years. The return in spring has mostly been in the traditional way. However, it has been noticed that abnormal numbers of animals from the herds do not follow the spring migration but stay on the winter range through summer without showing much urge to return to the mountains. This has caused much trouble to the reindeer owners.

Although no quantitative data are yet available it seems evident that the mode of autumn movement is closely related to the success of spring migration. No abnormal behaviour has been reported from areas maintaining traditional spring and autumn migrations. The Lapps believe that the transported reindeer have "lost their orientation ability" and are unable to find their way back to their traditional summer areas. This theory seems to be likely and there are several factors involved.

Most of the factors governing migration and orientation in reindeer are still obscure, but there are indications that migratory behaviour is strongly related to tradition (i.e. the behaviour is transmitted from generation to generation by learning). There are certainly genetic and hormonal factors involved also, but these alone are presumably not sufficient to elicit the behaviour. This is demonstrated by the fact that single animals or small groups of reindeer are usually unwilling to undertake goal-directed movements over long distances. Thus it seems necessary for a reindeer group to be of a certain minimum size in order to elicit the migratory behaviour.

Owing to the strong tendency of reindeer to congregate into herds, the large-group requisite for migration is in most cases fulfilled. For an optimal function of single animals in the herd, and also for an optimal function of the herd as a unit, it is necessary that intragroup agonistic behaviour be kept at a low level. This has been achieved by the development of hierarchal systems within groups in which, in ideal form, reindeer A

dominates B, which dominates C but not A, and so on. In that way all members of a group "know" their social positions and they tend to avoid situations which might result in overt confrontations. Dominance in reindeer has been dealt with in detail by Espmark⁴. The cohesiveness of the herd is further promoted by the fact that there are sub-groups in which the members display greater affinity to each other than to other individuals.

When reindeer are gathered in autumn the herd is split into small groups which are loaded on trucks and transported to the winter range where they are released. When the whole herd is moved and released in a new area the previous social structure and organization is destroyed: mothers are separated from their calves, individuals belonging to different sub-groups are pushed together and so on. The reindeer will find themselves in social chaos.

In this situation the reindeer have two ways in which to reduce increased agonistic activity. They may try to avoid each other in which case they scatter over large areas with the inevitable result of increased numbers of single individuals and small groups. Alternatively, they may "be on good terms" and establish a new social organization. The first alternative is most likely in cases of severe snow conditions with bad grazing opportunities. To reestablish group affinities under such circumstances the herd must be kept together by intense and careful herding during the first days following release.

Spring migration is usually initiated by the pregnant cows accompanied by their calves, now almost one year old. This vanguard group is usually joined by the sub-adults. Finally the rest of the herd, mainly mature males, follows. This segregation lasts without much modification during the whole summer. Spring segregation and its causes is discussed by Pruitt⁵ and Kelsall³.

In the case of the truck-transported reindeer, I assume that the animals, due to social disorganization and starvation, were forced to scatter to such an extent that the requisites for eliciting a spontaneous and normal re-migration were lost. In some cases reindeer without any experience of migration made up abnormally large proportions of the truck-transported contingents. If such animals disperse and do not come in contact with more experienced animals, the probability is great that they will never undertake a spontaneous re-migration. Even experienced animals, with a normal urge for migration, might be inhibited by the presence of numerous inexperienced animals, because

of the well developed allelomimetic behaviour characterizing reindeer.

In most cases the reindeer were transported to traditional winter range (i.e. ranges familiar from past migrations to experienced animals). In those cases it might be expected that the experienced animals could find their way back, provided that learning plays an important role in orientation. However, I assume that other factors, such as the social complications mentioned above, have greater effect. It is reasonable to question how the animals' memory of characteristics along the migratory route might be influenced by omission of an ordinary autumn migration. Is a gap in the migratory experience enough to eclipse the memory of the migratory route and thus make it difficult, or even impossible, for the animals to undertake a goal directed, spontaneous movement? In cases where reindeer were taken to unfamiliar areas it is easier to suspect disorientation as an important cause of abnormal migratory behaviour.

SUMMARY

Swedish reindeer have sometimes in recent autumns been transported distances of 150 to 300 km. by truck from summer ranges to winter ranges. Many of those animals did not go back to the mountains in spring but remained on the winter ranges. Four factors are considered to be possible causes for the abnormal behaviour: 1) Destruction of the herds' social organization because of the trucking; 2) The importance of uninterrupted learning of the migratory route; 3) Disorientation caused by unfamiliar winter areas; 4) The large proportion of inexperienced animals in the herds.

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