FOREST OWNERS AS MOOSE HUNTERS IN FINLAND

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ABSTRACT: A survey was sent to 2,514 Finnish hunters in 1997 to compare the opinions of forest owners and other moose hunters, as well as to examine a number of features connected with moose hunting activities. Forest owners comprised 46% of moose hunters in southern and central Finland. Non-material values, such as spirit of adventure, comradeship, and a feeling of excitement motivated most moose hunters. Their willingness to pay for hunting was more than triple the actual moose hunting costs. Forest owners and other moose hunters both considered the size of the moose population to be reasonable in relation to the amount of moose-related damage, and about one-third would have liked to increase moose numbers. Although forest owners were more aware and concerned about the effects of browsing, only 15% of the forest owners wanted to reduce the moose population. Moose hunting was considered to be so important that it restricted other hunting activities. Moose hunters wanted to reduce the number of large predators due to their influence on moose. The results indicate that local game management should be employed to optimize the costs and benefits of moose hunting.

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During the early 1990s, 40,000 - 50,000 moose (*Alces alces*) were culled annually in Finland (Fig. 1). Moose increased throughout Finland during the 1970s and became one of the most preferred game species (Ermala and Leinonen 1995a). Moose hunters account for about one-third of all hunters in Finland. In addition to several ecological studies on game species, the profile of Finnish hunters has generally been investigated with respect to their hunting behavior (Ermala and Leinonen 1995a,b). The status and management of moose in Finland was reported by Nygrén and Pesonen (1993), while in Sweden the values associated with hunting were investigated by Mattsson (1989, 1990).

Being a large herbivore and therefore highly visible, the moose is of great interest to both hunters and Finnish society as a whole. As far as the economic aspects of moose are concerned, detrimental effects occur through damage to forests and agricultural crops, and traffic accidents. Because hunting rights belong to landowners in Finland, moose hunters are often forest

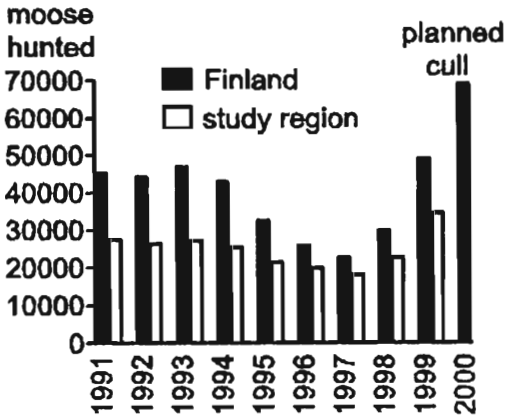

Fig. 1. The number of moose hunted in Finland from 1991 to 1999, and the planned cull for the season in 2000.

owners. In forestry decision-making, landowner-hunters are considered to be an important social group when strategies concerning the moose population size are determined.

Although the economic value of hunting forest birds has been calculated in Finland (Ovaskainen et al. 1992), relatively little is known about the value of moose and moose hunting. Detailed economic studies carried out earlier in Scandinavia have addressed moose (Mattsson and Kriström 1987, Soedal 1989) and attempts have been made to analyze the economic aspects of moose damage to forests (Helle et al. 1987). Factors affecting the carrying capacity of moose habitats have been examined by Heikkilä and Härkönen (1993).

This study compares the attitudes of 2 groups of moose hunters - forest owners and non-forest owners. The attitudes of both groups are important because of the essential role of hunting in moose management.

MOOSE HUNTING IN FINLAND

Moose hunting in Finland takes place as a group activity because at least 1,000 ha are required for moose hunting. Owing to the small size of forest holdings (average 30 ha), almost every hunting group has to make an agreement with several landowners. Often a group consists of neighboring landowners and other hunters who decide to rent a sufficiently large area. Close connections to local communities are often necessary to be accepted in such a group, which usually consists of 15-25 hunters.

Harvesting of moose populations is locally controlled in the 15 Finnish game management districts. Game is managed by 300 game management associations. These are local voluntary organizations. The game management districts are larger units, and these determine the number of licenses to be issued each year. The boards of these districts consist mainly of hunter's representatives and so the landowners are represented in the licensing process, although the main decisions are made by the senior game warden of the game management board. Frequent disagreements arise between forest owners' and hunters' organizations concerning optimal moose management. The Finnish government (Department of Fisheries and Game in the Ministry of Agriculture and Forestry) sets the hunting seasons, gives general culling recommendations, and collects money from licenses. Moose license fees are used to compensate for moose-related damage. Forest and agricultural damage are compensated on a collective basis without regard to the extent of local problems or value of license fees paid.

Moose populations are estimated by hunters during and after the hunting season, and sometimes by aerial surveys using fixed-wing aircraft. Helicopters are used to conduct intensive yearly counts of large permanent plots.

Hunting licenses are first given to game management associations, where they are divided among hunting groups. Efforts are made to find a balance between the size of the local moose population and the costs of damage. Disagreements among forest management associations and hunters may arise as a result of uneven distributions of moose population densities, as well as varying hunting opportunities.

METHODS

In 1997, a mail survey was sent to Finnish moose hunters in the southern and central parts of the country where private forest ownership is the most common form of forest ownership. Northern areas were excluded because of the low moose population and minimal hunting effort. A systematic sample of every 74th hunter was made from the basic population of 186,000 hunters registered in 1997. Surveys were sent

to 2,514 hunters of which 1,714 (68%) replied. The questions addressed the hunters themselves, hunting, and the hunter's opinions concerning the moose population in relation to its effects on forestry. Economic questions concerned the time spent on hunting, hunting costs, the size of the hunting bag, and the maximum amount hunters were willing to pay for moose hunting opportunities. Statistical comparisons between the responses of the 2 groups were made using chi-square tests (SPSS Incorporated, Chicago, Illinois, USA).

RESULTS

Eighty-three percent of the 1,714 hunters replying to the questionnaire had hunted in 1997, and 43% had hunted moose. Forty-six percent of the moose hunters were also forest owners. The main reasons given for hunting moose stressed non-material values such as a spirit of adventure (27%) and excitement (20%), as well as social aspects. Comradeship with other hunters ranked relatively high (24%). Although the average amount of meat obtained was relatively high (Table 1), only slightly more than 10% of the hunters gave meat as the primary reason for hunting. Fourteen percent of hunters hunted for exercise and 4% gave other reasons. Hunters expressed the importance of moose hunting by their willingness to pay for hunting opportunities, which on average, was triple the actual hunting costs (FIM 4,962, US$ 775 for non-owners and FIM 4,942, US$ 772 for forest owners). Slightly less than 50% of the hunters felt that moose hunting partially restricted possibilities to hunt other game.

Most moose hunters thought that the moose population level in 1997 was reasonable in relation to the amount of damage to young forest stands (Fig. 2). However, nearly one-third wanted a larger moose population. Although more forest owners than other hunters wanted fewer moose, the differences were not significant. Opinions concerning the moose population size in relation to all forms of damage, including traffic accidents, were similar to those concerning forest damage ($P = 0.193$). Forest-owner hunters were more concerned about the damage to forests caused by browsing than other moose hunters (Fig. 3). Almost 20% of the forest owners had experienced considerable damage to their forests. In addition, about one-third of forest owners were seriously considering changing from silver birch (*Betula pendula*) and Scots pine (*Pinus sylvestris*) to less productive spruce (*Picea abies*) because of the risk of moose damage. Forest owners felt that the

Table 1. Hunter statistics (means ± S.E.) in 1997. No statistically significant differences were found between forest and non-forest owners.

	Non-forest owners $n = 317$	Forest owners $n = 273$
Years of hunting	24.4 ± 0.8	31.4 ± 0.8
Years of moose hunting	16.4 ± 0.7	22.6 ± 0.7
Days of hunting	21.2 ± 0.9	22.8 ± 1.0
Days of moose hunting	9.2 ± 0.3	11.1 ± 0.4
Distance to hunt (local) (km)	11.8 ± 0.8	8.6 ± 0.6
Distance to hunt (other region) (km)	156.7 ± 16.0	165.0 ± 29.1
Amount of edible moose meat (kg)	27.6 ± 1.3	35.1 ± 1.7
Costs of hunting in total FIM (US$)	2,733 ± 164 (427 ± 26)	2,867 ± 170 (448 ± 27)
Costs of moose hunting FIM (US$)	1,267 ± 75 (198 ± 12)	1,599 ± 109 (250 ± 17)

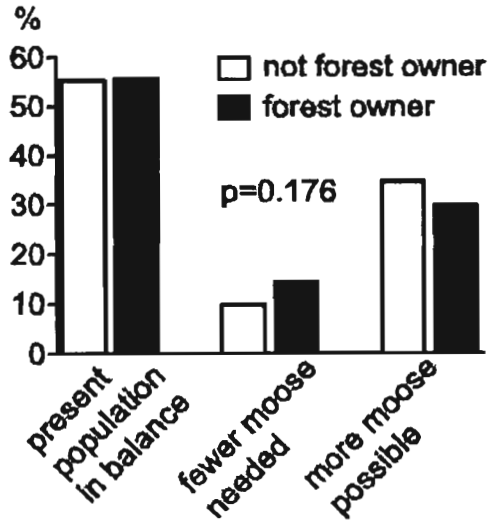

Fig. 2. Opinions of moose hunters (forest and non-forest owners) in 1997 of the size of the Finnish moose population in relation to damage in young forest stands.

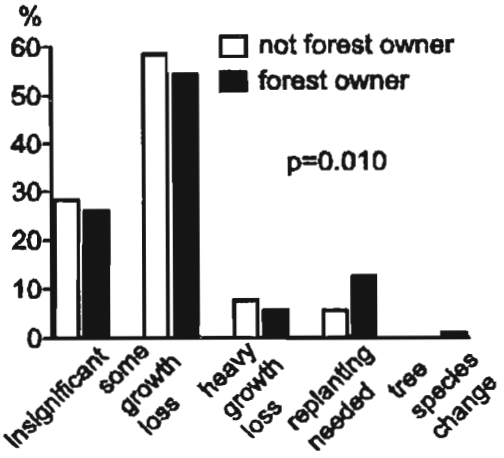

Fig. 3. Opinions concerning the importance of moose browsing effects on young forest stands.

compensation paid for moose damage was too small, while most non-forest owners had no opinion (Fig. 4).

Non-forest owners were often unable to give an opinion concerning the silvicultural effects of moose. Both forest and non-forest owners considered moose to have no, or only a minor role in reducing excess

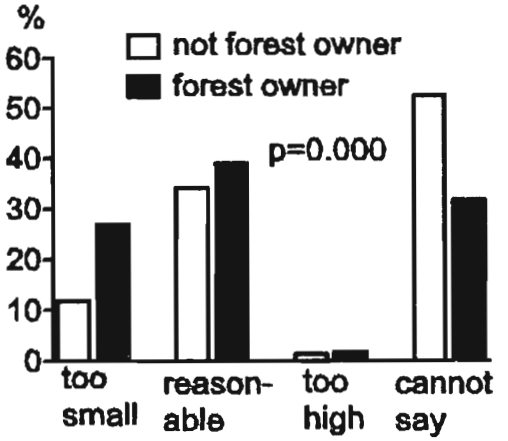

Fig. 4. Opinions about the level of compensation for forest damage caused by moose.

hardwood growth in Scots pine stands; 27% of forest owners thought moose were not useful in controlling hardwood. Opinions as to whether or not a hardwood undergrowth increased moose damage in Scots pine stands were more varied. The majority of the forest owners did not associate moose damage with hardwood undergrowth, although one-third considered that hardwood undergrowth probably encouraged moose (Fig. 5).

Almost all hunters felt that protecting young forest stands using repellents, mechanical shelters, or fences, was a reason-

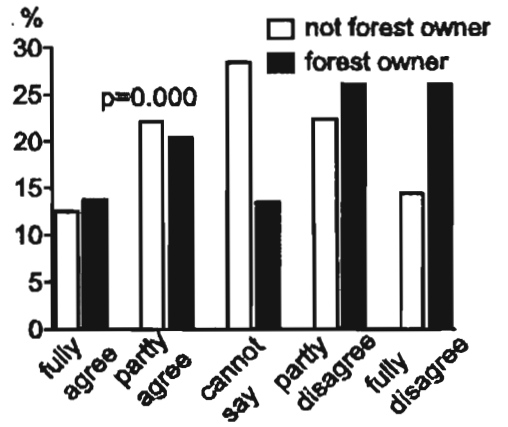

Fig. 5. Responses to the question of whether or not hardwood undergrowth increases moose damage on young Scots pine.

able means of preventing moose damage. However, one-fifth of the forest owners partly or fully disagreed with this idea, whereas non-forest owners had more positive attitudes ($P = 0.000$). The role of game crop fields in reducing damage was commonly accepted, although forest owners were somewhat less convinced ($P = 0.004$).

Forest owners, especially, would like a reduction in the numbers of large predators in order to protect the moose population (Fig. 6). In contrast, an increase in the roe deer (*Capreolus capreolus*) population was commonly accepted, although about 20% of the forest owners were more or less against an increase in this game species.

DISCUSSION

The Finnish moose population was estimated to be relatively low in 1997 and consequently the number of licenses issued that year was lower than it had been for several years previously. According to recent information, however, the moose population was frequently underestimated during the 1990s and there has subsequently been a sharp increase in the number of licenses planned to be issued in the year 2000 (Fig. 1). The fact that the moose density was actually higher than could be concluded from the official statistics for the study period, may have affected some of the opinions expressed by hunters.

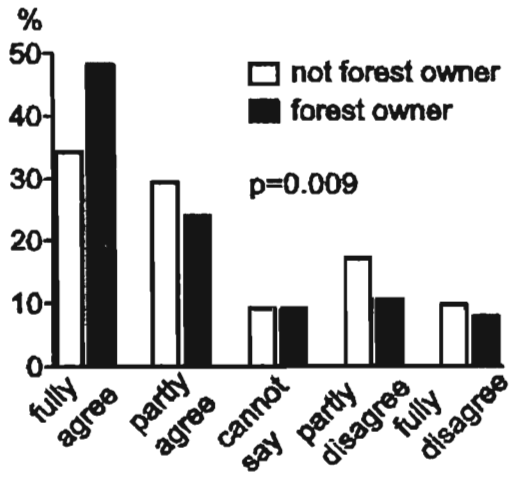

Fig. 6. Responses to the question of whether or not large predators should be reduced in order to save moose.

The importance of moose hunting was expressed by nearly half of the hunters. This may be due to its greater demand on a hunter's time relative to other game such as forest birds, which have also been ranked as popular hunting objects (Ermala and Leinonen 1993b). The importance of meat as a hunting motive was ranked relatively low compared with results from Sweden and Norway more than 10 years ago (Mattsson and Kriström 1987, Soedal 1989). However, the number of licenses in relation to the number of hunters in Finland was lower than it was in Sweden or Norway.

The majority of both forest owners and other hunters felt the moose population was reasonable in relation to moose damage to forests and involvement in traffic accidents. A high proportion (> 50%) of both groups wanted more moose despite the increased damage that could result. Their desire for more moose may have been related to a reduction in the number of licenses issued in 1997 because of declining population estimates. However, due to problems of underestimation, the moose population in the study area may not have actually decreased very much. Thus, local increases in forest damage and moose-related traffic accidents may have led some forest owners and other hunters to believe the moose population was too high.

The acceptance of an increase in the moose population, in spite of the fact that 20-30% of the forest-owner hunters had suffered some form of damage, indicated a certain degree of tolerance by the forest owners with regard to damage. This may be due to the possible monetary benefits received from hunting, and the collective damage compensation payments may have influenced their attitudes.

Based on personal hunting costs in 1997, the cost per hunting group (ca. 5,000 groups) can be estimated at about FIM 23,000 (US$ 3,600). The value of meat obtained per group averaged FIM 17,000 (US$ 2,650)(FIM 33, US$ 5 per kg). Thus, the total value of meat obtained by hunting in 1997 was about FIM 83 million (US$ 13 million) and the total cost to hunters was about FIM 115 million (US$ 18 million). The average cost per kg of moose meat was therefore comparable to commercial beef. The license revenues for the state in the 1990s varied from about FIM 7 to 22 million (US$ 1 - 3 million). The compensation paid to landowners for damage varied from about FIM 7 to 25 million (US$ 1 - 4 million).

Hunters were willing to pay triple the actual costs for the opportunity of hunting moose, which would amount to about FIM 390 million (US$ 61 million) in total. This emphasizes that values other than meat, the importance of which was ranked high by only 10% of those surveyed, are important to hunters in Finland.

Opinions about the relationships between hardwood undergrowth and moose damage to Scots pine were mainly in agreement with the results obtained from ecological studies (Heikkilä and Härkönen 1993, Härkönen 1998). However, a high proportion of forest owners believed that hardwood undergrowth increased the risk of damage. This result is of importance when considering the silvicultural cleaning of young Scots pine stands (Härkönen et al. 1998).

At the time of the study, there were concerns about increasing numbers of large predators in Finland. The estimated population of the brown bear (*Ursus arctos*) was about 900, and of the wolf (*Canis lupus*) about 100 individuals. These animals are mainly found in eastern Finland, where local predation can be high. Negative attitudes towards predators were common, and may have been one reason hunters were willing to co-operate with game management districts that planned to increase the moose population by reducing hunting. Extreme opinions were expressed by both of the studied groups of hunters. The increase in the roe deer population as a new game species was generally accepted with no significant difference between the forest owners and other hunters.

Our results indicate that the opinions of forest owners and other hunters were relatively similar. However, 15% of forest owners wanted a smaller moose population because of forest damage, while the proportion among other moose hunters was 10%. Moose populations are unevenly distributed in Finland and attention should be given to defining management unit boundaries and decision-making procedures that take into account forest damage. The willingness of hunters to pay considerably more for moose hunting makes it possible to develop moose management regimes that consider variations in local conditions.

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REFERENCES

ERMALA, A., and K. LEINONEN. 1995a. Metsästäjäprofiili 1993. Osaraportti 1. Kala- ja riistaraportteja nro 28. (In Finnish).

_____, and _____. 1995b. Metsästäjäprofiili 1993. Osaraportti 2. Kala- ja riistaraportteja nro 33. (In Finnish).

HÄRKÖNEN, S. 1998. Effects of silvicultural cleaning in mixed pine-deciduous stands on moose damage to Scots pine (*Pinus sylvestris*). Scandinavian Journal of Forest Research 13:429-436.

_____, R. HEIKKILÄ, W.E. FABER, and Å. PEHRSON. 1998. The influence of cleaning on moose browsing in young Scots

pine stands in Finland. Alces 34:409-422.

HEIKKILÄ, R., and S. HÄRKÖNEN. 1993. Moose (*Alces alces* L.) browsing in young Scots pine stands in relation to the characteristics of their winter habitats. Silva Fennica 27:127-143.

HELLE, T., H. PAJUOJA, and K. NYGRÉN. 1987. Forest damages caused by moose and their economic value in Finland. Scandinavian Forest Economics 29:7-26.

MATTSSON, L. 1989. The economic value of wildlife for hunting. Scandinavian Forest Economics 30:42-61.

_____. 1990. Hunting in Sweden: extent, economic values and structural problems. Scandinavian Journal of Forest Research 5:563-573.

_____, and B. KRISTRÖM. 1987. The economic value of moose as a hunting object. Scandinavian Forest Economics 29:27-37.

NYGRÉN, T., and M. PESONEN. 1993. The moose population (*Alces alces* L.) and methods of moose management in Finland, 1975-89. Finnish Game Research 48:46-53.

OVASKAINEN, V., H. SAVOLAINEN, and T. SIEVÄNEN. 1992. The benefits of managing forests for grouse habitats: a contingent valuation experiment. Scandinavian Forest Economics 33:263-274.

SOEDAL, D. P. 1989. The recreational value of moose hunting in Norway: towards modeling optimal population density. Scandinavian Forest Economics 30:62-78.