HUNTING: A PRODUCT OR A TOOL FOR WILDLIFE MANAGERS?

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ABSTRACT: Hunting is often defended as an effective management tool to manipulate wildlife populations toward stated objectives. This implies that managers 1) understand the role of hunting in population dynamics, 2) can effectively regulate size, age and sex composition of harvests, and 3) can predictably influence the target population. These criteria are seldom met in practise. Furthermore, since most management agencies set objectives in terms of sustained yield and hunter days, hunting is used as a tool to perpetuate hunting. Hence, the argument that hunting is a tool necessary for wildlife managers to control populations is circular and difficult to defend. Rather, hunting should be defended as a traditional and legitimate use of wildlife. At the same time, wildlife managers need to improve their understanding and predictive capability to use hunting effectively to manipulate populations.

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Management of animal populations at any point in time is characterized as either: 1) increasing a small or declining population; 2) stabilizing or reducing a high population; 3) exploiting a population and taking a sustained yield (Caughley 1977: 168). Legal sport hunting is a relatively inexpensive and expedient way to impact a wildlife population. However, the social significance of hunting as a multi-purpose recreational activity (Hendee 1974) and the difficulty in enforcing hunting regulations limit the practical choices available to wildlife managers. In wildlife management, knowing how to use exploitation in a predictable fashion can provide a powerful tool for the wildlife manager to achieve population objectives.

Resource managers often strive to identify harvest objectives that stabilize systems in terms of a sustained yield (Ricker 1954, Peterman 1975, Larkin 1977). Yet, stability is one of an infinite array of states a system can, and will, occupy; fluctuations in number are the norm in natural systems. Population cycles in small mammals are well documented and have spawned numerous theories of population regulation (Krebs 1978). Even deer (*Odocoileus virginianus*) and moose (*Alces alces*) appear to have cyclic oscillations in numbers (Peterson *et al.* 1984, Karns 1987). Haber and Walters (1980) have speculated that asynchronous cycles in adjacent caribou (*Rangifer tarandus*) populations are as important in triggering dispersal to adjacent lower density populations and, hence, in gene pool mixing. Consequently, man's attempt to stabilize populations may interfere with the dynamics operating at an ecosystem level.

Hunting might be argued to speed the loss of genetic diversity in a population. Genetic diversity is influenced by the number of breeding males and females, sex ratio, and number of offspring per female. Each of these variables is directly impacted by exploitation. Hunting reduces the average age in a population and usually reduces males more than females. While harvesting can stabilize a population at any number of selected densities, resilience (associated with genetic diversity) may be decreasing. Loss of genetic diversity is a major concern in insular populations, for example, grizzly bear (*Ursus arctos*) (Harris 1986), and adds another dimension to the question of the role of hunting in population dynamics, particularly in species with increasingly fragmented habitat.

Many wildlife management agencies set maximum sustained yield (MSY) as a harvest objective (Crête *et al.* 1981, Van Ballenberghe and Dart 1982). However, managing for

some value less than MSY may be preferable since populations harvested at levels above MSY decline rapidly (McCullough 1979) and the margin of error at MSY is small. Management for MSY as a function of population size alone is too simplistic. Exploitation of a population often truncates its age composition, has an impact on social organization, and may have an indirect impact on many non-target species in the same and different trophic levels (Holt and Talbot 1978). Maximizing sustained yield carries with it risk (Larkin 1977), especially when size and structure of populations is not known accurately, variability exists in extraneous factors such as weather, and actual harvest is often not well controlled.

HUNTING AS A MANAGEMENT TOOL

Wildlife managers view hunting as a largely additive mortality factor (does not result in an offsetting reduction in other forms of mortality) for many game populations. For example, hunting of moose appears to take a disproportionately high number of young adults and so functionally impacts a population differently than predation (Boer 1988). Mechanisms to compensate for such losses are not present if density-dependent processes are not operating (Eastman and Hatter 1983). At low densities, prime-aged moose taken by hunters are not likely to die from other causes and productivity may already be high. Hunting is an additive mortality under these conditions.

A similar hypothesis was evaluated on mallards (*Anas platyrhynchos*) by Anderson and Burnham (1976); they concluded that hunting loss below a certain level was compensated for by reductions in other mortality factors and that additivity occurred only above the threshold. The nature of the compensatory-additive relationship depends on the degree of flexibility in processes affecting natural mortality and net productivity. Compensation for hunting loss depends on the presence of density-dependent responses which result in increased survivability and/or productivity. But density-dependence is speculated not to occur below some threshold level. Identifying the threshold value then becomes important to management because, to be an effective tool, hunting must be an additive mortality.

Hunting is often defended as an effective tool to manage or manipulate populations towards stated objectives. This implies that managers 1) understand the role of hunting in population dynamics, 2) can effectively regulate size, age and sex composition of harvests, and 3) can predictably influence the target population. These criteria are seldom met operationally. Realities of the process of setting seasons and harvest quotas are complex; biological considerations are usually only 1 factor among the many social and political factors which shape harvest regulations. Even if management agencies do fully understand the role of hunting on population dynamics and can predict accurately the consequences of various harvest scenarios, implementation of harvest regulations is often difficult. Special interest groups and market forces (outfitters, ammunition manufacturers, etc.) often impede rapid changes in harvest strategies. Consequently, the wildlife manager is prevented from using hunting as an effective tool to manipulate the population.

The manipulation of moose populations in Sweden is an excellent example of the effective use of hunting as a tool. Moose numbers increased dramatically toward stated objectives through the use of selective harvesting of sex and age groups of moose (Cederlund and Markgren 1987). Hunting accounts for almost all moose mortality in Sweden; losses to predation, poaching, and disease are negligible. Sweden also has a long established and well-developed hunting system. Hence, control over selective age and sex harvesting is a workable option for wildlife managers there.

In North America hunting is one of many mortality factors operating in a moose population and usually accounts for relatively little of the total mortality. Consequently, population response to changes in hunting rates is relatively slow. Yet management agencies do strive to regulate population levels through hunting. Limited entry draws, zoning and age and sex specific harvest systems have been employed.

Most wildlife management agencies set their management objectives in terms of sustained yield and hunter-days of recreation. Hunting is then used as a tool to manipulate populations so as to produce the maximum hunting opportunity, i.e., the tool is used to create more opportunity to use the tool. The argument is circular and reflects the quandary of most wildlife management agencies, especially those in which funding is derived primarily from hunters.

CONCLUSION

Considerable debate and antagonism surrounds the very philosophy of manipulating wildlife populations to meet society's demand for hunting opportunities. Hunting and population manipulation are condemned primarily on moralistic and humanistic grounds (Kellert 1978). On the other hand, wildlife managers often defend hunting on grounds that hunting is a legitimate use of a natural resource (MacDonald 1987), traditionally and spiritually important, and an important management tool.

A reasoned argument can be made that hunting nurtures the spiritual well-being of sport hunters and is a morally neutral issue (Causey 1989). Whether hunting is legitimate, necessary or an outdated activity is an intensely personal and philosophical issue. Hunting is likely to continue as an activity for some time into the future and, as the debate between hunters and anti-hunters intensifies, wildlife managers will come under increasing pressure to defend the sport.

Wildlife managers need to learn better **how** to use hunting and must become more predictive about the consequences of hunting or not hunting. Currently, sport hunting does not endanger wildlife populations and many game species are managed effectively to remain at sustainable levels. In New Brunswick trial and error has, over time, provided an anecdotal background for management decisions with respect to moose (Boer 1987). Many game populations in North America are probably managed with similiar information.

Careful adherence to scientific methods is needed and, as Romesburg (1981) pointed out, hypotheses must be rigorously tested to achieve reliable knowledge. Modelling can be a powerful analytical tool to assist managers in exploring the consequences of management interventions. Modelling, by itself, cannot confirm relationships in a natural system: experimental manipulation of real populations is required. To become predictive about the consequences of alternate harvesting strategies, wildlife managers need to experiment with hunting in real populations as proposed by Anderson *et al.* (1987) for black ducks (*Anas rubripes*). Results of any experimental manipulation must be carefully measured and reported if wildlife management is to move forward as a science (Macnab 1983).

As wildlife managers we can be more effective if we are able to **predictably** influence wildlife populations with a clear understanding of the short-term and long-term consequences of our interventions. Accurate forecasting of future outcomes is a goal worth striving for. As wildlife managers we should recognize that most game populations are "managed" to produce the opportunity to hunt. Consequently, hunting should not be defended as a necessary tool for management but as a traditional and legitimate use of wildlife.

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