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Predation and Livestock Production: Perspective and Overview

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Predation (a mode of life in which food is primarily obtained by killing and consuming other animals) is a purely natural phenomenon, but it is a problem when the predator becomes too abundant or it is unacceptable for humans to share individuals of particular species of prey. Predation has likely been a problem since domestication and continues to be a problem which must be dealt with today. Although much of the focus in this compilation of papers is the livestock industry, predation may also be of concern with respect to wildlife species or household pets. The larger predator species may also constitute a direct threat to man. Some predator species (especially wild or feral swine and coyotes) may also interfere with other agricultural endeavors through destruction of fences, damaging crops, or the threat of spread of disease (Sewart et al., - this issue). Predation management with one goal in mind (i.e., protection of sheep) may also have spin-off benefits for other species as well (Shwiff and Merrell, Allen and Fleming, Shwiff and Bodenchuk, this issue).

To the livestock producer the most serious predator is the one causing trouble at a specific time and place. In the United States, those species which may cause trouble are: bear (grizzly or black), mountain lions, wolf, domestic dog, wild or feral swine, coyote, bobcat, lynx, fox and raptors, such as the golden eagle or black vultures (Avery and Cumings, this issue). Even smaller mammals can at times cause trouble, especially with lambs or kid goats. Some of these species are discussed in the contributing papers to this collection. Overall, the greatest threat to the U.S. livestock industry has been considered to be the coyote due to their wide distribution throughout most of the country (Houben, Nunley, this issue). However, wild and feral swine are rapidly spreading throughout much of the United States and are becoming a serious threat. Also, as grey wolves recolonize the West, they may eventually pose a threat equal or greater than that of the coyote (Breck and Meier this issue), and due to their larger size, wolves are likely to constitute a greater threat to the cattle industry than does the coyote.

Most species of farm or ranch livestock have at times been subject to predation. In the United States, poultry and swine are largely produced in confinement and are thus protected. This is not the case with grazing ruminants, and it is generally recognized that in commercial production of ruminants for meat and fiber production, confinement rearing is not an option. It is reasonably established that in monetary terms, the greatest total loss due to predation is that suffered by the beef cattle industry (Huben, Bruscino and Cleveland; Howery and DeLiberto, this issue) due to their greater value, larger numbers and wider distribution. However, when expressed as a function of the value of the industry, the sheep and goat producers suffer far greater loss (Shelton and Wade, 1979), and it traditionally has been these industries that have born much of the burden of maintaining predation management programs. Predation is one of the chief reasons cited by producers when they leave sheep and goat production (Shelton and Klindt, 1974; Nunley, this issue).

Expressions or evaluations of predator damage usually relate to the numbers or value of livestock killed by predators, but there are serious limitations to the use of this approach alone because it does not consider full costs associated with predators. During the 1970s, a series of studies were conducted to evaluate and document coyote damage to sheep in the absence of management in western states (Huben, Shwiff and Bodenchuk, this issue). With adult sheep, losses range from 1.4 to 8.4 percent and lamb losses range from 6.3 to 29.3 percent. In a similar study conducted with Angora goats in South Texas, Guthrey and Beasom (1978) reported 49% losses of adult does and 64% losses of kid goats due to predators (primarily coyotes). These studies likely represent the most accurate data available, but these reports are specific to the conditions under which the data were collected. The absence of control on study sites likely represents no control on the specific property involved but not necessarily on neighboring properties. The possibility of predator drift from these adjoining areas suggests that the reported loss estimates are likely conservative (Shwiff and Bodenchuk, this issue).

Several contributing authors refer to losses reported by the National Agricultural Statistics Service (NASS) based on producer surveys. These losses were incurred with some type of predation management in place. These data are often reported by states and for years using actual numbers or value of animals killed by predators. They vary by state, region, area, and year but often are on the magnitude of 1% for adult sheep and 3 to 4% for young stock. Similar values are sometimes reported for cattle but are generally lower. Many critics of predator management would suggest that losses of this magnitude could or should be tolerated, but there are additional factors to be considered. First, losses are not uniform, whereas a few producers may absorb the majority of the losses. These producers often go out of business with the result that these losses are transferred

to their neighbors, causing them to go out of business creating a "domino effect." This is the case in areas such as the periphery of the Edwards Plateau of Texas. Another qualifying factor is that actual losses often exceed those verified or reported. This fact is implicit in the compensation programs of some states (Bruscino and Cleveland, this issue). Wyoming, for example, pays producers for three sheep in response to each verified kill. Unverified losses may be substantially higher than this. Breck and Meier (this issue) reported an estimated detection rate of 1/8 of the actual losses of calves killed by wolves in a study conducted in Idaho.

An anology can be made that the value of livestock killed by predators represent "the tip of the iceberg" relative to the actual cost of predation. One of the substantial "other costs" is that of control efforts, whether conducted by government (Hawthorne, this issue) or by the individual producer. Producer efforts may include personal attempts to remove predators or altered-management practices to evade losses (night confinement, improved fencing, early weaning, choice of grazing area, etc.). These efforts will almost invariably represent increased costs and/or reduced animal performance (Howery and DeLiberto; Asheim and Mysterud, this issue).

In the final analysis, the greatest loss due to predation is that many farmers or ranchers fail to produce livestock (especially sheep and goats) because their belief that predation losses may be economically unacceptable. This results in the loss of potential income to the producer as well as the community to which they contribute, as well as the loss of rangeland improvement that can result from mixed-species grazing (Merrill, Reardon and Lineweber, 1966).

Lastly, one approach to evaluating the cost (or effect) of predation is through economic modeling. Asheim and Mysterud (this issue) report that the maintenance of genetically viable populations of wild carnivores in Norway will have an adverse effect on the sheep industry of that country. One suggested approach is to consider the entire Scandinavian region in terms of a viable population of wild carnivores. The Jones report (this issue) also indicated a negative effect of predators on the sheep industry in the United States.

Critics of predator control often refute losses reported by individual producers or claims of the impact of predation on the livestock (sheep) industry. Evidence of such an impact can be verified in other ways. There are at least two cases where institutional research flocks have been terminated or greatly curtailed due to predation. One of these was an experimental flock maintained by the Texas Agricultural Experiment Station at McGregor, Texas (Shelton, 1972), and another maintained by the University of California at Hopland, California (Jaeger, this issue; Dally, 2004). Another example of such an effect is the increased losses and decline in sheep numbers as coyotes reinvaded the Edwards Plateau of Texas (Shelton and Klindt, 1974; Nunley, this issue). Perhaps one of the most noted cases of an adverse effect of predation on sheep numbers is the case of the areas adjacent to the Big Bend National Park in Southwest Texas, together with the adjacent Black Gap Wildlife Management Area and the Big Bend Ranch State Park; these areas collectively encompass nearly two million acres on which no predator control is conducted. These areas are contained within, or are adjacent to, Presidio and Brewster counties. At the time the park was established the two counties had a sheep population of close to one-half million (415,266 in 1950). Twenty years later the two counties had only approximately 18% of the 1950 numbers. At present, there are almost none. This serious decline is largely attributed to predation (coyotes and mountain lions migrating outward from the protected areas). Sheep numbers in other southwest Texas counties (e.g., Pecos and Terrell) further removed from the park have also declined, but at a much slower rate and continue to produce a significant number of sheep.

It may be significant that the two countries which now supply much of the U.S. market for lamb and wool are Australia and New Zealand, which were originally almost free of predation. New Zealand continues to be free of predators. Australia currently has significant predation management issues, but also a substantial national effort to manage predation (Allen and Fleming, this issue).

If it is accepted that predation does constitute a serious problem to be dealt with, the logical question is how this is to be done. Common law in the United States (Bruscino and Cleveland, this issue) is that wildlife belongs to the state (public), and thus it might be assumed that because wildlife belongs to everyone, everyone should share in their keep (and management). Currently 14 states and four Canadian provinces have programs to reimburse livestock owners for losses caused by predators. In limited circumstances or under special conditions, wildlife organizations have reimbursed livestock producers for losses caused by the large predators, but not for coyotes which usually cause greater losses. In addition, since 1885, the federal government has taken a position to provide assistance to landowners, farmers or ranchers to manage wildlife damage (Hawthorne, this issue). However, wildlife species, especially predators, do not respect arbitrary property boundaries imposed by humans, and it is difficult or impossible for individual producers acting alone to manage predation when it occurs. This challenge is compounded by increasingly restrictive limitations on tools that can be used and the conditions under which some species can be removed. Thus, it is necessary that some entity with a broader interest participate in this effort. At the present time this role is served by the USDA-APHIS Wildlife Services Programs.

For a period of years, there existed a Western Regional Research Project relating to predation. This was a multidisciplinary group consisting of animal scientists, chemists, economists and wildlife biologists. Much of the effort of this group was directed at coyotes, but at times other species were studied. Studies included sight (e.g. flashing lights or other visual images), sound (high frequency emitters), odor, taste (repellants) and aversive conditioning. Some of these might work for short periods of time or under special conditions but had little or no long-term value.

In addition to previous efforts, ongoing research continues to evaluate other predation management tools and to refine the application of existing methods. These included the selective removal of offending animals, fencing, guardian animals, confinement, partial confinement, night confinement and some management practices, such as

early weaning or altering lambing, kidding or calving dates. It is important to point out that none of these provide an adequate or overall solution to this problem. Some of the tools mentioned above are discussed by contributors to this report.

Fencing can be used to discourage coyotes, dogs or wolves, but the expense involved in refencing large areas with low stocking rates has seriously limited this approach. Nunley (quoting Caroline, this issue) mentions that new fencing (when it was originally fenced) was a major tool to control wolf movement and to assist in their control in the Edwards Plateau of Texas. It should be pointed out that fencing would not deter mountain lions, smaller mammals or raptors. Generally, fencing is feasible only in areas of high stocking rates, for night confinement or as barrier fences such as the Australian Dingo fence (see Allen and Fleming, this issue) or where a number of producers cooperatively construct barrier fences. Several reports are available which discuss predator fencing (Gates, et al., 1978; Thompson, 1979; and Shelton, 1984). The possibility of placing barrier fences along major highways (especially new construction) should be considered to reduce predator movement along with the carnage resulting from highway accidents involving wildlife species, especially whitetailed deer.

In some areas, producers are able to remain in business only through aerial hunting of coyotes and feral swine using helicopters and fixed-wing aircraft. However, there are many problems with this approach. The primary problem is the expense. Another is that aerial hunting may not be permitted in certain areas. Finally, aerial hunting is not effective where substantial ground cover exists.

Recently, there has been considerable interest in the development of more efficient methods of selectively removing offending animals. In the intermountain West and California, the available evidence suggests that territorial, breeding coyotes are often responsible for the most loss. Accordingly, efforts are being directed toward the development of more effective methods of calling these territorial animals (Jaeger, this issue). Whether this can be done, and whether territorial coyotes in other areas of the country are those most likely to kill livestock, remains unclear.

The use of guardian animals is relatively new in the United States, although guard dogs were used by Native Americans for many years, and special breed guard dogs have been used in the Middle East and Europe for generations. These special breed guard dogs have only been introduced into the United States in relatively recent times (Andelt, this issue), and they have clear value in many situations. However, the successful use of dogs to protect livestock has been limited with free-ranging flocks in Texas and the Southwest. Dogs require frequent or daily attention, and many ranchers in the Southwest have a number of flocks scattered over large areas which cannot be seen daily and which would require many dogs. Also, dogs may not work well where many people have access to the grazing areas or where the animal populations are frequently changing. Guard dogs cannot be used with some other control measures, such as snares, traps or toxins. Also, it is not known how successful guard dogs are against wolves and grizzly bear. Other guardian animals, such as donkeys and llamas, have been used, and while there are reported successes with coyotes in some situations like fenced pastures, they may not be useful with larger predators.

Some Conclusions and Recommendations

1. Predation is a more serious problem for the livestock industry than most people realize unless they are somehow involved. This problem is almost certain to increase due to the dispersal of feral or wild hogs throughout the country and the expanding range of the reintroduced grey wolf.

2. Because predator species do not respect property or political boundaries, it is important that control efforts be conducted on a national, state or regional basis. At present, these efforts are carried out by the USDA-APHIS Wildlife Service Programs in cooperation with state agencies and livestock producers. Possibly some type of zoning could permit adapting management methods to the unique area being served. An appropriate approach for free ranging (fenced pastures) in the Southwest may be quite different from herded flocks or for farm flocks dispersed throughout the country.

3. Research relating to predation management should be a continuing effort, but should be a multidisciplinary effort involving those knowledgeable and close to the industries being served. Further, more research is needed to make existing management methods more effective, efficient and economical.

4. There is a need for more effective predator management tools including the limited use of effective and environmentally safe toxicants (see Fagerstone et al., this issue).

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