Human Dimensions *of* Wildlife Management

Second Edition

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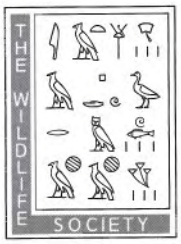

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6.8.2. Understanding Overexploitation

History is replete with examples of unsustainable wildlife use that led to ecological or economic collapse. Bioeconomic models are used to understand the economic roots of past overexploitation and to analyze the sustainability of proposed policies for wildlife utilization and illegal or unregulated taking of wildlife.

Recognizing and preventing the tragedy of the commons. If a natural resource has open access so that anyone who wants to can join in the harvest, then as long as the resource is generating positive net benefits (value greater than costs) new participants will join in the exploitation of it. This will occur until harvest costs have risen enough, and revenues or values have fallen enough, that no one harvesting the resource is making any money or enjoying any consumer surplus. This occurs at population size X_{OA} and harvest level H_{OA}, where OA designates open access. At X_{OA} the value of the animals harvested is equal to the cost of harvest, so that the wildlife resource is generating no net value to society. This situation, where the potential value to society from the wildlife population is lost due to overharvest associated with open access, is called the "tragedy of the commons," after the seminal article written by Garrett Hardin (Hardin 1968*b*). The "tragedy" here is that the wildlife population could provide positive benefits to society, in the form of meat or fur or recreation, but is overharvested to the point where its net benefit to society is zero. Exploitation of wild chinchillas is a classic example of the tragedy of the commons (Box 6.2).

The primary approach taken to avoid the tragedy of the commons in wildlife management is to set limits on harvest to conserve the animal population. This can be done by limiting the harvest that each individual can take (season or bag limits) or by limiting the number of harvesters who can participate in the hunt (limited access). Economists have proposed two main economic approaches to wildlife management that try to change the incentives that drive the open access result. The first is to charge harvesters a fee (tax) for each animal harvested. If the fee is set at the correct level, it will push the cost lineup so that the equilibrium population size increases. The animal population would then generate positive net values to society, but these are all captured by the government through the fee. Because it captures all of the net value of the harvest

Box 6.2 ***EXPLOITATION OF WILD CHINCHILLA AS A TRAGEDY OF THE COMMONS***

Short-tailed and long-tailed chinchilla, species that were both widely distributed along the length of the central Andes and adjacent mountains, were heavily sought after for their high-quality fur. Commercial hunting of both species of chinchilla was widespread in northern Chile beginning in the early 1800s.

The export numbers and prices for chinchilla pelts follow a typical supply–demand relationship. The price per pelt increased as pelt supply decreased. As the resource became scarce and the supply of pelts declined markedly after 1900, pelt prices rose sharply (15-fold during 1902-1909). High pelt values fueled even greater efforts to harvest chinchilla from a population that had already been decimated. Although killing of chinchilla was banned in 1929, the risk of being apprehended by a warden was low and the financial rewards were high, so harvest continued. The income received by very poor local harvesters, called chinchilleros, for one or two pelts was sufficient to cover their living expenses for at least 2 months (Jiménez 1996).

Analysis of the historical record suggests that the fur trade brought chinchilla to the brink of extinction (Jiménez 1996). Exportation of pelts rose during the nineteenth

Presumed extinct for decades, a small colony of short-tailed chinchilla (pictured) was discovered by Jiménez in 1992. Short-tailed chinchilla inhabit barren tallus slopes at high elevations. (photos courtesy Jaime Jiménez)

through a tax and effectively excludes some people from participating, this approach is politically unpopular and has been rarely applied.

The second economic approach is to convert the unowned wildlife resource into a privately owned resource (Box 6.3). This approach is used in many European countries, where it is most often accomplished through harvest quotas given to landowners. It is also used in some African countries where harvest quotas are given to villages, rather than to individual landowners. The quotas can differ from year to year depending on productivity of the wildlife population. Each quota owner can harvest their quota or sell it to someone else. In Africa, the harvest quotas are typically sold by villages to safari operators, who in turn sell the harvest rights to individual hunters.

6.8.3. Modeling Non-use Values

The basic model described above can incorporate non-use values of the wildlife stock. The top panel of Figure 6.5 shows two curves. The NVH curve represents the net value of harvest and is constructed by subtracting the cost curve in Figure 6.4 from the value curve in Figure 6.4. The OSY that maximizes net value of harvest occurs at population size X_{OSY}. A non-use values curve is superimposed on Figure 6.5. It has been drawn such that the non-use value is negative at higher population sizes. This would occur for species that generate high costs to those who live nearby when the species is abundant. Examples would include game species that cause severe damage to crops or ornamental plants, such as deer in parts of the United States.

The bottom panel of Figure 6.5 shows the net benefit to society generated by the animal population. The net benefit to society is the sum of the net value of harvest and the non-use values. In this case, the socially optimal population size, X^*_{OSY}, is smaller than the optimal size based only on hunting values, X_{OSY}. In such a case, society would benefit if hunters were allowed to harvest more animals, even though total value to hunters would decrease. In an extreme case, there might be a wildlife population where the negative marginal non-use value is so large that the optimal population size is smaller than X_{OA}. An example where this might occur could be a wildlife species that causes economic loss, such as deer in agricultural areas. In such cases, society would benefit if hunters would harvest

century as the demand for chinchilla fur and market prices increased in Europe and the United States. Annual pelt exports peaked at approximately 700,000 in 1900, only to decline by 96% during the next 10 years. This overexploitation was spurred by market prices for the pelts that had increased from 0.088 to 50 Chilean pesos per pelt during an 84-year period. More than 7 million chinchilla pelts were exported between 1840 and 1916, but it is estimated that 21 million chinchillas were actually killed. The resource was depleted so severely that it was effectively economically "extinct" by 1917. The last recorded sighting for a short-tailed chinchilla in the wild was around 1953. Long-tailed chinchilla were once also considered extinct in the wild, but a small population was discovered in 1975. A few scattered colonies of long-tailed chinchilla persist in two separate areas of north-central Chile.

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During the 1980s, a few remaining wild colonies of long-tailed chinchilla were discovered in the desert foothills of the Coquimbo Region of Chile. Although about half of known colonies now live within a protected national reserve, long-tailed chinchilla are critically endangered. (photos courtesy Jaime Jiménez)