



Role of Harvest and Environmental Factors on Horn Size of Mountain Sheep

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ABSTRACT: Harvest-induced evolution can have important implications for the sustainable management of populations world-wide; yet, the true effects of harvest remain highly debated. Even at limited temporal and spatial scales, population-level responses to harvest can occur across taxa, and include reduced size of weapons and growth rate, and early sexual maturation. Nevertheless, in most populations, the threshold of selection intensity that prompts evolutionary change is unclear. Harvest can affect patterns of weapon size in two distinct ways. First, intensive harvest can result in demographic changes, where declines in mean weapon size result from an increasing proportion of young animals harvested through time. Alternatively, selection for males with fast-growing weaponry may favor the persistence of males with slow-growing weaponry through time and result in declines in the average size of weapons in a population despite no change in age structure. Mountain sheep (*Ovis canadensis* and *Ovis dalli*) represent an ideal system to test the effects of harvest on weapon size because harvest of mountain sheep is highly regulated throughout their range and a wealth of phenotypic data exists. Additionally, reliable age data, which is critical to test shifts in age structure of populations, is available through horn annuli of mountain sheep. We synthesized harvest records of mountain sheep throughout their range and assessed changes to age structure and horn size over 46 years. After accounting for age, temporal trends in horn size were not explained by changes to the age structure in approximately 20% of hunt areas, but instead may be associated with selective pressures or environmental conditions. Nonetheless, age-specific horn size was stable in about 80% of hunt areas, indicating harvest practices for most



populations of mountain sheep in North America have not resulted in evolutionary changes to weapon size.

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