

## **Despite denials, persistent harvest-based selection leads to the evolution of smaller horns in mountain sheep**

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**ABSTRACT:** Pedigree-based evidence from one population, analyses of hunter-killed rams from several populations, and basic quantitative genetic theory provide strong evidence that intense selective harvests lead to evolutionary changes in mountain sheep horns. Yet, a modelling paper in the *Journal of Wildlife Management* claims that evolutionary change under heavy selective harvests is unlikely. Contrary to that claim and the supportive editorial, when the model is parameterized with values of additive and phenotypic variance, estimated for bighorn sheep, it predicts an evolutionary change comparable to that measured empirically at Ram Mountain. A paper in *Evolutionary Applications* compares changes in size of horns of harvested bighorn rams in 72 "hunt units" in western North America. It uses a biased adjustment to account for differences in age at harvest and defines 'no change' for each unit as lack of a statistically significant trend. When considered together, the slopes of temporal changes in horn size in all 'hunt units' suggest a decline in horn size in 93% of units in Alberta, and 58% in the USA. Contrary to their conclusion that harvest-induced evolutionary change is not a management concern, these publications further emphasize the urgent need for regulatory changes in the quota-free, morphology-based management of bighorn rams in Alberta, and possibly elsewhere.

*Biennial Symposium of Northern Wild Sheep and Goat Council 22:39; 2020*

**KEY WORDS:** Hunting-induced evolution, bias, modelling, rebuttal, horn size

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