CALCULATING HARVEST RATES FOR ALASKAN DALL RAMS USING REPORTED HARVEST AGE STRUCTURE: IMPLICATIONS FOR DALL SHEEP MANAGEMENT IN ALASKA

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Abstract: Alaska's regulated Dall (*Ovis dalli*) ram harvest management system, limiting harvest to full-curl, double-broomed, or eight-year-old rams and mandating reporting of harvested ram ages, has been codified for 20 years. During 2010-2012, contemporary management needs drove an age structure-driven method of estimating cohort harvest rates using reported age structures gathered over the last 20 years (n>20,000 rams). Using reported ages at harvest over the life span of any cohort of harvested rams allows calculation of the harvest rate during the first year of age-legality. Beginning with the obvious realization that legal rams from age 8-years and up were alive until they were killed, and adding the number of rams harvested in successive years from each age-cohort harvested over the life span of harvested rams from that cohort allows calculation of the minimum cohort harvest percentage upon becoming legal. These analyses indicate ram harvest rates during the first year of age-defined harvest liability for rams of any given cohort during the first 15 years of Alaska's full-curl harvest period have ranged from 40% to 60% of the minimum number of age-legal rams known with certainty (because we killed them) to be present when each cohort became age-legal for harvest. Age distributions among sheep harvested by both resident and nonresident hunters match the generalized survival templates from unhunted wild sheep populations, thus calling into question the folklore associated with ram hunter selectivity. There has been no change in per capita hunter effort for successful or unsuccessful hunters regardless of residency over the last 20 years in Alaska. The data suggest that restricting nonresident opportunities to favor resident hunters or reducing harvests to mitigate perceived threats to ram social biology or the ultimate outcome of the average sheep hunt are biologically unnecessary at this time. Management context and implications are discussed.

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***Key words*:** age structure, ram harvests, Dall sheep, *Ovis dalli*, Alaska.

Wildlife managers tasked with allocating harvests of wild mountain sheep are necessarily concerned with harvest rates. In practice, harvest objectives in most states and provinces are set based on aerial surveys or formulae which extrapolate numbers or percentages of harvestable wild rams based on survey data. Aerial surveys for Alaskan Dall sheep (*Ovis dalli*) are notoriously variable, and reflect only external population dynamics (Heimer 1994). The actual harvest rate is seldom known or knowable, and the impact of trophy hunting on wild mountain sheep genetics in the absence of definitive harvest rate data has been vigorously debated (Heimer et al 2004, Coltman et al 2005, Festa-Bianchet et al 2006). A similar controversy involving a perceived need for "genetic conservation" in the absence of a quantifiable harvest rate has also occurred in Alaska (Heimer 2005).

For approximately 50 years, harvest of Dall rams in Alaska has been open to anyone purchasing a license and requesting (for residents) or purchasing (for non-residents) the mandatory report form/tag. Some limited-entry permit areas have been established in Alaska, but the dominant management scheme in Alaska has always been open-but-regulated-by-bag-limit hunting opportunity available to both residents and non-residents. Throughout this time period, the legal ram definition has changed from 3/4 curl to 7/8 curl, and ultimately full-curl rams. For the last 20 years, a legal ram in Alaska has been defined as a ram, the tip of whose horn has grown through 360 degrees of a circle as seen from the side, is

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broomed (broken) on both sides, or has reached a minimum age of eight years (Heimer and Watson 1990). Alaska's full curl regulation was justified biologically because of Dall sheep population performance where ram age structures containing significant mature ram influence on breeding were significantly correlated with higher ovulation rates in ewes, greater reproductive synchrony, higher lamb production, better apparent survival, and empirically measured increases in ram harvests when compared with populations lacking mature rams (Heimer and Watson 1986, 1990). Some subsistence ewe hunting is allowed (Heimer 1999a), but is insignificant for purposes of this paper.

Dall ram hunting in Alaska has always been associated with the data-free assumption that Dall ram hunters overwhelmingly select the largest rams rather than taking legal rams across all age and size classes as they occur in a huntable population. This assumption will be evaluated in this paper.

Starting in the early 1990s, changes in weather (Heimer 1995, Pfeifer et al 2010) and predator abundance (Heimer 1999b) correlated with declining Dall sheep numbers throughout Alaska. Coyote predation over the last 20 years seems particularly significant because of the expansion of coyotes into sheep habitats which had previously been essentially coyote-free. Coyote/Dall sheep predation studies (Scotten 1998, Arthur and Prugh 2010) indicated that coyotes were responsible for between 25% and 12% of Dall lamb mortalities. Availability of alternate prey (primarily hares) seemed to transiently lessen the impact on Dall sheep Nevertheless, the emergence of coyotes as a significant predator on Dall sheep lambs temporally coincided with overall population declines. The apparent declines in Dall sheep numbers were of natural concern to resident hunters heir to the developed culture of Alaskan Dall ram hunting. Here's why:

Residents reasoned that if sheep numbers were in decline, competition for quality rams and hunting experiences would increase. Here, they presumed that Dall ram hunter numbers would remain stable or increase. Activist resident hunters also alleged that the presumed relative scarcity of legal or trophy rams was a compounded by non-resident hunting. Guided non-resident hunters have taken about 40% of the Dall ram harvest since Alaskan harvest statistics were first compiled beginning in 1967. The resident hunter suspicion that non-resident hunting was a significant cause of perceived ram scarcity was amplified by the impression that non-resident hunters (who must have a registered guide under Alaskan law) were taking the largest rams in the population. In addition, the interested resident hunters hoped to establish management practices (e.g. preference points, restriction of non-residents, increased non-resident fees, and *de facto* relative enhanced resident harvest allocation) borrowed from other jurisdictions they deemed more progressive than the existing Alaska system.

The primarily negative sentiment expressed by these resident hunters was focused on professional guides, particularly non-resident guides. In Alaska, guiding is considered a commercial enterprise, and non-residents needn't establish Alaska residence to engage in commerce. They must simply purchase the necessary commercial licenses. This results in the rather paradoxical situation where a non-resident may guide for a species (say Dall sheep) he/she may not legally harvest for him/herself. This inconsistency troubles many resident hunters. Every Alaskan resident seems to have his/her own personal or shared story of negative interaction with the guiding industry.

The cumulative effect of these perceptions and perspectives has been that "everyone" has come to accept the notion that legal rams were becoming increasingly scarce for the proposed reasons, and that the harvest rate was approaching 100% of each cohort as it became legal (Heimer 2005). Guides and non-residents were assigned primary blame because guided non-resident hunting success approaches an average of 70% while resident success has averaged about 30% over time, and may arguably be seen as trending downward recently. Naturally, resident hunters wanted to eliminate the competition they perceived from guides and guided non-residents.

Until the resident hunter's push to severely reduce non-resident hunting elevated the harvest allocation issue, Alaska's Dall sheep managers were content to manage according to established tradition, public perception, and area management

biologist impressions. A compounding factor was the perception of some Alaskan management biologists that selective trophy harvest was altering horn growth genetics in Alaska's Dall ram populations (Heimer 2006). These factors, acting in concert, drove the development of a technique for assessing known cohort harvest rates from reported harvest age structure. The technique and the management results to date are reported in this paper.

METHODS

Harvest Rate:

When Alaska's legal definition of a full curl ram was codified more than 20 years ago, it included an "or eight years of age" component. This was never intended to be a field identifier of legal rams because of the risk to the hunter of incorrectly aging rams in the field. Rather, the "or eight years old" provision was a 'safety net' allowing hunters to harvest mature rams which might not be full curl or broomed on both sides. Maximizing harvests in Alaska is important because Alaska's constitution (Article VIII) and the Alaska Statutes (Title 16) prescribe maximal, sustainable harvests in the interests of the economy and general well-being of the State of Alaska.

Hunters have been required to report the age of their harvested rams from counting horn growth annuli for the last 20 years. This they have done with acceptable accuracy based on comparative sampling of about a quarter of the harvest for five years following establishment of the full curl regulation. Sheep specialists (W. Heimer and D. Harkness) aged horns in taxidermy shops, compared the ages with those reported by hunters, and established that the hunters were sufficiently accurate for management purposes (Heimer, Alaska Department of Fish and Game, unpublished data). As a result, a data base of >20,000 ram ages was accumulated during the ensuing 20 years. The ages, harvest locations, resident status of the hunter, and horn sizes (base diameter and length) were available in this huge data base. The data base was sorted by harvest year, ram age, horn length, harvest location, and residency of the reporting hunter. Analysis was at the Game Management Subunit level, which separated Alaska's huntable Dall sheep into 16 subpopulations with the estimated total number of Dall sheep in the aggregate ranging from approximately 50,000 to 75,000, and declining toward 50,000 Dall sheep over the sample period.

In considering the management issue, the primary analyst, J. Want, noted that the entry age ram harvest rate from any ram cohort could be calculated for that cohort once rams of that age-cohort dropped out of the reported harvest due to all having either been harvested or died of old age. Dall rams in unhunted populations have a generally accepted 95% life expectancy of 12 years (Deevey 1947), but older rams have been harvested throughout Alaska. For purposes of this analysis, a mean maximal life expectancy for Dall rams was assumed to be 13 years of age. Hence the known cohort harvest rates were accurately calculable back to the year each cohort reached legal harvestable age after five years of harvest liability had elapsed. J. Want observed that every ram was technically legal-for-harvest at age eight regardless of its degree of horn development or brooming status. He then postulated that, technically, every ram harvested at an age greater than eight years had been available for harvest from the opening day of sheep season the year he turned eight years old. Thus, J. Want summed the number of rams harvested in subsequent years (which had survived from age eight years until they were harvested) and divided it into the reported harvest from that ram cohort at its first year of harvest eligibility. Multiplied by 100, this quotient gave the harvest rate in percent of that individual cohort during its first year of being legal for harvest.

Table 1 illustrates this rationale from Game Management Unit 12, the Northern Wrangell Mountains, a long-term, high volume producer of full-curl rams in Alaska. Game Management Unit 12 was representative of the amazingly uniform pattern of harvest across all of Alaska's Dall sheep habitats.

Dall Ram Survival

To test the assumption that hunters were killing "all of the legal rams" as they became legal, life tables (see Deevey 1947) were constructed and survival rates calculated as had been done by Deevey (1947) for Murie's (1944) data from

Table 1. Cohort age distributions from Alaska's Game Management Unit 12 from 19900- 2009. Shaded portion represents age-legal harvest from known cohort size.

Dall Ram Harvest GMU 12												Age Legal Total Harvest	Could Have Harvested	% of Available Harveste
Year/Age	5	6	7	8	9	10	11	12	13	14	15			
2009		13	32	23	17	15	10	3	3	1		72		
2008	4	10	12	20	36	29	10	2	2			99		
2007	4	5	9	41	41	25	16	3	1			127		
2006		4	21	47	38	27	11	3	1			127		
2005	2	6	27	49	34	20	9	2		1		115		
2004	3	14	37	44	37	19	4	1				105		
2003	1	4	8	58	65	23	7	1				154	269	57%
2002		3	20	51	41	22	4			1		119	256	46%
2001	4	3	20	45	24	32	5	2	1	1		110	218	50%
2000		2	8	48	22	23	8	6	1			108	210	51%
1999		3	12	39	55	32	12	8	1			147	255	58%
1998		3	14	40	58	45	20	3	4			170	326	52%
1997		2	12	39	31	43	13	7	2			135	338	40%
1996	2	3	20	61	42	31	12	6		1	1	154	353	44%
1995		2	16	67	63	29	11	4		1		175	371	47%
1994	2	6	27	48	49	26	10	3	2		1	139	328	42%
1993		8	23	58	53	22	14	1				148	317	47%
1992	3	6	25	63	42	22	10	6	1			144	302	48%
1991	2	11	44	74	71	45	18	10	4			222	363	61%
1990	5	13	38	55	46	42	27		4	1	1	176	387	45%

Mount McKinley National Park, Alaska and by Heimer and Watson for the Eastern Alaska Range (Game Management Unit 20A) (Heimer and Watson 1986, 1990).

If the assumption that hunters were literally killing "all the legal rams" as they became legal were correct, the survival curve should have indicated "no survival" after age eight (see Fig. 1).

Survival curves were constructed for harvested ram populations in all 16 sub-population ranges using the "Murie/Deevey survival plot," and compared with the assumption of total mortality (a vertical drop to zero survival at age eight) based on the assertion that, "We're killing them all when they become legal." Figure 1 also illustrates the contrast between the expected survival among Dall rams and that mortality predicted by the total harvest at legal age assumption.

RESULTS

Resident and Non-resident Comparisons

Resident and non-resident comparisons from mandatory hunter reports: percent success, mean horn size, ram age, and hunt length by residency over the last 20 years:

***Hunter participation*:** Overall participation in Dall sheep hunting has steadily declined by about 30% over the last 20 years. The major decline has been in hunting by resident Alaskans. Non-resident hunting has remained relatively constant. Hence, the common assumption that hunting pressure would remain stable or increase over time was shown to be false.

Hunter success: Although resident hunting success may have declined slightly from the long-term mean of 30% to the upper 20%, there is sufficient variability that defining a trend is questionable. Resident hunter success has remained stable, at around 30% over the last 20 years. Non-resident hunter success seems stable as well, averaging in the neighborhood of 70% for guided non-residents over the same time period.

Horn size: Mean horn sizes for resident and guided non-resident hunters were virtually identical. This has been the stable pattern for the last 20 years. There was so little difference or change in horn sizes for residents and non-residents (they were virtually identical) that no statistics quantifying differences were run.

***Ram ages*:** Mean ram ages by area and year were virtually identical for residents and non-residents throughout the 20-year sampling period.

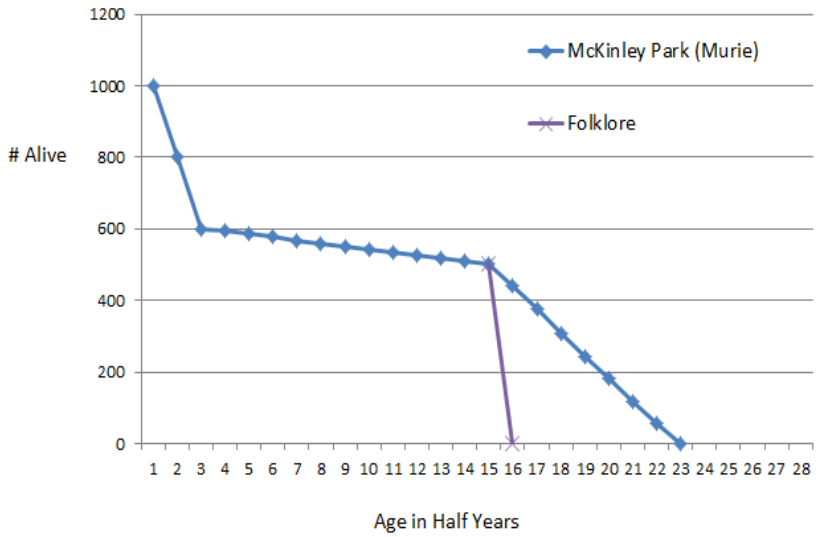

Fig. 1. Survival of unhunted Dall rams from Murie's data in McKinley Park, Alaska compared with hypothetical "folklore" assumption of total harvest upon becoming a legal ram in hunted populations of Alaska 1989-2009.

Hunter effort (length of hunt): Guided non-residents have always hunted longer than residents. Hunter effort did not change appreciably over the last 20 years for either group as sheep populations declined.

Harvest Rate Determined From Age Structure

The harvest rate calculations failed to support the assumption that harvest rates were approaching 100% at legal age. The most heavily hunted area in Alaska yielded a calculated first-year-legal harvest rate of 60% of known age-legal ram cohorts. The most lightly hunted area was harvested at 40 % of emerging age-legal ram cohorts, and the overall statewide average indicated a calculated harvest rate of about 50% of what could be known, with certainty, to have become age-available in that cohort when it became legal for harvest. Percent harvests from limited-entry permit hunt areas also fell within this range, as did areas where "genetic conservation" has been proposed. During any given year from 1989 through 2006, hunters averaged taking about half of the age-legal rams the year they became legal for harvest. Cohort harvest rates for 2006-2012 are not yet calculable, but appear to be following this general pattern.

Survival Rates of Rams in Hunted Populations

No populations of rams in Alaska, including those considered most heavily hunted, approached the "total harvest mortality" model. Actual survivorship curves of harvested rams (Fig. 2) bracketed the "Murie/Deevey unhunted ram survival curve" with the highest survival being recorded from the Northeastern Brooks Range. Ram survival in this area was significantly better than indicated by Murie's data from McKinley Park. The lowest survival rate was recorded from the Talkeetna Mountains. The survival rate from this area was significantly lower than reported from McKinley Park by Murie (1944).

Overall Results Summary

The data indicated the 'total Dall ram harvest assumption' which was generally accepted by managers and regulators is false, and that no restrictive management action is currently necessary to limit overharvesting of rams. There was no material difference in ram age or size between resident and guided non-resident hunters over the 20-year sample period. Ram age/size and harvest parameters appear to have changed little over the last two decades. Cumulative cohort harvest rates averaged about 50% per year rather than approaching a "total" harvest at legal age. The striking observed change has been an approximate 30% decrease in resident hunter effort.

Corroborating Evidence

Seven years of data collected pursuant to Alaska's sealing (or plugging) of all harvested Dall rams in Alaska (~6,000 rams) were analyzed independent of the larger sample. ADF&G biologists determined the ages of all these rams in the sealing (plugging) process. Although sample size was notably smaller, the results from this

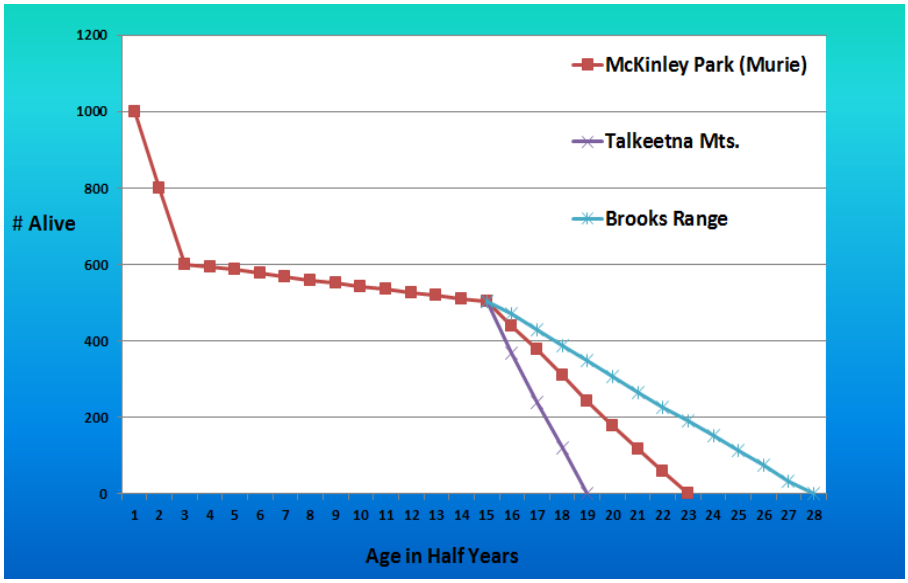

Fig. 2. Extreme survival rate ranges among full-curl Dall rams harvested since 1989 compared with Murie's data from McKinley Park, Alaska circa 1933.

subsample of the total harvest agreed almost exactly with the results from the overall sample.

DISCUSSION

Traditional Criticisms

The methodology for estimating harvest rates is strictly harvested cohort-size based. This could introduce some error because of variations in cohort size. Cohort size at legal age is primarily a function of initial birth-cohort size, but is also affected subsequent survival to harvestable age. However, the overall consistency of harvest rates for individual cohorts over the many harvest areas in Alaska and across the 20-year time span argues for the robustness of this approach to estimating overall harvest rate by averaging cohort harvest rates over time for each area.

The individual cohort harvest rate data were pooled to produce a 20-year average survival rate for each subpopulation. This approach was chosen to assure an adequate sample sizes and smooth individual-year variations. Consequently, these plots are heir to the many criticisms which have attended Deevey's approach to Murie's data for decades (Murphy and Whitten 1976). However, the survival rates estimated in this case were from essentially "closed" (or known) ram populations. This is because the only rams which entered the sample were "marked" by being shot by hunters, and constituted the entire sample.

Variations in Sheep Abundance and Hunter Numbers

While harvest rates within the cohort-based data were strikingly consistent, the interaction of declining Dall sheep populations (from an estimated statewide population of 75,000 in 1991 to an estimated 50,000 at present) during the 20-year sample period with changes in resident hunting pressure should not be overlooked. In the GMU 12 data example (Table 1), there appears to be an upward trend in percent harvest starting about 1999. This probably reflects lower cohort size in relation to hunter pressure because ram cohorts which should have entered the harvestable-age population in 1999 would have been born eight years earlier, in 1991. These dates coincide with generally increased environmental resistance due to the onset of an apparent unfavorable weather cycle (see Hik and Carey 2000). It should also be noted that the presence of coyotes and cessation of wolf control coincided with the period of difficult weather. There is more to be gleaned from this set of harvest data than has been covered here. This should not be considered the last word on this issue.

Review of Specific Critiques Already Registered

Dall rams in Alaska are legally harvestable when eight years of age (determined by horn annuli), if both horns are broomed (broken, not merely worn), or if the horn tip has grown through 360 degrees of a circle as seen from the side. Due to natural variability (Heimer and Smith 1975), it is obvious that (even though full curl at eight years is the norm) not all rams reach full curl of horn development on their eighth birthday. Some rams,

particularly those with smaller diameter curls, reach full curl before age eight, and some rams may never quite make full curl. Brooming in Dall rams is less common and less extensive than is typical among bighorns (Geist 1971, Heimer, confirmatory unpublished data).

This lack of uniformity coupled with the strong oral tradition associated with Dall ram hunting culture has occasioned some criticism of this age-structure/harvest rate methodology. Some individuals have argued that hunters don't select rams on the basis of age, but rather on the basis of horn development. I acknowledge this is the case, but fail to see how that compromises these estimates of cohort harvest rates. I argue that the calculated harvest rates should be seriously considered by managers because these rates deal only with what we know with certainty was in the population because we eventually killed it. Rams that may have been in any individual cohort, but were never killed by hunters do not enter into these calculations. Because Alaska Dall ram hunters presently seem only able to kill about half of any cohort the year it becomes legal, and cohort harvest was never total for any year thereafter (save the final year the cohort was represented in the sample), it seems probable there are some rams in every cohort that live and die of old age without ever entering our sample. If so, the overall harvest rates may actually be lower than calculated. There are certainly mortality factors beyond (and probably more significant) than hunting by humans.

Management Relevance

The finding of no definable difference in horn size (or age) between rams taken by resident hunters and guided non-residents indicates the legendary selectivity credited to both resident and guided non-resident Alaskan Dall ram hunters is unsupportable by data. Comparison of mean-age distributions between both groups of hunters force toward the purposeful suggestion that ram harvest choices over the last 20 years have been more random than selective. Certainly, there are Dall ram hunters who selectively harvest only very large rams. However, the overall data set indicates both resident and non-resident hunters took rams in what would be expected (from both age and horn length) to occur in a random sampling from normal distributions of horn size and age at and above the full curl minimum.

Similarly, horn length distributions within each harvested age class were striking in the uniform "normality" of their bell-shaped distributions. That is, there was no evidence that hunters were effectively selecting (by killing) the larger rams from each age class. These data appear to obviate the negative implications expanded from bighorn sheep to Alaskan Dall rams extrapolated from the original work of Coltman *et al* (2005). There is no reason to suspect that harvest across all horn lengths in every specific age-cohort should be linked to theorized genetic damage due to full-curl "trophy" hunting as it is managed in Alaska.

A management inconvenience associated with this method of calculating cohort harvest rate is that the first-year harvest rate cannot be accurately calculated for any given age cohort until that cohort disappears from the age distribution. This generally occurs at least five years after the year that cohort first became age-legal for harvest. That is, a definitive calculation of initially-legal year cohort harvest rate can't be accomplished until all the rams in that cohort are no longer reported in the harvest. Hence, "this year's" initial-cohort harvest rate cannot be calculated. However, the overall consistency of the data set seems to argue that barring unusual biological events (which do happen), Dall ram harvests in Alaska appear to have been essentially random among legal rams as well as sufficiently conservative that this lightly harvested resource remains sufficiently resilient to preclude the need for rapid management responses to transient drops in numbers of legal rams seen on aerial surveys.

After all, if rams are generally not legal for harvest until they are eight years old, lamb production failures will not be reflected in harvest till eight years later. Hence, consistent monitoring of lamb production/yearling survival should indicate an upcoming "shortage" of legal rams and its seriousness well ahead of necessary management actions. Additionally, severe weather events chronicled to date seem to affect lamb production and older-age cohorts on the mountain most severely (Watson and Heimer 1984). Certainly, monitoring production, survival to yearling age, adult survival, weather, and predation will indicate potential harvest scarcities

and trends well ahead (eight years in the case of failed lamb productions) of changes inferred from harvest data.

Alaska's Constitution and Statutes call for maximizing harvests under the sustained yield principle. The intent of these mandates is to maximize benefits to the economy and general well-being of the state (Alaska Statutes Title 16). Currently, the harvest of Dall rams has an estimated economic annual benefit of about $20 million to the state of Alaska. Of this total, the Pittman-Robertson funding match of federal conservation dollars (about $11 million annually), is a result of non-resident participation in Dall ram hunting. A non-resident license costs $85, and a non-resident sheep tag costs $425 for citizens of the USA. Costs to foreigners are greater. Consequently, unless there is a conservation issue that requires decreased harvests, it is not in the best interests of the economy of the state ($20 million per year or the ADF&G budget $11 million per year) to curtail non-resident hunting. Neither would it be beneficial for the guiding industry which provides the bulk of other economic benefit deriving from Dall ram hunting in Alaska. If the range of maximal known harvest rates has averaged 50% (ranging from 40% to 60% of any age-legal cohort for the last 15- and possibly 20 years), it seems unlikely there is a conservation issue associated with Dall ram hunting as currently managed in Alaska.

A Final Biological Note

It should be noted that the range of survival rates in hunted populations of rams (from Fig. 2) bracketed the survival rate of Dall rams in unhunted McKinley Park during the late 1930s. The poorest survival of any subpopulation in Alaska was from the Talkeetna Mountains. Survival there was notably lower than that of unhunted rams indicated by Murie's data from McKinley Park. The greatest survival was seen among rams from the northeastern Brooks Range.

Ultimately, survival rate is determined by overall environmental resistance, which varies from area to area and over time with weather and predation influences being the more powerful components of environmental resistance. Consequently, I can conceive no valid reason to assume that the survival rate of Dall sheep anywhere in Alaska should match that calculated from McKinley Park 70 years ago. Not having any better choice, I elected to use the calculated survival from birth to seven years of age from Deevey's 1947 actuarial analysis of Murie's data published in 1944. There may be some weakness associated with this choice, but that should not affect the cohort survival curves from age eight years onward. While hunting mortality is most likely additive among full curl Dall rams, it does not seem to be the dominant force in Dall ram survival where rams are hunted in Alaska. As important as full-curl Dall ram hunting is to hunters, managers, and the economy of Alaska, it doesn't seem that influential on Alaska's Dall sheep populations as currently managed.

ADDENDUM

Results of these analytical exercises were presented to the Alaska Guide and Commercial Services Board (which regulates guiding) and the Alaska Board of Game as relevant to proposals to drastically restrict non-resident (and some resident) hunting based on the premise that harvest at legal age/size was close to 100%. After these data were reviewed, the Alaska Board of Game made no changes to Dall sheep hunting regulations. Non-resident hunting is still open to anyone who wants to go, as long as they can afford the license, tag fee, and the hire of a registered guide as required by law. Similarly, there were no additional restrictions on (or liberalization of) resident hunting. The Alaska Board of Game retained Alaska's full-curl law as it currently existed. This, however, is certainly not the end of the story. Politics and special-interest pressure may yet alter Alaska's Dall ram harvest management program.

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