

SIMULATED FIELD TEST OF AGE AND SEX CLASSIFICATION CRITERIA FOR MOUNTAIN GOATS

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Abstract: A simulated field test of criteria for age and sex classification of mountain goats was conducted at the Sixth Biennial Symposium of the Northern Wild Sheep and Goat Council. After a 20 minute pictorial presentation of the horn, facial and pelage characteristics pertinent to field identification of 6 age/sex classes of mountain goats, a series of pictures of 13 mountain goats were projected. Participants were asked to identify the age/sex class of each goat on a test form. Sixty-seven percent of the answers were correct. Sex was correctly identified (81.0%) significantly more often than age (71.1%). Tests were stratified by the participants' previous experience observing or classifying mountain goats. Level of previous experience was reflected in accuracy of test scores regarding ages of goats, but was not significantly different among experience levels for accuracy of sex identification. Biases associated with the test, an explanation of test results, and applicability of these classification criteria to research and management of mountain goats are discussed.

The need for wildlife managers to evaluate reproductive success, subadult survivorship, sex ratios, and recruitment rates of mountain goat populations has been voiced by several authors (Hebert and Turnbull 1977, Bailey and Johnson 1977, and Macgregor 1977). Assessment of these parameters requires sufficient population composition data. Standardized criteria for collection of such data, both within and among states and provinces, will improve our understanding of mountain goat population dynamics and hierarchical behavior systems, facilitate comparisons of populations, and enhance management efforts.

A simulated field test of criteria for age and sex classification of mountain goats was conducted at the Sixth Biennial Symposium of the Northern Wild Sheep and Goat Council. The criteria consisted of quantitative justifications and narrative descriptions of six age/sex classes (kid, yearling, 2-year old male, 2-year old female, adult male, adult female) accompanied by pen and ink illustrations of each class (Smith 1988). The objective was to test the ability of biologists, wildlife managers, students, and lay persons to apply these criteria in a simulated field situation.

METHODS

During a 20 minute slide discussion, the classification criteria were presented to the audience. At the beginning of the presentation, the audience was provided test forms (Fig. 1) and informed that they would be participating in a simulated field test after the presentation. The test

Simulated Field Classification of American Mountain Goats
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Age/Sex Classes

K = Kid 2YM = 2 year-old male AM = Adult male
Y = Yearling 2YF = 2 year-old female AF = Adult female

1. _____ 7. _____
2. _____ 8. _____
3. _____ 9. _____
4. _____ 10. _____
5. _____ 11. _____
6. _____ 12. _____
 13. _____

Have you had past experience observing (please circle)
mountain goats? classifying

- None
 Some, non-technical (personal interest only)
 Some, technical (a small part of my professional work)
 Considerable, technical (regular part of my past or
present work)
 Other _____

Do you believe that with more experience you could use these
classification criteria to identify age/sex classes of mountain
goats?

Yes No Unsure

Occupation/Affiliation: _____

OPTIONAL

Name _____

Address _____

Fig. 1. Test form for simulated field classification of mountain goats.

consisted of a series of slides of close-up photographs of 13 different mountain goats. One to 3 mountain goats, which the audience members were asked to identify by age/sex class, appeared in each slide. A set of 1 to 3 slides (generally 2) offering different views (frontal and lateral) of the goats were shown. The audience was given approximately 30 seconds to classify the goat(s) on each set of slides.

The results of the tests were analyzed using one-way analysis of variance tests.

RESULTS

Eighty-three Canadians and Americans completed the test. Twenty-three (28%) had at least some previous experience classifying mountain goats in the field, although comments on the forms indicated the experience was generally limited to kids, yearlings, and adults and classifications were mostly from aircraft. Another 41 (49%) had some experience observing or censusing mountain goats; and 19 (23%) had no experience at all observing mountain goats (Table 1).

Table 1. Test scores from the simulate field test of age and sex classification of mountain goats.

Observer's previous level of experience	Percent correct answers (\bar{x} + sd)			
	N	Age/sex class	Age class only	Sex only
Classifying Goats	23	76.3 \pm 12.3	79.0 \pm 11.4	86.8 \pm 9.8
Observing or Censusing Goats	41	66.2 \pm 13.8	70.7 \pm 12.2	79.9 \pm 16.1
None	19	57.6 \pm 13.2	62.7 \pm 12.9	76.5 \pm 17.7
Total	83	67.0 \pm 14.7	71.1 \pm 13.3	81.0 \pm 15.3

For the 83 tests combined, 67.0% of the 13 mountain goats were placed in the correct age/sex class. I also analyzed test answers to determine whether the age (kid, yearling, 2-year old, and adult) or the sex of the mountain goats were most difficult to correctly identify. For the 83 tests combined, sex was correctly identified (81.0%) significantly more often ($F = 19.624$, $df = 1$, $P < 0.001$) than was age (71.1%).

Next I compared test results by experience level of observers. There were significant differences between the three experience levels' mean test scores for age/sex class ($F = 10.542$, $df = 2$, $P < 0.001$), age class ($F = 9.590$, $df = 2$, $P < 0.001$), but not sex ($F = 2.665$, $df = 2$, $P < 0.08$). At all three levels of observer experience sex of goats was significantly more often identified correctly than age (no experience: $F =$

7.736, $df = 1$, $P < 0.009$; experience observing: $F = 8.503$, $df = 1$, $P < 0.001$; experience classifying: $F = 6.125$, $df = 1$, $P < 0.002$).

Kids and adult males were most often aged correctly. Two-year olds of both sexes were most often aged incorrectly (Table 2).

Table 2. Percent correct answers for each age/sex class from the simulated field test.

Age/sex class	Percent correct answers
Kid	80.8
Yearling	65.7
Two-Year Old Male	34.4
Two-Year Old Female	35.0
Adult Male	84.4
Adult Female	71.9

DISCUSSION

The purpose of this exercise was to test the ability of observers of varying experience levels to classify mountain goats by age and sex. The positive biases of the simulation compared to a field situation were:

- 1) Optimum environmental conditions for observers,
- 2) Stationary subjects to observe and classify, and
- 3) Similar observation conditions (facilitating valid comparisons between observers of varying experience levels).

The negative biases of the simulation were:

- 1) Limited exposure to the classification criteria,
- 2) Lack of in-hand illustrations and other instructive material for reference,
- 3) Observers were given a brief time and sometimes only view of the subjects they were asked to classify,
- 4) Fifty-four percent of the subjects were shown individually rather than in groups (which is more typical of field situations) that permits comparisons of subjects,

- 5) After the simulation, several participants stated that they wished they had moved closer to the front of the long, narrow conference room because horn characteristics were difficult to distinguish from the back of the room,
- 6) Non-responses were counted as wrong answers.

Sex of the mountain goats was correctly identified significantly more often than the age despite the fact that sex was marked incorrect not only when the wrong sex was given but also when the correct answer required the sex of the goat but a participant's answer did not include it (e.g., sex was marked wrong when participant's answer was "yearling" and correct answer was 2-year old female).

Accuracy of age identification was significantly related to the previous experience level of the observer. However, the relationship between previous experience and accuracy of sex identification was not significant at $P = 0.05$, possibly because only 2 characteristics (horn curvature and basal circumference) require evaluation to determine sex whereas several criteria help discriminate age. More likely, the discrepancy between accuracy of age versus sex classification occurred because:

- 1) There are 4 age classes in Smith's (1988) classification versus 2 sexes,
- 2) Several participants who had previous experience classifying mountain goats told me that the simulation was difficult for them because they had previously only classified goats in summer (when pelage characteristics are radically different and body and horn sizes of sub-adult classes are smaller than in late fall, winter, and spring), and
- 3) The criteria for sex classification have been known and used for many years whereas very few technicians have classified all 4 age classes.

Although a computer simulation classified 91% of mountain goats correctly by age (Smith 1988), compared to only 71% by participants in this simulation, I believe that accuracies >90% can be achieved under field conditions. With more experience, more observation time, several views of subjects, comparisons with adjacent goats, and age specific behavioral information (Chadwick 1983, Geist 1964), observers can become adept at classifying ages of mountain goats. Likewise, sexually dimorphic behavior of mountain goats helps determine their sexes.

Finally, participants in this simulated field test were asked if they believed that with more experience they could use the classification criteria to identify age/sex classes of mountain goats. Four (4.8%) did not respond, 2 (2.4%) said no, 7 (8.4%) were unsure, and 70 (84.3%) answered yes.

APPLICATION

It is important that researchers and wildlife managers have access

to techniques and training that enable accurate age/sex classification of mountain goats. Researchers can only understand population dynamics, the context of social behavior, and relationships between the two if they are able to distinguish the sexes, and subadult age classes from adults. Managers need data regarding a goat herd's composition as well as its size to determine if and how it may be harvested. Managers also need to provide adequate instructional materials and/or educational opportunities to hunting permittees so that flexible, innovative harvest regulations can be implemented. Hunters must be provided with the prerequisite knowledge for compliance with regulations.

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