

MOUNTAIN GOAT STATUS AND MANAGEMENT IN IDAHO

DALE E. TOWEILL, Idaho Department of Fish and Game, PO Box 25, Boise, Idaho
83707, USA

Abstract: Mountain goats (*Oreamnos americanus*) are native to Idaho, the southernmost portion of their recent distribution in North America. Mountain goat populations apparently declined sharply early in the late nineteenth and early twentieth centuries due to unregulated hunting. The first survey of known mountain goats ranges indicated approximately 2,785 animals in 1955. Populations have increased only slightly over the 5 decades since, despite efforts to restore populations through transplants into native ranges and unoccupied suitable habitat. Mountain goat populations are believed to have reached a peak of 3,090 animals in 1990, and have declined steadily since. Currently mountain goat populations are at the lowest levels on record, with an estimated 2,590 animals remaining in Idaho. Several recent declines occurred suddenly, over <3 years, and resulted in near extirpation of some herds. Causes of recent declines are not well understood. The best-monitored mountain goat population in Idaho, the Palisades herd, demonstrated early and rapid population growth followed a population crash and near extirpation. Mountain goats are a game animal in Idaho. Harvest is strictly controlled by permit only, and only when populations exceed a threshold size of >50 adult animals as revealed by population survey data. Harvest is limited to <5% of the adults in each herd. Approximately 50-90 permits have been provided annually during the period 1982-present. Hunters are limited to harvest of 1 mountain goat in their lifetime. Hunters may harvest a mountain goat of either sex. Analysis of annual hunter harvest data indicate that hunter success rates are uniformly high (~80%), and that hunter success rates, male:female ratios among harvested animals, and mean age of harvested animals are all poor indicators of population trends.

Key words: mountain goat, *Oreamnos*, management, hunting.

Mountain goats occur only in northwestern North America. The largest populations occur in British Columbia and Alaska; populations in Idaho represent the southernmost limits of natural distribution although recent transplants have extended the range of this species into southern Utah and Colorado (Shacklton 1997).

DISTRIBUTION AND STATUS IN IDAHO

Information on the prehistoric distribution of mountain goats in Idaho is limited, but mountain goats are believed to have been distributed throughout northern and central Idaho (Fig. 1). Mountain goat bones have been recovered from 2 separate layers of the Bernard Creek rock shelter, an archaeological site within in the Hells Canyon Natural Recreation Area of Idaho (Randolph and Dahlstrom 1977). The bones were skeletal and fragmented, suggesting that the animals represented

were consumed on site; radio-carbon dating placed their age at 300 to 1,000 years old (Reagan and Womack 1981). A corresponding, but somewhat older (500-1,500 years old) site was reported on the Oregon side of Hells Canyon on Camp Creek (Leonhardy and Thompson 1991). Corless (1990), writing about the Weiser branch of the Shoshone Tribe, reported that they hunted mountain goats in the Seven Devils Mountains above Hells Canyon.

There are few written records of mountain goats in Idaho prior to 1950. Narratives describing mountain goat range in Idaho are scarce, and narratives are confusing because female bighorn sheep were often called goats or ibex. Hallock (1879, quoted in Lyman 1998) wrote “The White Goat is confined to the loftiest peaks of the Rocky Mountains: it is not known south of Colorado, and is probably rare south of the Washington Territory”. Owen Wister wrote in *The White Goat and His Ways* (1904) “In Alaska and British Columbia we find the goat, and in northwest Montana, and in Idaho, but only in spots ...”; more specifically, he says that mountain goats may be found as far south as the ‘Saw Tooth Mountains’ in Idaho.

Other early records of mountain goats in Idaho include the Stanley Lake basin (Stanley Lake, Alturus Lake, and Boulder Peak), Loon Creek, and mountains along the Salmon River (Davis 1939) and “the high peaks [Cabinet and Selkirk Mountains?] of northern Idaho” (Rust 1946).

In May 1949, Stuart Brandborg began a year of intensive field work to document aspects of mountain goat ecology near

the mouth of the Middle Fork of the Salmon River under the auspices of the Idaho Cooperative Wildlife Research Unit. Brandborg’s initial work was expanded by the Idaho Department of Fish and Game in September 1950, when he was directed to conduct census and distribution studies of mountain goats in the entire Salmon River drainage and Selkirk Mountain range. This project, which relied primarily on ground surveys, was continued through 1952 (Brandborg 1955). The statewide population estimate of 2,785 mountain goats distributed among 88 peaks and drainages was the first comprehensive estimate of mountain goat numbers in Idaho.

Although Brandborg’s 1955 estimate of 2,785 mountain goats in Idaho was based on ‘liberal’ estimates (Kuck 1977a), it is very comparable to subsequent information (Fig. 2). Kuck (1977a) believed that there were 2,200 to 2,500 mountain goats in Idaho in 1977, and statewide population assessments by wildlife managers with the Idaho Department of Fish and Game estimated 2,415 in 1981 (Idaho Department of Fish and Game 1980) and 2,765 in 1985 (Kuck and Pehrson 1985), 3,060 in 1990 (Hayden *et al.* 1990). Populations appear to have remained nearly constant through 2000, when the statewide population was estimated at 2,825 (Idaho Department of Fish and Game, file data). However, mountain goat populations may have declined between 2000 and 2004; biologist’s estimates following spring aerial surveys in 2004 totaled less than 2,590 mountain goats (Idaho Department of Fish and Game, file data).

Despite the relative consistency in estimated population size, there have been dramatic regional fluctuations in mountain goat populations between 1955 and 2004. Brandborg (1955) estimated that 195 mountain goats occupied the Selkirk Range of the Idaho Panhandle adjacent to northeastern Washington, and an additional 25 mountain goats were reported in the Cabinet Mountain adjacent to western Montana. By 1977 these herds had dwindled to approximately 40 animals (Kuck 1977a), and despite closure of hunting in 1971 and over three decades of protection, only about 50 mountain goats were present in 2003 (Toweill 2003). Declines are now believed to have been, at least in part, due to over-harvest.

In central Idaho, mountain goat herds declined slowly but steadily from 1960-1975, years when annual harvest of mountain goat regularly exceeded 100 animals. The decline was most pronounced among both populations and occupied habitat south of the Snake River, in Big Creek and the Middle Fork of the Salmon River. Following surveys in 1982, wildlife managers reported that 'satellite' herds appeared to be missing (Oldenburg 1983).

In contrast with central and northern Idaho, in mountain goat herds increased in southern portions of their distribution between 1955 and 1982 in Idaho's Pahsimeroi, Lemhi, Medicine Lodge and Snake River ranges.

Declines in mountain goat populations in northern and central Idaho after 1960 were largely offset by herds established by transplants into suitable but unoccupied habitats. A small herds was established at Echo Bay on Lake Pend

Oreille in 1960-1968 (stable at 40-50 animals from 1981-present), a herd was established in the Seven Devils Mountains near Hells Canyon in 1962-1964 (estimated to include 100 animals in 1981, and 200 in 2004), and a third herd was established north of Palisades Reservoir on the South Fork of the Snake River in 1969-1970. This herd, near Idaho's eastern border, grew rapidly and was estimated at 220 mountain goats in 1990, but declined from an estimated 195 animals in 2000 to only 42 in 2003. To the north, another mountain goat herd in the Red Conglomerates and Pilot Peak area along the border with Montana also declined dramatically from an estimated 155 animals in 2000 to 22 animals in 2004. Cause of these declines is not known.

MOUNTAIN GOAT MANAGEMENT

Mountain goat management goals identified in the statewide species management plan (Hayden et al. 1990) include management of mountain goat herds using both conservative hunter harvest strategies and transplants, refining knowledge of mountain goat population dynamics, maintaining or increasing recreational opportunities (consumptive and nonconsumptive) associated with mountain goat herds, and increasing knowledge of mountain goat diseases and parasites and their impacts on populations.

Harvest and Population Dynamics

Accurate data on mountain goat herd status is difficult to obtain. Many of the herds in central Idaho occur within designated Wilderness, and others occur along Rocky Mountain borders with adjoining states. Idaho has little true alpine habitat, and most mountain goat herds occur in subalpine habitats near

the tree line at elevations of 7,000-10,000 feet. Counts are typically conducted from helicopter, using trained observers, but are confounded by small, patchy habitats used by mountain goats, poor visibility due to the presence of trees and rough, broken terrain, mountain goat behavioral avoidance of helicopters (animals may flee into timber, hide under tree canopies, or even enter caves), and unstable air currents. Independent verification of data by ground observers is rarely possible, so that detection rates are usually unknown. Due to cost (and often unstable weather), replicated data is rarely obtained; in fact, most mountain goat herds in Idaho are surveyed only once every 5 years. Further, despite data indicating that areas used by mountain goats vary both seasonally and annually in Idaho (Kuck 1977b), most observers focus primarily on historically favored habitats during annual surveys. As a result of these concerns, data presented on mountain goat populations discussed in this paper are based on actual count data, rounded to the nearest 10 animals, and thus represent a minimum estimate of mountain goat numbers.

In an effort to improve population estimation, Pauley and Crenshaw (paper in review) marked mountain goats in Idaho's Hells Canyon area using paintballs from hand-held paintball guns fired from a helicopter. Subsequent surveys of variously marked and unmarked animals allowed calculation of estimated population size using a Petersen estimator. Of particular note was the estimated sightability of mountain goats in this area, which ranged from 0.37 to 0.46. Other published estimates of mountain goat sightability by helicopter-based

observers are 0.46 in coastal Alaska (Smith and Bovee 1984), 0.46 to 0.77 in west-central British Columbia (Cichowski et al. 1994), and 0.67 in the timbered Robson Valley of east-central British Columbia (Poole et al. 2000). Despite the low and variable probability of seeing mountain goats, the mark-recapture estimate shows promise for obtaining greatly improved population estimates.

Mountain goat populations are very susceptible to over-harvest and disturbance (for review, *see* Cote and Festa-Bianchet 2003). Idaho applies a very conservative approach to mountain goat harvest. Only one mountain goat may be harvested by an individual in Idaho, and all harvest is restricted to permits valid only in a limited area. In 2004, Idaho will issue a total of 40 mountain goat permits among 15 individual hunting areas statewide; i.e., maximum allowable harvest is less than 2% of the minimum number of mountain goats in the state, with an actual annual harvest that is likely less than 1% of the adult population.

Hunts are limited to discrete herds that include more than 50 adult mountain goats, and permits in those areas are limited to less than 4% of the adult population (1 permit/25 adult animals). Hunters may harvest any mountain goat, but are strongly encouraged to harvest adult male animals; nannies with kids are protected. Successful hunters must report their kill within 10 days for collection of biological data and hunt information; unsuccessful hunters must return their unused permit within 10 days of the close of the season. Hunters currently harvest an average of 40-50 mountain goats annually (Fig. 3).

Efforts to educate hunters to accurately identify and harvest only male mountain goats have had little success. Female typically have represented 30-40 percent of the harvest annually over the past 25 years (Fig. 4).

Hunter success rates are high. In 1975, 235 hunters harvested 93 mountain goats for a success rate of 40%; in contrast, harvest success has averaged >80% since 1980. Analyses indicate no identifiable association between population trend and either annual hunter success nor percent of the harvest comprised of females (Fig. 5).

Conservative management has provided a constant to slightly increase trend in average age of mountain goats harvested in Idaho. Average age of harvested mountain goats has increased from 5.2 to 6.2 years since 1990 (Fig. 6).

Among unsuccessful hunters, approximately half failed to hunt after receiving their permit. Kuck (1977a) reported that 32 (12%) of 267 mountain goat permit holders in 1975 failed to hunt, as compared with 3 (8%) of 39 permit holders I contacted in 2003 (file data).

Idaho's conservative approach to mountain goat management resulted in large part from studies conducted between 1969 and 1975 on Idaho's Pahsimeroi Range by Kuck (1977b). Following 3 years of baseline data collection, Kuck manipulated harvest rates in an attempt to relate harvest to annual production of kids. Although Kuck reported that annual production of kids appeared to be a function of shrub forage availability and nanny health,

survival and recruitment kids was not related to harvest; i.e., population recruitment was not compensatory relative to harvest. Kuck reported that surviving animals redistributed themselves in the most favorable terrain following removal of dominant adults via hunting. Thus, mountain goat densities and foraging pressure on the favored cliffs remained constant, while less preferred cliffs, even though more productive in terms of vegetation, were abandoned. Kuck hypothesized that hunting could therefore decrease production, and that hunting mortality was likely additive to natural mortality. He believed that behavioral dominance within mountain goat populations was a constant force directing forage exploitation in the most desirable habitats, so that removal of dominant animals had little impact on forage availability, animal condition, or production of kids. Kuck concluded that selection for physical characteristics of habitat rather than forage was the key determinant of mountain goat population size, and that hunting mortality was additive to natural mortality (Kuck 1977b). If hunting is indeed additive, harvest levels should be reduced to focus harvest insofar as possible on post-breeding adults. This approach to harvest, implemented in Idaho since 1976, has been supported by more recent research on hunted and unhunted mountain goat herds (Gonzalez-Voyer et al. 2000), whose work suggested that harvest should be limited to 1-2% of adult males annually. However, this approach has failed to result in increases in mountain goat populations; most herds are presently static or declining slowly.

Swenson (1985) reported on data obtained over an 18-year period in Montana's Absaroka Mountains, and suggested that mountain goat populations that relied primarily on grasses (rather than shrubs, as in Idaho's Pahsimeroi Range) had a potential to exhibit compensatory response to hunting pressure in past because the forage base was more resilient than in habitats where mountain goats rely on longer-lived shrubs (Swenson 1985).

Some mountain goat herds, particularly those resulting from introductions to suitable but unoccupied habitat, have grown rapidly and are able to withstand higher levels of harvest during the expansion phase following introduction. Adams and Bailey (1982) reported that a herd introduced to the Sawatch Range of Colorado produced an annual harvestable surplus of about 7%, and reported that kid production declined as the population increased. In Idaho, Hayden (1989) documented a rate of growth of 22% in the Palisades herd between 1971 and 1983. In this herd, twinning was common (29% of adult females observed during 1982-1983), and 86% of mature females were observed with at least one kid. Observed survival of kids was 88% and yearling survival 95% during this study. After modeling this herd, Hayden recommended annual removal of 10-15% of adults during the initial growth phase to stabilize herd size, and to reduce potential for the herd to exceed carrying capacity of available range. He noted that many introduced mountain goat populations peak within 2 decades following introduction, and then stabilize at a level well below the peak numbers seen in the expansion phase. The Palisades herd apparently peaked at

about 220 mountain goats in 1990, and between 2000 and 2004 it declined 78%, from a minimum of 195 animals to a minimum of 42.

These contrasting scenarios--endemic herds on stable to declining habitat in a 'post-decline' phase as defined by Caughley (1970) and introduced herds moving through phases of initial expansion, stabilization, decline, and post-decline phases--present a challenge to wildlife managers. Data suggest that harvest levels must be very conservative when applied to herds within stable environments unless those herds are clearly within the initial phases of population establishment as described by Caughley (1970). Data further suggest that, since harvest is likely additive to natural mortality within such situations and since no inersivity response to food availability can be expected, the only way to provide additional harvest is to change the habitat within which populations occur.

To benefit long-established mountain goat populations, habitat change must significantly improve the forage base and, at the same time, alter behavioral habitat use patterns. For example, recent retreat of glaciers and semi-permanent icefields should expose soil and result in an increased forage base. In Idaho, where glaciers and semi-permanent icefields are rare, another opportunity to accomplish this goal is natural wildfire on alpine and subalpine ranges. Allowing natural wildfire to burn within mountain goat habitats would reduce tree encroachment on subalpine and alpine meadows, and would likely reinvigorate decadent shrubs essential in mountain goat diets, thereby increasing productivity in mountain goats herds. It

appears that extensive wildfires in central Idaho Wilderness in 2000 have indeed resulted in an increase in mountain goat herds, but the evidence is confounded by associated changes in mountain goat visibility and detection by observers.

Evidence for initial rapid population increases following introduction of mountain goats into suitable unoccupied habitat provides wildlife managers opportunity to expand mountain goat range and associated hunting opportunity where habitat exists to support introduced mountain goats. However, such populations must be regularly monitored to keep expanding herds below levels at which they begin to damage available vegetation, resulting in a decline in numbers prior to herd stabilization.

Supplementing established herds of mountain goats in an effort to stimulate production has been attempted in Idaho, but available data are not encouraging. After only 3 mountain goats were observed in Idaho's Selkirk Range in 1971 and again in 1981, 28 mountain goats were introduced to this area. However, this introduction resulted in minimal herd response; only 34 mountain goats were present in 2001. It appears that survival of introduced animals is high, but that little recruitment has occurred. It was believed that food availability, if limited by mountain goats prior to their observed decline, should have increased due to the extremely low numbers of mountain goats present in this area over the decade of low use, but apparently either food availability was not a limiting factor or recovery did not occur.

Recreational Opportunities

Recreational opportunities associated with mountain goat management include hunting and wildlife viewing. Demand for hunting opportunity is high, with 400-500 applications received for the 40-50 mountain goat permits available annually since 2000.

Opportunities to view and photograph mountain goats in Idaho are limited for those unwilling or unable to climb into the steep and often remote country occupied. One of the premier viewing sites in Idaho is located at Farragut State Park on the south end of Lake Pend Oreille (Pope 2003). Sixteen mountain goats were introduced to Bernard Peak, 1960-1965 (Naylor 1988); the current herd numbers about 40 animals. These mountain goats are usually highly visible, and have become very habituated to people viewing them from the lakeshore or from boats below the primary cliffs utilized by the animals. Other sites include Priest Lake, the Mallard-Larkins Pioneer Area, Hells Canyon Dam, the Middle Fork Salmon River Canyon, the Main Fork Salmon River (above Corn Creek), and Upper Trail Creek (Pope 2003). These sites are very popular with the public, and interpretive materials have been provided at Farragut State Park.

However, much winter recreation has high potential to adversely impact mountain goat populations. Mountain goats are more susceptible to disturbance by helicopters than most open-terrain ungulates; Cote (1996) reported that mountain goats exhibited overt responses to 58% of helicopter flights within 1.2 mile (2 km), and Gordon and Reynolds

(2000) reported that mountain goats exhibited moderate to extreme response to helicopters during 75% of all sightings from the helicopter. Winter disturbance is especially problematic, since mountain goats that are already stressed by cold and by limited food supplies due to snow cover in all but the steepest environments may exhibit panic, increased metabolic rates and energy expenditure, and reduced time spent feeding (Gordon and Reynolds 2000). Repeated disturbance by helicopters, snow machines, or even logging or road building (Chadwick 1983) may result in abandonment of favored habitats—steep cliffs that

readily shed snow cover, allowing goats access to forage in an environment where they are normally secure from predators—potentially reducing probability of winter survival through mechanisms of increased energetic demand associated with feeding and increased exposure to potential predators.

Increased winter activity in the vicinity of mountain goat habitat, especially heli-skiing and over-snow travel by snowmobiles, has potential to severely reduced the amount of habitat that may be used by mountain goats.

LITERATURE CITED

- ADAMS, L.G., AND J.A. BAILEY. 1982. Population dynamics of mountain goats in the Sawatch Range, Colorado. *J. Wildl. Manage.* 46:1003-1009.
- BRANDBORG, S.M. 1955. Life History and Management of the Mountain Goat in Idaho. *Wildlife Bulletin No. 2*, Idaho Department of Fish and Game, Boise, Idaho.
- CAUGHLEY, G. 1970. Eruption of ungulate populations, with emphasis on Himalayan thar in New Zealand. *Ecology* 51:53-72.
- CHADWICK, D.H. 1983. *A beast the color of winter*. Sierra Club Books, San Francisco, California.
- CICHOWSKI, D.B., D. HAAS, AND G. SCHULTZE. 1994. A method for estimating mountain goat numbers in the Babine Mountains Recreation Area, British Columbia. *Proc. Northern Wild Sheep and Goat Council Symposium* 9:56-64.
- CORLESS, H. 1990. *The Weiser Indians: Shoshoni Peacemakers*. University of Utah Press, Salt Lake City, Utah.
- COTE, S.D. 1996. Mountain goat responses to helicopter disturbance. *Wildl. Soc. Bull.* 24:681-685.
- COTE, S.D., AND M. FESTA-BIANCHET. 2003. Mountain goat. Pp. 1061-1075 *in Wild Mammals of North America: Biology, Management and Conservation*. Second Ed., edited by G.A. Feldhamer, B.C. Thompson, and J.A. Chapman. Johns Hopkins University Press, Baltimore, Maryland.
- DAVIS, W.B. 1939. *The Recent Mammals of Idaho*. Caxton Printers, Caldwell, Idaho.
- GONZALES-VOYER, A., K.G. SMITH, AND M. FESTA-BIANCHET. 2000. Dynamics of hunted and un hunted mountain goat populations. *Proc. Northern Wild Sheep and Goat Council Symposium* 12:126.
- GORDON, S.M., AND D. M. REYNOLDS. 2000. The use of video for mountain goat winter range habitat inventory and assessment of overt helicopter disturbance. *Proc. Northern Wild Sheep and Goat Council Symposium* 12:26-35.

- GROVES, C.R., B. BUTTERFIELD, A. LIPPINCOTT, B. CSUTI, AND J.M. SCOTT. 1997. Atlas of Idaho's Wildlife. Idaho Department of Fish and game, Boise, Idaho.
- HALLOCK, C. 1879. The Sportsman's Gazetteer and General Guide. Forest and Stream Publishing Co., New York, New York.
- HAYDEN, J.A. 1989. Status and population dynamics of mountain goats in the Snake River Range, Idaho. M.S. Thesis, University of Montana, Missoula, Montana.
- HAYDEN, J., G. GADWA, G. MCNEILL, J. ROHLMAN, AND R. SHEA. 1990. Mountain goat species management plan, 1991-1995. Idaho Department of Fish and Game, Boise, Idaho.
- IDAHO DEPARTMENT OF FISH AND GAME. 1980. Trophy species: moose, bighorn sheep, mountain goat, pronghorn antelope. Species management plan 1981-1985. Idaho Department of Fish and Game, Boise, Idaho.
- KUCK, L. 1977a. Status and management of the mountain goat in Idaho. Pp. 37-40 in W. Samuel and W.B. Macgregor, eds. Proceedings of the First International Mountain Goat Conference, Kalispell, Montana.
- KUCK, L. 1977b. Impacts of hunting on Idaho's Pahsimeroi mountain goat herd. Pp. 114-125 in W. Samuel and W.B. Macgregor, eds. Proceedings of the First International Mountain Goat Conference, Kalispell, Montana.
- KUCK, L., AND R. PEHRSON. 1985. Mountain goat management plan, 1986-1990. Idaho Department of Fish and Game, Boise, Idaho.
- LEONHARDY, F.C., AND R.W. THOMPSON. 1991. Archaeological investigations at 35WA286 and 35WA288, Hells Canyon National Recreation Area, Wallowa County, Oregon. Alfred M. Bowers Laboratory of Anthropology Letter Report 91-11, University of Idaho, Moscow, Idaho.
- LYMAN,, R. L. 1998. White goats, white lies: the Abuse of Science in Olympic National Park. University of Utah Press, Salt Lake City, Utah.
- NAYLOR, K.S. 1988. Distribution, habitat use and population characteristics of introduced mountain goats at Pend Oreille Lake, Idaho. M.S. Thesis, University of Idaho, Moscow, Idaho.
- OLDENBURG, L.E. 1983. Mountain goat. Annual Progress Report, W-170-R-7, Study I, Job 5, Idaho Department of Fish and Game, Boise, Idaho.
- PAULEY, G.R., AND J.J. CRENSHAW. Evaluation of paintball, mark-resight surveys for estimating mountain goat abundance. J. Wildl. Manage. In press.
- POOLE, K.G., D.C. HEARD, AND G.S. WATTS. 2000. Mountain goat inventory in the Robson Valley, British Columbia. Proc. Northern Wild Sheep and Goat Council Symposium 12:114-124.
- POPE, A.L. 2003. Idaho wildlife viewing guide. Adventure Publications Inc., Cambridge, Minnesota.
- RANDOLPH,, J.E., AND M. DAHLSTROM. 1977. Archaeological test excavations at Bernard Creek rockshelter. Anthropological Research Manuscript Series No. 42, University of Idaho, Moscow, Idaho.
- REAGAN, M.J., AND B. WOMACK. 1981. A review of the archaeological evidence for the presence of *Oreamnos americanus* in the Hells Canyon National Recreation Area. Wallowa-Whitman National Forest, Enterprise, Oregon.
- RUST, H.J. 1946. Mammals of northern Idaho. Journal of Mammalogy 27:308-327.

- SHACKLETON, D.M., ED., AND THE IUCN/SSC SPECIALIST GROUP. 1997. Wild Sheep and Goats and Their Relatives. Status Survey and Conservation Action Plan for the Caprinae. IUCN, Gland, Switzerland and Cambridge, United Kingdom.
- SMITH, C.A., AND K.T. BOVEE. 1984. A mark-recapture census and density estimate for A coastal mountain goat population. Proc. Northern Wild Sheep and Goat Council Symposium 4:487-498.
- SWENSON, J.E. 1985. Compenstory reproduction in an introduced mountain goat population in the Absaroka Mountains, Montana. J. Wildl. Manage. 49:837-843.
- TOWEILL, D.E. 2003. Mountain goat. Annual Progress Report, W-170-R-27, Study I, Job 5, Idaho Department of Fish and Game, Boise, Idaho.
- WISTER, O. 1904. The White Goat and His Ways. Pp. 227-275 in C. Whitney, ed. Musk-Ox, Bison, Sheep, and Goat. Macmillan, New York, New York.

Fig. 1. Mountain goat distribution in Idaho (Groves et al. 1997).

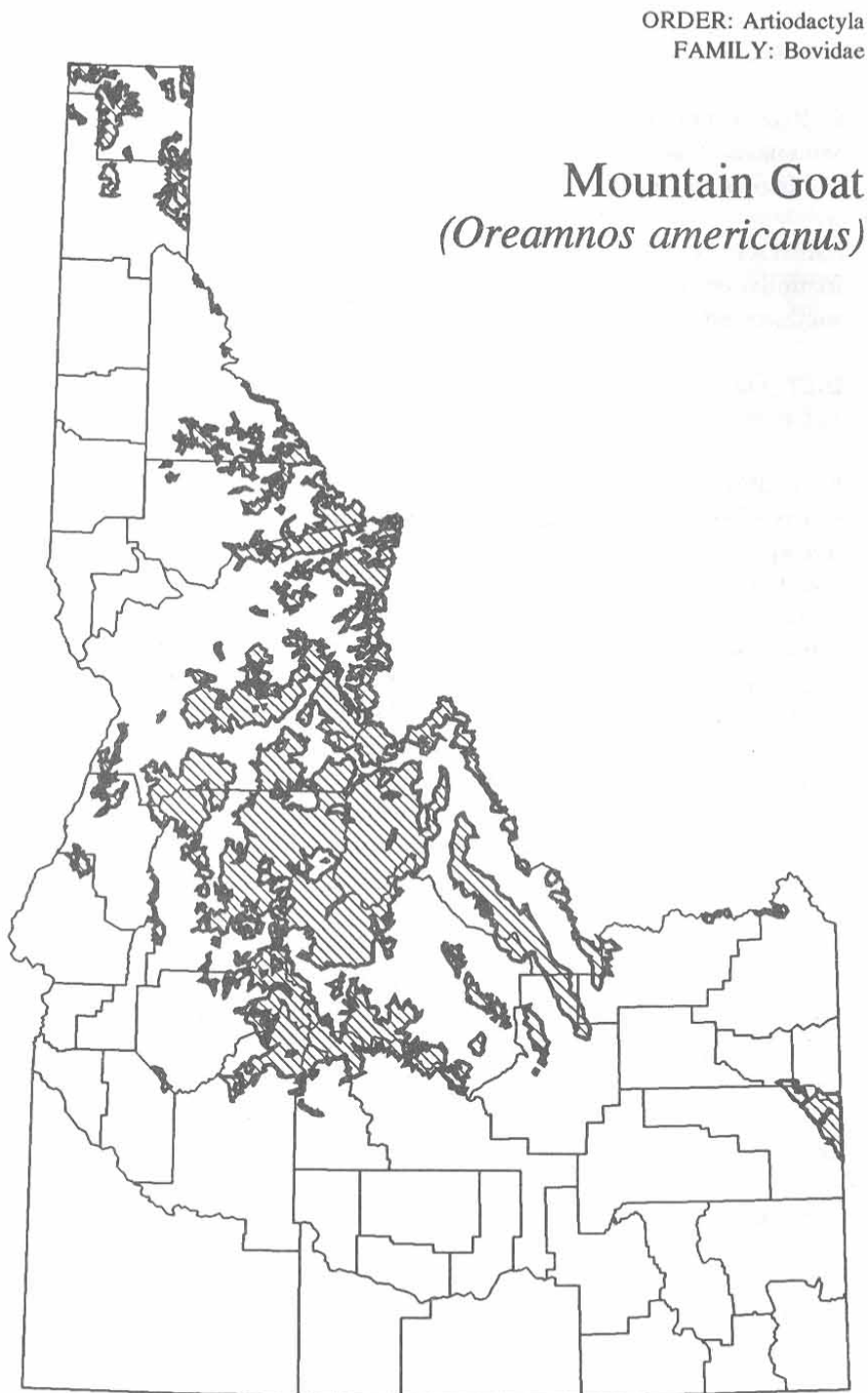


Fig. 2. Population estimates for mountain goats in Idaho, 1955-2004.

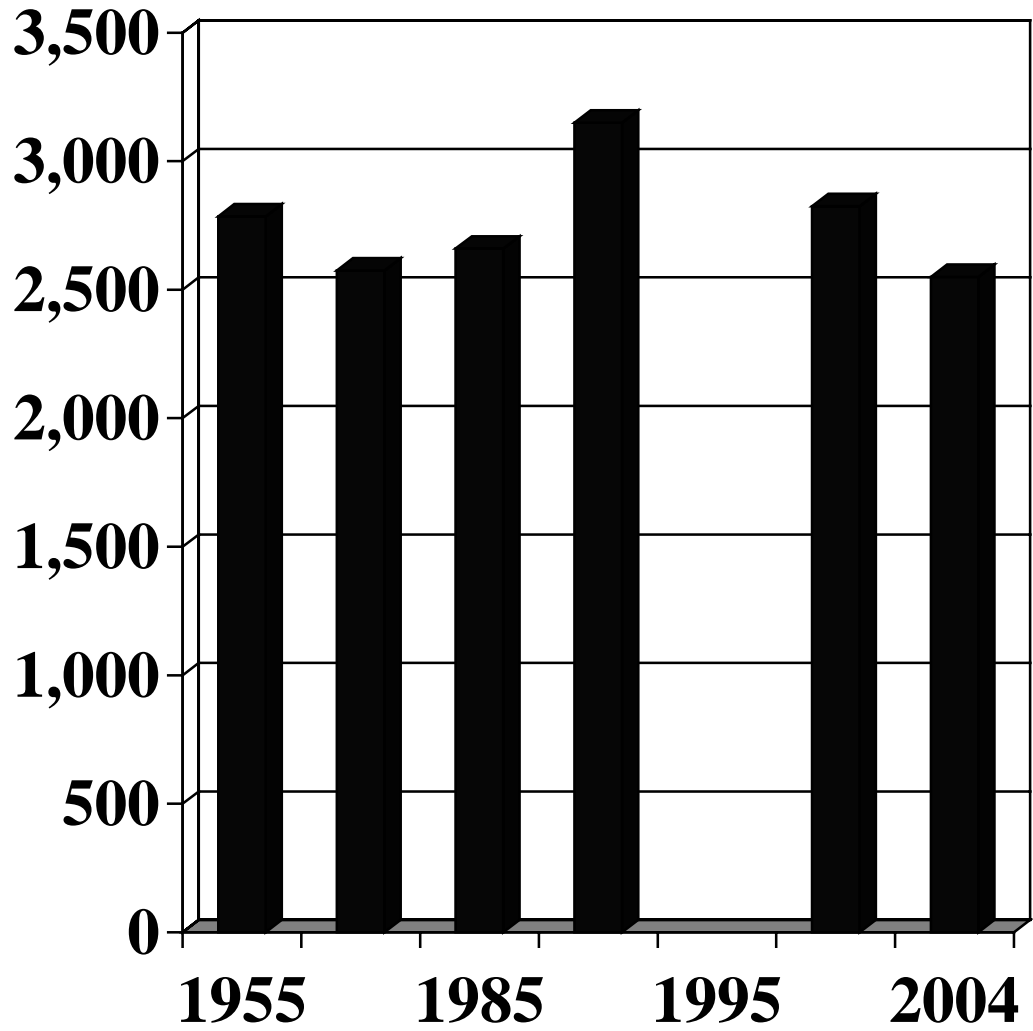


Fig. 3. Historic harvest estimates for mountain goats in Idaho, 1935-2003.

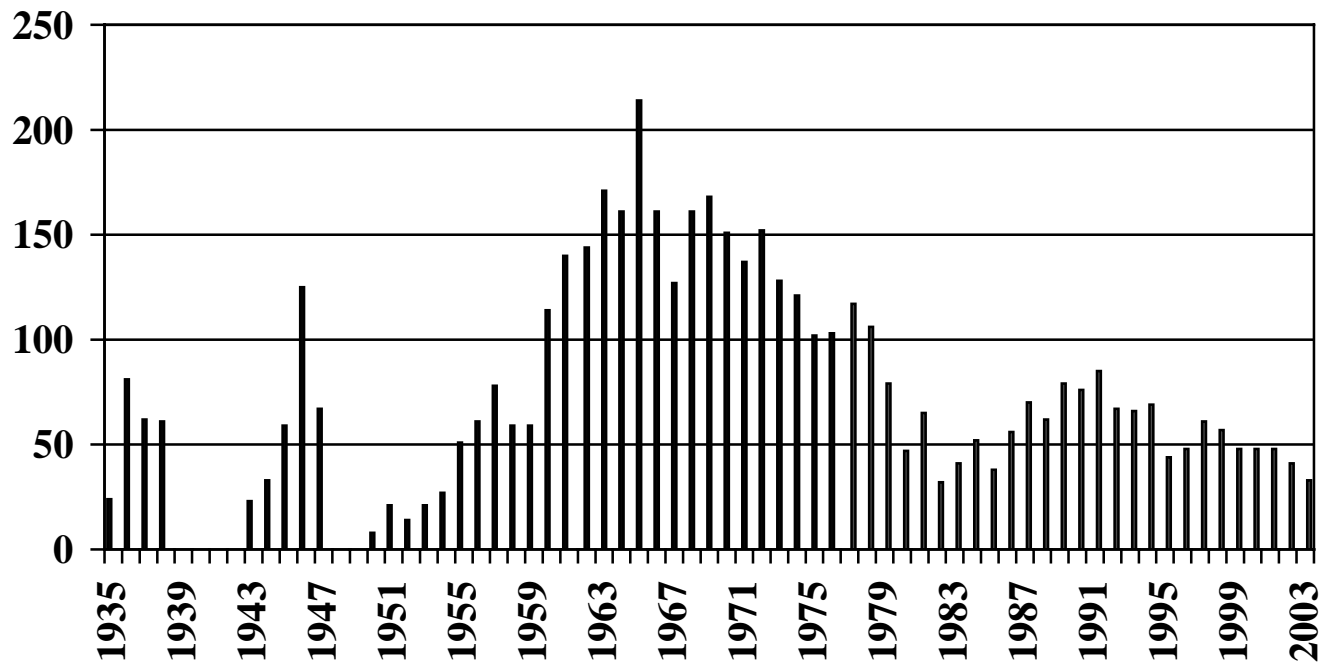


Fig. 4. Percentage of the annual mountain goat harvest comprised of males.

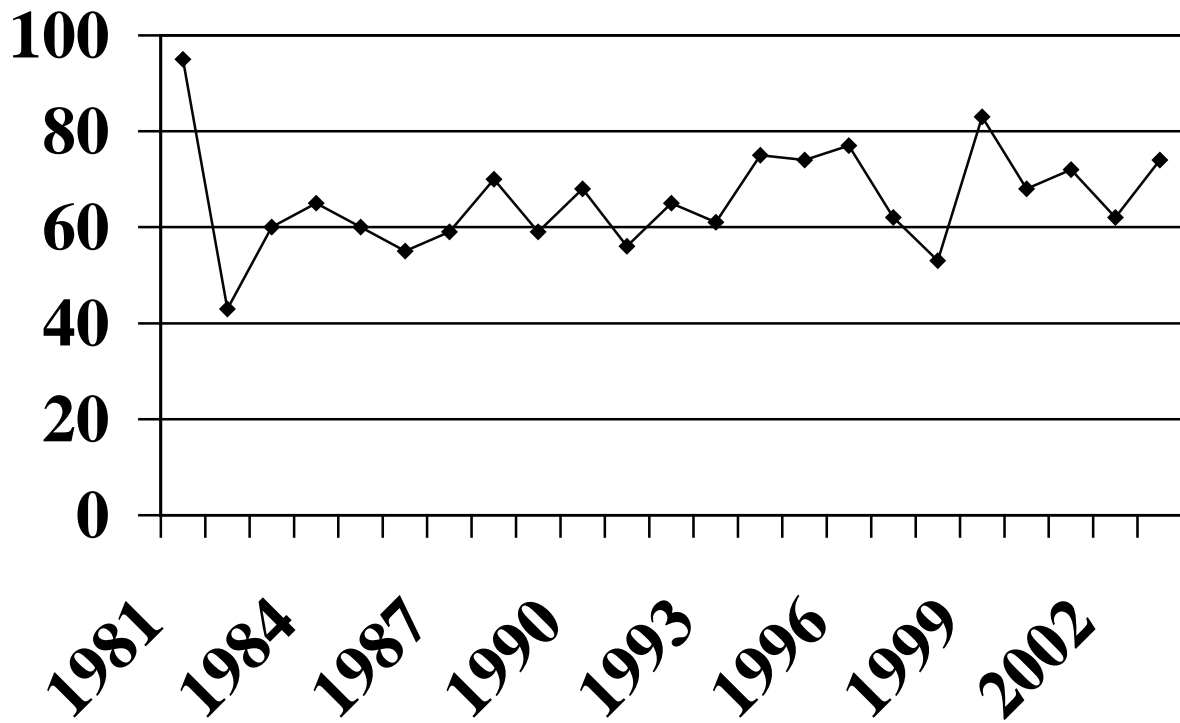


Fig. 5. Number of mountain goat harvest permits issued annually (solid line) and actual hunter harvests (dashed line).

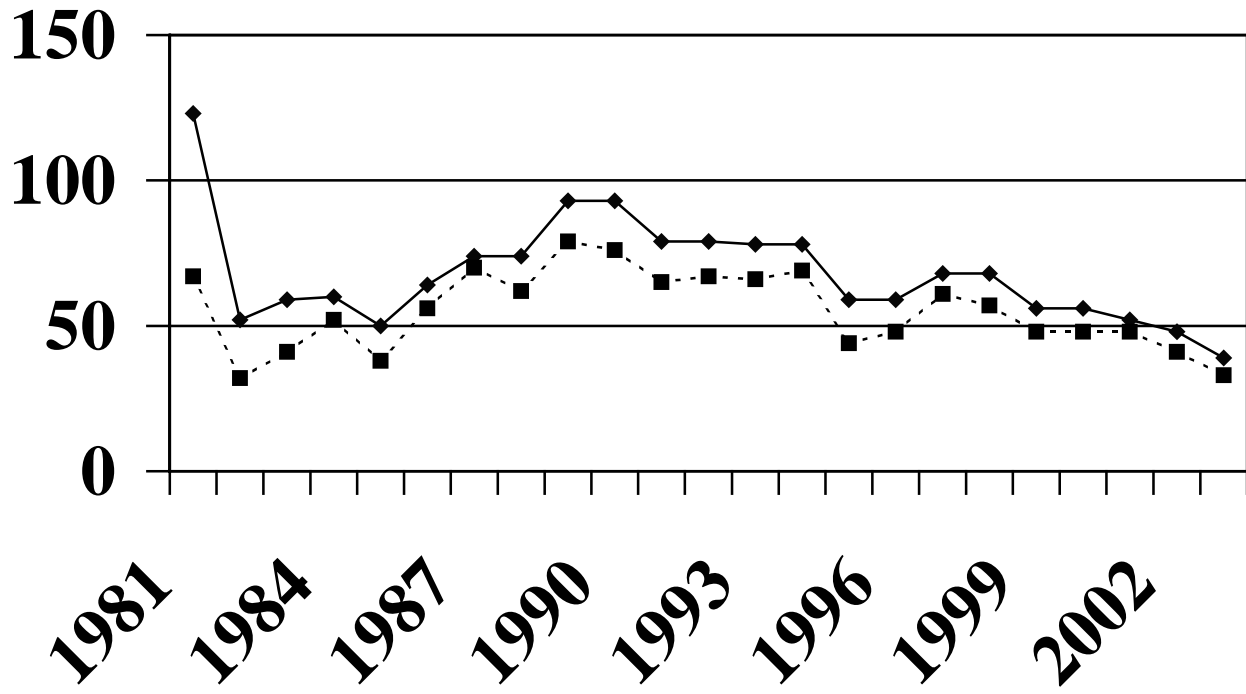


Fig. 6. Average age of mountain goats harvested in Idaho, 1990-2003.

