

TRANSACTIONS
OF THE
MOUNTAIN LION WORKSHOP

Nugget
Sparks, Nevada
January 13 & 14, 1976

Sponsor:

U. S. Fish and Wildlife Service
Region 1

Host:

Nevada Fish and Game Department

Co-Chairmen:

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Robert J. Fischer - USFWS, Division of Federal Aid

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WELCOME

Glen Christensen, Nevada Fish and Game Department

I would like to express our Director's apologies for not being here today and I want to extend a warm welcome to you on his behalf. We certainly feel honored to have this group meet in Nevada and the subject of this workshop is timely.

I don't know how it is in your state, but Mt. Lions are a sensitive subject in Nevada. We are always walking the tightrope in relation to the demands of the livestock people (depredation problems), mountain lion guides (commercial exploitation), and the protectionist.

The Fish and Game Department is, as usual, caught right in the middle between all of these groups and attempting to come up with an acceptable management program. It is a difficult situation, as any of you who have worked with the management aspects are aware of. We have a long way to go and I hope this meeting will lead the way towards more progressive and definitive management programs.

Bob Fischer will fill you in a little later on with some of the background in relation to the workshop and how it originated. Actually, Bob is the one who initially sparked the idea to get this going, and he's put quite a bit of work into the program. As far as the mechanics of this workshop, it has been my feeling for many years in participating in various workshops with Fish and Game organizations that there are just too many of them that simply do not meet the mark. With this in mind, we have invited what I think is a very select group of people to attend this workshop. Any time you set up a meeting by invitation only, you are going to be subject to criticism, but I think it is going to be worth it if we can meet our workshop objectives, and if each of you have come prepared to make this a successful workshop through active participation. A workshop is just what it says--everybody should be in there with their sleeves rolled up, kicking the issues around, and trying to come up with a satisfactory solution. At the conclusion of this workshop, I hope that we have aired our common problems and have pointed a way toward trying to solve some of these problems without duplication of effort. There should be some committees formed to compile the background material as well as see some of the specific objectives through to conclusion.

I would like to see a representative of this group be able to go to the Western Association at a later date and show them that the workshop was functional.

(After some discussion concerning how to handle the minutes of the meeting, it was decided to tape the entire session and send the transcript relating to each discussion topic to the individual Discussion Leader. Nevada would be responsible for taping and transcribing. Federal Aid would pay for the secretary to transcribe. Bob Fischer would distribute transcriptions to the appropriate Discussion Leaders for editing. Final Copy to be edited by Bob Fischer and typed by Federal Aid in Portland.)

FIRST MOUNTAIN LION WORKSHOP
January 13-14, 1976
Sparks, Nevada

ATTENDANCE ROSTER

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MOUNTAIN LION WORKSHOP
Nugget
Sparks, Nevada
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AGENDA

<u>TIME</u>	<u>TOPIC</u>	
Tuesday, January 13, 1976		
8:00 a.m.	Welcome	Glen K. Griffith, Director Nevada Dept. of Fish & Game
8:15 a.m.	Introductions	Glen C. Christensen, Workshop Moderator
8:30 a.m.	Review of Past and Current Mt. Lion Studies.	Bob Fischer, Discussion Leader
10:00 a.m.	Coffee Break	
10:30 a.m.	Biology and Life History Standardization of Terms and Measurements. Aging Methods, Food Habits, Habitat Needs.	Maurice Hornosker Discussion Leader
12:00	Noon Lunch	
1:00 p.m.	Biology and Life History (Continued)	
2:00 p.m.	Population Inventory Techniques Aerial and Ground Surveys Tracking - Capture and Radio Monitoring.	Richard Poelker and Wally Macgregor Discussion Leaders
3:00 p.m.	Coffee Break	
3:30- 5:00 p.m.	Population Inventory Techniques (Con't.)	

TIME TOPIC

Wednesday, January 14, 1975

- 8:00 a.m. Harvest Ken Greer, Discussion Leader
 Extent of Allowable Harvest
 Levels of Hunting Pressure
 Protection of Females and Young
- 10:00 a.m. Coffee Break
- 10:30 a.m. Depredation Harley Shaw, Discussion Leader
 Loss Assessment
 Handling of Complaints
 Transplanting
- 12:00 Noon Lunch
- 1:00 p.m. Depredation (Continued)
- 2:00 p.m. Mt. Lion Population Modeling Ken Russel, Discussion Leader
- 3:00 p.m. Coffee
- 3:30 - Research and Management Needs Bob Tully, Discussion Leader
5:00 p.m. Discuss and List Research Needed
 to Solve Management Problems.
 Cooperative Efforts Between States
 Environmental Impact Statements
 Endangered Species Listings

DISCUSSION SESSIONS

Review of Past and Current Mountain Lion Studies

Bob Fischer,
Discussion Leader

As many of you know, the Division of Federal Aid, U. S. Fish and Wildlife Service, had many requests from State PR project biologists to sponsor this workshop. I'm not going to go into detail concerning the sequence of events in getting this workshop approved because it's a long story. Through it all I received a few wounds, which are slowly healing, but I'm reminded of what Dr. Durwood Allen told me quite a few years ago--that in this business one has to develop a thick skin in order to survive.

Well, we're here today to communicate. The main objectives of this workshop are to improve communication and to encourage the dissemination of current information of mountain lion management and research activities.

Some time ago a letter was sent to Western States and other selected agencies asking them to indicate their desire for or against a mountain lion workshop. It was at this time that Nevada graciously volunteered to host the workshop. I want to thank Director Glen Griffith and Glen Christensen, Chief of Game, for their time and effort in arranging this important get-together. The mail inquiry showed that seven of twelve States enthusiastically wanted a workshop; two were doubtful that anyone could attend because of travel restrictions; one questioned the need for the workshop and two did not reply. It is gratifying to see that all

of the Western State Fish and Game Departments, except Utah and Wyoming, are represented. I noticed that three game division people and private lion hunter from Idaho are here at their own expense. We certainly appreciate your attitude in believing that this meeting was important enough for you to absorb the expense of attending. In addition to State personnel, I see representatives from British Columbia, two Cooperative Wildlife Research Units, and the Fish and Wildlife Service.

In order to get a handle on the "Review of Past and Current Mountain Lion Studies," I wrote to each agency about a month ago requesting that they prepare for distribution a summary of past and current activities conducted on mountain lions in their respective State. So, to kick off this session, I will call on each State and agency to present this brief summary. So, to avoid missing someone, I'll call on each State in alphabetical order. First of all, I'll call on Arizona, Harley Shaw.

Arizona Game and Fish Department: Harley Shaw

I'm reporting mainly on research in Arizona rather than management programs. John Phelps is here today and he will have something to add on the management level now or later on in the program.

Very briefly we are presently completing a 5-year study of lion numbers, movements, and impact on prey species on a 150 square mile study area. Major prey species in the area are mule deer and cattle. Capture-recapture data are used for population estimates.

Lion kills are located during hunting efforts with dogs as well as by radio-tracking. Approximately 1000 radio-locations have been made covering movements of 15 different lions. These data have not yet been fully analyzed.

Suspension of field work is planned for the coming project year (July 1, 1976 - June 30, 1977) to allow for analysis and publication of data gathered to date, as well as planning of new research efforts. Possible areas of interest for future research involve evaluation of livestock losses under conditions of increased deer numbers and investigation of cattle management options which might alleviate losses to lions.

At present our interest areas so far as future research, assuming we continue on, involve evaluation of livestock losses under conditions where deer numbers are relatively high. Our study area is in a situation where the deer population is fairly low. Regarding the other aspect of it, we have some leads that we feel are along the lines of cattle management options which might alleviate losses to lions, assuming the ranchers are interested in this sort of thing and that the economics of it are feasible. We have quite a bit to learn about the ranching business, but we do have some insight in terms of management options that might help, and I think we'll get into those in the session discussions that will follow. That pretty well covers the research end of it.

California Fish and Game Department: Dick Weaver

Mr. Weaver summarized the following report:

Synopsis of California Mountain Lion Study

Historical Status

The mountain lion in California has had many changes in its status. It was classified as a predator with a bounty on its head from 1907 through 1963. During that period a total of 12,461 lions were bountied in California. In 1963 the California Legislature followed the recommendation of the Department of Fish and Game and removed the mountain lion bounty. From 1963 through 1969 the lion was classed as a nonprotected mammal. In 1969 it was reclassified as a game mammal with a license required to take them. The Fish and Game Commission was given authority to regulate the take. Sport hunting requiring hunting license and tags was in effect during the 1970-71 and 71-72 hunting seasons.

The Commission did prohibit the use of traps and poison which was formerly legal. It also prohibited the capture or possession of live lions without a permit. In 1971 the Legislature passed a bill which established a four-year moratorium (since then extended to 5-years) on the sport hunting of mountain lions and strict regulations on the taking of depredation lions. Lions could not be taken until they had caused damage and a investigation was made by the Department of Fish and Game. Then a permit could be issued for a ten-day period, which was good within ten miles of where the depredation had occurred. The Legislature directed the

Department to study the lion populations of the state, to determine the best methods of providing sound management.

Investigations

The Department of Fish and Game started a mountain lion study in April 1971. A population survey of the lions within California was done primarily through field interviews and field investigation of reported mountain lion areas. Lion hunters, houndsmen, Department field personnel, allied state, federal and wildlife personnel, ranchers, conservationists, and those individuals we were aware of who had information on local mountain lion populations were contacted. Data on lion density and distribution was obtained.

As a result of this survey, we have determined there are approximately 74,000 square miles of lion habitat within California with an estimated population of approximately 2,400 animals. The major areas of high lion concentration occur on the coast range from Mendocino County to Del Norte County and on the coast range from Monterey south to Ventura County.

Study Area

The second phase of our lion study was an attempt to capture and mark the lions in a designated area in southern Monterey County, follow movements, obtain indirect indices of population density and gather life history and other pertinent data.

The 170 square miles is principally chaparral and oak woodland.

The larger mammals present in the area include: domestic livestock, blacktailed deer, lion, coyote, bobcat, feral pig, blacktailed jackrabbit, cottontail rabbit, brush rabbit, bushy-tailed woodrat, gray fox, raccoon, opossum.

The area was estimated to have a population of approximately 15 lions in the statewide survey. We captured and marked fourteen adult lions and two cubs in the study area. Radio collars placed on these lions were powered by solar cells or lithium chloride batteries. Each animal was weighed, measured and examined for parasites and general condition. The mountain lions showed more overlap of range than was expected. Although not all the lions in the study area were caught. We estimate between 16-20 for the study area with a density of approximately 10 per 100 square miles.

Prey Species

The major mountain lion prey species in California is deer.

Conclusion

The status of the California mountain lion in California is secure with populations at the carrying capacity of the present habitat available.

Weaver: At the present time we have five transmitters functioning on mountain lions. We're gaining some valuable information and will continue monitoring as long as the radio collars are functioning. Past monitoring efforts were not of 24 hour duration or done on continuous days very often.

Shaw: The 15 lions captured, was that in your 150 square mile area?

Weaver: These are lions that are using it; they don't necessarily live within it. That other 50 square miles is the area that we have closed to lion hunting. Actually our study area is probably two to three times that size.

California: Ron Thompson, U. S. Fish and Wildlife Service

We assisted the California Fish and Game Department in their mountain lion study. We captured more than 14 lions, of which some were too small to collar and a few were recaptures. (Total captures were over 25 in the California Study Area--some taken by hired lion hunters). We were glad to be able to help them out.

Our program is rather small as far as depredation is concerned compared to some of the other states, but we believe that the selective removal of depredating lions by professionals is the best way to control livestock depredations. Otherwise ranchers may take things into their hands and kill many more lions than necessary. It's been our experience that usually only one or two lions are involved in the depredation. Ray Nelson is our professional lion hunter. He has dogs that he's bred and trained for almost 25 years. I'd like to introduce Ray. Ray, please stand up. And his supervisor, Bob Quiroz, from Hubbard, California, and my assistant from Sacramento, Darrel Juve.

Our records on depredation show that prior to March 1, 1972, 73 head of calves, sheep, and goats, valued at \$3,541 were killed. Since the legislature of California placed a moratorium on hunting lions on March 1, 1972, we've had six depredation requests from the Department of Fish and Game. We took five mountain lions on these six requests. There was one lion involved in each case.

Colorado Fish and Game Department: Bob Tully

Colorado had 36 years of the bounty system at \$50 per lion. Finally in 1965 the lion was classified as a big game animal with license fees set at \$5 for residents and \$10 for non-residents; in 1967 the fees were raised to \$25 and \$50. As of January 1, 1976, we've gone to \$25 resident and \$200 non-resident license fees. In 1965 we allowed a 5½ month season and at the present time there is about a 6 month season. This provides considerable hunting opportunities, but our regulations are becoming more restrictive each year. The entire state is on a quota basis but it's wide open as far as participation. When a harvest quota is reached by geographic area, we cut off the issuance of the permits. The annual harvest has been about 58 animals since 1965, and the take in 1975 of about 94 animals is the highest on record. Since 1965 we've paid out \$50,000 for 75 Just Claims of damage to livestock, and the incidents are primarily related to sheep, with 43 incidents; 14 to cattle,; 14 to horses; and 4 to a combination of goats and donkeys. We've had payments in excess of \$5,000 for damage to sheep. The landowners or livestock operators can still kill a lion to protect their livestock, and because of that the annual take varies from one to five animals. We're trying to transfer all the control efforts to sport hunting through various means. We've been fairly successful. Our lion population was estimated to be 750 in 1970 and the trend seems to be stable in some areas and increasing

in others. We now estimate that there are over 800 lions in Colorado; perhaps well over a thousand. Please understand that these are very gross estimates. The Colorado Cooperative Wildlife Research Unit, Ken Russell who's here, and Mary Jean Currier, are working with the Division of Wildlife professional hunter. With some funds from Game Conservation International, we have established a study area in an attempt to document the distribution, sex, and age composition of the population density in one of our three best lion areas. Also, the Cooperative Unit is working on a method to better determine the age of lions taken, and on the development of a population model.

Colorado Cooperative Wildlife Research Unit: Dr. Ken Russell

Bob briefly described the studies that we're engaged in. I'd like to introduce the two people who are really doing the work on those studies. Mary Jean Currier is conducting the winter census and aging technique work. She has one year's field work behind her and has several more years to go, in the aging work particularly. Steve Sheriff is just beginning work on a population model. We'll get into this in more detail as the workshop proceeds. The winter census was initiated last December. It has short range value in terms of documenting the density as best we can on a small geographic area in Colorado. This will have immediate application in terms of being helpful to management biologists in the Colorado Division of Wildlife and also being available as a public educational tool.

The aging study was initiated because of the absence of an acceptable aging technique for mountain lions. It has many problems. There are no guarantees that there is a technique by which mountain lions can be aged, so there's certainly risk involved there and many of you have worked with this aging problem yourselves. We're hoping to make some headway pursuing a more physiological than morphological approach, although we're certainly considering morphological data as well. The population model will be discussed at some length tomorrow but, very briefly, it is a utilization, an extension, of population model work that has been done at Colorado State in preceding years. Over the past five or six years, models have been developed and are now operational in setting harvest regulations. These have been developed by Jack Gross and his personnel working at the Coop Unit. So our population model really is not a new model. It is just a modification or will be a modification of existing operational models. I think that summarizes what our research program is like.

Idaho Fish and Game Department: John Beecham

Idaho really does not place much emphasis on mountain lion research. We feel like we have a pretty good data base from which to work, at least on the lion population. We do have two limited tagging projects going on at the present time that are unfunded directly since the supplies, equipment, etc., that we're using comes from my black bear research project. It's really a

pretty limited effort--strictly capture/recapture population census. As far as management is concerned, the legislature made the mountain lion a big game animal in April of 1972. We've had a pretty restrictive season since that time. We do have a mandatory checking system on all cats harvested. This has given us a very good data base to manage the cat. That's the extent of what Idaho has done in the last couple of years.

Idaho Cooperative Wildlife Research Unit: Dr. Maurice Hornocker

We've done the population work that John mentioned in the back country on a stable, unexploited population. We published some of the dynamics of that population, particularly on territoriality and depredation. We're still working on some of the life history and behavioral information. We are working closely with John and Gary Power on some of their work with exploited populations, and will get into that a little bit deeper later on during this workshop.

Montana Fish and Game Department: Ken Greer

Maybe some of you have gotten a few of our reports so you know what we have been doing. In 1971, the status of the lion in Montana was changed from predator to a game animal. I don't know how the legislature goofed, but they overlooked establishing a licensing system when they made the change. So we had to persevere for two years with no fee permitted to take mountain lions. After the word got out, quite a few people applied for the

no-fee permit. About 1900 residents applied. During those first two years there were about 50 to 55 lions taken. Since then, we've patterned the lion regulations after the grizzly bear regulations, with which we had pretty good success. These regulations required the hunter to turn in the hide and skull. In addition the hunter had to apply for a trophy license. It worked very well. I recall that the first year we tried it on grizzlies we didn't get too much response from the hunters and it took about three years before we got good results. So, when it was introduced for mountain lions in 1971, we had nearly a hundred percent response. After the legislature corrected the license fees the requests for licenses dropped. This will be the third year since the legislature made the change and we are continuing to get a small annual increase. Of course, there is some conflict about nonresident participation; however, we're just about at the turning point.

The harvest has increased somewhat in the past two years. It went up to 75 a year ago and about 91 to 95 the past year. We're just starting in on our fifth year of information and I don't know if we're going to be at the breaking point as far as what the population can stand. This past week we did contact about nine houndsmen who might be interested in trying to do some capture-tagging and marking for us. That's about the extent of our research. In Montana like some of the other states, lions are a rather low-priority animal as far as funding is concerned. There's too much competition for the dollar. However, I think if we can get a few

animals tagged in certain key areas the resulting information may eventually pave the way for providing a little bit of money to conduct future studies.

Nevada Fish and Game Department: Willie Molini

Prior to 1965 little attention was given to the mountain lion in Nevada. In 1965 the Fish and Game Commission at the request of the Department of Fish and Game made the mountain lion a game animal. This classification didn't do much at first for the lion; but it did establish a season, which was year-round. Probably the primary restriction was on harvest methods. The Commission established the legal hours of taking from sunrise to sunset; and made the legal weapons the shotgun, rifle, or bow and arrow, but outlawed the pistol. This has since been somewhat changed. Now lions can be taken at any time and the use of a pistol is allowed. In 1968 a tag was required and, although no limits were established at that time, it was the first time we had the opportunity to record sport hunter harvest. Probably the most important change occurred in 1970, when a limit of one lion per person was established and a tag was required. Also that all lions must be checked within 48 hours after the kill by a representative of the Department of Fish and Game. These requirements really gave us the opportunity to begin the collection of biological data. In terms of actual studies, prior to 1970 we really didn't do much. In fact, from 1965 to 1968 I think we were just kind of baffled since the

lion became a game animal and we knew nothing about it and didn't have much control on harvest. We just kind of floated along for two years. Then in 1968 we got the tag requirement and things began to develop. In 1970 we initiated a PR project entitled "Mountain Lion Investigations", which was designed as a five-year project. Some of the specific objectives of the project were to determine seasonal distributions through capturing and marking as well as aerial surveys and harvest records. We wanted to try to measure productivity through analysis of uterian tracts from harvested animals, to get a hand on food habits through examination of stomachs from harvested animals; and, of course, to keep an accurate measurement on all mortality, particularly that of harvest, through our mandatory tag validation. This project has, in fact, been underway for five years and the objectives have been only partially met. As I think I mentioned, we do have good data on harvest, including depredation take and other mortality from 1970-1975. We have a pretty good accumulation of base line age and sex data for some mountain ranges, and we have gained limited information of food habits and productivity. Under this project we did make some gains regarding population information. Two studies were done for us under contract by the Division of Wildlife Services, U. S. Fish and Wildlife Service. One study is located in the Santa Rosa Mt. Range of north central Nevada, and the other in the Grant Mt. Range of southeastern Nevada. The one in the Santa Rosas was pro-

bably our first attempt at a mountain lion census technique. It was accomplished in cooperation with the Division of Wildlife Services through ground surveys (looking for tracks) and by helicopter. It turned out pretty well. The most significant work to date has been accomplished under this project and under the predator density portion of our deer herd group review study. Under this we started some intensive population inventory work in the Ruby Mountains of Elko County in northeastern Nevada. By capturing and marking lions and by using radio telemetry, we've been able to obtain considerable knowledge of that particular mountain lion population. Over a four year period we've been able to capture and mark 33 animals and we've been able to determine several things about the population. These are , (1) the size of the base population, (2) the age and sex structure, (3) the number of resident lions by sex and age and, (4) the home ranges for several lions. We've gained some insight into interspecific competition between lions, an insight into prey species relationships, something about productivity and population recruitment, and have accurate measurements of total harvests. All in all, I think from that study we've gained the type of information that's necessary to make sound management decisions for that area. Unfortunately, this is the only mountain range in the state where we have that type of information. We have some population information on about six other mountain ranges, and this year we're embarking on a new study. It's probably rather ambitious. What we want to do is get at least a sound ball-park estimate of the total lion population in the state. Nevada probably lends itself to this

type of work better than many states because our lion habitat consists of long, narrow mountain ranges. We can work the periphery of these ranges on the ground, pick up sign, and then follow up with a helicopter. I think we can get some pretty good data. We don't have these broad, massive ranges that Idaho, Montana and parts of Colorado have that are a little more difficult to work with. I think the most important part of this new work is that we want to identify the impacts of harvest and relate this to the management of the lion populations. Basically that's what we're involved in in Nevada.

Nevada: Joe Miner, U. S. Fish and Wildlife Service

Most of the take records that are available prior to 1965 were those of the Fish and Wildlife Service; they were not depredation control. Since then research by the Fish and Wildlife Service has been in conjunction with the Nevada Department of Fish and Game. In all due respect for everybody, we'll have to recognize that Dick Hall was a key man because of his ability to take lions and his knowledge of the country. Everybody relied on Dick's knowledge and expertise at the beginning of these studies. It was because of his knowledge and ability that the research in Nevada was able to progress as well as it has. Additional input from us will be from Dick and from Mike Laughlin from the Elko area. I would like to have both of them stand up so you know who I'm talking about. Any questions?

Molini: Bob (Fischer - Discussion Leader), if I might, I would add that the Division of Wildlife Services, U. S. Fish and Wildlife Service, has really been instrumental in our work in Nevada, especially Dick's expertise. They are now involved in the State-wide project with us this year. They have really been a big help to us.

New Mexico Fish and Game Department: Wain Evans

The New Mexico State Legislature in 1971 assigned the Game Commission responsibility for management of the mountain lion and made it a game animal. When they did this, they gave us an animal about which we knew nothing, and at the time not very many other people knew much about the lion either. We were subjected to pressures from certain groups to close the season and from ranchers and sportsmen to open the season. The most immediate question at the time became just how many lions do we have to work with? To answer this question, or at least to provide a partial answer, we initiated a project in 1972 in the southwest quarter of New Mexico, where based on our depredation complaints we thought our greatest mountain lion population occurred.

We divided the area into 22 subunits and then randomly selected eight of these units for sampling. We had a crew of one biologist and one lion tracker. The primary objective for two years was to count and examine tracks, to try to determine the sex of the animal and if it was an adult or a juvenile. In this way we hoped to come up with a minimum estimate of the lion population

in the southwest quarter of the state. After two years of spending about twenty days in each one of these units this team counted some 268 nonduplicated tracks, by their judgment, and managed to capture 29 lions, which they marked, but did not put on radio transmitters. We projected these estimates for the rest of the quarter of the state and came up with a minimum population of about 500 animals, which was considerably larger than most people had thought prior to this. However, about 40% of these animals were immatures, and maybe 70% of these juveniles are dead by the time they should have joined the breeding population.

Our management of mountain lions in the state consists only of the setting seasons and bag limits. We have about a ten-month season. Hunting is restricted to the southwest part of the state and parts of the northeast. One of the problems we're having is that there has been a sudden surge in reported attacks of lions upon humans in New Mexico. In the last two years we've had four such reports. I suspect that unless these start to die down we're going to have trouble. Of the four attacks one was absolutely certain, and involved the killing of a small boy. One of the reports apparently was pretty doubtful, but two other reports seemed pretty certain. One involved a woman who was attacked on horseback. I have about 40 copies of these reports that were made out by the field personnel in case anyone wants them. One more thing. These attacks on people all occurred in the past two years. We looked

back through the records to see when the last known incident occurred and the last one was 1915. Now all of a sudden, this big surge. If anyone has any ideas, we sure would like to know about them.

Greer: Has anybody tried to bring any lawsuits against your state relative to these attacks?

Evans: They haven't yet . . . We, as you know, don't pay depredations.

Greer: But this is a little bit different than depredation. This occurred in Montana with the grizzly bears, and I'm sure we'll see a test case in relation to the Tort Claims Act of 1973. There are a lot of different lawsuits occurring for different reasons, and I just wonder what some of the states have experienced as far as personal injuries.

Evans: Well, I don't know how this will all work out. I think we're going to be in trouble unless these attacks drop off, but as it stands now our state isn't liable for what the wildlife does to people or animals.

Greer: This is interesting. It may be of interest to some of you, (and there may be some correlation with future mountain lion management) that the Technical Committee on the Grizzly Bear have a workshop working paper in which they are trying to find out where and what the vulnerability is of different states as far as bears are concerned.

Oregon Department of Fish and Wildlife: Dave Harcombe

The mountain lion was classified as a game animal in Oregon in 1967 by the Oregon State Legislature and has been managed since 1970 more or less to reduce livestock damage. My study was begun May 1, 1975, just eight months ago. I don't have a whole lot to contribute, but a lot to learn. The aspects of the study are (1) to delineate lion habitat, (2) to develop a population sampling technique, and (3) to estimate the populations in 66 management units in Oregon. From report cards I have good information on mountain lion range and something about the habitat, which includes old-growth timber. In Oregon about 52% of the land is administered by Federal agencies--the U. S. Forest Service and the Bureau of Land Management. Our depredation problem has not been very severe.

Molini: Do you have lions in all of the 66 management units?

Answer: Not all of them, no. The wheat lands in Central Oregon and the high desert in the southeastern part don't have many cougars.

Texas Parks and Wildlife Department: Jack K. Parsons

In general the mountain lion in Texas is found in an area along the length of the Rio Grande adjacent to the Republic of Mexico with the higher population being located within the Trans-Pecos Region.

At the present time, the status of the lion in Texas is neither as a game animal or a protected species. For years, he has

been considered a predator and, therefore, may be taken at any time by any method. In general, it has long been the practice of ranchers residing in areas inhabited by lion to eliminate them or at least keep the populations very low because of predation on domestic livestock.

Until only a few years ago, the lion population in the State was given only a passing thought by the Parks and Wildlife Department except in a few isolated instances. However, in 1974 a bill was introduced in the State Legislature which would have given the animal a protected status. This move caused some concern within the Wildlife Division and it was recommended by the Division Director that if a change of status was desired concerning the lion that it be made a game animal. No action was taken on the bill and the lion is still an unprotected species in the State. This interest in the animal did, however, bring to our attention that very little was actually known about the population dynamics of the animal. We have conducted no research, or tried any type of management except to control the numbers on our Black Gap Wildlife Management Area which is located along the Rio Grande adjacent to Mexico and the Big Bend National Park in the southern portion of Brewster County. Since 1960 we have been in the process of trying to restore the desert bighorn sheep to the Trans-Pecos Area of the State. A brood pasture was established on the Black Gap Area so that the sheep could be raised under protected conditions. Since the beginning of the Bighorn Project there have been from 5 to 15

transient lion trapped on the Area annually in order to keep them away from the brood pasture and release areas. To our knowledge no bighorn sheep were lost to predation by lion through 1973. Approximately 2 years ago, for reasons I will not mention, we stopped all trapping operations. During this two-year period, the situation changed from a transient population only to the point where the 100,000 acre Area now supports a resident population of from 20 to 25 lion. We are now facing a severe predation problem on all big game species located on the Area.

The above example was cited only to indicate what could possibly happen over a portion of the State if the animal was placed under a protected status. If such a population increase did occur over a large scope of country it could very well be greatly detrimental to game populations within that area. Therefore, it behooves our Department to learn all that we can about the management aspects of the lion and that is the primary reason for my being at this workshop.

I realize that I can contribute but little if any input into this conference; however, I feel that I can learn much from those of you who are researching, studying and/or managing the animal, and I certainly appreciate the opportunity of attending.

Fischer: Yesterday afternoon over a beer Jack mentioned that when he and Bill Martin were spotlighting deer they encountered a few lions. Would you mind relating that experience to the group, Jack?

Parsons: When I tell of spotting lions on deer census lines, most people are slightly more than a little dubious and, to put it mildly, tend to relegate the story to the "tall tales" file. However, this is one time I have a witness present that can back up my story.

To preface my remarks we are using a method of censusing deer on our Black Gap Area utilizing a system of night spotlight lines. During a recent inspection tour of the Black Gap Area Mr. Bill Martin, Federal Aid Inspector from Albuquerque, New Mexico, arrived on the Area during the period when such a census was being conducted. To make a long story short Bill accompanied a crew on a spotlight census and in the course of running a 9-mile line, 9 deer and 4 mountain lions were seen. There was no doubt about the type of animal seen because in each instance the entire lion was observed for several minutes. Such sightings have been the rule and not the exception on each census conducted during the past 1½ years.

Utah: Bob Oppenheimer, U. S. Fish and Wildlife Service

Rodney John, Utah Fish and Game Department did not come to the workshop as expected. I work in 13 counties in the southern part of Utah. I'd like to tell you about the lion population in that area. A build up of lions has occurred in every county of that area. We have quite a few depredation problems. We work with the Division of Wildlife Resources of Utah, and we check with them before we take any lions. I'd like to tell you how we changed our policies in the last few years since it became a game animal. A few years ago, about 1960, we were taking between 80 and 100 lions a year. At the present time when we have a complaint, we refer it to Wildlife Resources and go check on the report. We only take the lions that need to be taken. Last year we took 19 lions. This year so far we've taken ten lions, eight out of one area. We have a problem now along the park boundaries.

Question: What role has Utah Fish and Game taken on lions?

Answer: I sure don't know. I do know that it is a game animal now and the State has a few active studies. A lot of permits are being sold. Sport hunters with dogs certainly seem to be on the increase. Last year we took 19 lions, the livestock men took 5, and the sports hunters took 158.

Washington State Department: Richard Poelker

I've been involved in a basic look at the cougar population in the State of Washington for the last two years. I've worked alone generally, with a few local hound men in tagging and capturing animals, but we haven't gone a long way down the road. We tagged a few cougars, all of which are dead at this time.

We've put out quite an intensive effort by going to the hound clubs with our program. They all agree that they probably wouldn't shoot a tagged animal, but the spirit of the hunt overcomes all good intentions, evidently. We're hopefully going to get into some radio tracking in the next year. We have homemade radio collars on hand that should work and we'll try to get some radio tracking done. We haven't had the response we hoped on the tagged animals. The objectives of the program was to try to estimate the population of the cougar within the state; to examine the current management program in relation to management alternatives which are available and those which are desired by sportsmen, the public, the Game Department personnel themselves; and to come up with management recommendations. We also wanted to examine the cougar harvest, the harvest reporting procedures, and the present control that we have over the current hunter take. Basically the cougar study was designed to terminate this summer. However, we plan to continue the field surveys as a minor part of an expanded cat study. We plan two more activities, one on bobcat and one on lynx. The bobcat will take about 75% of my time,

the cougar about 15%, and the lynx about 10%. We're going to switch emphasis to the bobcat. Since we couldn't differentiate when we had a strike with the hounds whether we had a bobcat or a cougar most of the captures we made with the hounds were bobcat. Tracking conditions are usually poor. The bobcat is becoming a management bonfire in our state because of high fur prices and conflicts between trappers and hound hunters.

Molini: How is the bobcat classified?

Answer: It has a dual classification as both a furbearer and a game animal, so it can be taken by licensed trappers and by sport hunters.

Question: I read your last progress report. My impression was that you had a voluntary tag return attached to the license?

Answer: We don't sell a tag. We have a mandatory reporting procedure. If you kill a cougar you have to report it within seven days to a Game Department representative. We're getting about a 45% return of harvested animals. We're probably maintaining a harvest in the neighborhood of 200-210 sport-killed cougar per year.

Question: You're getting roughly half of these back?

Answer: We're getting about half of the actual reports back. We're finding out about the others through examination of taxidermists' records because we license all taxidermists in the state and through our general hunter questionnaire.

Question: Do you enforce this?

Answer: Yes, they have been issuing citations for failure to report a cougar kill. It's a misdemeanor. It's sometimes difficult to enforce but I think several desirable management alternatives for cougar look good on paper but are very difficult to enforce, such as not killing kittens, not killing females accompanied by kittens, etc.

British Columbia: Daryll Hebert, Fish and Wildlife Branch

Daryll introduced Percy and Penny Dewar, and Jack Ray. We are probably considerably further behind than most states in terms of research and management. Just listening to some of the people here I think we are probably equal in terms of getting the cougars up to game animal status. Our hunter restrictions and season restrictions are probably about the same as most states. British Columbia Fish and Wildlife Branch initially started out to look at populations on about a thousand square miles area on Vancouver Island. Efforts have been somewhat reduced to looking at female family groups and radio tracking females and some kittens. In the Province of British Columbia about 500 cougar hunters kill around 300-350 animals per year. I don't intend to represent all

of British Columbia. There's quite a diversity of habitats throughout the province and we on Vancouver Island probably have more cougars than most other regions. We initiated a mandatory reporting system this year and as yet we don't know how it's going to work. As of this year, our province is now divided into over 200 management units.

Alberta not represented. (Mail strike likely prevented notification on time).

Saskatchewan: Terry Rock, Provincial Fish and Game. (Terry is in graduate school, University of Nevada Reno).

. . . . I don't think we have the mountain lion in Saskatchewan.

Dr. Carl Koford, University of California, Berkeley

We're mainly interested in determining distribution and numbers through track counts and identification. We've been working at this about two years now; tracked about 2500 miles. We have six study areas where we made intensive searches periodically to try to find out all the cats that are there by their tracks and then we made road and trail surveys for as many miles as we can in order to get a relationship between the numbers of animals found on the road in relation to numbers for that square mile area. Using this road count method plus calibration of the study area, we come out with

a ratio of about 6/10ths. In other words, if we find 3 cats for 100 miles of road, this roughly corresponds to about 6/10ths times 3 or 1.8 cats per 100 square miles. We don't count kittens; we count only large juveniles and independent cats.

Bob Davidson, Expedition Films, Inc., Springdale, Utah

We've become interested in mountain lions recently with the idea of doing a life-cycle study on film, not of the nature that you find on "Wild Kingdom," but of a more detailed, involved study. That's no reflection on "Wild Kingdom" because I have helped them do some of their programs also. Three years ago we obtained two kittens, which we have hand raised. One was from the Arizona Sonora Desert Museum and the other from the Great Plains Zoo in South Dakota. We would appreciate any help and would like to work with you on recording on film the life history of the mountain lion.

Christensen: Let's move into our discussion sessions. The next session will cover "Biology and Life History of the Mountain Lion." Lloyd Oldenburg, Idaho, wasn't able to be here as discussion leader. Maurice Hornocker has graciously accepted the responsibility for this session. Maurice Hornocker, Leader, Idaho Cooperative Wildlife Research Unit.

Biology and Life History
Standardization of Terms and
Measurements; Aging Methods,
Food Habits, Habitat Needs

Maurice Hornocker
Discussion Leader

What we would like to do is open up a give-and-take here. I would like for everyone to feel free to interrupt at any time with questions, and hopefully we can kick around some of these things that we're all ignorant about. Les Pengelly said once that we are all ignorant about different things, and I really think that is true.

I would like first to commend Glen and Bob for the setting for this kind of workshop. I had an opportunity to contact some of you for participation in this part of the program, but not everyone. Biology, life history, habitat and food habits are listed; and I think there'll be some overlap. That's fine.... but logically it appears that aging methods could be set aside for a separate discussion. Anyone who's had anything to do with an attempt to age animals, we would appreciate what you've learned -- or what you haven't learned. Also, the standardization of terms.... maybe we ought to get together and decide what we're going to call these animals. A lot of us are measuring these animals, teeth, feet, etc. I think it would be worthwhile for us to decide just how best to measure so that we're all on the same footing.

I think we ought to recognize that we're dealing with one of the most adaptable mammals in the world. The mountain lion can inhabit many kinds of environments and can live on animals the

size of mice or elk.

Mountain lion ecology is going to be different from the Pacific Northwest to the deserts of the Southwest. These are things that we should consider when we discuss any management program, and certainly the research approach. To begin, let's discuss some of our research. Hopefully, most of it will relate to management. I'd like to take ten or twelve minutes to tell you about our research in Idaho.

Before I get into this, though, I'd like to remark about the contribution that is possibly by a man who's had a lot of experience with these animals. Every successful lion project that I'm aware of has involved a man who's had long experience with dogs and with hunting lions for one reason or another. Wilbut Wiles worked for me, and our project would not have been nearly so successful without his help. I would urge anyone who's considering working with these animals to seek out the best man you can find. This could be a big factor in getting a study off to a successful start.

We worked nine years on this project in a winter range of about 200 square miles. We captured 63 different individuals; 32 juveniles, (kittens accompanying their mother), 16 adult males and 15 adult females.

We recaptured 41 of those individuals over 200 times...exact number of recaptures is probably around 225. We instrumented 15 of those individuals 37 different times, and we obtained about 1500 radio locations on them over the last three years, when we were

radio tracking. We instrumented lions on which we had a lot of prior information. Thus we could predict where they were and were able to gain more intensive data of a specific nature.

Our population was stable, and remained stable throughout the project. It was an unexploited population, with a history of very light human hunting pressure over a long period of time. We had roughly three males and six females throughout the study. The resident population was made up of about 20% adult males, 30% juveniles, and 50% adult females. Territoriality was the major factor in this stability. Their prey was "natural" -- and this population I would call in a "natural" state. We can expect to find, I think, an entirely different situation in exploited populations, in populations that have their social structure disrupted.

The following highlights the slide presentation:

Our study was conducted right in the heart of the Idaho Primitive Area on Big Creek, a tributary of the Middle Fork of the Salmon. We chose this area for a number of reasons. One was the isolation. The Salmon River topography here is steep with very little river bottom. The winter range for big game is on the south facing slopes. Very little snow clings to these slopes. There can be a foot to a foot-and-a-half of snow or more on the creek bottom but rarely do these steep slopes remain snow covered. The cats usually didn't tree too high. Once in a while they would

go up pretty high in a yellow pine. We used the Cap-Chur syringe, and because we needed lightweight equipment we developed a zip-gun to carry in the back packs. This is just a rifle barrel and we used, at that time, the Palmer powder charge shell to propel. The drug we used was Sernylan. It requires five to ten minutes to take effect.

Question: Did you use an antidote with the sedative?

Answer: Not an antidote, but we used promayine or acepromayine.

This smoothed the effects of Sernylan. A fine drug I would now use would be Ketamine--it's effect is much nicer. We used a nylon collar, called "Poka Rope" by its trade name. It has a little metal clip that you poke the rope through. It's readily adjustable, and its foolproof as far as slipping or tightening or breaking or anything. It's ideal. We had them on an old male for five years; we had them on several others for two or three years.

Question: What's the smallest lion you put them on?

Answer: We didn't put it on any small ones. We just put it on adults or those reaching adult size. We collared some of the kittens approaching independence. It's an excellent collar.

We made a series of measurements on all the cats we captured. Some of these are pretty good--some aren't. We attempted to get a shoulder height, and you all know you can shift that around and get a different measurement--it's pretty crude. But we tried to standardize it, and when we get into a discussion on standardization I'd like to hear how you do it. We measured feet in millimeters on all the cats, and on several individuals year after year.

Question: Did you use ear tags and plastic ribbon, too?

Answer: Yes, we used an aluminum ear tag and a plastic ribbon in each ear.

Question: How did the ribbon hold?

Answer: Some held well, some didn't. A tattoo in the ear works very well. The cat has a beautiful ear to tattoo. It's pretty fibrouse, very few blood vessels there, and by taking the ear between your thumb and forefinger you can rub all the hair off and it leaves a beautiful almost shaven surface. A tattoo will persist. It's been a fine technique--much better than in the lip. We tattooed both ears. We raised four kittens to attempt to determine those innate behavioral characteristics and the learned ones. We raised one to the age of four years, two to the age of 21 months. We checked the growth of these animals against those in the wild, the pelage changes, the dentation changes and replacement. A lot of these data aren't applicable to those in the wild. A lot of it is. It did give us a real insight into the innate behavioral characteristics of these animals.

The reason that our work began was an analysis of depredation on mule deer and elk. This was quite a controversy back in the early sixties in Idaho. We found that depredation on bighorn sheep and mountain goats really wasn't all that important. Elk and deer make up a big part of the diet of the lions and practically all the diet of some lions in winter. The effect on the population, however, wasn't all that great. They can kill these big bulls. We had one

94 pound female instrumented. She killed two of these big 6-point bulls one winter, as well as several other elk and dragged them all to coverts and always cached them. She had two 18 month old kittens to feed. The sticks and limbs were often bitten from trees and were all stacked over the kill. All of the kills are covered in this area. We found none of the wastage of wanton killing that one often hears about. Ours was the only disturbing influence in this area. Our radio tracking later showed that, if left undisturbed, the lion would remain with the kill until it was completely consumed. Small deer were completely eaten up. We also looked at the condition of the range and we're coming out with another paper on that. Recently a graduate student, Jim Claar, took a very hard look at the range-- what was produced, what was utilized. We analyzed over 100 rumin contents, and we've come up with some different conclusions.

We documented cannibalism. A big male killed and ate two 40-50 pound kittens. The third one escaped. This was in 1965. The third member of that litter was shot by a hunter last winter about 50 air-line miles from where we first captured it. We haven't been able to get that skull, much to our chagrin. The first lion we ever treed on the project had stalked, killed, and eaten a coyote. We've documented kills of beaver, raccoon, and pack rat. We have over 1500 radio locations both from the ground and the air. We tracked them throughout the year with the airplane. This was extremely important during the summer months when they dispersed over a wide area. So

while we weren't able to observe them directly, we could indirectly.

Question: What was your heaviest female?

Answer: 116 pounds. We had one change sex. We called it a young male when it was captured in the dark and under bad circumstances. Recaptured four years later, it was still a fairly small lion, but it was a female.

Question: What criteria did you use as your breakdown between adults and juveniles?

Answer: Animals still with their mothers are, of course, juveniles. Some animals become independent and are still juveniles, but you can't often tell. For example, we had one female that had three young with her. She weighed 94 pounds. One female kitten weighed 98 pounds; the other female kitten weighed 102 pounds; the male weighed 135. She was feeding this whole big crew.

Question: How old would they be at that time?

Answer: About 20-22 months. Some females get rid of them at a younger age. We saw one make her kittens become self-sufficient at about a year of age. But most of the time it's usually about 15-22 months.

Question: Can you estimate average time of first breeding for females

Answer: No, because I think that depends on the population status of that female. I think they can breed at two years of age but I think breeding depends on the social structure. I've stated that I don't think a female will breed until she has a place to live, until she's on a territory. We have strong evidence for that. In a heavily exploited population I would expect the females to breed when they

became biologically capable because there's room for them. In our unexploited population where there isn't much room the young must disperse. We've recorded six of them killed 50 to 100 miles from the study area.

Question: The study area is unexploited and the surrounding areas are exploited?

Answer: Right. A lot of our young cats disperse out to the edge of that Primitive Area, where they're more accessible to hunters, and they're being picked up there.

Question: Regarding your captive animals, when did they lose their milk teeth, or their baby teeth?

Answer: About six to seven months. This was true with the wild ones as well.

Question: What percent of the deer and elk were of good health and poor health?

Answer: Better than 50% of the elk and deer killed were in what we call "poor health" -- a poor state of nutritional health.

Seventy-five percent of both the deer and elk were either 9½ years old or less than a year and a half old, so the lions were killing the old and the young -- the old, feeble ones or the young, dumb ones.

Question: What was the incidence of coyote kills?

Answer: Three, during the study.

Question: Over nine years?

Answer: Yes.

Question: How was the coyote population in your study area? Was it high, or low?

Answer: I'd call it high. As near as we can tell it has remained pretty stable throughout all those years.

Question: No evidence of coyotes stealing the cougars' kills?

Answer: No, the cats lay right with their kill. They cover them all and stay within a very short distance. Now this is different in north Idaho where there are a lot of logging roads, and some lions there have learned, I think, that they get killed if they stay right with their kill. They go greater distances away, but they do come back to it. But in our study area, again, ours was the only disturbing influence, and they stayed and completely utilized the kills. Unless we scared them off, and even then some animals would come back to kills.

Question: Within your study did you find any difference in depredation between seasons of the year?

Answer: Yes, we found very little depredation on deer and elk during the summer months. In May, on some of those meadows back there, the ground squirrels really come out in numbers. At this time movement patterns of the cats change markedly, as determined by radio tracking. One female with small kittens spent an entire summer in a little drainage near Flossie Lake Burn. This burn was infested with ground squirrels. We know that they take a great many more small animals during the summer months. We just weren't able to

record any depredation, for that matter, on elk and deer during the summer. We know they kill them, but I think that this is negative evidence that they kill a lot fewer during the summer months.

Phelps: During the summer time down in our part of the country we found that depredation on deer was much higher than in the winter time. We don't know the reason, but of course, one of the reasons is that a lion will kill during the night and by nine o'clock the next day the buzzards have got it and there's nothing left. If they eat again they've got to kill again. On one occasion we found there were two lions, a lioness and her cub, had killed seven deer within a two-week period.

Answer: Well, during summer months, as I said, there isn't nearly that much predation pressure on deer and elk in our area. We are now working up the quantitative aspects of this depredation and it isn't as much as I had speculated during the early part of the study. This is based on our radio tracking.

I've taken more time than I intended. I hope this opens up a few things and I hope to visit individually with several of you. Now I think we'll move on. I've asked Gary Power, who's working on an exploited population on the eastern border of the Idaho Primitive Area in the Challis region to present his study. This population has been heavily hunted for a number of years. In this area alone almost 90 cats were killed the last year of our wide-open

season. I felt at that time that it would be a long time before the population would respond over there. I was wrong. They came back very rapidly. Gary has marked a number of animals there and is getting some really interesting things on the replacement of resident females killed by hunters.

Idaho: Gary Powers Highlights of Slide Presentation

As Maurice has indicated the work that we're trying to do in this area is on a heavily exploited population. Work was started during a closed season in 1972-73 which was preceded by a year (1971-72) of high kill of approximately 83 lions in the Middle Fork Salmon Area. I transferred into the area as conservation officer for the State of Idaho. Since I had previous experience running hounds I was asked by the regional game biologist to gather some information on how many lions we had in the area. I located quite a number of animals, even after the high kill. The information more or less tended to show that we could open the area the following year on a limited basis. Thus we ran the season from the 15th of December to the 15th of January.

The Challis Area varies in habitat type, ranging from high mountains to timber type on the upper end of the drainage. It is located more or less to the east of Maurice's study area in Big Creek; it borders the Idaho Primitive Area; it's really the first hunter access area. People can get into this area quite readily from Challis.

We are also working in the East fork of Salmon which contains somewhat different habitat type. Primarily it is semi-open timber and rocky mountains, with scattered sagebrush and grass, in the lower elevations. A large section of the study area has a fair number of big game animals.

I tried to work the areas that the hunters used heavily. Lions were captured and marked in an attempt to get some idea of how many animals that were in the area.

Question: How did the hunters feel about that?

Answer: It wasn't a competition factor. For example, outfitters that are working in the area have worked with me. These fellows have been really cooperative. It's an interchange of information, and it seems to be working quite well.

Question: Do these individuals serve as guides? Do they charge a fee, or are most of them just private hunters on their own?

Answer: We've got both. There are three major ones that are outfitters in the area that are charging a fee. A couple of them have been doing a fairly good job in seeking out the larger cats; others will take whatever they can get. We do have a number of private individuals.

With help from John Beecham we are working on stride measurements. The stride measurement is from the center of the track to the center of the track of an animal that is not running or really stepping out. We restrict measurements to relatively flat ground. We've found that this measurement varies between toms and females.

So far I haven't caught any females that had over a 39-inch stride. Even a 3-year-old tom will have a 39-inch or greater stride.

We've also been taking the width of the track, measuring from the outside margins of the toe. You have to be very careful that the toes aren't spread. The widest measurement on the female has been 3 inches, ranging usually at $2\frac{1}{2}$ to 3 inches. Tracks of 2 to 3-year-old toms will measure 3 to 4 inches. The largest tom measured so far was $5\frac{1}{2}$ inches with a 48-inch stride. A 162 pound cat had a $4\frac{1}{2}$ -inch wide track and a 44-inch stride. This information helps us determine whether the animals are males or females.

We started a mark and release program. We wanted to determine what effects the hunting had on the population and also to determine population structures in an attempt to get some idea of what sort of hunting season to recommend. We used numbered collars and tattooed the ear. Hounds were used to capture the cats. We're using the same modified capture gun that Dr. Hornocker built up, and it's quite effective. It's lightweight and it does the job. We usually aim for a heavy muscle such as the shoulder, wait until the animal is immobilized, then go up the tree and lower it down. I've been trying to underdose the animals to keep them from going completely out because if they completely relax there is the possibility of them falling and injuring themselves.

Question: What dosage do you use, Gary, for underdosing?

Comment: We've been using Sernylan according to a scale we've worked out. It depends quite a bit on the cat. For example,

.5 cc. Sernylan will be sufficient on an 80 pound cat, and depending on that particular individual, it may put him out fairly cold in five minutes or it may take three hours, as it did in one case! We weigh the animals which is quite a problem with back packs in steep terrain.

Question: Have you ever tried the net for catching them when you can't get to them in the tree? Have you had that problem?

Answer: No. I think that's reserved for Marlin Perkins.

We use a tattoo in the ear and in the upper lip. I didn't trim any of the hair away because if it is taken by a hunter he may want to have it mounted. The tattoo is quite legible even through the hair.

Question: Have you been getting pretty good retention?

Answer: I've only been able to check them after they've been in there for a year but it's been excellent. I have seen it after it's gone through a tanning process and it's still good.

We collar the animals with numbered collars such as Maurice has already described. I'm really impressed with these collars. Someone asked about chains earlier -- I think that this would tend to wear the hair. On these collars, whether it's been one year or two years there's been no distortion on the hair color at all. Take that collar off, fluff up the hair, and you can never tell it was ever there. We tried taking blood samples, but it was a total loss this last year because in cold weather when warm blood hits the cold test tube it causes a disaster....We're going to try a

method to keep these test tubes warm.

Question: Do you know anything about the Sernylan freezing and then thawing out?

Answer: About a month ago we had some Sernylan that froze and I don't know whether it was thoroughly thawed out or whether it was a carryover from a year ago. I had one small female that I had to shoot six times and ended up doubling the dose of straight Sernylan before I could get her out of the tree. It took three hours. I've used the same bottle a couple of days later under warmer conditions and have not had a problem.

Shaw or Phelps: We've had similar variation in response of cats in Arizona, and freezing definitely isn't a problem.

Beecham: I had problems with bears, too, during the summer. Occasionally you get a bad bottle, or it goes bad on you. Some of it may be freezing, but it's not the reason in all cases.

Power: We take a fairly good look at the condition of the captured animals. We check body condition, teeth, claws, any abnormalities, etc. In several instances we noticed the hair was scraped off under the leg. This is probably due to crusted snow conditions and could occur about any time of the year. We can determine whether some females are a resident or a transient cat by examining the nipple. A female with kittens has the nipple quite distended. The nipple is dark and even the pigmentation of the skin around it is dark to some extent.

Question: Is this actually pigmentation? Is it retained after the

hide has been tanned?

Answer: Yes, it is, in some cases. I've looked at three hides so far and they've varied in degree of darkness, but they were quite dark. It's really hard to find and you may have to really check through the hair before you can find it. If it's quite distended, and maybe only the nipple itself is darker, we use that as a break-off.

Question: How long does it take the fur to cover up that spot?

Answer: I really don't know.

We've got three resident toms marked. We've also got transient females and have marked five of them. These animals were about three years of age and have not had kittens yet. Some of these three-year-olds are appearing this year with kittens. They're having kittens at the age of three to four. Six resident females have been killed in the area during the last three years, and three of them were my marked cats. I still have a couple of marked ones out there.

We tried to work on predator/prey relationships. Deer and elk are taken but I have no recorded kills on bighorn sheep. I have seen bighorns taken in the Middle Fork Salmon, adjacent to our study area.

That's it as far as the slides. Now I'll give you a brief rundown on the progress of our study to date.

We've had 24 lions harvested in the last three years; 6 resident females, three of them marked; 7 resident toms, one marked; 5 transient females; 4 transient toms, 2 marked; one subadult tom

and one subadult female. Six, or 25 percent, of the total harvested lions were marked cats. I've captured 17 individual lions and got a location of approximately 52 sites, which includes both harvest and recapture data. Most of these were on transient animals. For example, 10 catches on resident females and all the rest were either toms or transient cats (24 on transient cats). In 1972-73 we estimated 26 lions in the study area after the season. These were animals that I was relatively sure were independent cats.

During that period there had been eight animals harvested in the area: 2 resident females, 2 resident toms, 1 transient female, 2 transient males, and 1 subadult male. In 1974-75 we had 11 harvested: 2 resident females, the rest were either transients or toms. The estimated population after the season was 31. In 1975-76 to date, we have 5 harvested: 2 resident females, 1 resident tom, 1 transient female, and 1 subadult tom. I feel that the reason we do have a high population shift is that there is a large reservoir area, the middle fork that is not hunted much, next to the study area. These animals have got to travel to find an open area. We're hypothesizing that this is the first vacant area that they can stay. The young animals on the study area don't have to travel so far; they set up residency there.

Question: How large is the study area?

Answer: It's approximately 1300 square miles. The winter range area is probably around 600 square miles.

Question: So you have about 30 animals after the hunting season in about 1300 square miles?

Answer: Yes. We do have certain drainages where hunter just don't go. It's interesting to note that there are five or six resident animals that nobody's been able to catch but they're still right there, even though it's heavily hunted.

Hornocker: Thank you, Gary. I might point out that Gary's population is in an area of very heavy livestock grazing. Depredations really aren't much of a problem; in fact, depredations on livestock aren't a problem in Idaho. There are very few complaints from the livestock people in Idaho, maybe one or two complaints each year, usually on sheep. Yet, you have cattle, sheep, and lions mixed up all summer long on most national forests in Idaho with the exception of the primitive areas. John Beecham of our department is also working on a similar kind of population in southern Idaho.

Question: Just off the record, have you any idea how many cats are killed in Idaho in, say, the last year?

Answer: Yes, roughly 112.

Beecham: I'm doing essentially the same thing that Gary's doing, only I'm working in a little different area. It has essentially the same population characteristics--it's a heavily hunted area. Maurice has done a considerable amount of research in Big creek and has a lot of data on the stable lion population and the social system that governs that population. But we don't know what happens to that social system with the impact of hunting. Does hunting disrupt that social system? Gary's working in Challis, Ron Sherer and myself are working on the

Boise River Drainage east-northeast of Boise. It's essentially the same kind of country Maurice and Gary are working in. I'm not going to go into any of the techniques because we're using the same techniques that Gary's using. Most of the hunting is confined to the estimated 230 square miles of winter range of the Study Area. Access is good and the roads are hunted quite heavily. We're going into the third year of the Study. During the last two years we've marked 13 individual cats (18 captures); 6 males and 7 females. Of these, 4 are adult males, 3 adult females, 3 subadult females, and 2 male and 1 female kittens. Three of the nine cats killed in the last 2 years were marked. Very few of the hunters who use this area get off the roads. Some snowmobiles are used but there is no guide outfitting to speak of.

Gary's covered what we're doing in the way of research so I thought I'd talk about what the Department is doing in the way of mountain lion management which is patterned, largely, on what Maurice has done in the Big Creek Area. In 1971 the legislature decided that they would make the mountain lion a big game animal. It became effective on April 1, 1972. That year we required a nonresident tag for \$10, but no special resident tag. We set a limit of one cougar per year per resident or nonresident, and a short season of September 2 to December 31. Actually that amounts to about the first of December to the 31 for hound hunters because that's about when we get our good snow. September through November is primarily for the benefit of deer and elk hunters who are in the field and who take a few lions incidently.

They don't need a tag. This is something the legislature thought the people of Idaho deserved. In 1973 we got a mandatory check on skulls and hides which had to be reported to a representative of the Fish and Game Department within five days after the kills. All skulls were retained by the Department for cleaning and measuring so we could assign some kind of an age classification and some idea of the harvest. The general season was extended through the 31st of January and in the roaded areas through the 15th of January. We separated the hound season, by opening it the first of December rather than the first of September. We also allowed for the issuance of nonconsumptive permits during that portion of the year where it was seasonable to hunt lions but the season wasn't open. People could go out for the purposes of photography or dog training. The 1974 season was essentially the same. In 1973 there were 34 people who took advantage of the nonconsumptive permit; in 1974, 42 individuals. I don't have a count for this year yet. In 1975 we required a \$5, resident tag. Limit is still one. Mandatory check are still in effect except for males. We retain only the females skulls now. We found that we were getting a lot of flack from the public by holding the male skulls. A lot of individuals were concerned about the trophy aspect of the skull--they wanted to get it measured as soon as possible and get the largest measurement that they could. They were concerned about us losing the skull or not getting it back to them quickly enough. We found that the really important information that we wanted was on the female segment of the population. We're recording male kills, but we're not cleaning or measuring the skulls. We fill out a form on

the skulls. We obtain information on the date of the kill, unit of the kill, sex, range, tag number. These are filled out by the individual that receives the kill, ships it into Boise where they clean it. In addition, each skull is marked with a plastic tag; blue tag on the skull, red tag on the hide. We get the skull into the lab, take certain physical measurements like the distance between the maxilla and the junction of the cementum and enamel on P4 and an upper canine to get some indication of age. It's pretty gross; we don't have any really reliable way to age these cats. I did get a look at Maurice's known age nine-year-old. I missed it a year. So, we're pretty pleased with the results. We're not breaking the classifications down. We're not refining it that closely. We put them into three major groups generally speaking: Kittens, subadults and adults. We look at the sutures; open sutures indicate a younger animal. We look at the tooth wear, and assign a relative age. We feel that we're getting good information. We're picking up some information on some possible causes of natural mortality. We record if an animal has suffered some kind of damage to the skull. Our mountain lion harvest for the last 15 years has averaged about 133 cats if you include the 1971-72 season, which was the last year that it was open, before it became a big game animal; 121 cats per year otherwise. Reports up through the 1971-72 season are based on conservation officer reports, in effect estimates, not nearly as accurate as the 72, 73, 74 data. They are somewhat low. I think we're getting a little better return on our lions. I'd guess that we check 90%. The last year

that we had an open season was the big year--303 cats were taken. Under present rules individuals are required to have a nonconsumptive permit.

Question: How does the enforcement of that work?

Answer: The guys get out and check them. Make sure they have their permits. Some individuals, if they're ambitious enough, they get out and check to make sure that a cat hasn't been taken or shot and left. But, generally speaking, it's pretty much on the honor system. Just allowing these guys to get out. I don't think they abuse it much. There's a lot of reports.

Question: This is during the nonhunting season?

Answer: Yes. You're not required to have a license if you bring in anybody from out of state who wants to go out and photograph lions. Some of the guides in the Salmon Area are getting \$500 to \$1000 for a five-day photography hunt.

Question: Your season runs through the end of January?

Answer: It has for the last two years. This year we have some areas that go into the first week of February. Next year they will be expanded beyond that. We feel that with the mandatory check we've got a pretty good handle on harvests and we can take as many cats as we want. The information that Gary's collecting in the Challis area and that we're getting from Boise pretty much indicates that these cats can take a lot of hunting pressure if you want to operate within the disrupted social system or the exploited population concept.

Poelker: What's been the response of your conservation officers to having houndsmen running around in the woods with hound treeing cats for fun, and bear and bobcat and other things that are there? I would be pilloried and tarred and feathered at home if I'd tried to do such a thing.

Question: What percentage of reports do you get on the mandatory exam?

Answer: I'm guessing about 90%. I know we don't get them all. You hear reports all along of cats that aren't turned in. They're taken and sold illegally.

Question: Did you say there was a charge on these nonconsumptive permits?

Answer: No charge. It's good for 16 days, renewable, and then we have a reporting system. People that have the nonconsumptive permits must fill out a card after each hunt.

Question: How about the big hide market, is it a real pain up there?

Answer: We've got green lion hides going for over \$200.

Question: Do you license taxidermists in your state? For instance, do all cougar hides in their possession have the Department seal on it?

Answer: Yes.

Question: Is it illegal for them to have an unsealed hide in their possession?

Answer: Supposedly. The only problem we have is that the sealing program has only been in effect for three years, this is the third year. If people have an unsealed hide in their possession, they can say it was taken prior to the tagging program and that they've had it in the freezer for 3, 4, or 5 years. The tagging program hasn't been retroactive to all lion hides in possession, so we have a little difficulty there but I think that will work itself out.

Question: Is there any trapping going on in your area?

Answer: No, not specifically for mountain lion.

Question: Is it legal to trap them?

Answer: It's legal to trap them, but the limit is still one. It's also legal to trap bear.

Arizona: Harley Shaw

In Arizona we have a lot of cottontails and jackrabbits, but we just flat out haven't seen evidence anywhere of these being taken by lions. Admittedly, the smaller animals are undoubtedly cleaned up when they are killed; but so far we've found only one rabbit that we knew a lion had killed, and this was an old tom that we were radio tracking. We could see where he had pounced a couple of times and crunched the rabbit, then walked off without eating it. I don't have the number, but of some fifty-odd scats that we've analyzed 62% are deer, 34% cattle, and 4% other species, so it's almost identical to our kill composition. We've made a point to not collect scats around a known kill. If we made a quick search around all of our kills we could very easily repeat our kill data. We tried to pick up scats while trailing and in areas where we hadn't found a kill. I don't know how good this is. There are a lot of problems in the scat analysis, but so far it almost repeats our kill data.

In terms of animals present, there seem to be a definite selection by cats. I might mention the cattle operation, and this, I think, is the key to the whole problem. We're dealing with an area that is a year-round cattle operation. It's a cow/calf operation, on the open range where the cows are dropping calves year round. You can see little bitty calves any month of the year out there. You've got a situation where extremely vulnerable animals are being dropped right in lion country day after day. These little calves are a lot easier to get than deer. To me it's

almost inevitable that there is going to be some selection, and it is showing up in our data in terms of the ratio of calves to deer as opposed to the ratio of calves to deer in the kill. If we run these figures out, based on, Maurice's figures in Idaho for kill frequencies, and then using this cyclic movements for several lions for an upper limit of kill frequencies to give us a range, we've estimated between 77 and 193 deer per year are being removed from the area. I might mention that our estimated deer population on the 150 square miles appears to be running very close to 1000 deer. We're using chopper surveys. Between 21 and 97 head of cattle per year are taken on these two ranches, which is a pretty sizeable number. We're having to face up to the fact that it is a real problem. The lions are eating a lot of beef. Of the cattle, about 90% are calves, probably 200 pounds and under. We're seeing very few larger animals taken. I've documented a couple of yearlings up in the 400-500 pound class, and I have now seen two mature cows around 300 pounds killed. One of these large cows was killed by a female that weighed about 80 pounds and was feeding some kittens. The other was killed by a mature tom. So they can kill the bigger animals, but they don't seem to like the idea too well.

That pretty well summarizes the impact information for Arizona. We haven't done much on movements of lions. I think you can see why I mentioned there may be some cattle management options available depending on the economics of it. The crux of the cattle loss problem seems to be the calf operation in my country.

British Columbia: Penny Dewar - Highlights of Slide Presentation

The type of area that we are doing our lion capturing and tagging in is on the east coast of Vancouver Island. We have a fairly difficult method of hunting. We either have to walk with the dogs or else we use the logging roads, which are many. We run one dog and carry the rest of them in the back of the truck. Using the logging roads we are able to cover the area most efficiently, and we usually hunt a distance of 15-20 miles a day. We cover the same area every day. In this way we feel that we're able to catch all the lions that cross the roads. We go about 5 or 10 miles an hour. The type of country that we're tracking in makes it difficult to follow the dogs. We have to go over a lot of streams and through a lot of swamps. We're also in an area that has been logged extensively and we have to go through logging slash areas. One of our biggest problems is that if trees are not available cougars at bay on the ground seem to be fairly aggressive. In four years we've treed over 70 cougars, some of these were recaptures. Most of them were in positions that we considered unsafe for tranquilizing. They were either too high in the tree or in a place that we felt we couldn't climb to get them out. Sometimes when we bang on the tree, the cougar will jump out and then we can tree it again. When we dart them, we always try to hit them in the hind end. The drug that we're using is Sernylan, and we've had fairly good success. Usually after we've tranquilized them we have about an hour and a half to work on the

animal. We've only had two deaths while tranquilizing them and both were the result of the cougar remaining in the tree after he was hit. This is when we stopped tranquilizing most of the cougars that were too high in trees. Most of the collars we put on the animals we make ourselves and we haven't found any evidence of these collars affecting the hide. We've made several different types of measurements on the cougars and we've found that none of them have been very successful. We've found even the way you hold the paw makes a difference on the measurement of the foot. We've several times treed the same cougar and gotten quite different measurements. We use elastic collars on kittens and have had good success. We've tattooed the ears of kittens and we're going to start tattooing the ears of all cougars. The eartags we used don't show up that well in the trees, so we're going to try the neckties.

Question: How is the retention of this type of tag?

Answer: We've had two lost, but we have a tag in each ear and we've been lucky not to have a cougar that's lost both of them.

Comment: We've used them, too, in both ears, and have only lost one tag out of three animals.

Dewar: Our method of radio tracking has been mostly from the ground. We have several places that are high vantage points and we can receive a signal usually for up to about 4 or 5 miles. Most of the cougars that we follow are females and they stay in very small areas; about 20 square miles in the summer, and down to about 5 square miles

in the winter. The reason it's so small in the winter is that winter habitat is diminishing. We've had good success radio tracking females; we've had less success radio tracking males, who travel in much larger areas. Several juvenile males have been shot over 100 miles from where we tagged them. One adult male we followed has an area of at least 250 square miles. We don't have the funds for flying too often, so we haven't been able to keep good track of most lions. A revolving antenna on top of a pole at our base camp enabled us to radio track collared animals all the time. Both of the females that we followed extensively came around our camp fairly often. They made several kills within a hundred yards of camp and stayed there for several days until the kill was consumed. We used the same antenna for flying as we did on foot; we'd just tape it to the wing of the plane. We haven't been able to make any good behavioral observations.

A female with three kittens had several kills at the same time. They were several miles apart and they traveled between these kills. They had a route that we were able to predict and several times we were able to see them crossing the roads. We found that they use all of the kills; there was no waste. In the summer most of the kills were made on the edge of openings, slash openings, and then they were dragged into areas of fairly heavy cover. We concentrated our study in about a 200 square mile area. There wasn't too much winter range. A mountain eight miles long that has mature timber on it, is probably the most

important part of our whole study area. It is the biggest single area of winter range that's left. We did a lot of measuring of scratches or scrapping and thought maybe we'd come up with some reason for them making them, but we just became more and more confused. We believe there's some communication involved, but exactly what we're not certain. We haven't really found any defined territories, or any territories defined by scratches. Most of the mature cougars are resident cougars. They sought cover such as under a rock or in a hollow tree to sleep in. We observed a female that had found cover to sleep in, but the kittens slept out in the snow, under no cover at all.

Question: Are some of the scratches distinctive? Can you tell which cat makes the scratch or whether it's a big one or small one?

Answer: No. We thought to begin with that a large scratch was made by a large cougar, but this wasn't the case. We found that sometimes cougars would make scratches a few feet apart. They would make something like 50 scratches a mile. Other times they would make only one scratch every two or three miles. The same cougar would make scratches all different sizes depending on the type of substrata.

Question: You say territories were 20 square miles down to 5 square miles. What are some of your greater distances you've tracked some of your adult cougars?

Answer: The farthest any cougar has gone is 100 miles. That was a juvenile male. He was shot. We didn't actually track him that

far. Most of the females stay in extremely small areas, and we've estimated that within 200 square miles there are about 8 resident cougars. We call them resident, but the males aren't actually resident in that area.

I might comment on immobilizing agents, that we've been using a different one than the two that have been mentioned here this morning. It's CI744. CI is for "clinical investigation." It'll have a different name when they market it, you can be sure. Caledamine is the name they use quite frequently. It's related to ketamine and is about twice as powerful. It's about half as powerful as sernylan. We haven't had that many animals down, but it showed great promise. We've used it on 25-28 lions, some in zoo situations and some in field situations. We've seen ketamine used on one occasion at a zoo. The result was, as Maurice described this morning, convulsions. It seems to be somewhat faster acting than sernylan, from what we've been able to read in the literature. It's not available on the market now. In fact, Parke-Davis is the manufacturer. It has completed the experimental stage and is being finally evaluated for licensing for commercial use. It may be available within this calendar year.

California: Larry Sitton - Highlights of Slide Presentation

We had trouble in our particular study area being able to secure mountain lions. We went six months without being able to secure one.

The study area is located in central California's coastal range in Monterey County just east of King City. This is the Big Sur Area. During the summer our conditions are hot and dry; during the winter it changes dramatically and we have a lot of water and snow at the upper elevations. We use the road system extensively in capturing mountain lions. We drag the roads so we can find tracks and then set off on the pursuit. We try to capture mountain lions all year long, in all different sorts of weather. We record scratches and any information we feel might be valuable to us. We collect scats whenever we find them. We find that one way of differentiating mountain lion scat from that of other animals is the presence of mountain lion hair in the scat. The mountain lions lick themselves, thus hair is present in the scat. Once we tree a cat we set up operations. We use the drug sernylan - .6 milligrams per cc concentration, with about 1.4 milligrams of acetone in combination in a 2 cc dart. We find that average dosage is generally adequate. Sometimes we have to second dose an individual after we get him out of the tree. We use a CO2 pistol in most instances. We find that the older cats, especially the older males, are calmer and tend to hold in a tree a lot easier than females or young animals. Once we get an animal that does hold to a tree we send our climber up to

immobilize it. Once the cat is ready to be approached we try to work a rope around him and especially try to get it behind the forelimbs, so that it's not around the neck or a hind leg, and lower him to the ground. We take standard measurements. We take canine measurements and incisor measurements and yet, we haven't been able to do much with any of these measurements. We tried tooth sectioning for age determinations. One of our lab people is trying to figure out a correlation. We found that some of our cats coming out of the drug while we're working on them are pretty restless, so by putting gauze strips around the animal's head we're able to keep him quiet a lot longer. Often when we take off the strips they'll just get up and walk away. If it's cold we try to maintain the animal's body temperature using space blankets, but most of the time it's pretty warm. In addition to the 14 male lions that we've captured and placed collars on we've captured 2 kittens. One of these kittens was drugged, and the other was captured with the catch pole by hand. It's a pretty hairy operation, but we managed to do it without any injuries to us or to the kitten. In these instances we haven't applied collars because the animals were too small.

We've had the most success with the lithium battery collar that has two batteries placed in a series. We tried with two batteries placed in parallel and only got about a 3-month life span on them. We also tried photocell. One of them really worked great; we had it for about a year's time, but we placed four others on and

these only lasted for about two weeks. They seemed to be too fragile for our work and they also seemed not to pick up the necessary ambient light down in the canyons to stimulate their workings. In monitoring the animals that we have collared we have fixed stations set up around the area. These have been highly vandalized. We have one working right now, and it's about 8 feet off the ground so people can't cut off the cable and take them home. We also use whip antennas and are operating on a 31 megahertz band. We're using whip antennas on vehicles with different types of receivers -- Johnston and Minnesota. We also have an OAR directional unit which is used very effectively from ridgetops and from roads, but the antenna design limits its effectiveness in brushy situations because it breaks off too easily. We use Johnston unit in combination with whip antenna mounted on an airplane. Some of our lions' ranges cover 175 square miles. This is one of the interesting things we've found -- that you can't actually take all the relocations and count those as home ranges. One mountain lion we captured had a home range of about 30 square miles in the southern portion of the study area, and after about 4 months he moved to the northern portion and set up another approximately 30 square mile area. Now he's moved about 8 miles north, and we're trying to see if he'll set up another home range. We've had 3 other male lions that have had essentially the entire study area as their home range, although in site selection they've only exhibited about 30 square mile range in their activities.

As for females we've had one reestablish her range on three different occasions. She's had ranges between 15 and 25 square miles. We've had very little luck in being able to get the females close enough to each other to see what the social structure is in a female-female situation, but as far as male-male interactions and male-female interactions we've recorded 22 of these in the past year and a half. In some situations we've monitored as many as four cats within about a 300 square yard area. One of the things that surprises us is the reassociation that the cats on our study area seem to exhibit. We've had numerous instances of what we feel were intraspecific competition problems. We've had several cats that were pretty badly scratched up.

Before we got into this study, we had one cat killed in the Sierras by another cat and we had to dig him out from underneath the snow. By the injuries and the teeth marks we did determine that it was another mountain lion that killed it. These intra-specific contacts seem to happen more often than we realized. One of our collared cats died of just such an action. The flesh had been removed from his whole lower jaw and was hanging free. He had numerous bite marks around his head, through his skull, shoulder, and on the hind portion.

Question: Did you find a male-male relationship there? Did you have another cat on the study area?

Answer: Yes, right. We captured another cat within about a quarter of a mile. We feel that it was that other cat was responsible for

the injury. We've had females with torn ears, but not with the massive scarring that we've found with the males. The prey kills that we've found in the study area have been much the same as you've described -- mostly mule deer. One time we came upon a kill and found a cat upon it. The bite marks were in the throat of the deer and at the base of the skull. Most of the animals are consumed and we generally don't find much waste.

In an area about 100 miles north of us we found a calf that was killed by a mountain lion. This is very rare for we don't have very many calves taken by lions. Our biggest problem in depredation is sheep. We've also found several kills on ferral pigs. We feel that lions are relying on pigs as well as the deer for their prey. We're trying to assess what the total impact of the lions is on other species.

It seems our population, as in other areas of the Western United States, has built up and some of these animals are seeking new territory or are being forced out and are coming into contact with metropolitan areas more frequently than they had in the past. We've moved several of these animals -- translocated them to other areas of the state, released them, and followed their movements to see what would occur. After a while they establish another home range. We've also done this with livestock predators and these animals seem to establish a home range without going back to the old habit of taking livestock, at least as long as we've been able to follow them with radio collars. We haven't been able to tell

sex or age by color of the animal. We've had both male and female animals exhibiting variations of color from red to almost grey. In none of these cases have we been able to attribute it to a geographic location, to age, or any other factor except individualities.

Question: I noticed in your slide show that you used the CO² pistol. Do you have any problems on distance and with too much penetration with the CO² pistol?

Answer: No, our problem has been lack of penetration. Sometimes in cold weather or when it's running low, the CO² won't push it out fast enough. We found that the 22 blanks we used earlier were not very well calibrated and a dart with a light load could go all the way through a corrugated building. They're just not standardized very well, the dart often didn't travel in a straight trajectory. So we went to the CO². Even with less power we felt it was less likely to injure the animal.

Comment: I've just about run out of low load 22 blanks, the very small, lowest powered ones, and I've reordered some. They're evidently out of production now. I wonder if anybody has substituted starter blanks or something like this?

Comment: Be very careful if you're using stud driver blanks the same color because they aren't the same quality and we found a very great variation in quality control even on the Palmer ones. We now weigh them all up with a balance scale.

Question: Has anybody else substituted anything?

Penny Dewar: We haven't done it ourselves because we haven't run out

yet but we will soon. We know someone who used the green medium and pushed the dart right to the very end of the barrel.

Comment: That's what Palmer tells you to do, but I think that reduces your accuracy because you're not getting your rifling effect from your barrel. So everybody who is about to run out of brown loads is going to be out of business since you can't buy the remnants or blank empty shells to load your own because they're not available.

Hornocker: What's the history of your population there? As far as exploitation?

Sitton: We had very heavy exploitation until the late 1950's when the bounty system was curtailed. The Fish and Wildlife Service trapped and hunted very heavily with dogs, for the cats from 1920 into 1950's. After that sport hunters pursued the lion until the moratorium went into effect.

Question: Was the sport hunting fairly heavy?

Answer: One thing that contributed to the heavy take was that in addition to the state bounty of \$50 or \$60, Monterey County had an additional \$50 bounty, so that was the highest bounty anywhere in the state. I think this is one of the things that influenced bounty records also. Somebody kills one in San Luis Obispo County, and if they take to Monterey County it gets bountied there for more.

Hornocker: This is the end of the presentation. Does anyone have anything further they'd like to comment on?

Phelps: You've developed the zip gun, Maurice. If anyone likes

the handgun approach I have developed a little extension barrel for a 44 handgun and use blanks. It's consistent, especially at short distances. We force the dart way forward and use a slow burning handgun powder.

Comment: I wanted to mention the catch snare. We've used it effectively on kittens up to 50 pounds.

Comment: Just in passing. I didn't mention when I was talking. Last summer Lewis Cox successfully snared two lions for us with the cable snare, the bear snare, and we had no injuries. One capture was at a kill and the other was just a blind snare.

Comment: We had refrained from using that for fear of injuries.

Answer: Of course, he was checking them daily.

Question: Did he have it on a drag?

Answer: I'm not sure, but I believe he had them both tied fast.

Comment: We caught one in an Aldrich snare with the drag. No apparent injury. Two toes were all that were in the snare. He was shot 6 months later and those two toes were gone.

Comment: I've snared about 300 bears in the last couple of years with the Aldrich Snares, and oftentimes when you don't see the damage in the foot, that's when you get it. There are certain ways you can get around that: daily checks, twice-daily checks, get them out of those snares as quickly as possible. With care snares do have some possibilities.

Hornocker: Willie Molini, let's hear what you've been doing in Nevada.

