THE FOOD HABITS AND LIFE HISTORY OF THE MOUNTAIN LION

(*Felis concolor hippolestes*)

by

Edward J. Connolly, Jr.

A thesis submitted to the faculty of the University of Utah in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Department of Vertebrate Zoology

Approved:

Chairman, Thesis Committee

Head, Major Department

Dean, Graduate School

University of Utah

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (Cont'd)

I. INTRODUCTION

The actual role that is played by the mountain lion (*Felis concolor*) in its relationship with big game and livestock on the range has long been a subject of considerable controversy. It is hoped that the information contained in this study will help to explain the long misunderstood complex relationship that exists between this predaceous animal and its prey.

The author first became interested in mountain lions in the winter of 1942-43. His initial interest was in hunting them for sport; and, subsequently, as he became acquainted with stockmen and ranchers throughout the state, he was called upon periodically to remove a lion which had killed livestock. After release from the armed forces he was employed by the Predator and Rodent Control Division of the U. S. Fish and Wildlife Service of Salt Lake City. It was while thusly employed that he came into daily contact with numerous stockmen who desired the lions left unmolested on their ranges and refused to allow government hunters on their property. The attitude of these ranchers caused the author considerable concern, because prior to that time he had felt that it was almost universally accepted that the mountain lion was a carnivorous creature whose presence on the range was detrimental to everyone's interest. His efforts to obtain data

concerning the lion's activity only furnished factual fuel for the already existing fires of controversy. The author discussed this problem with Dr. A. M. Woodbury of the Biology Division, University of Utah, and found that a fact finding study of the actual day by day activities of the mountain lion would be very desireable. The study was initiated in January of 1948 and has continued for one and one half years.

Game management officials of the Utah State Fish and Game Commission and the U. S. Fish and Wildlife Service took an interest in the study because they felt that information could be obtained which would be of value in practical game management. These two agencies expressed their interest in a financial way, under the Pittman-Robertson Act which enabled the study to be more comprehensive and to proceed at a more rapid rate.

The removal of large numbers of mountain lions from some areas of Utah, by sportsmen and government hunters, previously thought to contain only a few lions caused considerable concern among some of the officials charged with managing the game of the state. If previous estimates of the number of deer killed per lion per unit of time were correct, then the number of lions removed from these areas would indicate that the deer herd there should have been completely exterminated within a few years time. Thus of special importance to officials of practical game management is the phase of the study which deals with the tracking of the mountain lion through the snow in

order to obtain information as to the number of deer killed per mature lion per unit of time. A study was made by Frank C. Hibben in order to obtain this rate of kill information in 1934-35 under a cooperative setup between state and federal agencies in New Mexico. Hibben's figures on the rate of deer killed by mountain lions were questioned by several Utah wildlife officials because Hibben was trailing the lions with trail hounds, and might, therefore, have been "pushing" the lions away from deer kills to which they might normally return. So, the procedure of tracking the mountain lions through the snow without trail hounds, as was done in this study, was believed to be a better approach which would give us a much more accurate figure for the rate at which a lion kills deer. This tracking phase of the study also revealed, clearly written in the snow, many facts of considerable interest concerning the lion's life history.

An extensive review of the literature revealed that for the state of Utah there was no statistical information available as to the sex and age classes and conditions of deer killed by mountain lions, nor was there any information concerning the lion's food habits based on a stomach and scat analysis. Also found lacking from the literature for this area was information on the lion's life history, habits, and migration, and the lion-livestock-deer relationships. Therefore, considerable emphasis was placed on these items during the course of the study.

A. Acknowledgements

My sincere appreciation is due to the numerous individuals and government agencies whose cooperation and assistance have made this study possible.

Thanks are especially due to Dr. A. M. Woodbury and Professor Stephan D. Durrant, Department of Vertebrate Zoology, University of Utah; W. Leslie Robinette, U. S. Fish and Wildlife Service; Director R. L. Turpin and Big Game Agent D. M. Gaufin, Utah State Fish and Game Department; William H. Behle and Ray E. Gilbert, Biology Division, University of Utah; Dr. Odell Julander, U. S. Forest Service, Ogden, Utah; Howard Knight, Division of Biology, University of Utah; and Lee Kay, Utah State Fish and Game Department.

I am grateful to the following members of the U. S. Fish and Wildlife Service who rendered assistance whenever asked: Dr. Neil Hosley, Mr. Stanley Young, and Mr. H. H. T. Jackson, of Washington, D. C.; Mr. E. R. Kalmbach and Dr. Charles C. Sperry, Wildlife Research Laboratory in Denver, Colorado; Owen W. Morris and R. Scott Zimmerman, Salt Lake City, Utah; and Dr. Jessop P. Low, Logan, Utah. Special appreciation is expressed to each of the State Game Directors and U. S. Fish and Wildlife Predator Control District Agents for assistance in providing the names of mountain lion hunters. That I am unable to thank each of these contributors individually is

the only disappointing part of the task.

I am especially indebted to my wife, Louise B. Connolly, who provided helpful suggestions, criticized the entire manuscript, and typed nearly all of it.

To all I express my sincere gratitude and humbly hope that I have succeeded in incorporating into this study material that will have a practical application in game management work and may serve as a basis for more advanced work in this field.

II. METHODS AND PROCEDURE

Two areas of known mountain lion concentration were chosen for the tracking phase of the study. From January 8, 1948, to May 8, 1948, and from December 19, 1948, until January 26, 1949, the mountain lions were tracked in the Lost Creek-Echo Canyon Area of Morgan and Summit counties, Utah. An unusually severe winter necessitated abandoning the first study area, and so from January 27, 1949, until March 18, 1949, the tracking work was completed in the Book Cliff Mountains, Carbon County, Utah.

On one occasion, because of favorable weather conditions, it was possible to track a mountain lion through a total of 3 days of cougar activity within about 6 hours. More often, however, because of the rough topography of the land, most of the work had to be done on snowshoes and it required 1 to 3 days of snowshoeing in order to follow a lion through 1 night's activities. This work involved the expenditure of much physical energy. On many occasions ropes had to be used to descend through the rugged mountain ledges. Because snowshoes were a necessity, and the type of country which the lions inhabited was not conducive to rapid travel, progress was made very slowly. The primary hazard involved in this study was not the personal contacts with the lions, but was the sub-zero

temperature which periodically prevailed. At temperatures of -25 degrees Fahrenheit to -35 degrees Fahrenheit the situation changed from a matter of personal discomfort to a matter of survival.

As far as can be determined, approximately 18 to 22 different lions were tracked in the Lost Creek-Echo Canyon area, Morgan County, Utah, and 8 to 12 different lions were tracked in the Book Cliff Mountains, Carbon County, Utah.

The lion tracking was accomplished on the following dates in the following areas:

Date	Area	Lion Days of Activity	Notes
1/11/48	Francis Canyon, L.C.$_1$	1	
1/16/48	Sawmill, E.C.$_2$	1	Mature lion climbed tree
2/1/48	Sawmill, E.C.	1	Killed healthy doe.*
2/21-23/48	Pine Canyon, L.C.	1	Attempted predation on colt.
2/28-29/48	Cedar Canyon, L.C.	4	2 mature, 2 immature lion. Killed two point buck.
3/5-7/48	Sawmill, E.C.	2	Largest track observed 6$\frac{3}{4}$" across. Killed mature doe.
3/13/48	Francis Canyon, L.C.	1	Collected scat.
3/20-21/48	Cedar Canyon, L.C.	2	
3/26-28/48	Cedar Canyon, L.C.	2	1 porcupine killed.
4/3-4/48	Red Cedar, L.C.	2	1 porcupine killed.
4/7/48	Coal Hollow, L.C.	1	Intermittent tracks.
4/24-25/48	Francis Canyon, L.C.	1	1 porcupine killed.
5/8/48	Red Cedar, L.C.	1	Author killed lion in self defense.
6/20-25/48	Thompson Creek, Kane County, Utah	3	6 porcupine killed.
12/17-18/48	Echo Canyon proper	2	1 porcupine killed.
12/19-20/48	Tie Fork, S.F.$_3$	2	1 cottontail rabbit, 1 porcupine.
12/28/48	Waterfall Canyon, E.C.	2	
1/2/49	Signal Canyon, E.C.	3	1 porcupine killed.
1/3/49	Toone's Canyon, L.C.	1	
1/4-5/49	Heiner's Canyon, E.C.	2	Revisited old deer kill.
1/7/49	Bell's Canyon, L.C.	2$\frac{1}{2}$	Killed two point buck.
1/17-19/49	Sawmill, E.C.	3$\frac{1}{2}$	Mature doe killed.
1/22-25/49	Signal Canyon, E.C.	4	Killed doe.
1/26-28/49	Minnie Maud, E.C.$_4$	5	Killed fawn.

Date	Area	Lion Days of Activity	Notes
1/29/49	Dry Creek, W.C.$_5$	9	2 lions stayed in cave 3 days. Killed doe.
1/30/49	Dry Creek, W.C.	1	Female with kittens.
2/5/49	Cottonwood Creek,W.C.	2	
2/6-12/49	Minnie Maud, B.C.	9	1 lion stayed in cave 3 days.
2/18-19/49	Toone's Canyon,L.C.	2	
2/20-22/49	Grass Creek, E.C.	6	Mature pair. Killed fawn.
2/26-27/49	Grass Creek, E.C.	4	
2/28/49	Oak Creek,Millard Co.	1	Passing through area.
3/27/49	Dry Creek, W.C.	1	Tracks intermittent
4/3/49	Waterfall Canyon,E.C.	1	1 porcupine killed.

Key:
1. Lost Creek,Morgan Co.,Utah
2. Echo Canyon, Summit Co.,Utah
3. Spanish Fork Canyon, Utah Co., Utah
4. Book Cliff Mts., Carbon Co., Utah
5. Weber Canyon, Morgan Co., Utah

*Doe and fawn refer to mule deer.

The nocturnal habits of this carnivorous animal made the possibility of observing his activities in the field highly improbable. In order to obtain eyewitness reports of the lion's activities, questionnaires were mailed to 322 field men who had had experience with mountain lions in the 13 western states and the territory of Alaska. Considerable information concerning the life history and food habits of the lion has been tabulated from these questionnaires and placed in table form in appropriate places in the thesis.

III. DISCUSSION

A. Food Habits

1. Food preference

Observations made in the field while tracking the mountain lions through the snow indicate that lions depend upon deer as their main source of food during the winter months. Deer constitute such a large part of the lion's diet that it might be safely said that the lions live almost entirely as predators of the deer herds.

The following is a breakdown of the information obtained from the lion tracking phase of this study:

Days of cougar activity	87
Deer killed	9
Porcupine killed	12
Livestock killed (questionable)	1
Other (cottontail rabbit)	1

The above figures were obtained by tracking various mountain lions through the snow and indicate that a mountain lion killed an average of 1 deer every 9.67 days and 1 porcupine every 7.2 days during the winter months.

The lions showed no special preference as to sex and age classes or physical condition of the deer which they killed. It appeared that they chose the deer on the basis of proximity

and accessibility. The 9 deer which were found killed by mountain lions included 4 does, 3 fawns and 2 bucks. All of these animals appeared to be normal in all respects and in as good a physical condition for that time of year as the balance of the deer which were observed in the area. Two of the deer showed evidence of having been infested with bot fly larvae and the other kills, which were older, might possibly have been infested also. A bot fly infestation in a deer's throat is not considered an abnormal condition by W. Leslie Robinette, Biologist, Division of Wildlife Research, U. S. Fish and Wildlife Service. Also, Joseph S. Dixon in his study of the life history and food habits of the mule deer in California (1934:103) found, "In the majority of fresh mule deer heads that I have examined in California I have found from 1 to 34 larvae of the deer bot fly in the frontal sinuses or throat of the deer". The killing of normal deer by the mountain lions as revealed in this study is in contrast to the results of a study of mountain lions in New Mexico (Frank C. Hibbens, 1937: 42) in which it was alleged that all of the deer killed by mountain lions were in some way abnormal. One of the abnormalities listed was a concentration of bot fly larvae in the throat. Most of the other abnormalities were on the basis of body and leg measurements as compared with the body and leg measurements of an "average" deer in the same area. Whether or not either of these conditions are abnormal is questionable.

Observations made by Edward K. Beebe, Assistant District Agent of the U. S. Fish and Wildlife Service at the School of Forestry, University of Montana, Missoula, Montana, also indicate that mountain lions show no preference in choosing weak or crippled animals. Mr. Beebe states: "In March, 1947, Hunter Harold Mitton accompanied me on a hunt in Poorman Creek in Lewis and Clark County. We killed a large male lion shortly after he had killed a deer. The deer had been disemboweled and the intestines, stomach and contents of the chest cavity eaten. The entire body cavity was then completely filled with hair pulled from the deer's body and the lion proceeded to sleep under a nearby tree. There were several large mounds of snow nearby where the lion had covered successive layers of defecated material. Also, there were the remains of two more deer within 50 yards, presumably killed earlier by this lion. Incidentally, in trailing this lion we found a bull elk with a broken front leg; and the lion passed by this elk without making any attempt to kill him, subsequently traveling another two miles and killing the above mentioned deer. This is the second time I have observed a lion passing a wounded animal and subsequently making a kill of game apparently in better condition."

Table 1a shows the food preference of mountain lions based on the analysis of scatology specimens gathered at all seasons of the year. No special efforts were made to obtain

lion stomachs for analysis purposes as this would have necessitated the destruction of lions whose presence on the range was desired for tracking purposes. Of the 11 stomachs collected from other sources 7 were empty, 2 contained deer, 1 contained blood, and 1, which was killed because it had been attacking sheep, contained wool.

TABLE 1.

LION FIELD MEN	FOOD HABITS: ORDER OF FOOD PREFERENCE			DEER KILLS: Major Kills				Rate of Kill		Return to Kills		
	1	2	3	Bucks	Does	Fawns	No Pref.	No	Days	No	Yes	Number
Utah												
N. Robison, Anabella	Deer	Porcup.	Rabbit	x							x	3
E. Griggs, Salt Lake City	Deer	Porcup.	Sheep	x				1	week		x	2
V. Cottam, Escalante	Fawn	Lambs	Colts			x					x	12
Harrison Price, Junction	Deer	Porcup.		x	x						x	2-3
W. L. Roberts, Anabella	Deer	Porcup.	Colt		x			1-2	week		x	several
B. Argyle, Spanish Fork	Deer	Porcup.	Sheep	x						x		
Don Cowger, Cisco	Deer	Rabbits	Porcup.		x			4	week		x	many
J. W. Willis, Vernal	Deer	Porcup.					x	5	day		x	consumed
Robert Snyder, Duchesne	Deer	Sheep	Rabbit		x			4-5	week			
Verl Kelsey, New Harmony	Deer	Porcup.			x	x					x	numerous
V. Montgomery, Park Valley	Deer	Porcup.					x	2	day		x	"
Wm. Dalton, Parowan	Deer	Porcup.	Rabbit					1	week		x	lots
Arthur Brindley, Antimony	Deer	Porcup.	Rats				x	4	month		x	4 or 5
John Sampinos, Price	Deer	Sheep	Cattle		x	x						
Oren Adams, Cedar City	Deer	Sheep	Porcup.		x	x		50	year		x	1-5
George Nay, Salina	Deer	Rabbit	Porcup.		x			57	year		x	2
John Bird, Salina	Deer	Colt	Sheep	x	x			2	week		x	many
Bryce Johnson, Salina	Deer	Porcup.	Rabbit	x				4	day		x	consumed
Floyd Roberts, Richfield	Deer	Calves	Sheep	x							x	"
F.W.& G. Roberts, Antimony	Deer	Porcup.	Sheep	x		x		2	week	x		
Whitey Carroll, Veyo	Deer	Porcup.	Horses				x	1	week		x	
Ray Owens, Hurricane	Deer						x	2	week		x	
G. W. Proctor, Panquitch	Deer	Porcup.	Rabbit	x				2	week		x	consumed
Jack Butler, St. George	Deer	Porcup.	Horse		x			1	week		x	
Dee Craig, Santaquin	Deer	Porcup.		x				4	3	x		
Joseph Felix, Logan	Deer	Cattle	Porcup.		x			1-2	week	x		

FOOD HABITS

LION FIELD MEN	ORDER OF FOOD PREFERENCE			DEER KILLS								
				Major Kills				Rate of Kill		Return to Kills		
	1	2	3	Bucks	Does	Fawns	No Pref.	No	Days	No	Yes	Number
Utah (Cont'd)												
Ralph Robinson, Fillmore	Deer			x	x	x				x		
Newton McBride, Fillmore	Deer	Porcup.	Squirrel	x				1-2	week		x	once
P. O. Hurst, Fairview	Deer	Porcup.	Rabbit	x				11	6wks		x	
Charles Madsen, Provo	Chicken	Rabbit	Deer		x	x		3	30		x	twice
J.L. Pearson, Circleville	Deer	Porcup.	Rabbit	x				4	3wks		x	twice
L. G. Brown, Koosharem	Deer	Calves	Rabbit	x				45	yr.		x	four
Boyd Twitchell, Beaver	Deer	Porcup.	Rabbit		x			1-3	week		x	many
Bill Jensen, Huntington	Deer	Rabbit	Colts	x				1	week		x	twice
W.O.Nelson, AmericanFork	Deer	Porcup.	Sheep								x	consumed
J. W. Henry, Marysvale	Deer	Rabbit	Porcup	2/3	1/3						x	few
D. S. Good, Mayfield	Deer				x			1	week		x	
Darwin Brown, Richfield	Deer			x							x	consumed
Dortha Snyder, Myton	Deer	Sheep	Calves					1	4		x	
LaRue Emett, Veyo	Deer	Porcup.			x						x	
Oscar Hansen, Provo	Deer	Rabbit	Sheep	x	x			2-3	week		x	
Bill Nielson, Salina	Deer	Porcup.	Colts					2	week		x	
Albert Stewart, Loa	Deer	Porcup.	Rats	¼	½	¼		2	4	x		
Milton Campbell, Vernal	Colt	Deer	Calves		x			5	11		x	
R.L. Hoggatt, Green River	Deer	Porcup.	Colts	x	x						x	many
James Gray, Beaver	Deer	Colt	Porcup				x				x	twice
Alaska												
M. W. Kelly, Anchorage	Deer	Porcup.	Sheep		x			3	5		x	three

FOOD HABITS

LION FIELD MEN	ORDER OF FOOD PREFERENCE			DEER KILLS								
				Major Kills				Rate of Kill		Return to Kills		
	1	2	3	Bucks	Does	Fawns	No Pref.	No	Days	No	Yes	Number
Arizona												
Floyd Pyle, Payson	Deer	Porcup.	Calves	x								
Frank Colcord, Young	Deer	Javalina	Calves	x	x						x	many
R. R. Miller, Clifton	Cattle	Horses	Deer	x							x	varies
Giles Goswick, Humbolt	Deer	Calves	Porcup		x			3	6		x	consumed
California												
F. W. Keeler, French Gulch	Deer	Javalina	Birds	x				2	week		x	
Howard Bilton, Glenville	Deer	Cattle	Porcup					4-5			x	many
L. P. Simpson, Orland	Deer	Coon	Goats			x		3	week	x		
Wm. Frye, Porterville	Deer	Livestock	Rodents	x				4	week		x	20
Andrew Peroni, Marysvale	Deer	Horses	Livestock				x	1	week		x	seldom
Gus Landergen, Eureka	Deer				x			3	2		x	several
Charles Prindle, Central	Deer	Rabbits	Goats				x				x	20
Colorado												
Tom Barnes, Olathe	Deer	Sheep	Colts	x	x			5	1		x	three
Wm. W. Mink, Delta	Horses	Deer-Elk	Sheep		x	x		3	3		x	always
C. H. Vavack, Idaho Spgs.	Deer	Horses	Porcup		x	x		1	2wks		x	twice
R. C. Mink, Canon City	Deer	Horses	Porcup	x				2	week		x	many
Robert Terrell, Basalt	Deer	Rabbits				x		2	week		x	once
L. R. Crandell, Montrose	Deer	Horses	Sheep	x				2	week		x	
G. B. Sutton, Meeker	Deer	Colts			x			2	week	x		
F. F. Cochran, DelNorte	Deer	Elk	Grouse	x							x	three
C. B. Davidson, Craig	Deer	Colts				x		1	week		x	once
Sigfrid Palm, Ft. Collins	Deer	Colts	Porcup		x						x	once

LION FIELD MEN	FOOD HABITS: ORDER OF FOOD PREFERENCE			DEER KILLS: Major Kills				Rate of Kill		Return to Kills		
	1	2	3	Bucks	Does	Fawns	No Pref.	No	Days	No	Yes	Number
Colorado (Cont'd)												
H. N. Ferrell, Cortez	Deer	Colts	Rabbit		x			2	week		x	one
H. H. Kennell, Grand Junc.	Deer	Rabbit		x								
D. C. Jerome, Fruita	Deer	Horses	Porcup.	x				12	week		x	three
Herman Wilson, Estes Park	Deer	Colts	Goats		x	x					x	
B. L. Denton, La Vita	Deer	Colts	Porcup	x				1	week		x	2 or 3
J.L.Waldron, Kremmling	Deer				x							
Idaho												
L.L.Anderson, Meyers Cove	Colts	Mt.Sheep	Sheep			x					x	2
Howley Hill, Salmon	Deer						x	6	7wks			
A. R. Twilegar,	Deer	Rabbits	Rodents					3	2		x	2
Willard Rood, Jr., Salmon	Deer	Porcup.	Rabbit				x	1	week		x	always
Ed James, White Bird	Deer	Porcup.	Elk		x	x		7	week		x	
Robert Donley, Garden Valley	Deer	Porcup.					x	1	1		x	many
Roy Tumelson, Lewiston	Deer	Porcup.	Stock				x				x	winter
Montana												
C. E. Beebe, Browning	Deer	Elk			x	x		4	month		x	many
Frank Haacke, Philipsburg	Deer	Porcup.				x					x	next kill
E. K. Beebe, Missoula	Deer	Porcup	Elk					6	6-8wks		x	always
Nevada												
Robert Dickey, Ely	Deer	Porcup.	Colts	x				9	15		x	consumed
Stanley Kaiser, Pioche	Deer	Porcup.	Colts	x				1	2		x	

FOOD HABITS

LION FIELD MEN	ORDER OF FOOD PREFERENCE			DEER KILLS								
				Major Kills				Rate of Kill		Return to Kills		
	1	2	3	Bucks	Does	Fawns	No Pref.	No	Days	No	Yes	Number
Nevada (Cont'd)												
Ira Garrison, Pioche	Horses	Deer	Porcup	x	x			7	week		x	always
L. R. Shares, Ely	Deer	Colts	Sheep								x	ten
New Mexico												
R. L. Raley, Hope	Porcup	Deer	Colts				x				x	once
Alvin Dunagan, Animas	Deer	Stock	Porcup				x				x	consumed
G. W. Evans, Magdelena	Deer	Colts	Calves	x				1	week		x	4-5
Arnold R. Bayne, Animas	Deer	Javalina	Colts		x			2-3	week		x	2 or more
H. C. Pickens, Santa Fe	Deer	Horses	Porcup				x	50	year		x	consumed
Oregon												
L. M. Maurer, Cave Junction	Deer	Porcup.	Grouse		x			21	3 mos			
L.J. Bales, Alsea	Deer	Elk					x					
E.J. Sherman, Mololla	Deer	Rabbits	Birds	x				6	3 wks		x	many
E.J. Barney, Fall Creek	Deer	MtGoats	Rabbit	x				7	4			
Dale Benney, Roseburg	Deer	MtGoats	Colts	x		x		1	3		x	consumed
Don Pankey, Roseburg	Deer			x				1	week		x	three
Ralph Johnston, Riddle	Deer	Burros		x	x			1	week		x	
F.R. Williamsen, Ashlund	Deer	Rabbits	Porcup		x			1	1			
C. R. Duval, Taft	Deer	Fish						2	1		x	seven
Roy Tracy, Estacada	Deer	Stock	Beaver				x					
W.M. Eastham, Cottage Grove	Deer	Beaver	Stock	x				2	week		x	many
E. U. Smith, Myrtle Pt.	Meat			x	x			2	week		x	twice
Elvin Lewis, Veneta	Deer	Sheep	Birds	x				3	week		x	consumed
Kirby J. Taut, Central	Deer			x	x			4	1		x	many

FOOD HABITS

LION FIELD MEN	ORDER OF FOOD PREFERENCE			DEER KILLS								
				Major Kills				Rate of Kill		Return to Kills		
Oregon (Cont'd)	1	2	3	Bucks	Does	Fawns	No Pref.	No	Days	No	Yes	Number
Arthur Wooley, Drain	Deer	Beaver	Stock	x						x		
Carl Thornton, Sutherlin	Deer	Rabbits	Sheep	x				5	1		x	many
L. T. Grant, Harlan	Deer	Elk		x	x			2	week		x	varies
ArchieWilliams,Blue River	Deer	Porcup.	Rabbit	x				1	3wks		x	several
Roy Vann, Willamina	Deer	Sheep	Goats	x		x		6	week		x	four
E. W. Conklin,Sweet Home	Deer	Rabbits	Sheep				x	2	1		x	often
S. W. Koontz, Albany	Deer	Rabbits		x							x	three
Stanley Colegrove,Booking	Deer	Sheep	Pigs	x	x			50	year		x	once
Roland McRae, Wallanea								3	week		x	usually
L. R. Gardner, Newport	Deer	Birds	Elk			x					x	several
Ray E. Cox, Yoncolla	Deer	Sheep	Goats	x				2	week			
Alfred Zollman, Joseph	Deer	Porcup.	Stock	x							x	once
J. F. Thomas, Remote	Deer	Coon			x			3	1		x	always
E. O. Worley, Azelea	Deer	Goats	Colts				x				x	twice
Joe Jackson, Yoncalla	Deer	Rabbits	Sheep				x	1	1			
Carl J. Wood, Agnes	Deer	Rabbits	Sheep	x							x	
Francis Williams, Lebanon	Deer	Rabbits	Sheep				x				x	once
Loren Thornton,Wedderburn	Deer	Sheep	Hogs				x					
W.M. Clark, Redmond	Deer				x			1	5		x	seldom
Charles Anway, Oakridge	Deer	Rabbits	Beaver	x				1	week		x	
Maurice Wood, Oakridge	Deer	Grouse	Rabbit				x	1	week		x	consumed
J. B. Wadmar, Powers	Grouse	Deer	Rabbit	x				1	week		x	spoiled
Oran King, Holley	Deer	Rabbits	Birds				x	1	week		x	always
J. J. Hudack,Gold Beach	Deer	Stock	Sheep	x							x	2-3
Everett Limpbeck, Lyons	Deer	Goats	Sheep		x							
Perry J. Wright, Glide	Deer			x				1	12		x	several
W.B. Patten, Culp Creek	Deer	Goats	Sheep				x	3	1		x	several

FOOD HABITS

LION FIELD MEN	ORDER OF FOOD PREFERENCE			DEER KILLS								
				Major Kills				Rate of Kill		Return to Kills		
				Bucks	Does	Fawns	No Pref.					
Oregon (Cont'd)	1	2	3					No	Days	No	Yes	Number
C. R. Poe, Plymouth	Deer	Squirrel		x				2-3	1		x	many
H. E. Ediger, Dalles	Deer	Sheep	Goats									
L. W. Peters, Mehama	Deer	Porcup.						1	1		x	once
W. R. Tonkin, Brownsville	Deer	Rabbits					x	1	week		x	
Frank Merritt, Holley	Deer	Rabbits	Sheep	x				2	week		x	several
Glenn D. Good, Walterville	Deer	Rabbits	Grouse		x	x		1	week		x	consumed
Robert Millican, "	Deer				x			1	week		x	1-2
Harley Cain, Lowell	Deer	Sheep	Goats	x				3	day	x		
L.L.Lewis, Central Point	Deer	Porcup.	Horses	s				1-2	week		x	winter
Texas												
E.L.Love, Sierra Blanca	Deer	Colts		x				2	week		x	20
Guy West, Valentine	Colts	Deer					x				x	once
John E. Hearn, Cotulla	Deer	Colts	Calves	x	x			2	week		x	many
Herbert Ward, Cotarina	Deer	Hogs	Javalin				x	3	week		x	spoiled
Paul Evans, Van Horn	Deer	Horse	Porcup	x				2	week		x	always
Earl G. Baker, CasaPiedra	Colts	Sheep	Deer		x						x	2
Lee Duncan, Alpine	Deer	Horse	Sheep	x				2	week		x	
Fred Moore, Sierra Blanca	Deer	Horse	Goats	x				5	21		x	3
Jack T. Jolley, Allamore	Deer	Horse	Goats				x	1-2	week		x	many
Mrs.J.McCarley, Pt.O'Connor				x				3	week		x	many
Washington												
Frank Hansler, Tacoma	Deer	Rabbits	Beaver	x				3	2		x	many
Gordon Stuart, Lucerne	Deer	Beaver	Goat	x				3	8		x	several

FOOD HABITS

LION FIELD MEN	ORDER OF FOOD PREFERENCE			DEER KILLS								
				Major Kills				Rate of Kill		Return to Kills		
Washington (Cont'd)	1	2	3	Bucks	Does	Fawns	No Pref.	No	Days	No	Yes	Number
Jack E. Handy, Okanogan	Deer	Porcup.	Sheep		x		x	1	3		x	twice
Laurence Sprengel, Colville	Deer	Porcup.		x		x		75	year		x	
Wyoming												
Frank Morris, Cody	Deer	MtSheep	Elk				x	2	week		x	not ofte

TABLE 1a

FOOD HABITS BASED ON COUGAR SCAT ANALYSIS

Area	Season	Scat Contents
Thompson Creek, South of Bryce Canyon, Kane County, Utah	Summer	Mature deer, red summer pelage.
		Mature deer, red summer pelage.
		Young fawn--fine brown hair
		Young fawn--fine brown hair
		Porcupine
		Porcupine
Red Cedar Canyon, Lost Creek, Morgan County, Utah	Summer	Mostly young fawn--considerable grass and some older deer hair.
	Fall	Porcupine
	Fall	Porcupine
	Late fall or winter	Mostly young fawn. Some mature deer--red summer.
		Mature deer, gray pelage
		Mature deer, gray pelage
	Summer	Mature deer, summer pelage, considerable grass.

TABLE 1a (CONT'D)

FOOD HABITS BASED ON COUGAR SCAT ANALYSIS

Area	Season	Scat Contents
Red Cedar Canyon, Lost Creek, Morgan County, Utah	Summer	Considerable vegetation. 1 claw and fur of citellus. Mature summer deer hair.
		Teeth, bones and hair of unborn fawn. Some rabbit bones and hair. Few porcupine quills.
		Young fawn hair and bones.

2. Approaching, killing and eating prey

Field observations showed that almost without exception the lion approached his prey in a stealthy manner from higher ground until within 50 to 100 feet from it. The lion then closed the remaining distance with several large bounds, pounced on the animals back, the force of the impact knocking the prey to the ground. An exception to this was observed when a lion who, hunting with three other lions, waited upon a ledge for a two point buck to move closer, then jumped from the ledge directly onto the buck's back and rode the buck "piggyback" for approximately 60 feet down the hill before pulling him to the ground. The three other lions, two of them kittens, all went directly to the kill. The deer was approximately 70 percent consumed, so it seems reasonably safe to assume that it was shared by all lions present.

Tracks in the snow during this study indicated that a lion never missed his prey once he started the charge.

All of the deer kills examined showed tusk puncture wounds on the back of the neck, and tusk and other teeth puncture wounds in the vicinity of the larynx. All of the deer died as a result of strangulation or from punctures in the veins of the neck or both. One of the fawns that had been killed by a lion had a large portion of the right side of its face torn away by what appeared to be the lion's claws. Whether or not

this injury was received as the initial blow or whether it occurred during the death struggle could not be determined.

The type of cover which is used by a lion when approaching its prey is dependent, of course, upon the types of cover available. Tracks in the snow indicated that the lion took advantage of every bit of cover available to conceal his presence whether brush, rocks, or conifers. The lion appears to use an approach which is suitable to his environment. Mr. Lester R. Gardner of New Port, Oregon, once observed a mountain lion preparing to attack a deer. Mr. Gardner described the lion's manner of approach as "very strategic--will even crawl--stop--drop flat--especially in high fern".

A professional lion hunter of many year's experience, Mr. Verl Kelsey of New Harmony, Utah, has the following to say about the method of attack used by mountain lions on deer: "I actually believe that there are few men who have witnessed a lion killing its prey out in the wilds of nature. This I have never seen. I have seen tracks in the snow that told a very plain story on several different occasions. I have seen several times where young lions have stalked deer keeping as low as possible with his tracks 3 to 4 inches apart until only a short distance, say 40 to 60 feet, from the feeding deer. Then in a quick rush he would catch his prey before it made only one, two, or three bounds. If the deer was able to get free of the young cat you would see where he had either caught it again within 100

yards or where he had given up and walked away."

Jack E. Handy of the U. S. Forest Service of Okanogan, Washington, has made the following observation concerning the manner in which a lion approaches and kills its prey: "Many deer kills have been found where no sign of a struggle occurred. It was apparent that the lion caught the deer in its bed and killed it before it got up. How they kill a deer has never been definitely determined from the many kills I have examined. An interesting case was reported by a sheep herder here in which a large female lion attacked a grown sheep within 100 feet of where the herder was standing. The lion sprang on the ewe and just lay on her holding her down. The herder shot the lion and the sheep was uninjured. No claw or tooth marks were on the ewe. We have had a case or two of lions robbing trap lines and eating the catch. One ate a fox. This lion was tracked down and killed and was a very old tom. I found one case where three lions killed and ate a coyote. Porcupines are a favorite food and most lions have quills in their front feet. These quills do not seem to bother them much. Several cases where they have caught and eaten grouse were found."

Another manner of approach was observed by Mr. Joseph L. Pearson of Circleville, Utah, who saw in an inch of fresh snow where a lion had crept up on a three point buck deer. The deer was lying under a tree, and the lion had not jumped in his

approach. Mr. Pearson states that the lion, "walked up and took hold of the deer". Mr. Pearson also observed other instances where the lion jumped on the deer from the ground, and has noted that when the lion hits the deer it seems as though his action has a paralyzing effect.

There have been other reports that would seem to indicate that the lion is not always consistent in his manner of approach and attack. Mr. Newton McBride of Fillmore, Utah, observed: "This time the lion was tagging the deer herd. From my observation of tracks they have been known to kill deer actually running them uphill to make the kill. Mostly it is a sneak attack."

Mr. Homer C. Pickens, Department of Game and Fish of Santa Fe, New Mexico, states that he has observed many times tracks in the snow which indicated where a mountain lion had attacked a deer. Mr. Pickens states, "These tracks in the snow are very accurate and in only a few instances where they attacked a buck deer and were horned off did they go on their way hunting for another deer".

In the brush of California above San Fernando and below Palmdale, Mr. E. O. Worley of Azalea, Oregon, watched a mountain lion attack a deer. Mr. Worley states that it was an average sized lion and a very small deer. The lion, with his tail sticking straight up in the air, made a run of 75 yards with a speed which made the deer seem slow. The lion jumped on the

deer and both disappeared from Mr. Worley's sight into the canyon. The fawn was dead when Mr. Worley reached it.

In January of 1948, trail hounds belonging to Frank Merritt of Holley, Oregon, were "cold trailing" a lion. The dogs startled a deer which took safety in flight before the cougar was jumped. The deer ran under a windfall log and was pounced upon by the lion and killed while Mr. Merritt looked on.

Mr. Oscar Hansen of Provo, Utah, observed in the field that a lion keeps to the downwind side of the deer keeping the underbrush between it and its prey until within 15 or 20 feet of it, and then runs and makes his attack. On one occasion Mr. Hansen observed that a full grown cow elk got to her feet six times before the lion finally killed her, going a distance of 80 yards from the first point of contact to the last point of struggle.

The manner in which a mountain lion kills a deer is described by Mr. W. M. Eastham of Cottage Grove, Oregon, as follows: "All healthy prime cougar kill with the same pattern, a front foot on the head, one on the shoulder, and a bite through the spine just back of the ears."

A lion killing a deer in this same manner was observed by Mr. Ira Garrison of Pioche, Nevada, who saw the lion jump upon the deer's back, catch the deer by the nose with the front paw, and with the teeth sunk in the deer's neck the lion twisted until

the neck was broken.

Mr. Dortha Snyder of Myton, Utah, states that a friend of his, Judge A. W. Turner, came upon a lion while fishing on the Strawberry River above the mouth of Beaver Canyon. The lion had attacked one of Mr. Snyder's young calves. Judge Turner threw rocks at the lion but he would only roll his tail and growl so the Judge prudently retreated and notified Mr. Snyder. The deer weren't too plentiful in that area in the summer and the lion stayed close to his kill making it easier for Mr. Snyder's dogs to locate his fresh track, and the following morning the animal was treed and shot.

Mr. John W. Henry of Marysvale, Utah, reports having seen tracks in the snow that indicated where a lion approached the rear of the browsing deer and sprang 15 feet or more onto the back of the victim.

An eyewitness report of an attack upon a deer by a mountain lion is given by Mr. Burnell Argyle of Spanish Fork, Utah. Mr. Argyle states: "The lion just waited until the deer was close enough to jump on in about four or five leaps."

Another eyewitness lion attack upon a deer is reported by Mr. Arthur Brindley of Antimony, Utah, who observed that, "The lion approached the deer in a manner similar to that of a house cat after a mouse. After getting within range, the lion rushed its prey."

Mr. John Sampinos of Price, Utah, observed a lion attack

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Utah				
N. Robison, Anabella				Cover kill befor leaving.
Ed Griggs, Salt Lake City		Tracks indicated buck deer-lion struggle.		Heavy teethmarks on neck. Heart & lungs eaten first.
V. Cottam, Escalante				Buried kill under pine needles.
Harrison Price, Junction				Broken neck, crushed skull.
W. O. Roberts, Anabella				Covers kill in summer. Doesn't move carcass while eating.
Bernell Argyle, SpanishFork	Waited until deer close, then jumped on it. 4-5 leaps.		Pounced on back.	
Don Cowger, Cisco				Claw marks on flanks. Teeth marks on back of neck.
J. W. Willis, Vernal			Pounce on back. Bite thru spine	Bury kill.

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Utah (Cont'd)				
Robert Snyder, Duchesne				Tracks, size of prey.
Verl Kelsey, New Harmony			Bite thru vertebrae of neck just once.	Bitten on neck.
V. Montgomery, ParkValley				Tracks, claw marks on back.
Wm. C. Dalton, Parowan	Stalk deer.	Deer scrubbed him off of back by running under tree.	Pounce on back.	Buried.
Arthur Brindley, Antimony	Like a housecat after mouse. Charge after getting in range	Pounces on deer, bites spinal column, sets claws in flank.		Bite on back of neck. Claw mark on hams.
John Samplnos, Price	Semi-crouch, hidden, inching forward to striking range.	Deer faced lion fought with horns and fore-feet.		Tracks, scratches on back, broken neck.
Oren Adams, Cedar City				Tracks
George Nay, Salina	Stalks from up-hill side in timber. 2-4 bounds	Mare defending colt.	Bites deer on neck, smashes porcup. skull.	Tracks, buried, teeth marks.

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Utah (Cont'd)				
Bryce Johnson, Salina	Sneaking thru scruboak. Charge from 40 feet.		Slashed deer's throat with paw. Rode deer 70 ft.	Cut throat at the "T" bones. Buried.
Floyd Roberts, Richfield	Lion chasing - deer running.			Wounds on back.
F.W.&G.Roberts, Antimony				Holes in neck. Buried. Eat from top side down.
Whitey Carroll, Veyo			Porcup. in cage slid paw underneath.	Buried. Liver - eaten first.
Ray Owens, Hurricane				Buried
George Proctor, Panquitch				Covered kill.
Jack Butler, St. George				Covered kill.
Dee Craig, Santaquin	Sneak thru brush. Charge from 30-40 ft.		Pounce on back-bite spinal cord.	Tracks in snow.
Joseph Felix, Logan				Covered kill.
Ralph Robinson, Fillmore			Lion on fawn's back, biting at back legs.	Tracks

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Utah (Cont'd)				
Newton McBride, Fillmore	Tagging the deer herd. Sneak attack.			Covered and dragged kill. Eat insides first.
Charles Madsen, Provo		Bucks of deer herd fought off lion.		Buried kill.
J. L. Pearson, Circleville	Crept up on sleeping buck & grabbed it.		Pounce on deer & paralyze it.	Buried kill.
L. Garnell Brown, Koosharem				Covered kill.
Boyd Twitchell, Beaver		Deer ran on smelling lion scent.		Dragged and buried kill.
Bill Jensen, Huntington	Head-on battle.	Buck defended herd.	Broken neck.	Covered prey.
W.O.Nelson, American Fork	Crawl up to deer &spring. Bunch sheep & kill in circle on outside.		Jump on deers back-deer jumped twice, then down. Strike sheep in head with front foot, bite in neck.	Covered kill.

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Utah (Cont'd)				
J. W. Henry, Marysvale	Lion approach from rear-springs 15ft. to back.			Buried.
Darwin Brown, Richfield				Sign, covered kill
Dortha Snyder, Myton	Saw deer track running from a lion.			Tracks.
LaRue Emett, Veyo				Buried kill. Roll hide back from meat.
Oscar Hansen, Provo	Thru brush cover approach from up-wind.	Cow elk got to feet 8 times before going down.	One bite just ahead of withers on neck.	Crushed ribs-Covered kill.
Albert Stewart, Loa				Lacerated back. Covered kill.
Milton Campbell, Vernal				Wounds on top of prey.
R.L.Hoggatt, Green River	Lion ran deer down steep mountain and caught them.			Broken necks. Buried kills.

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Utah (Cont'd)				
James Gray, Beaver				Buried kill, neck wounds.
Alaska				
Maurice W. Kelly, Anchorage				Wounds on neck and shoulders.
Arizona				
Floyd Pyle, Payson				Covered kills.
Frank Colcord, Young				Heart & liver eaten. Covered kill.
R. R. Miller, Clifton				Shoulder & neck eaten first.
Giles Goswick, Humbolt				Covered and ribs eaten.
California				
F. W. Keeler, FrenchGulch	Stalk, quick rush. If misses stalks another.			Actions of trained hound.

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
California (Cont'd)				
Howard Bilton, Glenville				Dragged & covered kill.
Lyle P. Simpson, Orland				Dragged & covered kill. Lungs, ribs, heart eaten.
Andrew Peroni, Marysvale				Broken neck, covered kill. Liver, heart, lungs eaten.
Gus Landergen, Eureka	Sneaks like housecat to within 40-50ft. then few jumps.			Neck broken & bitten.
Charles Prindle, Central				Buried kill. Bitten on back of neck.
Colorado				
Tom Barnes, Olathe				Buried kill.
Wm.W. Mink, Delta				Insides eaten first. Cavity filled with sticks.

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Colorado (Cont'd)				
C. H. Vovak, IdahoSprings				Licks meat & bones with tongue.
R. C. Mink, Canon City				Entrails eaten. Covered kill.
Robert Terrell, Basalt				Top of neck bitten. Scratches on ribs.
Ben R. Crandell, Montrose				Tracks. Covered kill.
Glen D. Sutton, Meeker				Back of neck bitten.
E. F. Cochrane, DelNorte				Dragged & buried kill.
C. B. Davidson, Craig	Lion was crawling along ledge ready to spring on deer.			
Sigfrid Palm, Ft. Collins				Covered kill.
H. N. Terrell, Cortez				Marks on neck. Covered kill.

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Colorado (Cont'd)				
H.N.Kennell,Grand Junc.				Heart,lungs, liver eaten first
D. C. Jerome, Fruita	Slinking approach tail whipping from side to side.			Crushed bones. Covered kills.
Herman Wilson,Estes Park				Bitten neck,deep claw marks.
B.L.Denton, La Veta				Tusk punctures behind ears.
J. L. Waldron,Kremmling				Bites in back of ears.
Idaho				
L.L.Anderson,Meyers Cove	Chased cattle for 100 yds.out of timber.	Mare severely scratched protecting colt.	Lion waited on bank & killed beaver	Claw marks on neck & back.
Hawley Hill, Salmon				Buried & portion of kill not scattered.
Arlie R. Twilegar,Northern	Jumped from windfall onto ewe.			Tracks,buried kill,bitten thru back of head.

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Idaho (Con't'd)				
Willard Rood, Jr., Salmon				Dragged & covered kill.
Ed James, White Bird	Approached from tree to tree & rock to rock.		Charged from 50-60 ft. onto deer's back, bit back of neck.	Bitten neck, covered kills.
RobertDonley, Garden Valley				Skeleton all together and cover bones.
Roy Tumelson, Lewiston				Covered, wounds on neck.
Montana				
C. E. Beebe, Browning				Covered kill, larger bones eaten.
Frank Haacke, Philipsburg	Approach from higher ground, only few jumps			Hole eaten into chest.
E. K. Beebe, Missoula				Chest cavity open, ribs sheared off back bone.

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Nevada				
Robert Dickey, Ely				Covered kill.
Stanley Kaiser, Pioche				Tracks, scats.
Ira Garrison, Pioche	Sneaking approach. Two together will ambush.		Front paw on nose, twisted deer's neck until broken.	Dragged & buried kill.
L.R. Shores, Ely				Tooth marks.
New Mexico				
R. L. Raley, Hope				Tracks, covered carcass, teeth marks, size of prey.
Alvin Dunagin, Animas	Sneaking approach under cover.		Impact knocks deer to ground Deer grabbed by throat.	Tracks, covered kill.
G.W. Evans, Magdelena				Gutted, covered kill.
A. R. Bayne, Animas	Keep behind rocks or trees.			Buried kill.

TABLE 2. (Cont'd)

PREDATORY BEHAVIOR				
LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
New Mexico (Cont'd)				
H. C. Pickens, Santa Fe		Several cases of lion being "horned off" by buck deer.		Covered, kills not scattered.
Oregon				
L.M.Maurer, Cove Junction				Bitten in neck.
L. J. Bales, Alsea		24 dairy cows in huddle with heads out, lion circling.		Covered kill.
E. J. Sherman, Molalla	Sneaking approach to 40ft then charge. Deer escaped.			Covered kill, hole eaten thru ribs, heart & liver eaten.
E. J. Barney, Fall Creek	Stalks to reasonable distance, then charges.	Large buck deer jumped off steep rockslide to escape.		Covered kill not scattered.
Dale Bonney, Rose Creek				Teeth marks, broken neck.
Don Pankey, Roseburg				Large covered kill.

TABLE 2. (Cont'd)

PREDATORY BEHAVIOR				
LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Oregon (Cont'd)				
Ralph Johnston, Riddle	Stalk thru brush & over ridges.			Covered kill, bones chewed.
P. R. Williamson, Ashlund				Covered kill.
C. R. Duval, Taft				Bitten behind ears.
Roy Tracy, Estacada				Burled kill, not scattered.
W.M.Eastham, CottageGrove			Front foot on head, one on shoulder & bite thru spin	
E. U. Smith, Myrtle Point	Like a housecat stalks a mouse.			Covered kill, size of bite on neck, heart & liver eaten.
Elvin Lewis, Veneta				Bite behind ears
Kirby J. Taut, Central		Witnessed deer in flight after lion killed one of herd.		Covered kill, teeth marks.
Arthur Wooley, Drain				Bite on neck below skull.

TABLE 3. (Cont'd)

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Oregon (Cont'd)				
Carl Thornton, Sutherlin				Kill covered & liver eaten.
L. T. Grant, Harlam				Cover kill.
Archie Williams, BlueRiver				Marks on neck & throat. Covered kill.
Roy Vann, Willamina				Will cover when revisiting, will not on final visit.
E. W. Conklin, Sweet Home		Thru flight only.		Broken neck & opened up on front of ham.
S. W. Koontz, Albany				Covers kill.
StanleyColegrove, Brookings			Sometimes lion plays with deer like cat & mouse.	Covers kill.
Lester R. Gardner, Newport	Very strategic- will crawl, stop, drop flat.			Hard to find.

PREDATORY BEHAVIOR				
LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Oregon (Cont'd)				
Roy E. Cox, Yoncalla				Broken neck & teeth marks on back of neck.
Alfred Zollman, Joseph	Goes straight to an animal when he spots it.	Only if lion doesn't get a good hold when he jumps.	Read story in snow.	
J. F. Thomas, Remote		Doe fighting for her young.	Porcupine-lion flipped him up & bit between front legs.	Lion slits the throat.
E. O. Worley, Azalea	Stalk about 75 yds. Run very fast with tail straight up.	Deer too frightened to act.	-Large lion jumped small deer & carried it out of sight.	Four marks on back where lion lit.
Joe Jackson, Yoncalla	Tracks in snow indicate house cat tactics.	They can't defend themselves.		Clean kill, neck broken. Not always covered.
Francis Williams, Lebanon				Scratch marks. Usually cover kill-not always.
Loren Thornton, Wedderburn				Eats chest&under shoulder-covers.

TABLE 3. (Cont'd)

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Oregon (Cont'd)				
W. M. Clark, Redmond		Running away		Open cavity back of shoulder on side.
Charles Anway, Oakridge	He sits on low rim & waits for deer.		Jumps on deer & bites on back of neck.	Seldom eats hot meat, lets it lay before eating.
Maurice Wood, Oakridge				Bite on top of neck-sometimes suck, then leave.
J.B. Wadmar, Powers	Tracks tell the story.			Cover kill.
Oran King, Holley				Covers kill.
J. J. Hudack, Gold Beach	Like a house cat after robin.	A hog will attempt to fight.	Lion picked buck out of herd-he knows fat ones.	Clean kill-kills before he starts eating.
Everett Limpbeck, Lyons				Bury kill. Will pick up large kill & carry off
Perry J. Wright, Glide				Bite in neck & scratching to cover kill.

TABLE 2. (Cont'd)

PREDATORY BEHAVIOR				
LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Oregon (Cont'd)				
W. B. Patten, Culp Creek				Tracks, claw cuts, partly covered & not all eaten.
C. R. Poe, Blymouth				Teeth marks on throat.
H. E. Ediger, Dalles				2-4 holes in neck.
L. W. Peters, Mehama				Buried.
W. R. Tonkin, Brownsville	Lion had deer on run.	Doe deer came to man for protection. Man left Lion killed doe that night.		
Frank Merritt, Holley			Lion hounds scared out deer which was killed by a lion.	Covered
Robert Millican, Walterville				Covered
Harley Cain, Lowell				Manner killed & eaten.
L.L. Lewis, Central Point				Covered kill.

TABLE 5. (Cont'd)

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Texas				
Ed. L. Love, SierraBlanca				Cover kill & tracks.
Grey West, Valentine				Breaks neck, eats heart lung liver, covers.
John E. Hearn, Cotulla				Go into short ribs, eat liver lungs heart, cover kill & return.
Herbert Ward, Catarina				Claw marks, covered kill..
Paul Evans, Van Horn	Kill at night	Lion came across doe & fawn on trail, fawn ran & doe chased lion 80 ft.		Size of scratch in covering.
Earl G. Baker, CasaPiedra				Tracks & manner of eating.
Lee Duncan, Alpine				Lion break neck
Fred Moore, SierraBlanca				Cover kills.

TABLE 2. (Cont'd)

PREDATORY BEHAVIOR

LION FIELD MEN	MANNER OF APPROACHING PREY	PREY ATTEMPTING TO DEFEND ITSELF	MANNER OF KILLING PREY	CHARACTERISTICS OF A LION KILL
Texas (Cont'd)				
Jack Jolly, Allamore	Stalk a lone deer like a cat & mouse. Late afternoon.	Lion catches victim without it being aware.	Have run them off a fresh warm kill.	Cover kill. Kill big, grown animals.
Mrs. Jack McCarley, Pt. O'Connor	Lion kept deer's attention by showing & moving tail.			Tracks & covered kill.
Washington				
Frank Hansler, Tacoma			Same method each time-biting in neck	Licks hair off before eating & leaves it around kill.
Gordon Stuart, Lucerne				Eat out the flank before ham & cover kill.
Jack L. Handy, Okanogan				Tracks-neat pile of remains.
Laurence Sprengel, Colville				Opens stomach first, claw marks on face or neck.
Wyoming				
Frank Morris, Cody				Tracks, covered kill.

upon a deer. He states that the lion's approach was semi-crouch, hidden, inching forward to within striking distance, jumping on back and biting the neck. Mr. Sampinos, who lives in an area of extremely heavy lion concentration, also reports having seen a group of deer defend themselves against a lion by facing the lion, striking at him with their heads in a bunting fashion and also striking out with the fore feet.

Mr. Bryce Johnson of Salina, Utah, who observed a mountain lion attack upon a deer states that the attack was accomplished in the following manner: "The lion was sneaking through the scrub oak toward the deer; when about 40 feet away he started to make long fast lunges, jumping four times and onto the five point buck that had just started to go. One slash with the lion's paw and the bucks throat was cut and his shoulder lay wide open. The lion rode the buck approximately 70 feet before both fell."

A lion was observed sneaking through the brush and rocks until within 30 or 40 feet from a deer by Dee Craig of Santaquin, Utah. The lion then made a rush, sprung from the ground, landed on the deer's back and sunk its teeth into the spinal cord.

A lion in the process of killing a fawn was observed by Mr. Ralph Robinson of Fillmore, Utah. He states that the lion was on the fawn's back and the fawn was on its feet. The lion was biting at the fawn's back when it was shot in the head, and the fawn ran off through the timber. Mr. Robinson states that it

a very big lion.

The following observations of the manner in which a mountain lion kills its prey were made by Willard Rood, Jr., of Salmon, Idaho, who states: "Although I have never witnessed a cougar making an actual kill, I have found many, many instances where they have made kills and many of them shortly before I arrived. I have also found evidence where they have made attempts and missed. From their tracks in the snow and the patterns left, I know that they stalk the game much the same as a house cat stalks a mouse or a bird. And, contrary to the usual belief, it is difficult for them to catch a deer. I have seen where several attempts have been made before they finally do make a kill. I once found where a cougar had caught, killed and partly eaten a bobcat. He had outmaneuvered, proved swifter and more wiley than the bobcat. I have also known them to kill coyotes and have had them kill and eat the coyotes on my trapline that were in traps. This information has been gathered over a period of twenty years of hunting and trapping."

Tracks observed in the snow by L. J. Bales of Alsea, Oregon, showed clearly where a large mountain lion had jumped onto the back of a two year old bull elk that went approximately 75 feet before falling down. The lion had been in the area for many years and was easily identified by the loss of three toes from his right front foot, and the natives had nicknamed him "Toeless Pete". After the lion was killed by Mr. Bales, a herd

elk increased to 70 head within two years.

An observation of the manner in which a large male lion killing grown cattle was made by Howard Bilton of Glenville, California. Mr. Bilton found where two of the cows were dragged a distance of 200 feet and estimates the weight of the cows at 750 pounds. This lion had made no other kills in three weeks. It was noted that he killed by leaping on the cow's shoulders-the cow immediately stampeded down the hill. The lion caught cow's muzzle with one paw and pulled her head around causing cow to fall hard. The cow's neck was broken which Mr. Bilton believes resulted from the fall. In the case of a cow heavy with calf this lion also ate the unborn calf as proven by a hoof and ear found in the lion's stomach.

The mountain lion apparently maintains his instinct to kill for food to the bitter end. Mr. Nay of Salina, Utah, gives an example of this: "We had a captured mountain lion we used in training of the dogs. One day we ran over it accidentally with the car. We put it back in the pen knowing there wasn't much hope of its living. Some hogs were feeding close by to its pen and we figured it was too weak to bother them. All of a sudden it grabbed one of those pigs and had its throat bleeding as though it had been stuck. We had a very hard time getting it to release the pig. The next day the lion died."

The lion undoubtedly alters his approach to his prey to fit each individual situation. Mr. Cyrus Willberg of Castle Dale,

Utah, on February 1, 1949, during one of the most severe winters on record, saw a large mountain lion casually following a deer herd near Red Narrows of Spanish Fork Canyon in Utah. The deer were experiencing considerable difficulty in breaking a trail through the deep snow, and the lion was taking advantage of the path which they had broken.

A lion does not always kill its prey immediately. While hunting mountain lions in Utah County, Mr. Arnold Smith of Payson, Utah, chased a lion away from a deer which he was still in the process of killing. Mr. Smith's dogs had the lion treed before the deer had stopped thrashing around in the blood covered snow. The deer was bleeding profusely from tusk puncture wounds in the throat area.

Trail hounds belonging to Mr. W. M. Clark of Redmond, Oregon, also once chased a lion from a partly killed deer. The lion had bitten the deer through the back of the neck and the deer was paralyzed to the extent that he could not raise his head.

Apparently lions do miss their prey occasionally. Mr. E. O. Worley of Azalea, Oregon, followed one medium sized lion that made six attempts to kill deer in a matter of 4 or 5 miles. The snow was fresh and on every attempt the lion had made a run of 60 yards jumping from log to log across a small canyon. When he made his spring for the buck he lit all flattened out in the snow and just walked away. The snow showed where the buck had

[illegible]ged and run away. This was the most unusual case of a lion [illegible]sing its prey that Mr. Worley had ever observed.

There are other reports of the prey having successfully [illegible]ded the lion. Mr. William C. Dalton of Parowan, Utah, [illegible]tes: "I have observed evidence of livestock and big game [illegible]casionally freeing themselves by scrubbing the lion off [illegible]eir backs by running under a tree."

The state fur inspector for Colorado, Mr. Howard H. [illegible]nnell of Grand Junction, has made the following observation: "I killed a 190 pound lion, 8 feet, 2 inches, male, January [illegible]9, 1949, in the New Castle area. This lion traveled about 14 miles in a very rough and rocky country before it made a kill, after killing a large buck it bedded down under a rim for about 12 hours, it treed a short distance from the bed. I opened the paunch the following day and found it consisted of about 15 pounds of deer meat, hair and hide. This lion went through a band of our mountain sheep, but I found no evidence of mountain sheep in the stomach."

The possibility exists that mountain lions might show a preference for the "stragglers" of a herd rather than for the weaker animals. Mr. Charles Madsen of Provo, Utah, has observed in the snow a number of places where the deer have attempted to defend themselves. Mr. Madsen states that when there is a buck or two in a bunch of deer they get close together and the bucks defend the herd against the lions.

A doe fighting to defend her fawn from a lion was observed by Mr. J. S. Thomas of Remote, Oregon. The doe fought valiantly with her front feet but lost the fight. Mr. Thomas killed the lion.

Many field men are prone to believe that the courage of a buck mule deer has been highly underrated. Mr. Bill Jensen of Huntington, Utah, once observed a four point buck sacrifice his life in an effort to protect the herd. He states that when the does saw the lion they ran away with their fawns, but the bucks stayed to fight. The first one that charged the lion was killed, "Like a cat kills a mouse".

Tracks in the snow observed by Mr. Ed Griggs of Salt Lake City indicated that there had been a struggle between a buck deer and a lion. Mr. Griggs found broken deer horns, deer hair, and lion hair in the snow, and inasmuch as he did not find the deer's carcass he assumed that the lion failed in its attack.

Almost without exception tracks in the snow showed that whenever a lion killed a deer he would drag it to a place of seclusion or cover before starting to eat it. In one instance a lion was observed to have dragged a large deer through some almost perpendicular ledges with an exhibition of almost unbelievable strength.

The unmistakable characteristics of a mountain lion kill are as follows: (1) Large tusk punctures on the back of the animal's neck. (2) One or more sets of tusk and teeth punc-

[illegible] on the throat in the vicinity of the larynx. (3) The [illegible]l's ribs chewed away leaving a hole about 8 to 12 inches [illegible] diameter leading into the chest cavity. (4) The heart, [illegible]ver and lungs of the animal eaten first. (5) The carcass will [illegible] almost entirely covered with sticks, leaves, dirt or snow. (6) If the majority of the carcass has been consumed, the [illegible]jority of the remaining bones and flesh will be left more or [illegible]ss in a single pile rather than scattered over a wide area in a manner typical of dogs or coyotes.

Mountain lions have been observed at times to return to previous kills and eat from them. At other times they were observed to kill the deer, eat once from it, and then move out of the country into another area. The reason for such conduct is unknown. It may be said generally, however, that large males and yearling lions are least apt to return to the kill. Likewise it may be said that a female that is providing for kittens will almost invariably return to the kill. Some females with kittens have been known to remain right at the kill until it is consumed.

Concerning the lion's returning to eat from a previous kill, Mr. Verl Kelsey of New Harmony, Utah, states: "In this area during the winter months usually a lion will return several times until the entire kill is eaten. I do not find this is as true with the larger males, but the average lion will return if the kill is unmolested."

Figure 1. Mountain lion canine teeth puncture wounds on the back of doe mule deer's neck received in initial assault. Morgan County, Utah. January, 1949.

Figure 2. Pencil points to a tusk-puncture wound in the throat of a doe killed by a lion in Weber Canyon, Morgan County, Utah. January, 1949.

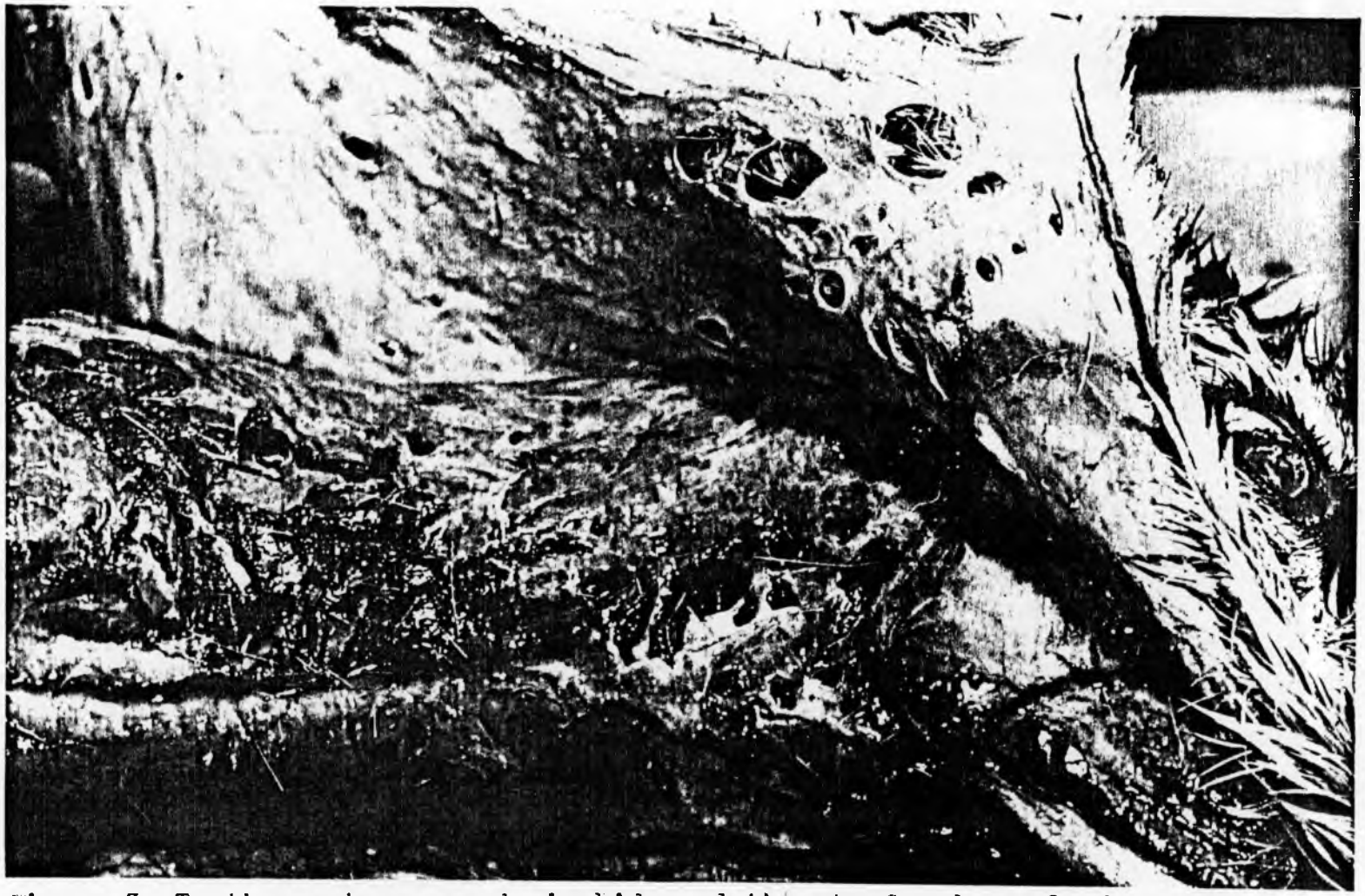


Figure 3. Teeth puncture wounds in hide and throat of a doe mule deer killed by a mountain lion--front oblique view. Note tusk puncture wounds (in left hand corner of picture) received on back of neck presumedly in initial assault. Morgan County, Utah. January, 1949.

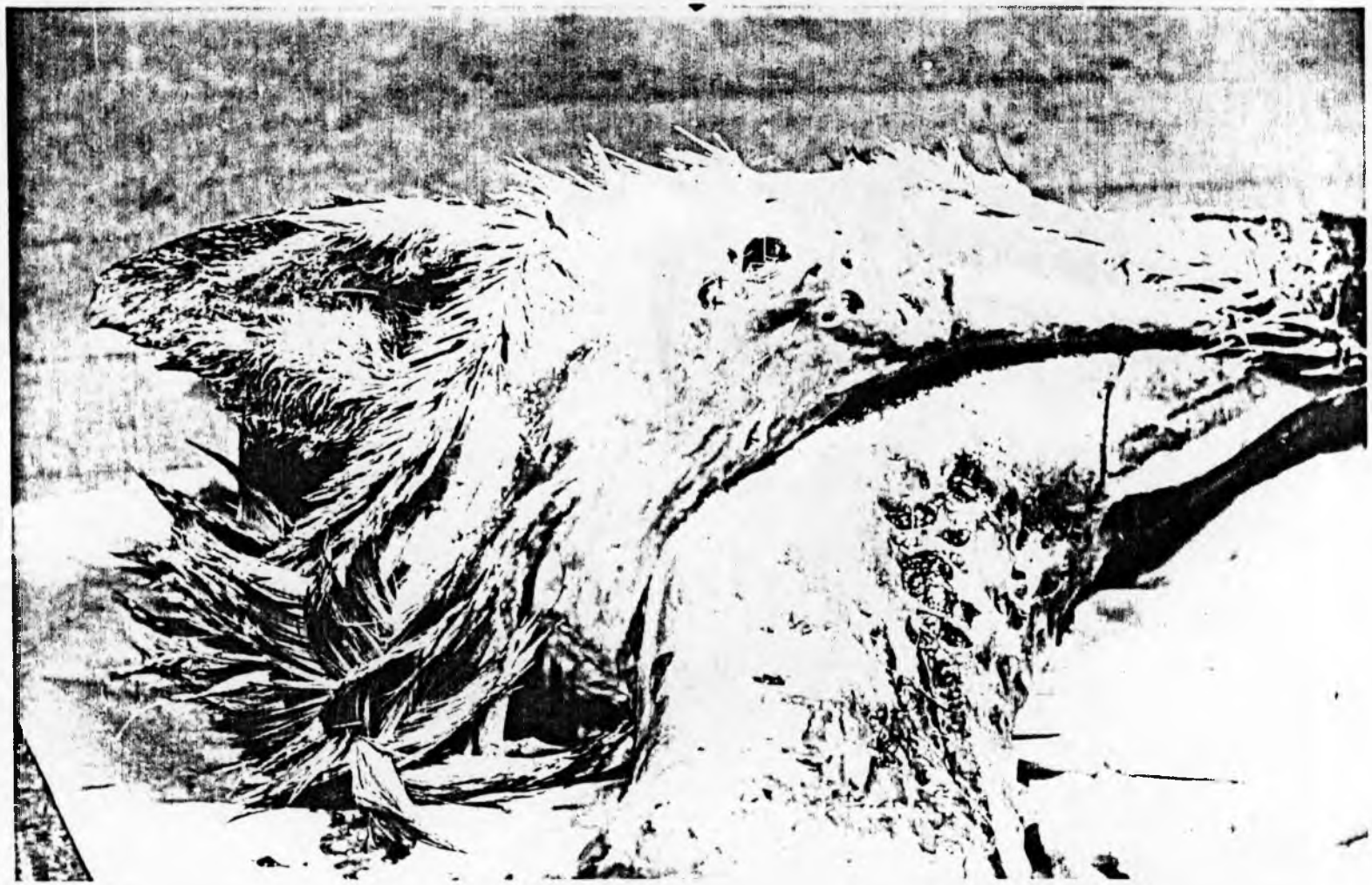


Figure 4. Teeth puncture wounds shown in the hide and flesh of a doe mule deer killed by a mountain lion in Morgan County, Utah. Side View. January, 1949.

Figure 5. Doe mule deer killed by mountain lion showing all of the characteristic signs:(1) hole chewed through ribs into thorax, (2) heart, liver and lungs eaten, (3) dragged 80 yards to sheltered place after killing, (4) carcass covered with material available. Weber Canyon, Morgan County, Utah. January, 1949.

Figure 6. Mule deer fawn killed by a mountain lion in Weber Canyon, Morgan County, Utah. Before being eaten, deer was dragged into sheltered place in a characteristic manner. February, 1949.

Figure 7. Mule deer killed by female mountain lion upon which 2 kittens have been feeding. Note that the carcass was dragged to a sheltered place in a characteristic manner. Morgan County, Utah. February, 1949.

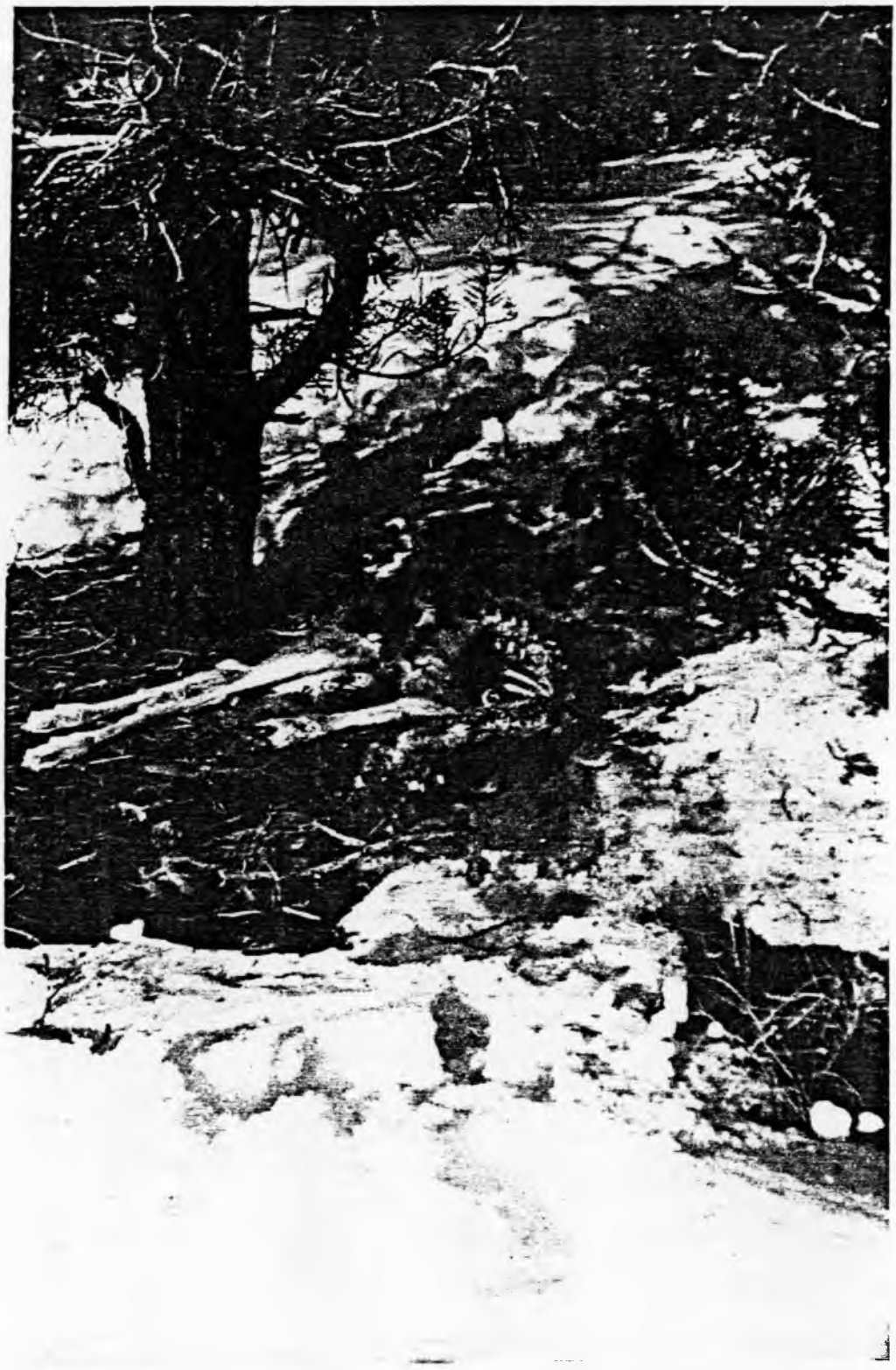


Figure 8. Remains of a mule deer killed by a lion in Nevada National Forest, Ely, Nevada. Note that the remains are not scattered but remain more or less in one pile. March, 1949.

Figure 9. Doe deer killed by mountain lion in Weber Canyon, Morgan County, Utah. Approximately 50 % consumed. January, 1949.

As far as can be determined, lions will not eat every day, but sometimes every other day. Mr. Harrison Price of Junction, Utah, has the following to say about this matter: "I caught a kitten female that weighed about 45 pounds and my brother raised it. He kept it two years. When it was fed a whole sheep it would eat all it could and bury the rest and would eat only every other day. I have found it that way when trailing them. They eat all they can, bury the rest, and wait 24 hours before eating again."

Other food items in the diet

It is almost universally accepted among wildlife biologists that deer is the main food item in the lion's diet. Several times during the course of this study lion tracks and livestock tracks crisscrossed intermittently, and the livestock were not molested. This has led the author to believe that it is only the abnormal or senile lions that kill livestock for food.

Mr. W. O. Nelson, Supervisor for the Predator and Rodent Control Division of the U. S. Fish and Wildlife Service in Utah, once observed the remains of 275 sheep that had been killed in two nights by a lion in the vicinity of Strawberry Reservoir in Wasatch County. On another occasion, Mr. Nelson counted 48 sheep that one lion had killed at one time. These represent the heaviest losses observed by Mr. Nelson during almost thirty years of predator control work.

Porcupines constitute the second largest item of food for mountain lions. Field observations indicate that on the average a lion kills one porcupine every 7.2 days. Figures 10 and 11 show the remains of porcupines killed and eaten by mountain lion. A porcupine which has been killed and eaten gives all the external appearances of having been very expertly skinned out by an experienced trapper and the body removed so that all that remains is the hide and quills. Nearly all

Figure 10. The quills and hide are all that remain of a porcupine killed and eaten by a mountain lion (right center) south of Bryce National Park, Kane County, Utah.

Figure 11. Remains of a porcupine killed and eaten by a mountain lion on the summer range, Kane County, Utah.

lions skinned by the writer have had quills somewhere in the body. Analysis of scats has shown that lions eat large numbers of quills with their food. Although these quills are not digested, they pass through the entire digestive tract apparently without damage.

On one occasion it was evident from the tracks that a lion had knocked a porcupine out of a tree and then killed and eaten it on the ground. It was impossible in this, as in all other cases, to determine the exact manner in which lions kill porcupines. Mr. Whitey Carroll, a professional mountain lion hunter of Veyo, Utah, reports that he observed a lion kill a porcupine in a cage at a zoo in Albuquerque, New Mexico. The lion turned his paw over so that the claws were upward then slid it under the porcupine and with a lightning blow flipped the porcupine to the ceiling. The porcupine was either severely stunned or dead when it fell to the bottom of the cage. The lion then picked the quills from its paw with its teeth and proceeded to eat into the porcupine's viscera.

At an early stage in the study, mountain lion tracks were found leading to the carcass of a yearling white face steer in a manner which suggested a stealthy approach and then a charge. The carcass was about 60 percent consumed, and was partially covered with snow and leaves. This steer was first tabulated as having been killed by a lion. Later, as more information was obtained about the characteristics of a lion kill, it was

decided that this tabulation was erroneous. At later stages of the study lions were observed to deviate from their normal route of travel in order to investigate, apparently for the sake of curiousity, deer which died of starvation (winter loss). On one occasion while in the field with W. Leslie Robinette and Jay Gashweiler, Biologists of the Division of Wildlife Research of the U. S. Fish and Wildlife Service, one mature lion was observed to have covered up a deer which had died of starvation. This may have been what happened to the steer.

One cottontail rabbit was killed and eaten by a mature male lion in Tie Fork of Spanish Fork Canyon. Tracks in the snow indicated that the rabbit apparently ran from the brush when the lion approached, and the lion was upon him in two bounds. All of the rabbit had been consumed with the exception of three feet, a portion of his neck and the head, which were held together by the hide and fur.

Deer probably fear the lions more than they do man. During the course of this study, an old female and two kittens were tracked into a basin in the red ledge country north of Coalville, Utah. While walking up the rim of the basin, it was noted that deer were slowly and quietly moving out of the way. A movement in the brush about 200 yards distant revealed a young lion approximately half grown slinking through the brush, taking advantage of every cover. While walking away, the lion

stopped periodically for as much as 25 or 30 seconds at a time to observe his observer. Its path took it within a few feet of a large mature mule deer doe which was standing broadside also curiously looking at the observer. While watching the doe through binoculars it was noted that the lion was less than 50 feet away and traveling at a good fast walk when first observed by the deer. She cocked her head as though in an effort to get a better look at whatever was approaching. The lion passed through a small clearing so that the deer easily recognized it. The effect upon the deer was electric. To say that this deer that had just observed a mountain lion was in "full flight" would be using the phrase very conservatively. The fleeing deer passed within approximately 80 feet of the observer ignoring him completely.

A situation similar to the above was observed by W. R. Tonkin of Brownsville, Oregon, who was working in the woods one day when a doe came running and snorting to him and stayed around all the rest of the day. When he returned next morning he found that a male yearling lion weighing about 100 pounds had killed the deer during the night and had eaten a considerable portion of it.

Probably the instinctive lust to kill is more deeply rooted in some lions than in others. Ordinarily they kill to eat, but on occasions where opportunity is available, they often kill and continue to kill as long as the opportunity

kills itself even though they are not hungry. Mr. Stanley Hedgrove of Brookings, Oregon, while tracking a mountain lion through the snow found where it had killed 5 civet cats, 1 coon, and 2 deer without eating a bite of the animals it had killed.

Observations have been made where the same lion has eaten a variety of different foods. Mr. P. O. Hurst of Fairview, Utah, observed one case where a lion had killed a large buck and 20 feet away it also killed a beaver, but very little was eaten of either.

The food preference of mountain lions is covered rather briefly by Fred Moore of Sierra Blanca, Texas, who found: "When a lion gets hungry he is not at all particular about what he kills. I have found where they have eaten skunks, foxes, and coyotes from field traps. I have seen where they have killed grown horses and even know an instance where a big old male lion picked a grown bull."

An unusual incident in which a mountain lion raided a farmer's pig pen in the Arkansas valley many years ago was observed by Robert Mink of Canon City, Colorado. Mr. Mink believes the lion must have become hungry while it was crossing the valley and where it was some 30 miles from any wild game. It killed two young pigs in a pen about 100 yards from the farmer's home. This lion had lost two toes from the left hind foot.

There is a strong inherent tendency for mutual animosity between cats and dogs; and of the two groups, the dog group is usually the aggressor. An exception to this rule was observed by Mr. W. R. Tonkin of Brownsville, Oregon, who, with a hunting partner, found where a trail hound had been killed by a lion that had hidden on a log and waited for the dog to approach. The next day the same lion was chased and treed by dogs belonging to Mr. Tonkin. There was evidence to indicate that the lion had tried to ambush the second dog in the same manner that it had the first, but the second dog was smarter and held its distance. Only small portions of the first dog could be found scattered about.

If the lion has the courage to fight and kill a dog, he will normally consume a large portion of it if he is not disturbed. Such an incident is reported by Mr. Frank Merritt of Holley, Oregon, who in May of 1941 put two trail hounds on the trail of a lion that had been seen crossing a road. The lion killed Mr. Merritt's very best dog but he did not find out about it that day. He went back the next day with other dogs and succeeded in capturing the lion which proved to be a yearling about 5½ feet in length. It had killed and eaten the first dog, leaving only the hide and feet which it covered and was still guarding.

A trail hound belonging to Mr. Oran King of Holley, Oregon, was also killed by a mountain lion and partially eaten. The lion lay by the dead dog until chased away from it by additional

trail hounds the next day when it was treed and killed.

Considerable bear meat and bear fur has been found in the stomachs of mountain lions several times by Mr. Arthur Wooley of Drain, Oregon. This gives rise to the possibility that bears and mountain lions may, in some way, help to hold one another's population in check. The lion is considered a strictly carnivorous animal, and the bear, although grouped with the carnivores, is usually considered to be omnivorous. It is well known that bears are very fond of carrion, and it seems probable that a bear might eat from a lion kill. This might precipitate a conflict between the two. Whether this would explain the presence of bear meat in a lion stomach or whether lions regularly prey upon bears is not clear and would require a great deal of field work to answer.

There is some indication of individual variation in the food preference of lions. Mr. Ed Griggs of Salt Lake City, Utah, reports the following: "I trailed a female lion in Nebo Creek of Spanish Fork Canyon in central Utah. She had three small cubs with her. I saw by tracks in the deep snow where she caught a bobcat to feed the cubs. All that was left was a front and hind foot and part of the cat's head. Since then I have noticed where four different bobcats have been killed and eaten by a lion. The lion will eat almost any kind of game but prefer deer. I have found five cases of beaver kills where the lion laid in wait for the beavers to come up or down their slides

while dragging tree trunks. One of these cases was in June while I was fishing, when a fawn would have been easy prey."

On the basis of information submitted by William W. Mink of Delta, Colorado, it appears that the mountain lion may serve as one of the natural checks on the beaver population. Mr. Mink states: "We had one experience where a lion was busy catching beaver. He would come down at night when the beavers were out and pounce upon one like a cat upon a mouse. He had cleaned out one colony of beavers for us."

An interesting case of a mare attempting to defend her colt is reported by Mr. George Nay of Salina, Utah, who says: "A lion was trying to stalk a colt on Poverty Flats. The mare tried to keep the colt on lead of them, but the lion sprang on its back. One shot and the lion took to cover."

A neighbor of Mr. L. L. Anderson of Meyers Cove, Idaho, brought in a mare that had a young colt. The mare was scratched severely on the leg and thigh. She no doubt fought off a cougar to protect her colt.

During the spawning season Mr. C. R. Duval of Taft, Oregon, found where a mountain lion was taking fish from a small stream.

The competition that exists between wild carnivorous mammals is exemplified by the experience of Ralph Johnston of Riddle, Oregon, who tells the following story: "I was hunting a few years ago when the dogs got on the track of a lion and after following it a few days I caught up with it. It had

killed a deer on a brushy ridge and had been eating on it. I could see on the leaves where it had been laying there watching the deer carcass about 20 feet from it, and as near as I could tell a coyote came up to eat off of the deer and the lion caught it and killed it. There were claw marks on the coyote's side and it had been bitten through the head."

It is the general consensus of many field men that the role of the lion as a predator upon livestock has been highly overrated. Mr. Harrison Price of Junction, Utah, states: "I have trapped for about thirty years and have inspected hundreds of livestock kills, but I was never sure of a lion kill in the bunch. About one third of the kills were bobcats and the rest were coyotes. Lions do not eat off any carcass that they do not kill, and if not traveling through the country will eat the entire carcass."

In February, 1949, Willis Butolph of Wellington, Utah, with his trained lion hounds treed and killed a mature female mountain lion that had been killing sheep in the juniper foothills on the west edge of the Book Cliff Mountains southeast of Wellington, Utah. This lion's stomach when examined was found to contain a considerable quantity of wool. This lion was abnormal in that the inside of its front limbs were almost entirely devoid of hair. The bareness was at first thought to be caused by a disease, but microscopic examination of the bare hide in that area failed to reveal a cause. The pattern of the

bareness was symetrical on both legs, which made some biologists who examined it inclined to believe that the bareness was of hereditary nature. Dr. Don M. Rees of the Biology Division of the University of Utah, upon examining i stated that he was inclined to believe that the bareness was due to wear, probably from excessive rubbing. This seems pr able in view of the fact, as in Figures 12 and 13, that the front paws of the animal appear to be turned outward in an abnormal manner. If she did not have complete control of her front paws, she may have endeavored to grab her prey between her two fore limbs, which might account for the rubbing. She appeared to be perfectly normal in other respects, and should have experienced no difficulty in capturing deer which were plentiful in that vicinity. The fact that a prime mature fem turned to easier prey, namely sheep, lends credence to the hypothesis that possibly she did not have full control of her front paws. It tends to support the more general hypothesis that lions do not normally feed on livestock unless their natural prey, deer, cannot be obtained and they are forced to turn to livestock as a source of food. If lions are crippled and cannot catch deer, they might turn to livestock or other animals more easily captured. Further evidence on this matter is reported by Aagard Livestock Company of Summit County, Utah who found an old "gummer" mountain lion killing sheep in broad daylight within rifle range of the camp wagon on their desert

Figure 12. View showing worn area on inside of right fore limb of a sheep-killing mature female lion. Note that right front paw is turned outward in an abnormal manner. Lion killed by Willis Butolph, Carbon County, Utah, February, 1949.

Figure 13. Fur worn off inside of left fore limb of female sheep killer mountain lion in an abnormal manner. Lion killed by Willis Butolph, Carbon County, Utah.

range 20 miles from the nearest mountains. The lion's teeth were rounded from wear, his claws were worn and frayed, and his body gave the external appearance of being "just a bag of bones." On numerous occasions throughout this study, lions were observed to have crossed the tracks of sheep and cattle in the snow and to continue on their way leaving the livestock unmolested. In one instance a group of four lions that had just passed through a herd of cattle in which there were numerous calves, which would have been easy prey, killed a two point buck deer less than a quarter of a mile away.

Inasmuch as the tracking phase of this study was conducted during the winter months during which snow was plentiful, it was impossible to determine the water requirements of the mountain lion. On the basis of some cougar stomachs which were examined, their seems to be some indication that lions are prone to drink the blood of their prey. Perhaps many of the animals which were killed but not eaten may have been killed for their blood. The habit of grasping a deer by the throat after it is down may be an act of slaking the thirst with blood. Whether this supplements their summer requirements for water can only be surmised.

A similar case of a lion being fond of blood was surmised by Mr. Perry J. Wright of Glide, Oregon, who states: "I was called a few years ago to bring my dogs and catch a lion that a party said was killing his sheep. I investigated and examined

the sheep which were bitten through the windpipe and jugular vein. No other marks on them. When I caught her (lion) she was poor (condition) but otherwise okey. Her teeth were good but evidently she just wanted blood."

Among field men it is almost universally accepted that lions are extremely fond of horse meat, especially colts. Only one case came to the writer's attention when he was called to investigate an attempted predation upon a colt owned by the Rust and Sons Livestock Company of Croyden, Utah. Tracks in the snow indicated that a large mature lion made several attempts to approach the corral that contained the colt. A rancher in the area stated that his sheep dog barked incessantly that morning about daylight and the concensus was that the dog's barking saved the colt.

B. Life History

1. Youth

Field men with mountain lion experience agree that the female lion gives birth to young at any time of year.

Boyd Twitchell, a government hunter of Beaver, Utah, with his trail hounds in the winter of 1946-47 captured a female lion and four kittens which were about 24 hours old. The young were about 13 inches long with black and brown spots. The same winter he captured a litter of three kittens which were approximately 6 months old, indicating that young may be born at any time of the year.

The young are usually born in a cave, windfall, or other place of shelter. The litters seem to average between one and three in number, although records of six are known. When born the young possess black spots all over their bodies. These spots gradually disappear until the age of approximately one year, at which time only a few spots remain on the insides of the fore limbs. The newly born of Felis Concolor hippolestes are reported by Young and Goldman (1946:115) as being 12 inches in length and weighing 16 ounces.

Mr. William C. Dalton of Parowan, Utah, reports that lion kittens weigh approximately 1 pound at birth. While on a hunt his dogs treed a female which showed signs of pregnancy. He says, "I performed a caesarian operation taking four unborn kittens.

They gave signsof life. I gave them artificial respiration, dried them off, brought them into Parowan and showed them to the local doctor. He observed them to be almost ready for birth. I weighed them, two males weighed 16 ounces each, two females 14 ounces each. The female weighed 110 pounds, measured 6 feet 4 inches, tail length 24 inches, heel bone 9 inches. The kittens I kept for about 6 weeks or 2 months".

The female lion moves her kittens from deer kill to deer kill as soon as they are capable of following her. Extremely small lion kitten tracks have been observed following a mature lion's tracks in the snow. Yearling mountain lions were examined at the Hogle Garden Zoo at Salt Lake City, Utah, and a comparison of the size of their tracks with the size of lion tracks observed in the field of mountain lions who were capable of survival without their parents indicates that a lion is usually self-supporting at the age of 12 or 13 months. Lion hunters on two separate occasions in different areas, Dixie National Forest and Spanish Fork Canyon, Utah, found half grown lion kittens following the trail of mature male lions, and living from the kills which the male lion made. Both of these areas had been subjected to rather intensive mountain lion hunting by sportsmen and government hunters, and in both areas hunters had succeeded in treeing and shooting female lions with kittens but darkness had overtaken them before all of the kittens could be trailed down and killed also. It is

Figure 14. Black spots found on Felis concolor hippolestes kittens under 1 year of age. (Photo by Lee Kay, Utah State Fish and Game Department)

Figure 15. Typical facial expression of Felis concolor hippolestes kittens (Photo by Lee Kay, Utah State Fish and Game Department.)

logical to assume that the kittens left on their own prior to the age of self-support, took to following in the wake of mature lions and took to partaking of their kills until such time as they could become self-supporting.

2. Parental and family relations

Immediately prior to parturition the female lion is either deserted by the male, drives him away, or secludes herself to have her kittens. It is the general concensus among field men that the male lions assume no obligation in the rearing of the young. However, observations have been made contrary to this. Mr. Riley Hale, a government hunter of Grantsville, Utah, while running his coyote trap line in Skull Valley, Tooele County, Utah, was passing the mouth of a cave when a large male lion bounded out and climbed a tree almost directly above his head. Mr. Hale shot the lion, and as he did so a female lion bounded out of the cave and went up the same tree. He also shot the female and then crawled back into the cave and captured two small kittens. From all indications this group of lions appeared to be living together as a complete family unit, but on the basis of all other observations it seems to be the exception rather than the rule.

There have been instances observed in which the male lion assisted in rearing the kittens. Mr. Ed Griggs of Salt Lake City, Utah, gives the following information about a hunt in Spanish Fork Canyon in Utah County: "I came across a kill that was being eaten by two small cubs and a very large male. The kittens were very poor, and the mother was probably killed while they were very young."

Another observation which might indicate that the male lion assisted in rearing the young is given by Walter L. Roberts of Annabella, Sevier County, Utah. Mr. Roberts states that he found where an old tom made a kill and carried it to the female and the kittens.

Tracks in the snow have indicated on numerous occasions that a female lion with half-grown kittens had spaced the kittens from approximately 100 to 120 feet apart and the entire group had moved through the junipers in a more or less straight line. Moving through the mountains in this manner would enable them to cover considerably larger area than if they were to hunt together in a close pack.

It is not uncommon to find tracks in the snow which indicate that an aggregation of four or five mature mountain lions are traveling and hunting together. Mr. Stanley Colegrove of Brookings, Oregon, found such an aggregation and treed one old female and four young ones in one tree. The young ones were nearly grown and averaged almost 7 feet in length.

The theory that cougar aggregations result from family ties that are not broken is also advocated by Frank Hansler of Tacoma, Washington, who has, "seen them (kittens) with their mother until they were three years old, also a mother with one, two, and three year kittens still with her, at least hunting with her".

Mr. Perry J. Wright of Glide, Oregon, observed that, "When

the kittens are 3 to 4 months old the female parent will move to where there are more deer. I have seen cases where a mother fed or helped feed her year old kittens and also a younger litter. I don't think this happens very often."

Mr. W. M. Eastham of Cottage Grove, Oregon, states: "Last February (1949) I found signs of an old female and a 2 year old female kitten she still had with her for training. Although the young cat was really on its own it had not been bred, so was still in company of its mother. They were hunting about 6 square miles area, and had been there about 2 weeks. I had an accurate check as I hunted that area 2 weeks before. It might be interesting to know they separated while hunting, each made its own deer kills and then they got together to eat their fill. The one that made the kill seemed to be the one to cover it. . . I saw evidence that both returned to, or near, the kills several times. Male lions and females without family ties hunt alone. By alone I mean without sharing kills or checking on each other. They use the "scrape" method of getting into contact with each other."

There are indications based on very concrete evidence that the male lion will often kill the young if given the opportunity. One of the nation's foremost mountain lion hunters, Mr. Jack Butler of Kanab, Utah, has observed three instances of the adult male killing young kittens. Mr. Butler states that he is at a loss to know why they do this, and states that he has observed

a house cat to do the same thing.

Mr. Verl Kelsey of New Harmony, Utah, states: "I have found several cases where the old male had killed young kittens. In one instance the male killed and ate three kittens under a ledge. They were completely eaten except for the head, legs and tail. The tracks in the snow showed plainly the fight between the male and female and later that day I caught the old female who in her anger would not tree but chose to stay on the ground and fight and kill the dogs."

A similar incident was observed by Mr. LaRue Emett of Veyo, Utah, who says, "I caught a female lion who had had two kittens and went back two days later and found tracks of a big male lion. I trailed him from where he had killed the two cubs and caught him".

Mr. R. E. Cowger of Cisco, Utah, observed from the tracks in the snow that the male lion came upon the mother and four kittens eating at a deer kill. The male killed one kitten and the others all fled.

Mr. Orrin Adams of Cedar City, Utah, reports that he was trailing a big male and found a cub the lion had killed. Mr. Adams believes that he had killed the mother of the cubs three days before.

Mr. Ray Owens of Hurricane, Utah, observed where the male lion had killed and eaten the cubs in their den, leaving only the hide and bones.

Mr. George Nay of Salina, Utah, states: "The male lion does extensive traveling to as many females as he can locate with young kittens, killing the male kittens. I found one this year (1949) with its skull crushed and the vital chest organs eaten."

A female parent lion was killed by Bryon L. Denton of La Vita, Colorado, who was not able to get the kittens out of the rocks that night. He went back the next morning, but a male lion had already killed and devoured two of them. At another time, Mr. Denton raised three young lions after killing their mother when they were only about 9 days old. He lived in the mountains and trapped a large male lion that was trying to get at them. This lion made three different trips before a trap was set to pick him up.

Another example of a male lion killing the kittens was observed by Floyd Pyle of Payson, Arizona. Mr. Pyle trailed a female lion to her den where she had one small kitten. The trail hounds were put on her back track which led back to her original den where two dead kittens were found. Tracks of an old tom led away from the den so Mr. Pyle gave chase and caught him.

William C. Dalton of Parowan, Utah, observed a case in which the female was away hunting when the litter was killed. Mr. Dalton states that he has also found yearling males killed by larger male lions, but that the larger males spare the

yearling females.

Apparently the female lion realizes the male's attitude toward her kittens and sometimes takes measures to protect her offspring. With regard to this matter Mr. Newton McBride of Fillmore, Utah, says: "My observation from one litter we dug out having two kittens was that the hole under the rock was much too small for even the old cat to get to and had to be dug out considerably before making our entry to get the kittens. I have often wondered if she didn't give birth to them on the outside of the cave and keep them on the inside until such time as they could do their own traveling, as she could not of got to them to feed them. This must have been the old 'she's' plan to keep them from being eaten."

The male parent's actions in killing the kittens may be the natural means for holding the population in check. Mr. Oscar Hansen of Provo, Utah, found that where he had taken several male lions out of an area, there is a tendency for the lions in that area to increase more rapidly.

There is some evidence to indicate that if the male lion tries to kill the kittens while the female parent is present he will encounter considerable opposition. A scream of a lion in the mountains of Oregon caused Mr. J. S. Thomas of Remote, Oregon, to investigate the cause of the disturbance. He found a male and female lion engaged in a terrific battle and he killed both of them. A search of the area revealed the little

kittens under a slab of bark where he believes the female parent had hidden them for protection.

Female lions have been known to put up a terrific battle with trail hounds in order to protect their young, but their mother love instinct is not deep enough to cause them to attack a human who is capturing or killing the kittens.

TABLE 3.

LIFE HISTORY												
LION FIELD MEN	NO. IN LITTER	SELF SUPPORTAGE (MOS.)	ADULT MALES		SIZE		WEIGHT		DO LIONS SCREAM?			TYPE OF LION DENS
			All Young	Bear Young	Ave.	Max.	Ave.	Max.	Yes	No	Positive Identification	
Utah												
N. Robison, Anabella	2-5					8'4"	140	200		x		
Ed Griggs, Salt LakeCity	3	12		yes	7'6"	9'3"	170	265		x		ledge caves
V. Cottam, Escalante	2-6				9'		300		x			
Harrison Price, Junction	3	8			7'6"	9'6"	160	210		x		various
W. L. Roberts, Anabella	2-4	8-12		yes		8'6"	160	200		x		
B. Argyle, Spanish Fork	2-6	12			8'	9'1"	160	193		x		ledge
Don Cowger, Cisco	1-5	8-9	yes		*7'	9'6"	95	150	x			
J. W. Willis, Vernal	2-4	8-12		yes	8'6"	9'6"	150	200		x		
Robert Snyder, Duchesne	3-	5			8'2"	9'9"	150	190	x		tracks	
Verl Kelsey, New Harmony	2-4	5-6ft	yes		7'	9'6"	120	207		x		
V. Montgomery, Park Valley	3-4	12	no	no	7'	7'7"	135	177	x		treed	
Wm. C. Dalton, Parowan	3		yes	no	7'2"	7'7"	100	205	x			
Arthur Brindley, Antimony	3	12	no	no		9'11"	155	200				
John Sampinos, Price	3	6-8		yes		6'4"		100				
Oren Adams, Cedar City	1-4	10	yes	no	7'6"	9'4"	160	200		x		
George Nay, Salina	2-6	14	yes	no	5'6"	8'7"	130	170	x			any shelter
John M. Bird, Salina	2-5	9-11			7'-8"	10'11"				x		
Bryce Johnson, Salina	2-3					8'11"			x			
Floyd Roberts, Richfield	3	6		yes	6'2"	9'4"	135	172	x			
F.W.&G.Roberts, Antimony	2-5	4-6	no	no	5'9"	9'	60	200	x			
Whitey Carroll, Veyo	2-3	12	yes	no	6'6"	7'6"	110	196		x		
Ray Owens, Hurricane	1-4	12	yes	no	8'	9'2"	160	190		x		any shelter
G.W. Proctor, Panquitch	2-5	8			7'2"	7'10"	140	180		x		
Jack Butler, St. George	1-5	7	yes	no	7'3"	7'9"	160	217		x		
Dee Craig, Santaquin	1-4	60lb.			6½'	8'4"	90	140		x		

*Estimated

TABLE 5. (Cont'd)

LIFE HISTORY												
LION FIELD MEN	NO. IN LITTER	SELF SUPPORTAGE (MOS.)	ADULT MALES		SIZE		WEIGHT		DO LIONS SCREAM?			TYPE OF LION DENS
			All Young	Near Young	Ave.	Max.	Ave.	Max.	Yes	No	Positive Identification	
Utah (Cont'd)												
Joseph Felix, Logan	3-4	4-6	no	no	*	9'6"	120	175		x		caves
Ralph Robinson, Fillmore	1-2		no									
Newton McBride, Fillmore	2-3	12	no	no	6-7'	7'6"	150	207	x		Heard in wild	
P. O. Hurst, Fairview	2-4	18	no	yes	7'6"	7'8"	150	155		x		caves
Charles Madsen, Provo	2	8-10		no	8'	9'8"	125	260	x		Human distress	seasonal
J.L.Pearson, Circleville	3	6	no	no	7'6"	7'8"	160	168		x		
L. G. Brown, Koosharem	2-4	9-10	no	no	7'	9'6"				x		
Loyd Twitchell, Beaver	3	12	no	no	6'9"	9'7"	125	250	x		House cat	Numerous
Bill Jensen, Huntington	3-5	18	no	yes	7'	10'4"	250	381		x		
W.O.Nelson, American Fork	1-5	8-12	yes	no	6'5"	7'5"	125	200		x		
J. W. Henry, Marysvale	2-5	65lbs	no	no		8'4"			x			
D. S. Good, Mayfield	1-3	9	no	no	*7'	7'8"	90	150		x		When having young
Darwin Brown, Richfield	1-4	12	no	no		7'8"				x		
Dortha Snyder, Myton	3-4	3-4	no	no	8-10"	10'2"	200	250	x		Wounded	
LaRue Emett, Veyo	1-5	5½ft	yes	no	7'	8'3"	110	180		x		
Oscar Hansen, Provo	1-5	18	no	yes	8'4"	8'8"	160	168	x		Whistle-scream	Timber
Bill Nielson, Salina	1-6	12-24	no	no	7'	11'	125	225		x		Rocks
Albert Stewart, Loa	1-5	10	no	no	6'	9'	110	200		x		Ledges
Milton Campbell, Vernal	2-5	12-16	no	no	8'	9'2"	175	200		x		
R.L.Hoggatt, Green River	2-6	12	no	no	7½'	8'10"	120	225		x		
James Gray, Beaver	2-4	10	no	no	7½'	8'6"	125	160		x		Varies
Alaska												
M. W. Kelly, Anchorage	3		no	no			112	180		x		

*Estimated

TABLE 3. (Cont'd)

LIFE HISTORY												
LION FIELD MEN	NO. IN LITTER	SELF SUPPORTAGE (MOS.)	ADULT MALES		SIZE		WEIGHT		DO LIONS SCREAM?			TYPE OF LION DENS
			Full Young	Near Young	Ave.	Max.	Ave.	Max.	Yes	No	Positive Identification	
Arizona												
Floyd Pyle, Payson	2-4	8-12	yes	no	7'6"	8'4"	125	210	x		Tracks	
Frank Colcord, Young	2-3	18	yes	no	7'	11'4"	115	185		x		
R. R. Miller, Clifton	1-4	12	no	no	8'6"	9'1"	180	250		x		
Giles Goswick, Humbolt	2-4	12	no	no	6½'	8½'	110	202		x		
California												
F. W. Keeler, FrenchGulch	1-6	12	yes	no		9'2"		165		x		
Howard Bilton, Glenville	2-4	10-12	no	no	7'2"	8'8"	135	204		x		
L. P. Simpson, Orland	1-4	14	no	no	5'8"	6'8"	90	145		x		
Wm. Dye, Porterville	1-4	18	no	no	6'8"	7'8"	120	158		x		
Andrew Perioni, Marysvale	2-3	24	no	no	8'	8'11"	60	125				
Gus Landergen, Eureka	2-4	10-12	no	no	6'	8'1"	100	150				
Charles Prindle, Central	2-4	16	yes	no	6'	9'3"	120	190				
Colorado												
Tom Barnes, Olathe	4	12	no	no	8'	9'9½"	150	200	x			
Wm.W. Mink, Delta	2-3	6-9	no	no	*8'8"	9'	140	150	x		Woman Screaming	
C. H. Novak, IdahoSprings	2	13	no	no		8'6"		175	x		High pitch long wail	
R. C. Mink, Canon City	2-3	12	yes	no	7'	9'4"	150	210	x		Mating call	No certain
Robert Terrell, Basalt	2-4		no	no			115	200		x		
Ben R. Crandell, Montrose	2-4	12	no	yes	8'	9'8"	175	210	x		Fire siren reversed	

*Estimated

LIFE HISTORY

LION FIELD MEN	NO. IN LITTER	SELF SUPPORTAGE (MOS.)	ADULT MALES		SIZE		WEIGHT		DO LIONS SCREAM?			TYPE OF LION DENS
			All Young	Near Young	Ave.	Max.	Ave.	Max.	Yes	No	Positive Identification	
Colorado (Cont'd)												
Glen D. Sutton, Meeker	1-4	10	no	no	8'6"	9'3"	160	205	x		When treed screamed at dogs	
E. F. Cochran, Del Norte	1-3	9			5'	6'9"	90	135	x		Scream	
C. B. Davidson, Craig	3		no	no		9'2"	80	92	x		Woman scream	
Sigfrid Palm, FortCollins	2		no	no	8'	7'11"	125	128	x		Woman in distress	
Harry N. Ferrell, Cortez	1-3	12	no	no	7'6"	9'2"	150	181		x		
H. H. Kennell, GrandJunc.	2-3	12	no	no	8'4"	8'2"	160	190		x		
D. C. Jerome, Fruita	1-5	100lb	yes	no	7'7"	9'3"	120	185				
HermanWilson, EstesPark	3	10	no	no	*7'	8'	145	173		x		
B. L. Denton, La Veta	3	12	yes	no	7'	10'4"	140	211	x		Female screams male like bull	Old hole of Prospector
J.L. Waldron, Kremmling	2	24	no	no	*8'	9'						
Idaho												
L.L.Anderson, MeyersCove	2-4	18	no	no	8'	11'4"	140	180	x			
Hawley Hill, Salmon	2-4	6	no	no	8'	9'7"	120			x		
A. R. Twilegar,	2-5		no	no	8'	9'4"	100	200				
Willard Rood, Jr., Salmon	1-4	12-18	yes	no	7-9'	8'6"	150	210		x		
Ed James, White Bird	2-4	12	no	no	7'6"	8'6"				x		
RobertDonley, Garden Valley	5	16	no	no	7'8"	9'				x		
Roy Tumelson, Lewiston	2-4	5-6	no	no						x		

*Estimated

LIFE HISTORY												
LION FIELD MEN	NO. IN LITTER	SELF SUPPORTAGE (MOS.)	ADULT MALES		SIZE		WEIGHT		DO LIONS SCREAM?			TYPE OF LION DENS
			Full Young	Rear Young	Ave.	Max.	Ave.	Max.	Yes	No	Positive Identification	
Montana												
C. E. Beebe, Browning	1-5	25	no	yes	8'6"	9'5"	150	192		x		
Frank Haacke, Philipsburg	1-4	24			7'6"	8'2"	150	200	x		Woman in distress	
Ed.K.Beebe, Missoula	1-5		no	no				214	x			
Nevada												
Robert Dickey, Ely	4	7-9	no	no	7'6"	8'6"	120	165		x		
Stanley Kaiser, Pioche	2-3	24	no	no	8'	9'11"	150	251		x		Ledges
Ira Garrison, Pioche	3-5	12-18	no	yes	7'9"	9'11"	160	240	x		Woman's scream	
L.R. Shores, Ely	2-3		no	no	*7'6"	8'10"	125	160		x		
New Mexico												
Richard L. Raley, Hope	3	10	no	no	6'	6'8"	120	175		x		
Alvin Dunagan, Animas	4	8	no	no	*7'	9'4"	75			x		
G.W. Evans, Magdelena	1-4	12	no			9'4"	100	200		x		
A. R. Bayne, Animas	2-4	9-12	no	no	*7'	8'6"	75	175		x		
H.C.Pickens, Santa Fe	2	18	no	no	6½'	7'1"	110	150		x		
Oregon												
L.M.Maurer, Cove Junction	2-3	12	no	no	7'	8'4"	100	155		x		
L.J. Bales, Alsea		10	no	no	6'6"	9'3"	100	182	x			

*Estimated

LIFE HISTORY												
LION FIELD MEN	NO. IN LITTER	SELF SUPPORT AGE (MOS.)	ADULT MALES		SIZE		WEIGHT		DO LIONS SCREAM?			TYPE OF LION DENS
			All Young	Near Young	Ave.	Max.	Ave.	Max.	Yes	No	Positive Identification	
Oregon (Cont'd)												
E. J. Sherman, Molalla	2-4	12	no	no	6'5"	8'1"	135	180		x		
E. J. Barney, Fall Creek	1-4	8-10	yes	no	6'6"		135	150	x		Captured	
Dale Bonney, Roseberg	2-5	12-20		yes	8'8"	9'11"	150	240		x		Only with cats
Don Pankey, Roseburg	1-4	12	no	no	7'	9½'				x		
Ralph Johnston, Riddle	2-3	5-6ft	no	no	7-8'	8'8"	125			x		
P.R.Williamson, Ashland	2		no	no	8'	9'2"	125			x		
C.R. Duval, Taft	2		no	no	7'6"	8'9"	125	180		x		
Roy Tracy, Estacada	3-4	12	no		8'	9'4"	130	145	x		Like bark	
W. M. Eastham, Cottage Gr.	1-4	5-6	yes	no	7'	9'2"	110	200		x		
E. U. Smith, Myrtle Point	2	12	no	no		9'6"	200	300	x		Frightened Woman	
Elvin Lewis, Veneta	2-3	12-18	no	no	6'6"	7'6"	135	175		x		
Kirby J. Taut, Central	1-3	24	yes	no			140	220	x			
Arthur Wooley, Drain	3	10-12	yes	no	7'1"	9'3"	100	250		x		
Carl Thornton, Sutherlin	1-4	12-24	no	no	7'	10'4"	120	200		x		
L. T. Grant, Harlan	3-5	8	no	yes			150	225	x		Woman in distress	
Archie Williams, Blue River	1-3	24	no	no	8'	9'6"	150			x		
Roy Vann, Willamina	1-5	6	no	yes	7'	8'6"	100	175				
E.W.Conklin, Sweet Home	2-4	20	no	no	7'	8'5"	175	200		x		
S. W. Koontz, Albany	3	10-11	no	no	6'3"	7'	120	175		x		
Stanley Colegrove, Brookings	3	6-12	no	no	7'	9'6"	70	150	x		In cage	
Roland McRae, Wallanea	2	12	no	no		9'10"		200	x		Woman in distress	
L. R. Gardner, Newport	2	50lbs	no	no		9'		165		x		

*Estimated

LIFE HISTORY												
LION FIELD MEN	NO. IN LITTER	SELF SUPPORT AGE (MOS.)	ADULT MALES		SIZE		WEIGHT		DO LIONS SCREAM?			TYPE OF LION DENS
			Litter Young	Near Young	Ave.	Max.	Ave.	Max.	Yes	No	Positive Identification	
Oregon (Cont'd)												
Roy E. Cox, Yoncalla	1-4	8-12	no	no	6-7'	9'	145	220		x		
Alfred Zollman, Joseph	2-5	18	no	no			180	230		x		
J.F. Thomas, Remote	2-3	16-20	yes	no	8'4"	9'11"			x			
E. O. Worley, Azalea	2-6	6-9	no	yes	7'4"	9'7"	100	207		x		
Joe Jackson, Yoncalla	1-3	12-18	no	no	7'	9'3"	110	240		x		
Carl G. Wood, Agnes	2-3		no	no	8'	9'	100	125		x		
Francis Williams, Lebanon	2-3	60-70	no	no	6'6"	6'10"	90	116		x		
Loren Thornton, Wedderburn	2		no	no	8'	11'6"	150			x		To have cats
W. M. Clark, Redmond	3	18	yes	no	8'	8'	160	210		x		
Charles Anway, Oakridge	1-3	12			8'	9'10"	170	200	x			
Maurice Wood, Oakridge	1-4	18	no	no	8'	10'6"	125	180	x		Eagle, but louder	Fallen tree
J. B. Wadmas, Powers	1-3	12-24	yes	no	7-8'	9'4"	150	220		x		
Oran King, Holley	1-5	12	no	no	7'	8'6"	125	200		x		
J. J. Hudack, Gold Beach	2-3	12-18	no	no	7½'	10'7"	150	210		x		
Everett Limbeck, Lyons	3		no	no	6'8"	6'	120	100		x		
Perry J. Wright, Glide	1-3	12	no	no	6'6"	8'4"	90	175		x		
W. B. Patten, Culp Creek	1-4	371bs	yes	no	7½-8'	10'4"	90	120	x		Witnessed	
C. R. Poe, Plymouth	3	11	no	no	6'11"	8'8"	147	227		x		
H. E. Ediger, Dalles					6'	7'8"	160	185		x		
L. W. Peters, Mehana	4		no	no		8'6"				x		
W. R. Tonkin, Brownsville	1-4	7	no	no	8'		175		x		Woman's scream	
Frank Merritt, Holley	3	8	no	no	7'	9'1"	125	225		x		
Glenn S. Good, Walterville			no	no	8'	8'9"	150			x		

LIFE HISTORY												
LION FIELD MEN	NO. IN LITTER	SELF SUPPORT AGE (MOS.)	ADULT MALES		SIZE		WEIGHT		DO LIONS SCREAM?			TYPE OF LION DENS
			All Young	Near Young	Ave.	Max.	Ave.	Max.	Yes	No	Positive Identification	
Oregon (Cont'd)												
Robt.Millican,Walterville	2-3	12	no	no	8'	8'6"	175	200		x		Varies
Harley Cain, Lowell	2-4	24	yes	no	7'8"	10'6"			x		Witnessed	
L. L. Lewis,CentralPoint	4	14	no	no		8'9"	125	175		x		
Texas												
E.L.Love,SierraBlanca	2-3		no	no	7'6"	8'6"	140	220		x		Varies thru area
Guy West, Valentine	1-3	8			8'	8'9"	125	212				
J. E. Hearn, Colulla	3-6	6	yes	no	6½-8'	9'5"	150	220		x		Varies
Herbert Ward, Cotarina	3-4		no	no	7'1"		125			x		
Paul Evans, Van Horn	2-3	6	no	no	7'6"	8'6"	150	200		x		
Earl G. Baker,CasaPiedra	2-3		no		7'	8'2"	100	140		x		
Lee Duncan, Alpine	3	12	no	yes	7'	8'9"	110	183		x		
Fred Moore,SierraBlanca	2-4	6	no	no	7½'	8'3"	135	190	x		Louder thanBobcat	
Jack Jolly, Allamore	1-3	8-10	no	no	7¼'	7'9"	125	16[illegible]	x		Tracks	Caves in bluff
Mrs.J.McCarley,Pt.O'Connor	2-3		yes	no		8'10"	140	200	x		In trap	Ledges
Washington												
Frank Hansler, Tacoma	2-4	12-36	no	yes	7'6"	8'6"	170	185		x		
Gordon Stuart, Lucerne	1-4	maturity	no	no				180		x		Any dry place
Jack E. Handy, Okanogan	1-5	18-24	no	no	*7'	9'11"	140	250		x		
Laurence Sprengel,Colville	1-5	24	no	no		8'9"	140	206		x		

*Estimated

LIFE HISTORY													
LION FIELD MEN	NO. IN LITTER	SELF SUPPORTAGE (MOS.)	ADULT MALES		SIZE		WEIGHT		DO LIONS SCREAM?			TYPE OF LION DENS
			All Young	Near Young	Ave.	Max.	Ave.	Max.	Yes	No	Positive Identification	
Wyoming												
Frank Morris, Cody	**2-3**	**10**	**no**	**yes**			**75**	**100**	**x**			

3. Maturity

The "scratches" made by mature lions and the lion's scream, if such a scream exists, are part of the courtship of this carnivorous animal. It is believed that a female lion in heat will move into an area containing numerous "scratch" stations. The first male that contacts the female when she is in heat is usually the promiscuous mate. The literature indicates that the female may copulate with more than one male during the period of heat. The author saw evidence in the snow that appeared to indicate a courtship and copulation. The male tracks are usually more circular and considerably larger than the females. Two lions were following the same trail above the ledges and through the junipers. The tracks led out onto an open brush flat and then indicated that considerable romping about had occurred, the tracks being similar to those left in the snow when a lion is chasing a rabbit. The tracks finally led to the southeast corner of the oak brush area clearing and there was evidence there that a terrific fight had taken place. There were several blood spots on the snow, some very small and others several inches in diameter. The snow was beaten down in a rectangular area of about 8 by 15 feet. The author first believed that the signs left in the snow were the result of a fight between two mature males, but the fact that the two lions left the scene together "rimming" on through the country a

has caused the author to believe that the signs in the snow resulted from an altercation which terminated in copulation. If this incident was a copulation of two mature lions, there certainly appeared to be no indication of submission on the part of the female.

It was hoped that during the course of this study it could be determined whether or not mountain lions actually scream. The study, however, only succeeded in furnishing factual fuels for the proverbial fires of controversy in this matter. Questionnaires received from 160 field men with mountain lion experience from the 13 western states and the territory of Alaska state that many of them have heard the mountain lion scream, some of them actually having seen the mountain lion while it was screaming. The author has spent considerable time in various types of mountain lion habitat, and has never heard a mountain lion scream. The author has witnessed lions making three different noises: (1) a "hissing" similar to that of the house cat, (2) a deep gutteral rumbling sound in the throat when angry, and (3) the low hollow whistling sound made through the lips and teeth. Mr. Perry Oveson, a government hunter at Castle Dale, Utah, has given evidence that this low whistling sound may be used by the femal lion in calling her kittens to her. Mr. Oveson captured two kittens alive in the Manti National Forest of Carbon County, Utah, and kept them tied up near his camp. The first night

the kittens were captive this low whistling sound was heard emenating from the forest adjacent to the camp. Investigations disclosed that it was the female lion apparently trying to communicate with the kittens, but lacking the courage to come any closer to the human camp.

A similar incident was observed by Mr. George W. Proctor of Panquitch, Utah, who saw the kittens whistling for their mother and also heard one whistle in a cave.

The lion's scream is so well established in fiction and in the minds of some of the American people that any screaching sound heard in the night is usually termed the scream of a lion. However, Bob Trask of Mill City, Oregon, in the summer of 1948 went to the spot where a lion had been reported screaming. Within a few minutes his dog treed a female lion.

Mrs. Bessie McCarley of Port O'Connor, Texas, who has been a government hunter and trapper for many years, gives the following information regarding the mountain lion and its scream: "A mountain lion seldom approaches the hunter's camp closer than 100 yards and occasionally gives his dismal howl. He generally gives the last one gradually, dying out and sounding like O-oo-Oh! O-oo repeated 3 times. I have heard him scream in several different ways--one like a man in distress, a child and a woman. It is as terror striking as it is varied. The average camp dog runs to cover when a lion is awakening the echoes of the canyon, and horses and mules have a horror

of them. A cub's cry resembles the screech of a parrot. The cubs also often utter a soft whistle."

A government hunter in southern Utah, Mr. Boyd Twitchell of Beaver, Utah, reports an instance of having heard the male and female lions scream. Mr. Twitchell states: "On one particular hunt while circling a ledge three of us heard a male lion and female scream. In my experience the scream is a mating call."

Mr. Vernal Montgomery of Park Valley, Utah, a government hunter, states that he witnessed a lion scream. Mr. Montgomery says: "The lion was treed. The noise was nothing like a bobcat, wolf, coyote, or any other animal I have ever heard."

C. Ecology

1. Habitat

In the state of Utah, mountain lions have retreated before the advance of civilization until they now occupy only the rugged, shelf-ledge rocks in the wilderness areas. During summer months the author has observed lion signs and has collected scats in heavy timbered and rocky, mountainous areas in the Canadian and Hudsonian Life-Zones. During the winter months the lions follow the deer herds in their migration down from the higher vegetative zones through the Transition Life-Zone and into the juniper areas of the Upper Sonoran Life-Zone. As far as can be determined, during the summer months while at higher altitudes lions do not utilize dens or caves to the same extent that they do in the winter at lower elevations. During the winter months, possibly for protection from the subzero weather, lions were found to consistently use caves for dens. One group of mature lions used an old homestead cabin in lower Weber Canyon, Morgan County, Utah, as a den. (See Figure 22) In another instance, four mature lions, 2 males and 2 females, were found living together in the same cave. The author accompanied two sportsmen on a lion hunt in which the trail hounds chased one of the lions into the cave which contained three others. The stomachs of all four were empty and neither of the females were pregnant. (See Figure 24) There were also

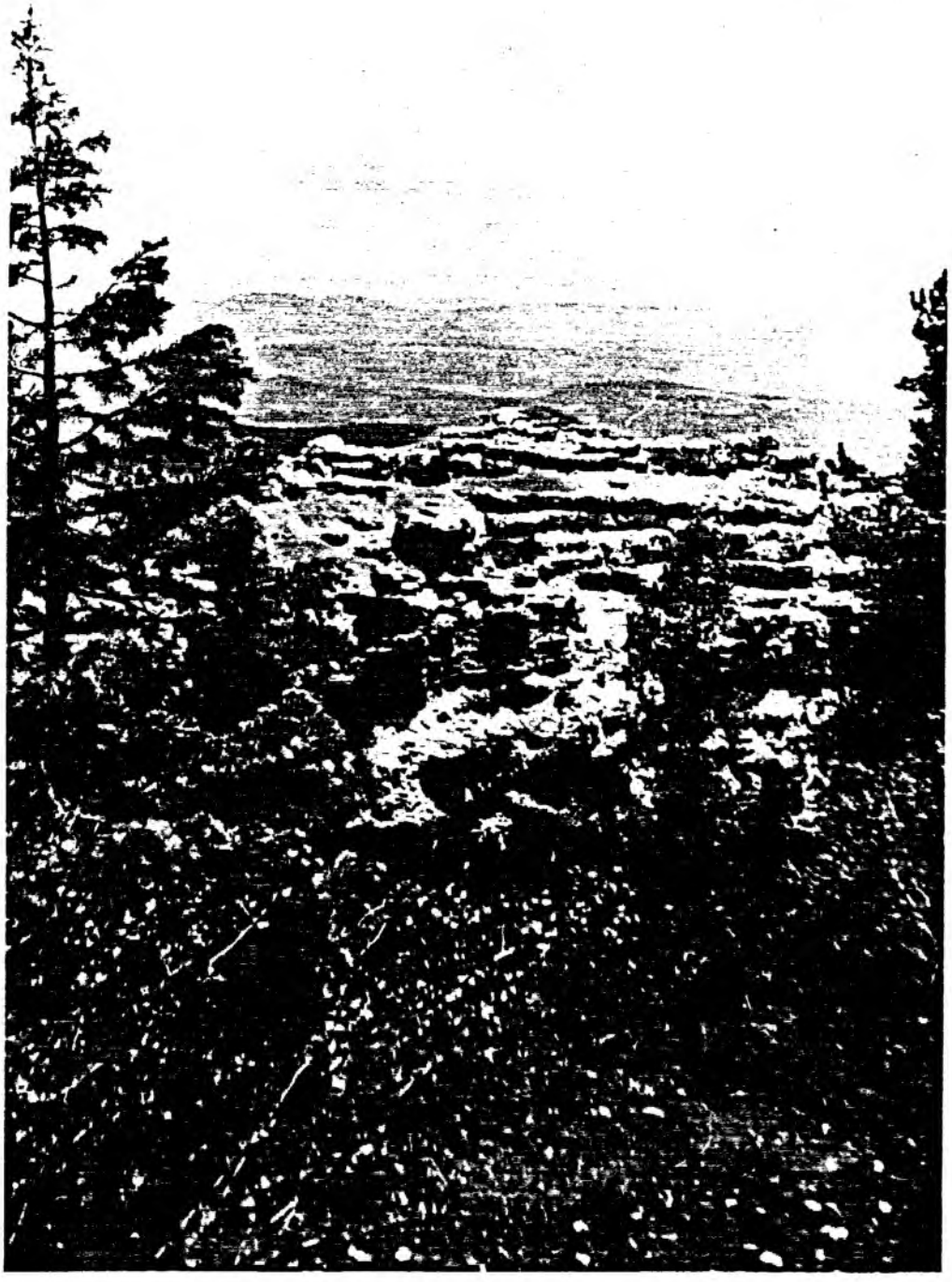


Figure 16. Typical summer range of the mountain lion in Utah. Transition and Canadian Life-Zones south of Bryce National Park, Kane County, Utah.

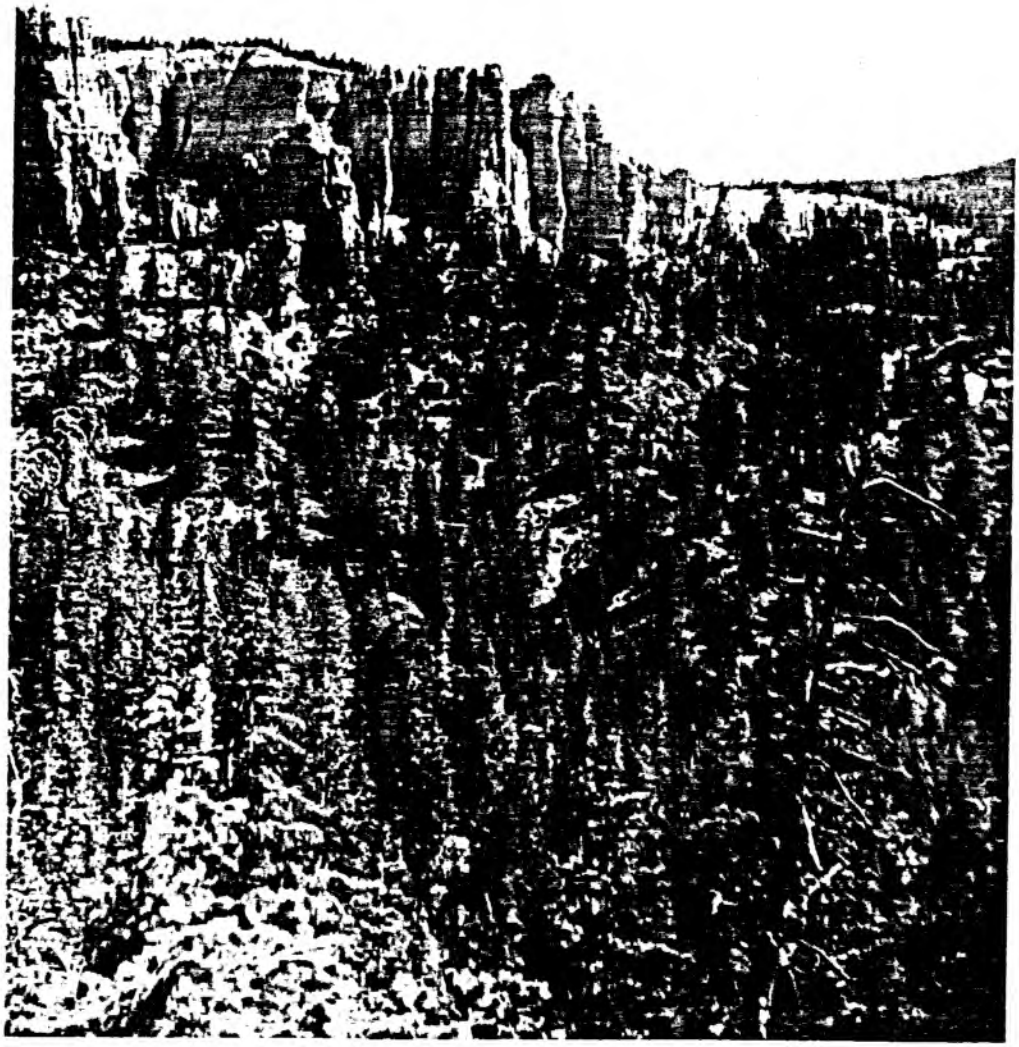


Figure 17. Transitional and Canadian Life-Zones of vegetation, and rock cliffs and ledges, Kane County, Utah. Typical summer range of the mountain lion.

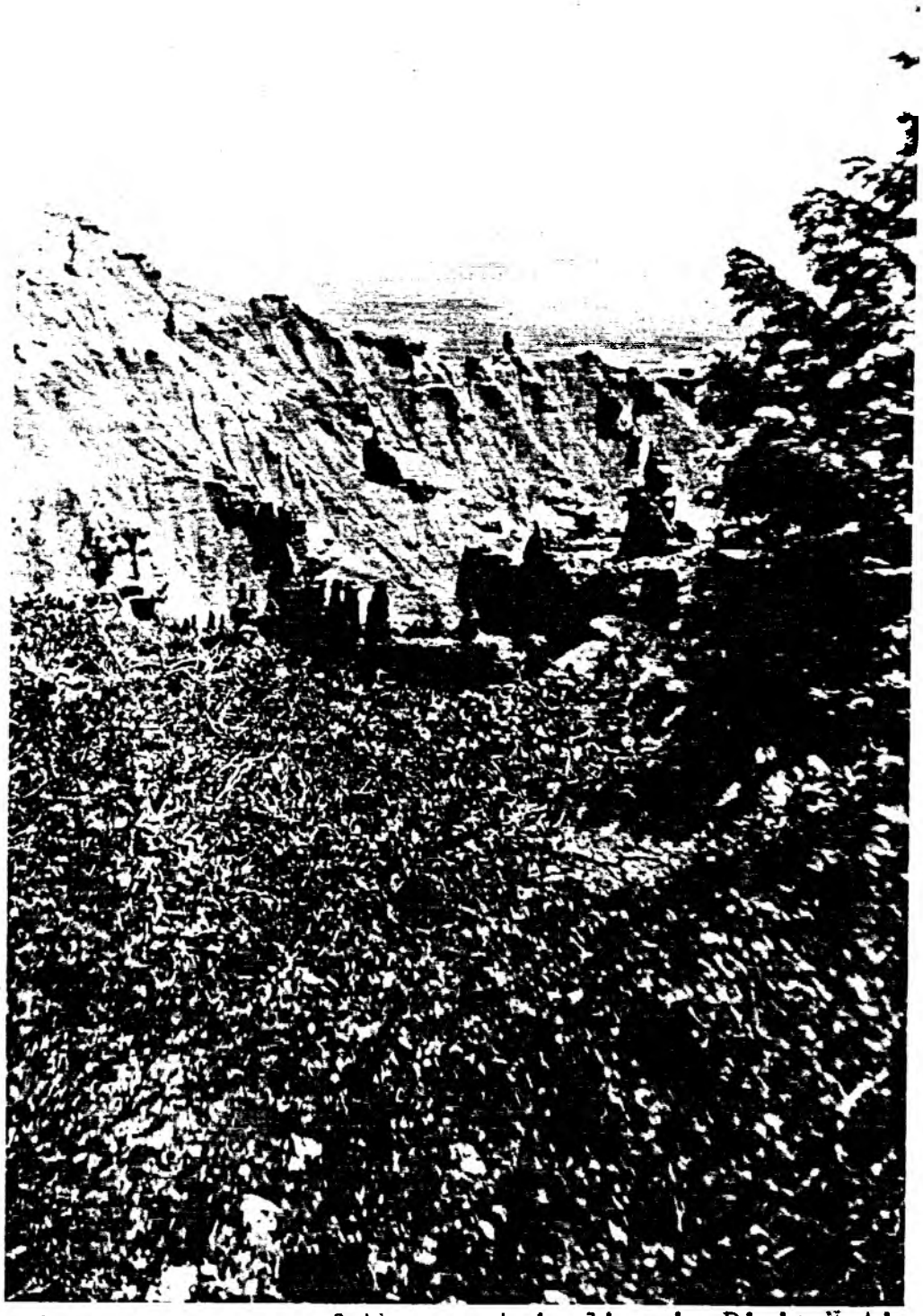


Figure 18. Summer range of the mountain lion in Dixie National Forest, Kane County, Utah.

igure 19. Typical winter range of the mountain lion is the pinon-
niper areas of the Upper Sonoran Life-Zone pictured above.
evada National Forest near Ely, Nevada.

Figure 20. Another example of mountain lion winter range in the Nevada National Forest near Ely, Nevada.

Figure 21. Typical mountain lion winter range. Rocky areas in the pinon-junipers in Nevada National Forest near Ely, Nevada.

Figure 22. Homestead cabin in Weber Canyon, Morgan County, Utah, used by 4 mature lions as a den. The remains of 3 deer almost entirely consumed were found inside.

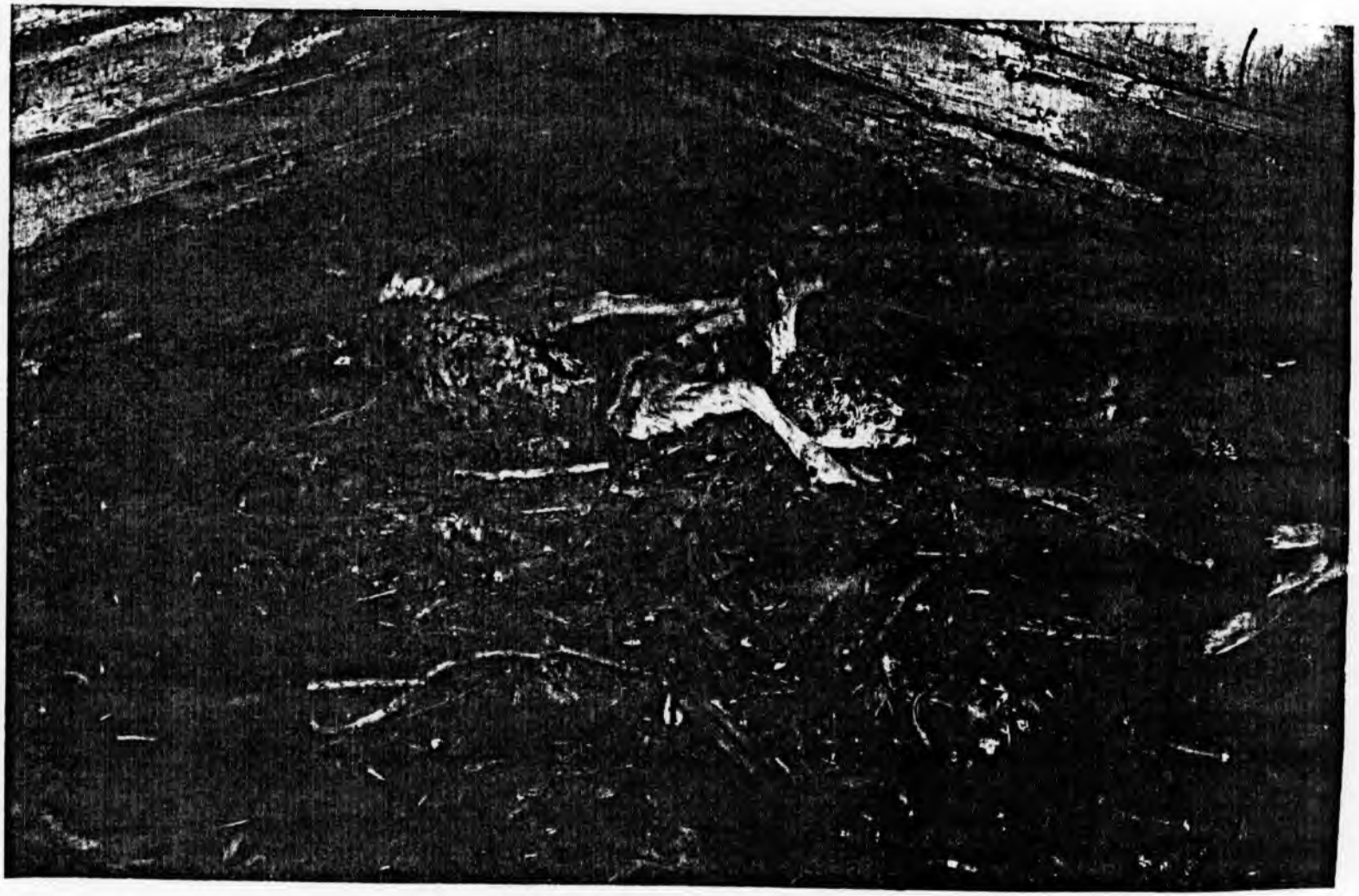


Figure 23. Remains of a mule deer fawn killed and dragged into an old homestead cabin used as a den by 4 mature lions in Weber Canyon, Morgan County, Utah.

Figure 24. Small entrance to a large cave lies even with author's shoulder on path upon which trail hound is standing. Four mature lions were found in this cave on January 31, 1949. Weber Canyon, Morgan County, Utah.

fresh tracks in the snow outside the cave showing that a mature female lion with two kittens had been in the cave shortly before our arrival. This community aggregation is a far cry from the "lone wolf" type of existence followed by most mature lions. This temporary association of so many lions in the same cave might be explained on the basis of the fact that most of the deer in the area were concentrated in two or three small canyons, and this cave was located at the head of one of the canyons, and just over the ridge from one of the other canyons. The deer herd was concentrated near deer "feed grounds" at the mouths of each of these canyons.

The use of caves or dens by mountain lions is dependent upon the climate and topography of the area. Throughout the state of Utah it has been observed that lions use dens consistently, especially during the winter months. On the other hand, Mr. Giles Goswick of Humbolt, Arizona, who has killed over 500 mountain lions, states that he has never found an instance in which a lion has used a den. He states that it has been his experience that the lions sleep in a different place almost every day.

In New Mexico Mr. Homer C. Pickens of the Department of Game and Fish has observed that the mother lion kills the deer and moves the kittens as soon as they are big enough to travel from kill to kill, and rock dens or caves are not used.

The type of terrain chosen by the lion is naturally

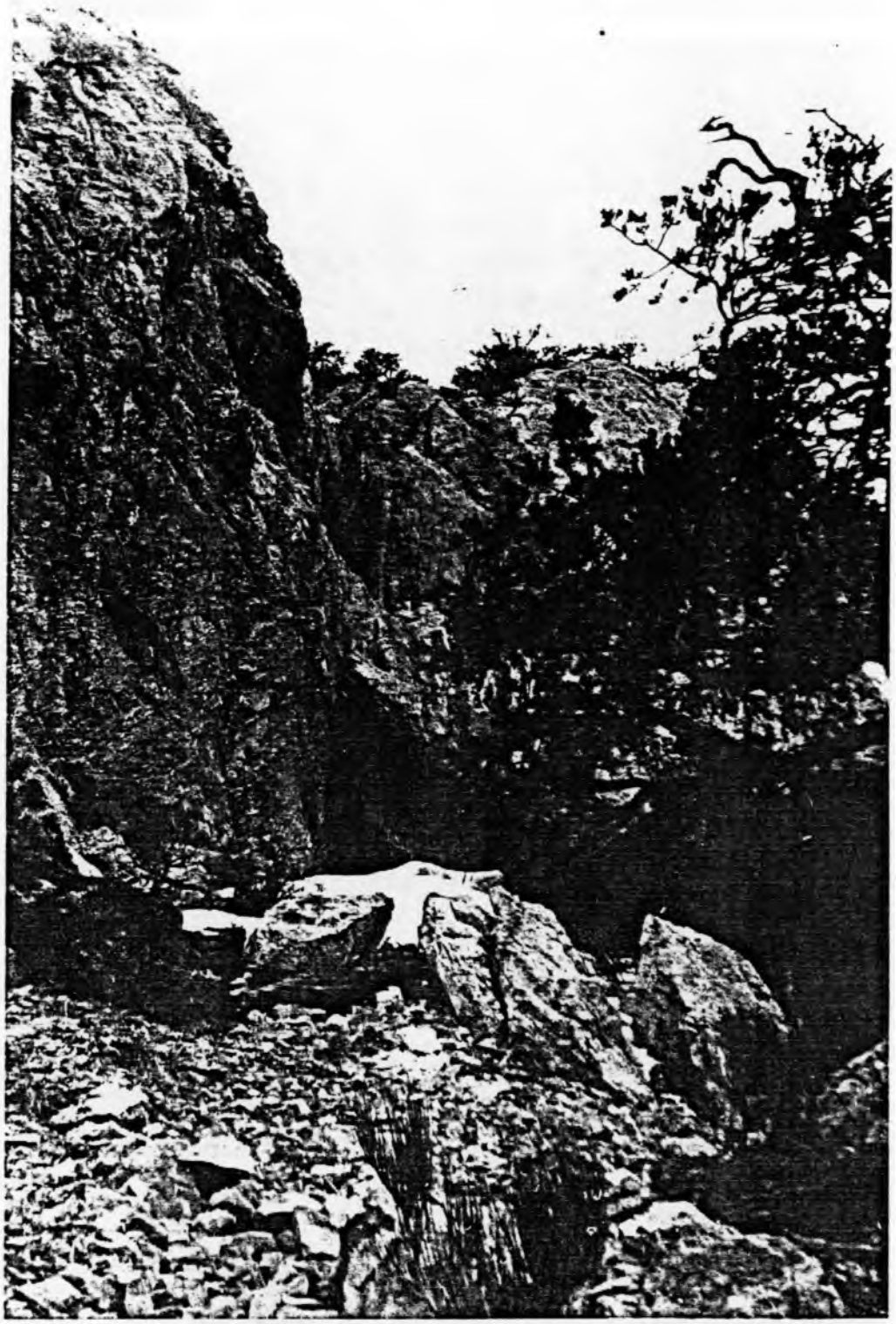


Figure 25. Entrance to an abandoned mine shaft (above patch of snow) used as a den by mountain lions in Nevada National Forest near Ely, Nevada.

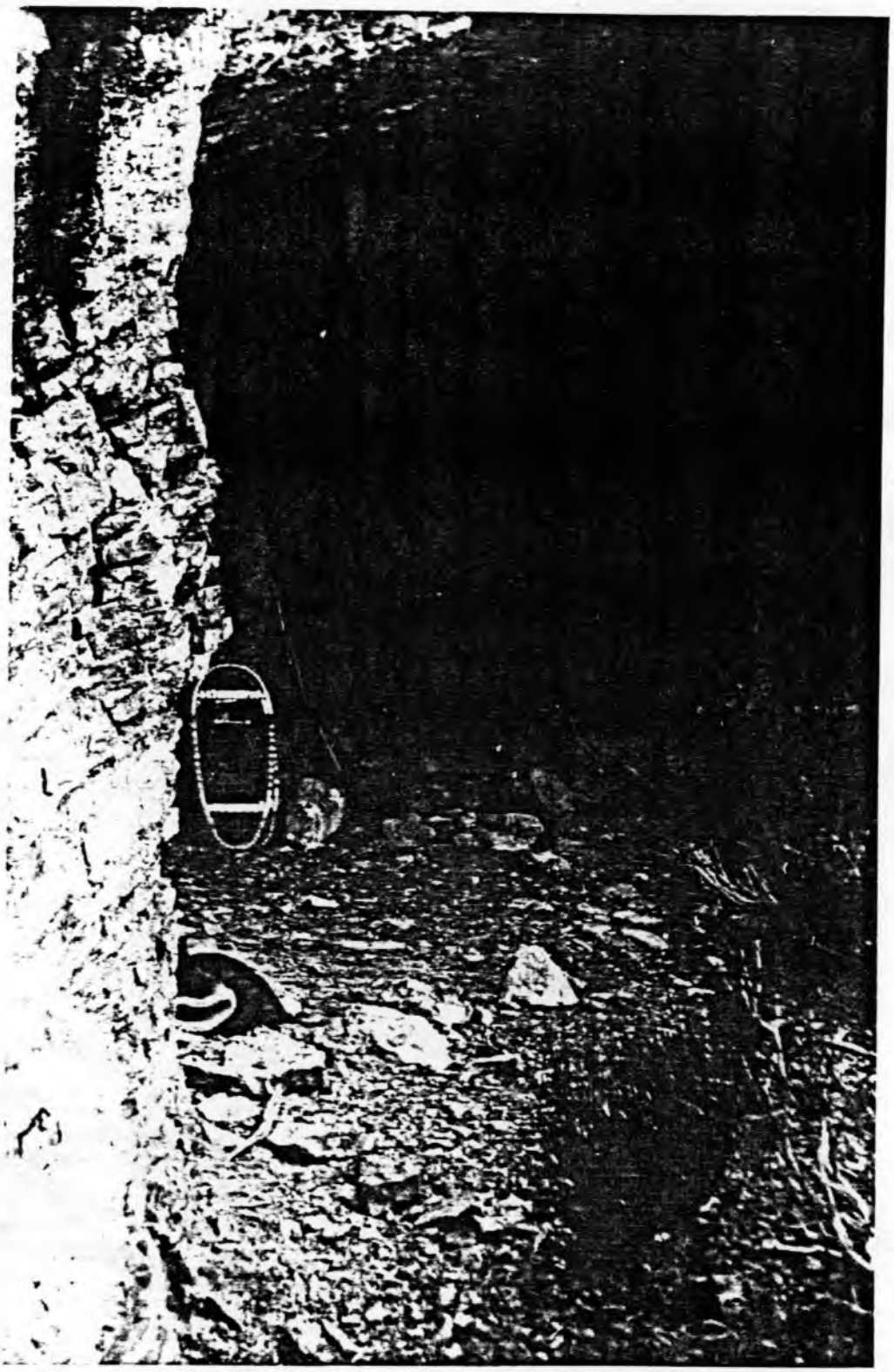


Figure 26. Inside view of an abandoned mine shaft used periodically as a den by mountain lions in the Nevada National Forest near Ely, Nevada.

Figure 27. Young adult Felis concolor hippolestes in juniper tree. (Photo by Lee Kay, Utah State Fish and Game Department)

dependent upon the supply of game animals upon which he depends for food. Mr. Leonard T. Grant of Harlan, Oregon, states: "In our country they have their young in the best game country."

It is common knowledge that it is much easier to capture with trail hounds a large mature lion or a lion passing from prime condition into old age than it is to capture a yearling lion. The yearling lion, when chased, takes to flight for safety and has been observed by the author to travel 10 or 20 miles through the mountains before finally being held at bay by the hounds. Mature lions or lions past maturity usually run only a few hundred yards and then seek safety on a ledge or in a tree. From this it can be inferred that with increasing age past maturity the lion becomes more or less set in his ways, and not being in the habit of fleeing, takes to a tree more from the annoyance standpoint than from fear of the hounds.

An exceptionally large mountain lion track, approximately 6 and 3/4 inches in width was found in one of the study areas during the fall of each year, and was readily identified because of its large size. This lion, assumed to be a male, has been using the same crossings in the same canyons each fall for the past seven years. Some of the local residents and ranchers have nicknamed him "Old Widowmaker". His track was observed in February of 1949 in an area 12 miles from where it was seen in the fall of 1948.

Records of lions in confinement indicate that their

longevity ranges between 6 and 17 years (Young & Goldman, 1946:59). These figures cannot be considered as being representative of longevity in the wilds. It is logical to assume that a lion in captivity that has its food brought to it each day would continue to stay alive even after its teeth and claws had deteriorated to the extent that it would experience considerable difficulty in staying alive on the range. Lions in captivity eventually die of causes incident to age. A lion in the wild, after losing his faculties to kill prey, may survive on carrion for a short time. If it sought easier prey such as sheep it would soon be dealt with.

Mr. Perry Oveson of Castle Dale, Utah, has given evidence to indicate that after a lion passes the peak of his efficiency and finds it harder and harder to catch the wily deer as prey, he is not above eating carrion in order to keep from starving to death. About the year 1935, Mr. Oveson states that he placed a poison sheep carcass in Joe's Valley, Carbon County, Utah, for the purpose of coyote control. The carcass was placed there in the fall, and upon returning to it in the spring, Mr. Oveson found five large mature lions (Felis concolor hippolestes) dead in the immediate vicinity. Indications were that all of the lions had passed the peak of their efficiency, in that their claws were frayed, their teeth rounded, and their general physical condition was poor.

2. Structure and behavior pattern

The structure of the mountain lion is briefly described by Goldman (Young & Goldman, 1946:183) as follows:

> The subspecies of Felis concolor, subgenus Puma, form a compact group readily distinguished from the other cats by the combination of large size, slender form, long cylindrical tail, short ears, and the plain color of adults. In the young, widely-spaced black spots form a different pattern from that of the young in other cats examined. The cranium is short and rounded. General observations indicate that the breeding season extends throughout the year. From one to six young are produced at a birth, the average being two, at least in the western part of the United States. The dental formula is $\frac{3}{3}\ \frac{1}{1}\ \frac{3}{2}\ \frac{1}{1} = 30$ as in typical Felis.
>
> The sexes are alike in color, but males are larger than females. The skulls of adult males are distinctly larger, more angular and massive, with more strongly developed sagittal and lambdoid crests than those of adult females. The skulls of the females, conversely, may be distinguished by their smaller size and more smoothly rounded brain case, with lesser development of sagittal and lambdoid crests. The dentition is heavier in the males, but not far out of line with the differences in cranial proportions.

With regard to the subspecies upon which this study was made, Felis concolor hippolestes, Goldman gives the following description of general characteristics:

> General characters--Maximum size perhaps the largest of all the subspecies; general color rather pale; pelage long, full and soft; skull very large, elongated; dentition light. Similar in size and color to missoulensis of the northern Rocky Mountains but cranial proportions, especially the greater total length of skull and relatively narrower zygomata, distinctive. Similar also in size to oregonensis of the Cascade Range, but color paler; skull differing in detail, notably the lesser elevation of the

> frontal region. Closely resembling azteca of the Sierra Madre of Chihuahua and the Mogollon Mountain region of New Mexico and Arizona in color, but larger; pelage longer; dentition heavier. Compared with kaibabensis of northwestern Arizona the present subspecies is darker in general color, the dark median dorsal area more clearly defined; skull broader.

Long sharp retractile claws, heavy dentition, and powerful muscles make the lion well adapted for his predatory existence. It has an exceptionally large pancreatic gland for an animal of its size, which, it is believed, better enables it to meet a crisis. A large pancreatic gland provides for a rapid secretion of insulin.

Based on figures of actual weight and measurement by W. Leslie Robinette, Biologist, Division of Wildlife Research of the U. S. Fish and Wildlife Service, the weight of a mature lion in Utah is usually between 75 and 175 pounds, and the overall length including the tail is on the average between 6 and 8 feet. Table 3a contains a list of mountain lion hunters from various towns throughout the state giving the actual weights and measurements as taken by Mr. Robinette.

The lion "scratch" or "marker" may be used as a means of marking the lion's travel route, which may enable him to orient himself again each time he enters a certain area. Mr. Whitey Carroll of Veyo, Utah, a professional lion hunter, in a letter to the author (unpublished) gives an excellent description of a lion scratch, its probable purpose, and the

TABLE 3a

MATURE UTAH MOUNTAIN LION WEIGHTS AN

Hunter	Date	Area
Ahlstrom	1/46	Kanosh
Ahlstrom	2/5/46	Fillmore
Ahlstrom	1/46	Kanosh
Hanchett	2/5/46	Monroe
Ahlstrom	1/46	Kanosh
Ahlstrom	2/46	Kanosh
Hurst	3/25/46	Fairview
Hanchett	3/15/46	Monroe
Ahlstrom	1/46	Kanosh
George	2/46	Kanosh
Charlesworth	10/22/44	Kanosh
Naye	12/30/46	Salina
Naye	12/46	Salina
Twitchell	12/31/46	Beaver
Hanchett	1/6/47	Richfield
Ahlstrom	1/8/47	Fillmore
Ahlstrom	12/31/46	Holden
Hansen	2/2/47	Spanish Fork Canyon
Hurst	4/12/47	Fairview
Brindley	1/19/47	Monroe Mountain
Hanchett	1/18/47	Marysvale
Hanchett	1/20/47	Serviceberry Creek
Hanchett	1/15/47	Marysvale
Roberts	1/3/47	Antimony
Hanchett	1/25/47	Anabella
Naye	1/3/47	Salina
Downard	1/17/47	Spring City
Hanchett	3/3/47	Clear Creek
Montgomery	12/5/47	Indian Creek
Connolly, Ed	5/8/48	Weber Canyon
Connolly, Wallace	1/18/48	Coalville

ND MEASUREMENTS

Sex	Weight	Length
Female	122 lbs.	
Female	85 lbs.	
Female	89 lbs.	
Female	91 lbs.	
Female	86 lbs.	
Female	80 lbs.	
Female	103 lbs.	
Male	114 lbs.	
Male	139 lbs.	
Male	87 lbs.	
Male	125 lbs.	
Female	80 lbs.	6'3"
Female	86 lbs.	6'1"
Male	137 lbs.	7'4"
Female	97 lbs.	6'8½"
Female	87 lbs.	6'6"
Female	86 lbs.	6'9"
Female	92 lbs.	6'6½"
Male	155 lbs.	
Male	137 lbs.	7'8"
Male	152 lbs.	6'11½"
Female	92 lbs.	6'4"
Female	99 lbs.	6'6"
Female	90 lbs.	6'2"
Female	93 lbs.	6'3½"
Female	73 lbs.	6'6½"
Female	107 lbs.	7'2½"
Female	106 lbs.	7'2"
Male	173 lbs.	7'4 & 3/4"
Male	150 lbs.	7'4"
Female	99 lbs.	6'1"

manner in which it is made. Mr. Carroll states that when a male lion leaves the kill it usually strikes out to where other lion are, varying his direction according to the character of the country. If there are rough cliffs and high rugged mountains, with caves and huge boulders where other lion lay up in the daytime, he is apt to travel on the tops of the bluffs where there is dry litter or dry grass needles. Usually under a tree or cliff or in a cave he will stop to make markers. There will be a scrape or scratch about 8 to 12 inches long and about 7 inches wide. If the material under foot is deep, the scooped out material may be piled 3 inches to 12 inches high where the stroke ends, depending upon the thickness of the litter. These lion markers are made as a rule when the lion has a full stomach, when in search of other lions, or when merely traveling through the country. They seldom or never take time to make a marker or visit them when foraging or stalking[a/] prey. When the maker of the sign comes through the country again, even though weeks later, it will stop, examine the marker and again scrape its paw as before choosing a spot within 2 or 3 feet of the first marker. The same lion may make several of these markers within a few feet of each other in the course of a year, and he may make a dozen markers along a fifteen mile route when traveling through the country. All lions invariably visit these markers when they are proceeding leisurely through the area. Lions scratch with both hind and

Figure 28. Several mountain lion "scrapes" or "scratches" in the dry dirt under a sandstone ledge in Morgan County, Utah. Note lion fecal pellets near "scratch" in lower right hand corner of photo. (Photo by W. Leslie Robinette, U. S. Fish and Wildlife Service)

front paws depending upon the type they wish to make at the place and time. When using the hind paws the male makes a scratch in two different ways: (1) He stands perfectly still, thrusts his tail straight up in the air as he gives a scratching push with first one hind foot and then the other. He then snaps his tail and squirts a small amount of urine straight out onto the scratch. (2) Most of the scratches are made with the front feet. These scratches are believed to serve as a means of communication or identification of the lion. Mr. Carroll states that a strange lion in a territory can be identified by his scratches, and that his scratches will also reveal what he is up to. The female makes signs similar to the male but not as often nor for any set purpose. Mr. Carroll further states that there are two other types of sign which the lion leaves on the summer range: (1) The tree mark which is for the benefit of the claws, and (2) the carcass of an animal which is partially covered over.

Although capable of tearing down and killing large livestock animals, such as a horse, or large big game animals, such as an elk, without difficulty, lions have a deep rooted fear of dogs and will run from any dog that has the courage to approach it.

Mr. W. M. Eastham of Cottage Grove, Oregon, found lions to be individuals, and that age, food conditions, climate, topography of the country, sex and time of the year were most

of the important factors that govern their conduct.

Another general rule is that during the winter months where one lion track is found usually several more lions will be found within the vicinity of a few miles area. These areas of lion concentration are usually not far from the winter deer herds, upon which the lion are dependent for food.

The lion is instinctively a master of the stealthy approach. During this study a lion was never observed to have missed a deer once it started an attack. Feats of enormous strength were exhibited by the mountain lion which, except for the evidence written there in the snow, would otherwise be very hard to conceive. The author observed an instance where a large four point buck deer was dragged up an almost perpendicular river bank into the brush. Also observed were the remains of a two point buck deer which had been dragged into the crotch of a tree approximately 4 feet off the ground. Mr. Riley Hale, a government hunter of Grantsville, Utah, states that in the Oquirrh Mountains of Utah he saw where a large buck deer had been dragged by a mountain lion up a tree and draped over a limb approximately 7 feet from the ground.

The mountain lion is believed to be one of the fastest animals in the forest for a short burst of speed, but lacks endurance. A small lung area may have a bearing on this condition.

The writer has observed many large mature male lions whose faces showed signs of having been raked by claws on

numerous occasions. It is logical to assume that these wounds were received in battles with other mature lions possibly either over food or mates.

Injuries among lions are not uncommon because of the rather violent existence which they live. A lion skull taken near Vernal, Utah, was found to have been honeycombed in the frontal sinuses of the skull as shown in Figure 29. (Skull No. 6542, Male, Vertebrate Zoology Museum, University of Utah) No one in Utah could explain this strange bone formation, so photographs of the skull were sent to the Wildlife Research Laboratories of the U. S. Fish and Wildlife Service in Denver, Colorado. Dr. Charles C. Sperry, a Biologist there, advised the writer as follows:

> The photographs of mountain lion skulls enclosed with your letter created considerable interest in this laboratory and have been carefully examined by a number of individuals.
>
> No one here has previously seen a malformed skull such as pictured, but the concensus is that it probably resulted from an old injury.

The lion's instinctive fear of man and dog does not necessarily mean that he is a coward among other animals. The caretaker at Hogle Garden Zoo in Salt Lake City, Utah, tells of an incident in which a mountain lion accidentally got into an African Lion's cage. A terrific battle ensued, but the lions were separated by attendants before the battle was finished. The caretaker reported that the mountain lion would

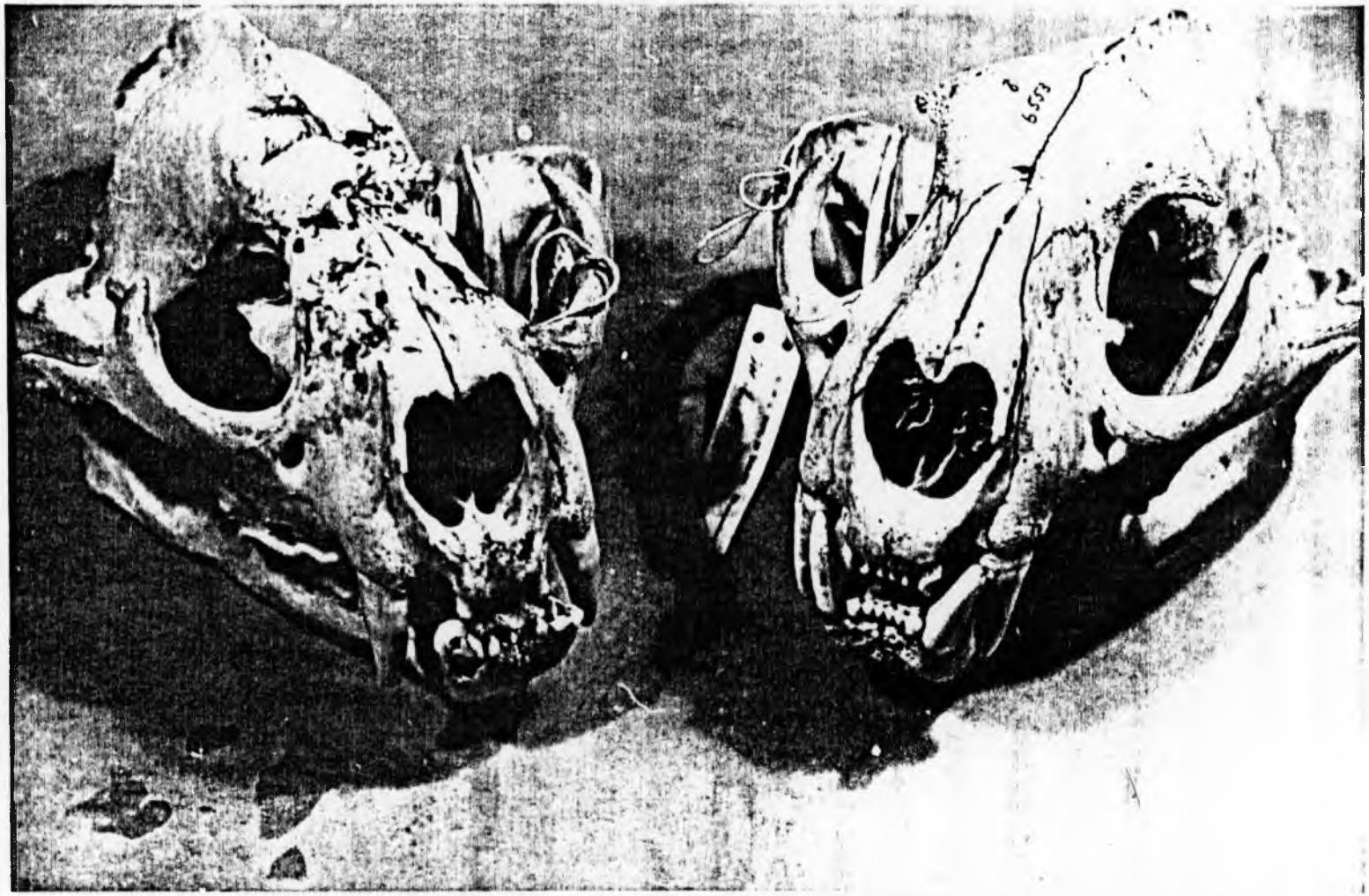


Figure 29. Honeycombed effect on skull of mountain lion, left, is believed to be the result of an old injury. Lion killed near Duchesne, Utah. Skull at right is normal. (Skull No. 0542, Male, Vertebrate Zoology Museum, University of Utah)

strike the African Lion four or five times before the African Lion could strike once in return. This caretaker felt that the mountain lion was much the faster of the two.

Mr. Perry J. Wright of Glide, Oregon, has observed that the female is much more aggressive than the male, and also possesses a wilder disposition.

Peculiar to the mountain lion is the high degree of animosity which each adult male of this species holds for his fellow lion. There are no other animals that prey upon the mountain lion, so this animosity may be a natural means that enables this species to hold its own population in check. With such a scheme of competition, only the more masterful lion would survive and reproduce. This culling of the weaker animals may be the reason that no animal can equal the mountain lion in its ability to take prey. A display of such animosity is cited by Mr. H. E. Ediger of The Dalles, Oregon, a taxidermist who states: "Last year a trapper brought a mountain lion into my shop for mounting. It had been caught in a trap. Along comes another mountain lion and kills him. This was a large male. It had one hole behind the ear and two at the base of the head, which must have killed him almost instantly."

Another instance of a large tom that was caught in a trap being killed by another large tom is reported by Mr. Elvin Lewis of Veneta, Oregon.

Howard Bilton of Glenville, California, found where two large male lions had fought a terrific battle. Both lions were trailed and killed. One was badly bitten and had pulled two claws out, the other not quite so badly mauled.

Although many cases are known where lions have stalked men out of curiousity, few cases of an unprovoked attack have ever been recorded. There are historical records of rabid mountain lions attacking groups of people. The members of one group that were not killed outright by the lion later died of hydrophobia. (Young & Goldman, 1946:119)

Rare attempts on the part of mountain lions to kill human beings have, in most cases, been unsuccessful. In most instances the lions have either been frightened away, or killed. During the course of this study the author had one contact with a mountain lion which could have led to very undesirable consequences. On the 8th of May, 1948, while tracking a large mountain lion through the junipers and shelf ledge rock in the Lost Creek-Echo Canyon study area of Morgan County, Utah, the writer was led by tracks into a cave. A glance into the cave proper showed that it was empty but the author failed to look up onto a little shelf in the right hand corner of the cave upon which this large male lion was sleeping. It was assumed that the lion had back-tracked, so the author walked away from the cave watching the tracks very closely in an effort to determine where the lion had left the trail. When

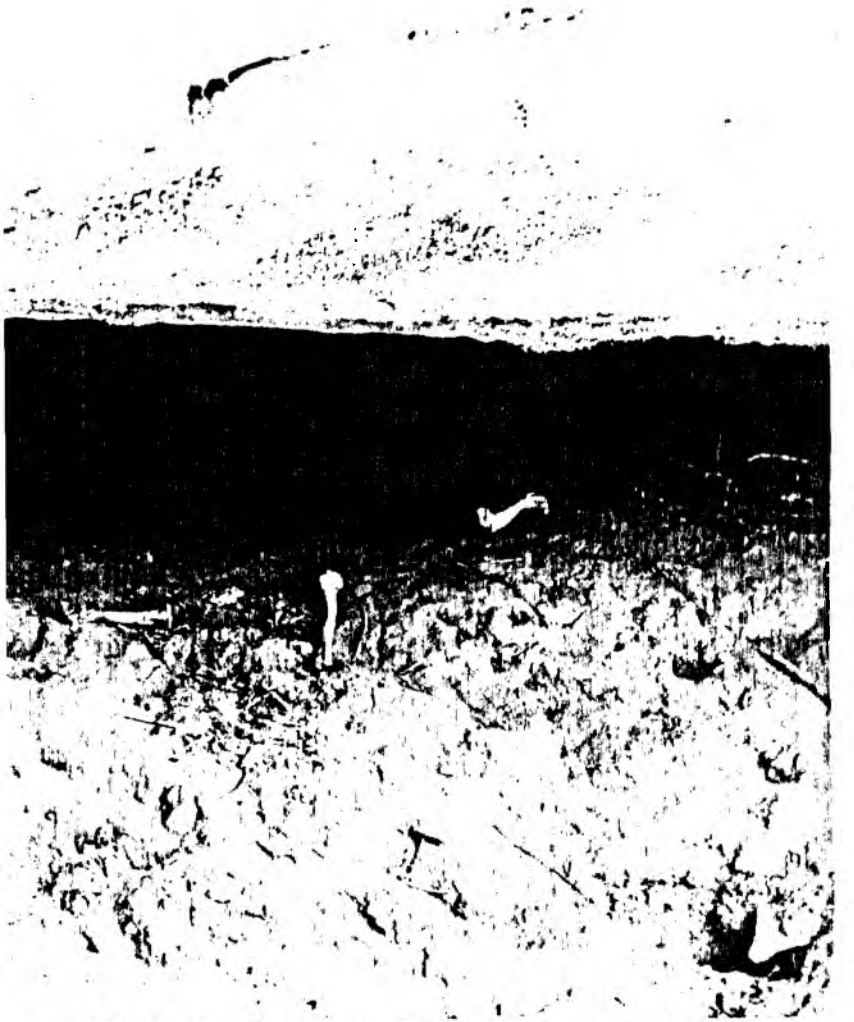
about 80 feet away from the cave the author heard something strike the sand below the ledge at the mouth of the cave and in turning about saw a large mature lion advancing toward him. An effort had been made for a long time to get a picture of a lion in his natural habitat under normal conditions. On the assumption that the lion would eventually stand still, a camera was hastily dug from the pack so that a picture could be taken. The lion did not stop, but steadily continued his advance. In the excitement the author did not realize that he had the lion cornered in the bottom of a ravine between two huge snowdrifts and that there was no other path by which the lion could escape. The lion had the look on his face of a dog that had done something wrong and, returning to his master, expected to be punished. He did not appear mean or belligerant but on the other hand, if he gave any indication of wanting to be friendly, the author certainly failed to recognize it. His advance continued, so he was killed with a German Luger pistol. The lion tore up a large area of brush and snow in his death throes. It was regrettable that such an active specimen had to be sacrificed.

A somewhat similar experience with a mountain lion was had by Mr. Frank Bartlett of Ogden, Utah. While camping on a fishing trip on the Gros Ventre River near Jackson Hole, Wyoming, on August 17, 1947, at three a.m. in the morning a mountain lion came up to within 2 or 3 yards of the tent and

Figure 30. The mountain lion that followed the author, right, from a cave during the tracking phase of this study. A mature male Felis concolor hippolestes. J. L. Vickers, left, Salt Lake City sportsman.

Figure 31. The cave from which a lion followed the author in Morgan County, Utah, Dr. J. M. Woodbury, left, and writer. (Photo by W. Leslie Robinette, U. S. Fish and Wildlife Service)

Figure 32. The lion in Figure 30 which
31 was lying on a bed of twigs on this
cave proper and failed to observe him.



trailed the author from the cave in Figure
dirt shelf when the author peered into the

screamed. Mr. Bartlett flashed a light through the tent window and saw the lion standing there swaying back and forth as though smelling something on the ground. The lion made no attempt to take the bacon or other foodstuffs, and was plainly visible in outline but soon moved out of the light leaving tracks in the mud.

The mountain lions in the cages at the Hogle Garden Zoo in Salt Lake City, Utah, were observed to lie around quietly in their cages all day, sometimes sleeping the larger part of the time, but as darkness approached they appeared to become restless, pacing back and forth inside the cages. The majority of instances in which a mountain lion has attacked or attempted to attack human beings has occurred at night. Mr. Loren Thornton of Widderburn, Oregon, states: "My brother was crossing a large, grassy glade coming to camp at night when he saw a pair of large eyes directly in front of him, and advancing toward him. At times they would disappear and then they would be closer until they got within 30 feet of him. So he shot at it and it was a large male lion."

Mr. Roy Lytle, a rancher of Eagle Valley, Nevada, had the experience of being chased by a lion at his ranch above Spring Valley during the winter of 1948-49. Accompanied by his wife, daughter-in-law, and grandson, he had gone out to the ranch to feed the stock. The ladies remained in the car while he went to the haystack to throw down hay for the cattle. But, hungry

as the cattle were, not one came near and they appeared to be uneasy. Mr. Lytle left the haystack to investigate and was confronted by a lion standing in the road some distance back of his parked car. He ran back for his car, reaching it about three leaps ahead of the lion. Guns were obtained at a neighbor's ranch and Mr. Lytle returned expecting to find some of the cattle in the process of being devoured. The lion was lying in the door of the barn when they arrived at the scene and was shot where it lay. A postmortem examination of the beast showed it to be suffering from malnutrition. It was an old animal, its teeth were well worn, and it measured 6 feet 7 inches in length.

Mr. Albert Stewart of Loa, Utah, reports that while riding on a horse checking his trap line he circled back and could see where a lion had followed his horse's tracks.

Another instance of a lion stalking a man is reported by Mr. R. E. Cowger of Cisco, Utah, who was stalked by a lion for four fifths of a mile while he was bringing in a deer on skiis.

Although the instinctive fears that a lion possesses toward a human being are deeply rooted, there have been instances when wounded lions have been pushed too far and have assumed an aggressive attitude. Mr. Floyd Roberts of Richfield, Utah, found himself in a very awkward situation when, with a group of government hunters, they wounded a lion and their hounds were holding it in the brush. Mr. Roberts threw a rock, hitting

the lion in the ribs, whereupon the lion charged and chased Mr. Roberts down the sidehill. With the lion right at his heels, he ran past Lloyd Roberts and Adria Ahlstrom, and Lloyd Roberts shot the lion.

There is some evidence to indicate that some lions are more aggressive than others. Mr. George Nay of Salina, Utah, reports treeing an old female eight times with hounds. The lion finally sprang from the tree directly at Mr. Nay but was intercepted by his fighting trail hounds.

A case in which a wounded lion in a cave cornered by approaching hunters sprang from the mouth of the cave at the hunters was observed by Mr. Joseph Felix, currently of Crowley, Louisiana, but formerly of northern Utah.

It is believed by Mr. E. U. Smith of Myrtle Point, Oregon, that a very old mountain lion is more apt to attack a human being than a young one. Mr. Smith also cites an instance where an older lion attempted to take a dressed deer from him while he was carrying it. He states that the lion came within six feet of him.

Mr. Gordon Stuart of Lucerne, Washington, was away from his trapping cabin overnight and a lion entered the shed in the front of his cabin, took out a sheep pelt and played with it in the fresh snow all around the cabin, but did not touch a quarter of deer meat hanging in the same shed.

Mr. Charles Princle of Garberville, California, states that on April 1, 1948, the Vallejo, California, police got a phone call that a lion was on Carquinez Bridge. Investigating, the police found a mature lion on the bridge and shot it. As far as could be determined it was not a pet, but was a wild one.

A definite behavior pattern for mountain lion has been observed by Mr. R. E. Cowger of Cisco, Utah, who has found: "Mountain lions seem to be creatures of habit in that: He (or she) will almost always follow the same route through his normal range. Will often follow his own tracks on returning to the place from which he started. Are given to patrolling an area of country regularly, invariably passing under certain ledge rims, etc., traveling under cover but along routes that give excellent vantage points of the country. Will never eat anything that is spoiled or tainted, seldom anything that they have not themselves killed. It is my opinion that while the lion is generally conceded to be a cowardly animal he never shows any outward signs of fear in the presence of humans as is apparent with other animals when cornered. It is also my belief that the lion is one of the fastest (fleetest) animals on foot for a distance of about 100 yards. However, they cannot retain this speed over any great distance."

Oil of catnip is sometimes used to a good advantage in

TABLE 4.

PREDATORY BEHAVIOR (CONT'D)

LION FIELD MEN	STALKING OR ATTACKING HUMANS	LIVESTOCK LOSSES					
		Total No. Investigated	No. Killed By Lion	By Bob-cat	By Bear	By Coyote	By Wolf
Utah							
N. Robison, Anabella		10yrs.Exp.	15			Many	
Ed Griggs, Salt Lake		12	4	1	2	5	
V. Cottam, Escalante			15			Many	
W. L. Roberts, Anabella			Few	Several		Hundreds	
B. Argyle, Spanish Fork		11	2			9	
Don Cowger, Cisco	Followed by lion.	500	3	30	100	350	
Robert Snyder, Duchesne	Yes, when wounded.	3	3				
Verl Kelsey, NewHarmony		Many	Half			Half	
Wm. C. Dalton, Parowan	Yes	1000	200	50	10	740	
Arthur Brindley, Antimony	Yes	1	1				
John Sampinos, Price	Yes	75	25	5	10	35	
Oren Adams, Cedar City	Yes						
George Nay, Salina	Yes	Several	2	10	7	75	
Floyd Roberts, Richfield	Yes	8	1			7	
Ray Owens, Hurricane		Hundreds	Few	Hundreds	Many	Hundreds	
G.W. Proctor, Panquitch		100	8	20	2	75	
Dee Craig, Santaquin		74	50	20	1	3	
Joseph Felix, Logan	Wounded lion sprang at hunters from cave.						
P. O. Hurst, Fairview	Wounded lion.	4	4				
J.L. Pearson, Circleville		Many	20	10		100	
Boyd Twitchell, Beaver		2	2				
Bill Jensen, Huntington	Jumped at him when caught in trap.	50	50				
W.O. Nelson, American Fork		Several hundred	at least 500		Sev. hund.	Over 1000	Sev.
Darwin Brown, Richfield	Only when wounded or cornered.						
Dortha Snyder, Myton		2	2				

TABLE 4. (Cont'd)

PREDATORY BEHAVIOR (CONT'D)							
LION FIELD MEN	STALKING OR ATTACKING HUMANS	LIVESTOCK LOSSES					
		Total No. Investigated	No. Killed By Lion	By Bobcat	By Bear	By Coyote	By Wolf
Utah (Cont'd)							
Albert Stewart, Loa	Yes	20	1	4		15	
R. L. Hoggatt, GreenRiver	Tracks followed men.						
James Gray, Beaver		75	1	10		64	
California							
F.W.Keeler, FrenchGulch	Yes						
L.P.Simpson, Orland		9	3	2	1	3	
Wm.Dye, Porterville		22	9	5	1	7	
Colorado							
Tom Barnes, Olathe	Wounded or cornered.						
C. H. Vovak, IdahoSpgs.	Was followed by lion while packing a deer.	27			7	20	
R.C. Mink, Canon City		2	1		1		
G. D. Sutton, Meeker		1000	7	30	125	728	
E.F.Cochrane, DelNorte	Lion tracks on human's						
Sigfrid Palm, Ft.Collins		15	1	2	1	11	
H. N. Ferrell, Cortez	Followed a man.						
D. C. Jerome, Fruita		20	5		10	5	
B. L. Denton, La Veta		50	7		5	38	
J.L.Waldron, Kremmling		20	3		3	14	
Idaho							
Hawley Hill, Salmon	Followed men on horses	30	2		1	23	
Willard Rood, Jr. Salmon		20			20		

TABLE 4. (Cont'd)

PREDATORY BEHAVIOR (CONT'D)							
LION FIELD MEN	STALKING OR ATTACKING HUMANS	LIVESTOCK LOSSES					
		Total No. Investigated	No. Killed By Lion	By Bobcat	By Bear	By Coyote	By Wolf
Montana							
C. E. Beebe, Browning	Reports of stalking and attaching.						
Frank Haacke, Philipsburg	Lion crept up and watched him at night.						
E. K. Beebe, Missoula	Persons followed by lion.	200-300	No record kept.				
Nevada							
Robert Dickey, Ely		2	2				
Stanley Kaiser, Pioche	Starved male charged rancher.						
Ira Garrison, Pioche	Newspaper article on lion attack	10	10				
L.R.Shores, Ely		200	12	58		130	
New Mexico							
G.W. Evans, Magdelena	Lion killed boy in Texas.						
H.C.Pickens, Santa Fe	Will trail man.						
Oregon							
L.M.Maurer, Cove Junction	Followed a man.						
L. J. Bales, Alsea		15	3	4	3	5	
E. J. Sherman, Molalla		117	24	33	10	50	
E.J.Barnee, Fall Creek	Will stalk out of curiosity.						

TABLE 4. (Cont'd)

PREDATORY BEHAVIOR (CONT'D)							
LION FIELD MEN	STALKING OR ATTACKING HUMANS	LIVESTOCK LOSSES					
		Total No. Investigated	No. Killed By Lion	By Bobcat	By Bear	By Coyote	By Wolf
Oregon (Cont'd)							
Dale Bonney, Rose Creek	Lion laid in brush watching man work.						
Ralph Johnston, Riddle	Followed by lion.						
P.R.Williamson, Ashland		6	2		2	2	
C. R. Duval, Taft		9	4	1	2	2	
E. U. Smith, Myrtle Point	A very old cougar tried to take a dressed deer from him.	2	2				
Elvin Lewis, Veneta		15	6	1	4	4	
L.T. Grant, Harlan	Three cases-lion were all discovered and killed.						
Roy Vann, Willamina		10	9	1			
E. W. Conklin, Sweet Home		5	1		2		
Stanley Colegrove, Brookings		Thousands	3rd	4th	1st Offender	2nd	
Roland McRae, Wallanea		100			2	98	
L.R.Gardner, Newport	Several hunters						
Roy E. Cox, Yoncolla	Lion will follow man from curiosity, but no intent to kill.						
Alfred Zollman, Joseph	Will follow a man, but not attack unless cornered.	1000	100	50	50	Hundreds	
J.F. Thomas, Remote		4		4			
E. O. Worley, Azalea	Have proof of lion killing boy.	6	2	3	1		

TABLE 4. (Cont'd)

PREDATORY BEHAVIOR (CONT'D)							
LION FIELD MEN	STALKING OR ATTACKING HUMANS	LIVESTOCK LOSSES					
		Total No. Investigated	No. Killed By Lion	By Bobcat	By Bear	By Coyote	By Wolf
Oregon (Cont'd)							
JoeJackson, Yoncalla	One followed him for three miles-never closer than 10ft.						
FrancisWilliams,Lebanon	Followed out of curiosity.	45	8		5	32	
LorenThornton,Wedderburn	Follow on trails.	50or more	10	10	20	10	
W.M.Clark, Redmond	Follow thru curiosity.						
CharlesAnway,Oakridge	A very hungry lion will follow for fresh meat.						
MauriceWood,Oakridge	Curiosity	12		1	1	10	
J. B. Wadmar, Powers	Small boy killed and eaten.	Many	2				
Oran King, Holley	Followed him at night through curiosity.						
J.J.Hudack,GoldBeach	Been followed several times.	7-8	3	1	2	1	
EverettLimpbeck,Lyons		3		1	1	1	
P. J. Wright, Glide		2	2				
W.B.Patten,CulpCreek	Starved one attacked two children-their father killed it.	Many	Mostly				
C.R.Poe, Plymouth		Over 100	9				
L.W. Peters,Mehama	Followed by lion.						
W.R.Tonkin,Brownsville	Trailed closely by young cougar.						
Frank Merritt, Holley	When wounded.						
Harley Cain, Lowell	Followed by lion.						

TABLE 4. (Cont'd)

PREDATORY BEHAVIOR (CONT'D)							
LION FIELD MEN	STALKING OR ATTACKING HUMANS	LIVESTOCK LOSSES					
		Total No. Investigated	No. Killed By Lion	By Bobcat	By Bear	By Coyote	By Wolf
Texas							
E.L.Love, SierraBlanca	Old, toothless lion stalked miner.	100	50	30		20	
Grey West, Valentine			500	90		1500	
J.E. Hearn, Cotulla		75	53	10		12	
E.G. Baker, CasaPiedra		1000	400	150		450	
Fred Moore, SierraBlanca		400	300	25		75	
J. T. Jolly, Allamore	Will fight when cornered.						
Mrs.McCarley, Pt.O'Connor			50	Many		30-40	
Washington							
Frank Hansler, Tacoma	Lion don't follow-are cowardly toward men.	200		10	100	50	
GordonStuart, Lucerne	Like to follow man's tracks.						
J.E.Handy, Okanogan	One case of 14 year old boy definitely proven.	2	1		1		
Laurence Sprengel, Colville	Report of boy killed and eaten in Okanogan County.	15	1		12	2	
Wyoming							
Frank Morris, Cody	Lion followed school child home.						

attracting mountain lions to a trap or to an automatic device for taking pictures of the animal in the wild. The author experimented with oil of catnip mixture and found one which was attractive to caged mountain lions in that they would "pull" a cyanide gun. The purpose behind the development of this lethal device as applied to mountain lions was to enable the author to make a collection of summer stomachs, in order to obtain information concerning the summer food habits of the lions.

In walking, the lion places the hind foot into the track made by the front foot. It is believed that this aides the lion in a stealthy approach. Tracks in the snow indicated on one occasion that the bounds taken to catch a deer were 13 feet apart, and on another occasion, going downhill, were 15½ feet apart.

When training a pack of young hounds, it is common practice among lion hunters to take a 22 rifle and shoot the treed lion in the tail, making him angry so that he will jump out and run several hundred yards before going up a tree again. This is done primarily to teach the young hounds the art of treeing and holding the lion. While engaged in this practice, the author has on several occasions watched lions leap from the ground to limbs 8 to 10 feet off the ground, without ever touching the trunk of the tree.

3. Home range and travel routes

Individual lions were observed to use the same travel routes periodically while passing through the same canyons. The writer was unable by dating them, however, to predict with any degree of accuracy just when the lions would come back through the country again. Their travel routes vary from season to season, and the deep snow and deer herd migrations hold the lions to lower elevations during the winter.

The lion lives a nomadic existance which is apparently one process of continual movement from area to area within the limits of its seasonal ranges. Mr. Harrison Price of Junction, Utah, has the following to say about the movement of lions: "I have caught every lion I could find in every direction from here every winter, and the next winter there would be as many as the winter before. I think that most of the lions around here come from Zion Canyon country. They seem to drift north most of the time."

As far as can be determined, no other mammal has a home range equal to that of the mountain lion in actual miles traveled annually. Mr. Perry J. Wright of Glide, Oregon, found that: "The lion's ranging distance will vary in different localities and, of course, some will travel farther than others. A mother with kittens will range around about a 5 mile radius."

Evidence to indicate how far a mountain lion travels in one general direction was observed by Herman Wilson of Estes Park, Colorado, who states: "I was in a party with a group of hunters who trailed one (lion) an estimated 30 miles in one general direction without ever jumping it out. Two days time was spent at this hunt."

It was observed in tracking that lions travel either over prescribed routes in one direction, or over a circular route. Mr. Sigfrid Palm of Fort Collins, Colorado, has observed that lions follow a certain route going in a circle and returning at intervals of from two to three weeks, and probably covering a distance of about 30 to 50 miles.

The extremely wide range and long travel routes of the mountain lion are verified by Mr. Arthur Brindley of Antimony, Utah, who has found that the lions drift in "schools" and that they are continually working into his territory from other places. Mr. Brindley says, "I catch all of the lion in this territory and then for a while there are no lion around. Suddenly more move in."

In Oregon, a grown lion was observed by S. W. Koontz of Albany to make a round of his travel route in from 8 to 15 days, and in bad weather would lay up for several days at a time usually under a rock or log where it was dry.

It would be almost impossible to endeavor to calculate the amount of territory that is covered by a mountain lion in his travels. Mr. Walter L. Roberts of Annabella, Utah, states:

TABLE 5.

RANGE, HABITAT, AND POPULATION TRENDS

LION FIELD MEN	TRAVEL		HABITAT	SEASONAL ALTITUDINAL MIGRATION		POPULATION TRENDS			
	Area (mi.)	Distance (mi.)		Yes	No	More Abundant	Less Abundant	Same	Evidence
Utah									
Norman Robison, Anabella		20					x		Harder hunting
Ed Griggs, Salt Lake City		15	Ledges	x			x		Less sign
V. Cottam, Escalante			Ledges&brush	x			x		Stock loss
Harrison Price, Junction			Ledges&timber	x				x	Annual Catch
W. L. Roberts, Anabella		35	Ledges	x			x		Too many hunters
B. Argyle, Spanish Fork		20	Ledges		x			x	Tracks&sign
Don Cowger, Cisco		40-50	Ledges	x		x			Sign
J. W. Willis, Vernal		50-100	Ledges&timber	x			x		
Robert Snyder, Duchesne	50	20	Ledges	x				x	Sign
Verl Kelsey, New Harmony		45	Ledges	x			x		Deer kills
V. Montgomery, Park Valley		20			x		x		Sign
Wm. C. Dalton, Parowan	100		Ledges&timber	x				x	Sign
Arthur Brindley, Antimony		25	Ledges&brush	x			x		Sign
John Sampinos, Price	10	10	Ledges& caves	x			x		Stock loss
Oren Adams, Cedar City	25		Ledges&timber	x			x		Hunting
George Nay, Salina		30-40	Ledges& caves	x			x		Sign
John M. Bird, Salina	25		Ledges	x				x	Track
Bryce Johnson, Salina		13	Ledges	x			x		Sign
Floyd Roberts, Richfield		12	Brush & ledges	x			x		Tracks
F. W. &G. Roberts, Antimony		5-50	Ledges&timber	x				x	Sign
Whitey Carroll, Veyo	75		Deep canyons				x		Scratches
Ray Owens, Hurricane	100	50	Ledges	x			x		Tracks
G. W. Proctor, Panquitch		10	Ledges	x			x		Tracks
Jack Butler, St. George		75	Ledges&brush	x			x		Tracks
Dee Craig, Santaquin		10	Ledges	x			x		Tracks
Joseph Felix, Logan		3-4	Ledges				x		Tracks
Ralph Robinson, Fillmore			Ledges	x				x	Deer kills
Newton McBride, Fillmore	5	10	Ledges	x			x		Tracks

TABLE 5. (Cont'd)

RANGE, HABITAT, AND POPULATION TRENDS									
LION FIELD MEN	TRAVEL		HABITAT	SEASONAL ALTITUDINAL MIGRATION		POPULATION TRENDS			
	Area (mi.)	Distance (mi.)		Yes	No	More Abundant	Less Abundant	Same	Evidence
Utah (Cont'd)									
P. O. Hurst. Fairview		10	Ledges	x			x		Hunting
Charles Madsen, Provo	35		Ledges	x				x	Sign
J.L.Pearson, Circleville	15	35	Ledges	x			x		Sign
L. G. Brown, Koosharem		15-20	Ledges	x			x		Hunting
Boyd Twitchell, Beaver		20	Ledges	x			x		Sign
Bill Jensen, Huntington		14	Ledges&brush	x				x	Kills
W.O.Nelson,AmericanFork		15	Ledges				x		Reported & found
J. W. Henry, Marysvale		15		x			x		Tracks
D. S. Good, Mayfield			Ledges	x			x		Tracks
Darwin Brown, Richfield		10	Ledges	x			x		Kills,tracks
Dortha Snyder, Myton		50	Ledges	x				x	Tracks
LaRue Emett, Veyo		80	Ledges &brush	x			x		Sign
Oscar Hansen, Provo	30		Ledges & brush	x			x		Tracks
Bill Nielson, Salina		6-8	Ledges,timber brush	x			x		Sign
Albert Stewart, Loa		20	Ledges	x				x	
Milton Campbell, Vernal			Ledges	x				x	Tracks
R. L. Hoggatt,GreenRiver		15-20	Ledges&timber	x				x	Sign
James Gray, Beaver		40	Ledges	x			x		Hunting
Alaska									
Maurice Kelly, Anchorage		30	Ledges	x				x	Field reports
Arizona									
Floyd Pyle, Payson		40	Ledges,rocks	x				x	Sign
Frank Colcord, Young		45	Ledges,rocks	x			x		Hunting

TABLE 5. (Cont'd)

RANGE, HABITAT, AND POPULATION TRENDS

LION FIELD MEN	TRAVEL		HABITAT	SEASONAL ALTITUDINAL MIGRATION		POPULATION TRENDS			
	Area (mi.)	Distance (mi.)		Yes	No	More Abundant	Less Abundant	Same	Evidence
Arizona (Cont'd)									
R. R. Miller, Clifton			Ledges		x		x		Hunting
Giles Goswick, Humbolt	100	10	Brush		x			x	Sign
California									
F. W. Keeler, FrenchGulch		50-60	Timber & brush	x			x		Sign
Howard Bilton, Glenville		70	Ledges&brush	x			x		Hunting
L. P. Simpson, Orland		15	Ledges&brush	x			x		Sign
Wm. Dye, Porterville		42	Brush	x			x		Tracks
Andrew Peroni, Marysvale		40	Dead falls	x			x		Sign
Gus Landergen, Eureka		40-male 20-female	Hollow logs	x			x		Sign
Charles Prindle, Central		30	Ledges, timber	x			x		Sign
Colorado									
Tom Barnes, Olathe		15	Ledges	x			s		Sign
Wm. W. Mink, Delta			Ledges	x		x			Sign
C.H. Vovak, Idaho Springs		25	Ledges, caves	x					
R.C.Mink, Canon City			Rough country	x		x			Tracks, kills
Robert Terrell, Basalt		40	Rocky points	x				x	Tracks
Ben R. Crandell, Montrose		50	Ledges, brush	x		x			Gov't. Reports
Glen D. Sutton, Meeker	100	50	Ledges		x	x			
E.F. Cochrane, Del Norte		65	Rocky country		x				Sign
Corrin Davidson, Craig			Ledges		x	x			Tracks
Sigfrid Palm, Ft.Collins		40	Ledges		x	x			Tracks
H. N. Ferrell, Cortez		40	Ledges	x				x	Sign
H.N.Kennell, Grand Junc.	35	20	Ledges	x				x	Kills

TABLE 5. (Cont'd)

RANGE, HABITAT, AND POPULATION TRENDS									
LION FIELD MEN	TRAVEL		HABITAT	SEASONAL ALTITUDINAL MIGRATION		POPULATION TRENDS			
	Area (mi.)	Distance (mi.)		Yes	No	More Abundant	Less Abundant	Same	Evidence
Colorado (Cont'd)									
D. C. Jerome, Fruita	50	25	South slopes	x				x	Kills
HermanWilson,EstesPark		30		x				x	
Bryan Denton,LaVeta		50	Ledges	x		x			Reports
J.L.Waldron,Kremmling			Ledges					x	Kills
Idaho									
L.L.Anderson,MeyersCove		30	Ledges	x			x		Tracks
Hawley Hill, Salmon	40			x			x		Hunting
A.R. Twilegar,Northern		30	Ledges,rocks	x			x		Bounties
Willard Rood,Jr.,Salmon		10-15	Rough country	x			x		Tracks
Ed James, White Bird		10-50	Caves in ledges	x					
RobertDonley,Garden Valley		40	Ledges	x			x		Experience
Roy Tumelson, Lewiston		20-30	Ledges	x					
Montana									
C. E. Beebe, Browning		107	Ledges &timber	x			x		Reports
Frank Haacke,Philipsburg		40	Ledges	x				x	Reports
E.K.Beebe, Missoula	15	30	Ledges&timber		x	x			Lion killed
Nevada									
Robert Dickey, Ely	30	15	Rock country		x	x			Sign
Stanley Kaiser, Pioche		25	Rough country	x		x			
Ira Garrison, Pioche		15-30	Low ledges	x		x			Kills
L.R. Shares, Ely				x		x			Tracks

TABLE 5. (Cont'd)

RANGE, HABITAT, AND POPULATION TRENDS									
LION FIELD MEN	TRAVEL		HABITAT	SEASONAL ALTITUDINAL MIGRATION		POPULATION TRENDS			
	Area (mi.)	Distance (mi.)		Yes	No	More Abundant	Less Abundant	Same	Evidence
New Mexico									
R.L. Raley, Hope		75	Ledges		x			x	Scent posts
Alvin Dunagin, Animas		30-40	North sides	x		x			Kills
G.W.Evans, Magdelena		50-100	Ledges &brush	x			x		Hunting
A. R. Bayne, Animas		20	Caves,ledges		x			x	Kills,track
Homer C. Pickens,Santa Fe		20	Rough country	x				x	Annual kill
Oregon									
L. M. Maurer,CoveJunction	40	16	Timber &brush		x	x			Sign
L.J. Bales, Alsea		15	Ledges		x	x			Tracks
E.J. Sherman, Molalla		5	Ledges&timber	x			x		Sign
E. J. Barney,Fall Creek		62	Windfalls	x				x	Sign
Dale Bonney,Rose Creek	2030	100	Any kind	x				x	Sign
Don Pankey, Roseburg		20	With deer herd	x		x			Too much poison to hunt.
Ralph Johnston, Riddle		15	Hollow logs	x				x	Sign
P.R.Williamson, Ashlund		30	Ledges	x				x	
C. R. Duval, Taft			Ledges&timber	x					
Roy Tracy, Estacada			Ledges &brush	x				x	Sign
W.M.Eastham,CottageGrove			Ledges,timber, brush.	x			x		Reduction in habitat.
E. U. Smith,Myrtle Point			Brush	x				x	Sign
Elvin Lewis, Veneta	20		Ledges		x	x			Sign
Kirby J. Taut, Central		20	Brush	x				x	
Arthur Wooley, Drain		20	Brush,timber		x	x			Tracks
Carl Thornton,Sutherlin	20		Windfall logs	x			x		Kills,sign
L. T. Grant, Harlem			Game country	x			x		Sign

TABLE 5. (Cont'd)

RANGE, HABITAT, AND POPULATION TRENDS									
LION FIELD MEN	TRAVEL		HABITAT	SEASONAL ALTITUDINAL MIGRATION		POPULATION TRENDS			
Oregon (Cont'd)	Area (mi.)	Distance (mi.)		Yes	No	More Abundant	Less Abundant	Same	Evidence
Archie Williams, Blue River		20	Timber, windfall	x			x		Tracks
Roy Vann, Willamina		40	Ledges, brush	x		x			Sign
E. W. Conklin, Sweet Home	20-30		Steep rocky timber	x			x		Records
S. W. Koontz, Albany	50		Ledges	x		x			Increase during war
Stanley Colegrove, Brookings	25-50		Ledges	x					
Roland McRae, Wallanea			Ledges	x		x			Records
L. R. Gardner, Newport	10-15		Ledges	x			x		Experience
Roy E. Cox, Yoncolla	8-10		Deep canyons	x			x		
Alfred Zollman, Joseph		15-20		x				x	Experience
J. F. Thomas, Remote	7		Hollow logs	x				x	Sign
E. O. Worley, Azalea		17	Ledges	x		x			Sign
Joe Jackson, Yoncolla	1-20		Ledges, timber	x			x		Except in poison areas
Carl G. Wood, Agnes			Ledges					x	Sign, report
Francis Williams, Lebanon		20	Ledges	x		x			Sign
Loren Thornton, Wedderburn		10	Hollow logs	x				x	Sign
W. M. Clark, Redmond		100	Timber, brush	x		x			Tracks, sign
Charles Anway, Oakridge		25	Ledges, timber					x	Reports
Maurice Wood, Oakridge		50	Timber, logs	x				x	Sign
J. B. Wadmar, Powers		15	Thick timber	x			x		Sign
Oran King, Holley		10	Windfalls	x				x	Tracks
J. J. Hudack, Gold Beach	25	30	Ledges, brush	x				x	Reports
Everett Limpbeck, Lyons			Timber	x		x			Sign
P. J. Wright, Glide	15		Timber, windfall	x				x	Sign
W. B. Patten, Culp Creek		30	Bluffs	x				x	Sign, kills
C. R. Poe, Plymouth			Timber, brush		x		x		Tracks, sign

TABLE 5. (Cont'd)

RANGE, HABITAT, AND POPULATION TRENDS									
LION FIELD MEN	TRAVEL		HABITAT	SEASONAL ALTITUDINAL MIGRATION		POPULATION TRENDS			
	Area (mi.)	Distance (mi.)		Yes	No	More Abundant	Less Abundant	Same	Evidence
Oregon (Cont'd)									
H. E. Ediger, Dalles								x	Tracks
L. W. Peters, Mehama		25	Where deer are		x			x	Tracks
W.R.Tonkin, Brownsville	12		Ledges, brush	x		x			Hunting
Frank Merritt, Holley		10	Timber	x		x			Sign
Glenn D. Godd, Walterville			Timber, brush	x				x	Sign
Robert Millican, "			Timber, brush	x				x	Tracks
Harley Cain, Lowell		60	Timber, brush		x			x	
L.L.Lewis, CentralPoint		50	Ledges		x			x	Sign
Texas									
E. L. Love, SierraBlanca			Ledges	x		x			Experience
Grey West, Valentine		80	Ledges, timber				x		Tracks
John E. Hearn, Cotulla		100-300			x		x		Tracks
Herbert Ward, Catarina		15	Heavy brush		x			x	Catch
Paul Evans, Van Horn		40	Ledges	x			x		Hunters
Earl G.Baker, CasaPiedra			Ledges		x		x		Stock kills
Lee Duncan, Alpine			Ledges		x			x	
Fred Moore, SierraBlanca	80	40	Ledges					x	No.Killed
Jack T. Jolly, Allamore	30-40		Ledges	x				x	Reports
Mrs.J.McCarley, Pt.O'Connor		30-35	Brush areas		x		x		More deer
Washington									
Frank Hansler, Tacoma		40	Ledges	x		x			Tracks
Gordon Stuart, Lucerne		24	Ledges	x			x		Tracks
Jack E. Handy, Okanogan		40	Ledges, timber	x			x		Reports
Laurence Sprengel, Colville	50	75	Ledges, rocks	x			x		Tracks

TABLE 5. (Cont'd)

RANGE, HABITAT, AND POPULATION TRENDS									
LION FIELD MEN	TRAVEL		HABITAT	SEASONAL ALTITUDINAL MIGRATION		POPULATION TRENDS			
	Area (mi.)	Distance (mi.)		Yes	No	More Abundant	Less Abundant	Same	Evidence
Wyoming									
Frank Morris, Cody		25	Ledges, timber	x		x			Tracks, kills

"I don't know how big a territory a lion covers, and I don't believe anyone else does. We have new lions drifting in from the Colorado River each year."

It was observed by the writer that the mature male lion is much more nomadic and has a much wider home range than the female lion. Most of the tracks observed "traveling through the country", so to speak, have nearly always been the tracks of large mature male lions. This same tendency was also observed by Mr. P. O. Hurst of Fairview, Utah, who has noted that: "Male lions seem to cover much more territory than females or kittens."

Contrary to the popular belief that members of the cat family will not voluntarily enter water, the mountain lion takes to water whenever it is necessary to accomplish its purpose, whether it be to capture its prey or to escape when being pursued by hounds.

Archie Williams of Blue River, Oregon, observed where a female lion had left two half grown cubs a mile behind and went hunting. After killing the female her back track was taken and the cubs located. Prior to this time, she had been observed to swim a river but couldn't get the cubs to swim, so she hid behind a log hoping they would follow, but they would not. She then returned to them.

Another instance of a lion voluntarily taking to the water is reported by Mr. Roy Tumelson of Lewiston, Idaho. Mr.

Tumelson tracked an old tom across country for 30 miles in almost a direct route. He states that the lion did not hesitate to swim large streams, as the main Salmon above Riggins, Idaho, and directly over the mountains he did not hesitate to swim it again 5 miles below Riggins.

4. Population determination and trends

The presence of this species in an area is easy to determine if any shelf-ledge rock is present. The lions in their travels are prone to pass either above or below any type of ledge that may be present. By looking in the dust or dirt under these ledges the lion's tracks can be seen and easily recognized. The track is distinct with eliptical shaped toes, and gives the overall impression of being circular in the snow. In the dust or mud, however, the four eliptical toes with no claw marks showing appear to be more or less in front of the heel imprint. Inasmuch as the hind foot is placed in the imprint made by the front foot, the print of the hind foot is usually the only one that is left visible to the eye. The heel imprint of the rear foot follows roughly the shape of an isosceles triangle pointing forward, with the forward one third of the triangle having been chopped off. The track of the mature lion averages about 4 to 7 inches across. The distance between the tracks varies from 11 to 20 inches depending upon the size of the lion.

Also of value in attempting to determine the number of mountain lions in a given area are scats which can usually be found under a ledge or under a tree throughout the area. The lion's scat is easy to distinguish from a bobcat's or coyote's because of its comparatively large size.

Figure 33. Mountain lion track pattern in snow. Pocket knife indicates relative size. Tracks in center of picture made by a mature lion followed by 2 immature lions walking directly in older lion's tracks. Tracks of 4th lion, mature, joins tracks of other 3 near top of page. Nevada National Forest near Ely, Nevada.

Also of value in detecting the presence of this species in an area are its characteristic "kills". An experienced field man can tell almost at a glance whether a dead deer was killed by a lion, as a hole from 5 to 10 inches in diameter will have been chewed through the ribs into the chest cavity. There will also be some attempt made to cover the kill either with sticks, dirt, leaves or snow.

Because of the nomadic habits of the lion, the determination of the population in actual numbers is almost impossible to obtain. There have been several areas in the state of Utah in which it was thought that, through intensive hunting and control methods, all of the lions were exterminated. Within a few years, however, there were more lions back in the area than before as others migrated in from surrounding areas. The only natural checks on the mountain lion seem to be (1) starvation, (2) mankind, and (3) intraspecific competition.

There is a high degree of correlation between the field man's occupation and his opinion concerning whether lions are more abundant, less abundant, or about the same. Sportsmen hunters and professional hunters seem to feel that the lion population is on the decline, while the stockmen usually regard the population as either remaining the same or on the increase.

5. Economic status and control

The hunting of mountain lions has been the occupation of a large number of men for many years. Foremost among these was the late Jim Owens who was hired by Theodore Roosevelt to remove the lions from the Kaibab National Forest, and was very thorough in doing so. America's foremost lion hunter of today, Mr. Jack Butler, of Kanab, Utah, specializes in taking parties on mountain lion hunts. Mr. Butler guarantees his party a lion or there is no charge for his services. He has been carrying on in this occupation in southern Utah for forty years, and has very rarely ever failed to get one of his guests a mountain lion. Jack Butler's generosity and willingness to assist any biologist in studying mountain lions that he can is commendable. There are also numerous outdoorsmen like Mr. Ed. Griggs (Figure 34) who raised a large family of boys primarily by trapping and hunting mountain lions for stockmen in Utah County. Mr. Griggs made most of his kills with a 22 Colt Woodsman pistol because a rifle was too bulky and cumbersome to carry through the rough ledges in which the lions are hunted. Mr. Griggs advocated a theory on lion populations that it took the author many, many years to finally accept. Mr. Griggs has maintained that there are, "Plenty of mountain lion." A survey of all areas of known mountain lion concentration during the winter of 1948-49 indicates that Mr. Grigg's statement on lion numbers is almost an understatement.

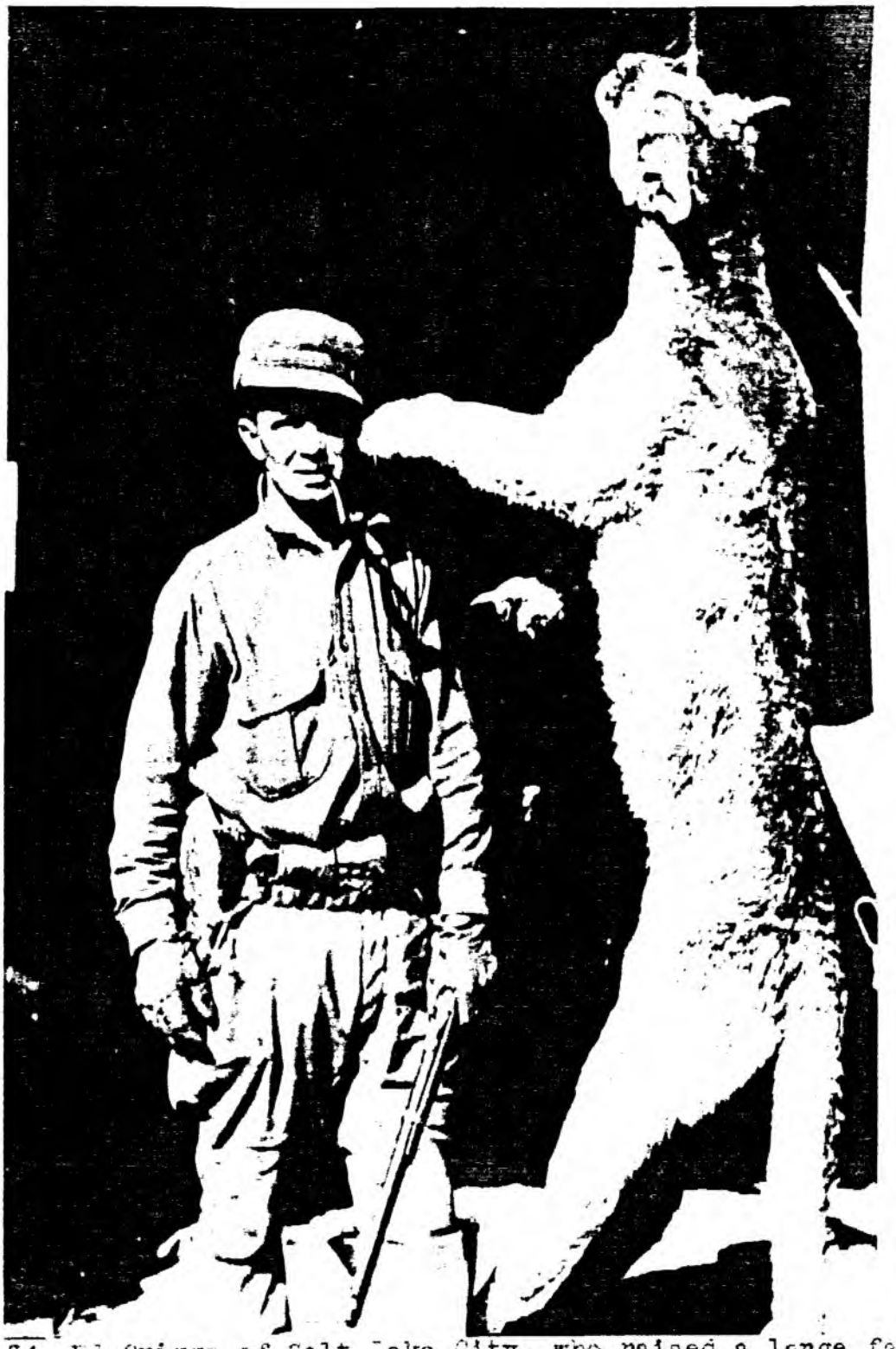


Figure 34. Ed Griggs of Salt Lake City, who raised a large family of boys trapping and hunting mountain lions in Utah County, Utah. Measurements of the lion pictured were not made, but for comparison purposes Mr. Griggs is 5 feet 8 inches tall.

Mr. W. M. Eastham of Cottage Grove, Oregon, states: "Predatory animals are both my hobby and way of making a living as a free lance hunter, and nearly 20 years with traps and hounds in the northwest is a good teacher, providing, of course, a person is both interested and observing. Frankly, I wouldn't want to see all the lions killed. I hate and love them. Certainly they have my deepest admiration and I'm not sure it would do to kill them all in the back country where man doesn't meddle with nature. As you can guess, I believe nature without the interference of humans is perfect. True, where lions are limited to areas that have become too small by man crowding them, they may cause trouble."

Predator control is an extremely controversial subject. On one side of the issue are men who would make extinct every wild carnivorous beast that exists--literally stamping out the masterpieces of geologic ages. This group justifies its actions on the grounds that they are protecting the stockman with 5 children to feed who has been losing stock to a mountain lion. Trippensee (1948:223,397) expresses the other side of the issue briefly as follows:

> The control of predators as a general management policy is of doubtful merit. Wherever deer are abundant, overpopulation rather than the menace of predation is the chief threat to the survival of a herd. Under this condition the systematic extermination of all natural enemies merely adds to the problem. Where the population density is well below the carrying capacity of the range and a larger herd is desired, predator control is then justified. Dogs, mountain lions,

> coyotes, bobcats, and wolves are the only carnivores sufficiently destructive to warrant treatment.
>
> The blundering activities of man, which attempt to increase one animal by reducing another, may unbalance the entire wildlife population of an area and produce the opposite result from that desired. Much mismanagement has resulted from a lack of knowledge of the food of a predaceous species or from only a partial knowledge of the relationships of several species. Predator relationships are complex and cannot be dealt with as simple phenomena.

A mountain lion which is handicapped or one that finds out it is much easier to kill a slow moving sheep or cow than it is to stalk the wily deer may constitute a menace to livestock. In such a case it would be much more sensible to eliminate the guilty individual rather than condemn the entire species.

A very close examination was made of all deer killed by lions, and as far as could be determined there was not an abnormal animal among them. So that the premise of racial sanitation by culling of the unfit by predators apparently does not apply to the predator-prey relationship that exists between the lion and deer. It is to be remembered, however, that the lion takes his prey by surprise, catching the unwary rather than the physically handicapped. From this it can be surmised that the mountain lion's function in a biotic community is the removal of the mentally lax or deficient deer. This would tend to produce a more keen and alert herd. The

culling of the weaker animals from a prey population is greater when the predator and prey are more evenly matched. In the case of wolves or coyotes, the culling of the unfit could very easily take place because of the fact that the wolves and coyotes capture their prey by chase and by "wearing down" the victim until it can be hamstrung and pulled down.

Leopold (1933:247) has the following to say concerning the predator-prey relationship between deer and carnivorous animals:

> It is said that a normally distributed herd of deer on Vancouver Island, after the lions and wolves had been killed off for their benefit, suddenly "huddled up" on a small part of their original range and overgrazed it. Apparently normal depredation had some as yet obscure influence in keeping the deer normally distributed over the range. In this case there is no assurance that the control work and the huddling were actually cause and effect. The case is cited merely as suggestive of many possible predator influences as yet beyond our vision.

Dr. D. Irvin Rasmussen (1941:248) found that the lion on the Kaibab Plateau, Arizona, "has a very definite place in the biotic relations of the pinon-juniper community, if by its abundance and its pressure on deer, deer numbers are influenced. As herbivores, the deer exercise the greatest direct influence on the native plant species of the woodland association and apparently influence, directly or indirectly, the majority of organisms present".

The Kaibab National Forest is a classic example of how mountain lion removal can be one of the main factors responsible

for an overpopulation of deer. The deer increased to the point where the range was so severely damaged that in 22 years it has shown only a slight recovery.

Normally when an overpopulation of deer causes a deterioration of the range, the downhill condition is given added impetus by some stockmen that maintain, "My father ran a thousand head of stock on that piece of ground, and I'm goin' to run a thousand head on there if I have to put green glasses on 'em to do it". Many fail to realize that once an area has been over grazed the vegetation must go through a series of ecological successions before suitable grazing conditions can be once again attained.

Because of the extremely large size of a mountain lion in Morgan County, Utah, an effort was made to obtain him for the museum at the University of Utah. The parties giving pursuit to this large lion might have succeeded in their mission except for the intervention of a rancher upon whose property the lion was ranging. This rancher had had considerable trouble with an overpopulation of deer on his ranges, and periodically was forced to resort to rather drastic action to reduce the numbers of deer, especially to protect his haystacks during the winter. It was his desire that the lions be left on his ranges in order to hold the deer herds in check. This rancher has been running cattle for over 25 years on a summer range infested with mountain lions, and reports that he has yet to find

evidence of a lion ever having killed one of his cattle.

An interesting opinion on man's meddling with nature is given by Mr. Ray Owens of Hurricane, Utah, who states: "The mountain lions and coyotes are hunted and killed until there are very few left in Utah, which brings a hardship on some people and in some cases is not good for the stockmen. Whenever you upset nature's balance too much, it does harm. The poison campaign is carried too far. Hundreds of men that made a living by trapping in Utah are now out of a job. The coyote is not so plentiful, but the rabbits and rodents are doing more damage here than the coyotes ever did. I could give lots more information on lions but it would only lead to their destruction."

IV. CONCLUSIONS

1. These studies indicated that a mountain lion will on the average kill 1 deer every 9.67 days during the winter months, and 1 porcupine every 7.2 days.
2. The role of the mountain lion as a predator upon livestock during the winter months has been highly overrated.
3. The adult male lion will ordinarily kill young kittens if the opportunity occurs.
4. In attacking its prey the lion will alter its approach and final charge to fit the situation. In most cases of larger mammals, however, it will pounce on the animal's back, usually biting it in the back of the neck and forcing it to the ground. The animal is then bitten in the throat and is killed either by strangulation or by puncture of the neck veins or both.
5. A normal mountain lion will not ordinarily attack a human being.
6. Deer constitutes the principal food item in the lion's diet.
7. There is some evidence to indicate that it is only the senile or abnormal lions that kill livestock for food.
8. Individual livestock killers should be dealt with individually. The entire species should not be annihilated because of the actions of a few.

9. The mountain lion functions in a biotic community primarily by keeping the deer population in check and preventing undue pressure upon the browse vegetation.

V. SUMMARY

Mountain lions were tracked in the snow from January 8, 1948, until May 8, 1948, and from December 19, 1948, until January 26, 1949, in the Lost Creek Area of Morgan County, Utah, and from January 27, 1949, until March 18, 1949, in the Book Cliff Mountains, Carbon County, Utah, for a total of 87 days of cougar activity. Under these conditions, a mature mountain lion killed on the average one deer every 9.67 days and one porcupine every 7.2 days, and its principal prey was mule deer. Possibly the role of the mountain lion as a livestock predator during the winter months has been highly overrated.

Hair of mature deer, fawn, porcupine, rabbits, and rodents, in order of decreasing quantities, has been found in lion stomachs and scats. The study showed no special preference for sex and age classes or the physical condition of the deer which were taken during the winter months. Deer seem to be chosen on the basis of proximity and accessibility, which does not corroborate the predator sanitation theories. (Leopold,1933:244) Tracks in the snow indicated that the lion in hunting adult deer uses a stealthy approach to within fifty to one hundred feet of its victim and then closes the remaining distance with large bounds and pounces upon its back. The prey is usually thrown

to the ground by the force of the impact. If not, it may be pulled over by the grip of the teeth on the neck, by twisting the head, or by biting the spinal cord. When the deer is down the lion seizes it by the throat and backs away to avoid the front hoofs of the struggling animal and holds the animal unti it is dead. Deer killed by lions upon examination indicated death was due to strangulation or from punctures of the veins of the neck, or both. Carcasses of deer having a hole chewed through the ribs; heart, liver and lungs eaten; and covered with either snow, dirt, leaves or twigs, are indications of a lion kill. It was observed that a lion never missed its prey once he started the attack.

Lion kittens are born at any time of year in a cave, windfall, or other place of shelter. The litter averages two, and the male parent assumes no responsibility in raising them. A mature male lion will usually kill the kittens if given the opportunity. It appears that scratch scent stations and the lion's scream are part of their courtship. The mateship is promiscuous and the female is either deserted or slips away from the male to have her young. Very small kittens are moved from deer kill to deer kill by the female parent. The seasonal altitudinal migration of the lion is similar to that of the deer and caves seem to be preferred as dens during the winter months. The lion, with nocturnal habits, seems to range more widely than other predators. The factors keeping the lion

in check are (1) man, (2) starvation, and (3) intraspecific competition.

The subspecies of mountain lion in central and northern Utah (Felis concolor hippolestes) is the largest in existence. Specialized teeth, powerful muscles, and long sharp claws make the lion well adapted for a predatory existence.

The lion inhabits wilderness areas of rough topography, and avoids contact with man. There are, however, records of lion having killed large horses without difficulty. The lion lacks stamina, but is extremely fast for a short distance. A concentration of lions near the deer herds in winter is not uncommon. Instinctively afraid of a dog, the lion will either run or seek safety from any dog that has sufficient courage to approach him. These instinctive fears of man and dog are more pronounced in some lions than in others.

Questionnaires were mailed to 322 field men who had had experience with mountain lion in 13 western states and the territory of Alaska. Considerable information concerning life history and food habits of the lion has been tabulated from these questionnaires, and placed in table form in appropriate places in the thesis.

This study should help to explain the long misunderstood relationship that exists between predator and prey. In the case of individual livestock killers, it appears that it would

be wiser to dispose of the guilty individual rather than to annihilate the entire species.

VI. BIBLIOGRAPHY

Hibben, Frank C.

1937. A Preliminary Study of the Mountain Lion. University of New Mexico Bulletin, Biological Series. Volume 5, number 3.

Leopold, Aldo

1947. Game Management. New York. Charles Scribner's Sons, p. 247

Rasmussen, D. Irvin

1941. Biotic Communities of Kaibab Plateau, Arizona. Ecological Monographs, p. 248

Trippensee, Reuben Edwin

1948. Wildlife Management. New York. McGraw-Hill Book Co., 1st edition, p. 223,397

Young, Stanley P. and Goldman, Edward A.

1946. The Puma, Mysterious American Cat. Washington, D. C. The American Wildlife Institute, 1st edition, p.183, 209.

Dixon, Joseph S.

July 1934. A Study of the Life History and Food Habits of the Mule Deer in California. California Fish and Game Commission, 20(3), p.103.