Brains of modern felids are advanced beyond the stage represented by a *Pseudaelurus*, (a specimen about 15 million years old) and a genus probably near the ancestry of modern felids. The neocortex is expanded ventrally in the temporal lobe (which extends below the level of the pyriform lobe) and, most strikingly, enlarged in the region of the anterior and posterior sigmoid gyri, with ansate and cruciate sulci developed in relation to the latter expansion. The anterior sigmoid gyrus is continuous rostrally with a slightly enlarged prorean gyrus, the beginnings of which were seen in *Pseudaelurus*.

Helminths of nine species were identified from 39 cougars obtained in northeastern Oregon (Wallowa, Baker, and Union Counties), viz., *Taenia omissa* Luhe, 1910 (100%); *T. ovis krabbei* Moniez, 1879 (61%); *T. hydatigena* Pallas, 1776 (10%); *Mesocestoides lineatus* Geeze, 1782 (5%); *Toxascaris leonina* von Linstow, 1902 (69%); *Toxocara cati* Schrank, 1788 (15%); *Physaloptera praeputialis* von Linstow, 1889 (13%); *Pterygodermatites affinis* Jagerskiold, 1904 (ca. 2%); and *Trichinella* sp. (larvae) (ca. 2%). In addition, undeveloped cestodes of the genus *Taenia* in 26 animals had lost rostellar hooks and could not be identified. Host records, prevalence, and biological characteristics of some of the helminths are discussed.

The eastern panther roamed New York until about 1890, about the same time that deer became scarce in the region. Since 1871, the state of New York had paid bounties on 99 cougars. The last bounty was paid in 1894, for a puma killed in Hekimer County. A conflicting report states that 107 bounties were paid between 1871 and 1897. The only "recent" evidence of cougar in the northeast was authenticated by a photograph and was shot near Mundeville, Kent County, New Brunswick in March of 1932. Natural history information is provided on the cougar and a few reported sightings are described.

The author interviewed several people whose lives pivot around the cougar. Differing outlooks are presented by a wildlife filmmaker, hunting guide, and staff biologists. Hunting guide, Stan Meholchick, takes only the big toms and the older, non-reproducing females. If a track spans more than 39 inches between paw prints on one side, the guide could be 90 per cent certain that it is a mature male. This guide rotates his hunting areas, usually on a three-year cycle. Maurice Hornocker, research biologist and nationally acclaimed expert on cougars, said that the cougar population had increased in the last 30 years, and may be on the order of 20-40 per cent in the American West. The biggest limitation on cougar populations is habitat loss. Cougars can be successfully reintroduced to the wild and breed well in captivity. After a 50-year absence, cougars are back in Yellowstone Park. There were at least 20 cougars in Yellowstone in the summer of 1989. Many mountain lions from...
adjacent national forests. Hornocker believes that the cougar population can be maintained at its present level if Idaho institutes a statewide quota system that severely limits the number of females harvested. Jim Dutcher, wildlife filmmaker, is making a film about the cougar which had been tentatively titled "Cougar: The Ghost of the Rockies". Hornocker is the film's technical expert and was scheduled to be completed in time for a Fall 1990 showing on the ABC network.


A convulsing 5 year-old intact female mountain lion was presented to the Atlanta Animal Hospital. The lion had been fed only beef livers and kidneys and, occasionally chicken necks for more than a year. The lion weighed 33 kg and had appeared healthy until shortly after deworming with about 1300 mg of piperazine citrate. Treatment and therapy are discussed in detail.


Gastrointestinal helminths including two species of cestodes (Taenia omissa and T. ovis krabbei) and three species of nematodes (Toxocara cati, Cyclicospirura subequalis and Ollulanus tricuspis) are reported from two free-ranging cougars (Felis concolor) in Washington (USA). Ollulanus tricuspis is reported for the first time from cougars and represents the first occurrence of this parasite in a sylvatic felid from North America.


A bounty was placed on the cougar in 1935 until removed and reclassified as a predator in 1961. The cougar achieved game animal status in 1966 and became a trophy class game animal with controlled-permit only hunting seasons in 1987. Cougars are found throughout the state except for dry, open steppe and shrub-steppe areas east of the Cascade Mountains. The population was estimated at 1500 animals statewide. Pursuit only seasons are available for hunters and during these seasons no cougars may be killed. Cougars may only be killed during special permit seasons by permit holders. All permit holders must complete and return a questionnaire after the season or are ineligible to receive a permit the following season. A valid hunting license is required to hunt or pursue a cougar and a hound stamp is required if dogs are used. The pelt must be presented to a State Wildlife Agent or a Department office for sealing within 10 days of the kill. The bag limit is one cougar and it is illegal to kill or possess spotted kittens or an adult accompanied by spotted kittens. Attacks by cougar on domestic animals is not common in Washington and constitutes a minor management concern. High road density and timber harvest are the major habitat concerns for cougar management. An ongoing study has raised concerns about the level of poaching with 44% of the cougars collared since the early 1970's being killed illegally. Washington State does not license or promote guiding.

We present data on 245 mountain lion incidents reported in Montana between July 1989 and July 1995. Incidents were defined as an interaction between mountain lions and humans or livestock, initiated by the mountain lion, that was perceived serious enough to warrant attention by wildlife agencies. Combined incidents increased from 23/yr to 48/yr throughout the period. There were 123 (50.2%) incidents involving livestock and 122 involving humans. The number of livestock incidents increased regularly from 8 in 1989-90 to 35 in 1994-95. Sheep (67%) were most frequently preyed upon by mountain lions followed in rank by horses, goats, cattle, poultry, llamas and rabbits. Human incidents were highest in 1991-92 (n=27) and declined steadily to 14 in 1994-95. The peak time period for both livestock and human incidents was between June and November. Age and physical condition of mountain lions killed in control actions is characterized as young (1-4 yr; 61% less than or equal to 2 yr) and in good condition. There is no difference in either age structure or condition class of lions involved in livestock vs. human incidents. Male mountain lions were involved in significantly more livestock incidents than females, but sex ratios of lions involved in human incidents were not significantly different from 50:50. Livestock incidents occurred in central Montana where sheep production is greatest and in western valleys where there is a greater proportion of hobby ranchers. Human incidents mostly occurred near western intermountain valley communities. A record of the frequency of calls to agencies by people involved in incidents inflates the reporting of actual incidents. We discuss biological, socioeconomic, and policy factors affecting rates of both livestock and human incidents.


We describe research initiated in Montana during 1995 to help reduce the uncertainty associated with decisions concerning mountain lion management in a rapidly changing environment. The American West is experiencing the most massive redistribution of humans since the early land-rush days. Of the 10 US states with the fastest growing human populations, seven are in the West. At the same time, mountain lion populations are reported to be reaching historically high levels in many of these areas. Human-mountain lion interactions are also reported to be increasing and creating difficult choices for people living and working in the region, as well as for agencies responsible for mountain lion management. We use a risk assessment approach that identifies real or objective risks associated with mountain lions and perceived or subjective risks. Both risks have associated benefits and costs to society or management that we are measuring with economic methodology. Socio-economic literature suggests a bimodal distribution of beliefs about such risks, skewed to both over and under estimation of the objective risk. The discrepancy between what the public perceives and those risks that experts believe is scientifically founded creates significant policy dilemmas. Over-estimation of the risk increases management costs. Underestimation may initially lower costs, but creates a potentially volatile whiplash of negative sentiment in the event of low probability-high consequence mountain lion-human interactions. To understand and manage the objective risk, we are comparing distribution and abundance data for mountain lions with variables pertaining to habitat, prey, land-use, humans, policy governing mountain lions, and the historical influence of wolves. For the subjective risk, we are using mail and telephone surveys to gain insights into the knowledge, beliefs, attitudes and underlying assumptions of both the public and wildlife professionals about mountain lions. We are also using an economic method of "expressed preference" to estimate the public's acceptance of risk associated with mountain lions. Results will be formulated into conceptual models as well as an objective feedback management
function based upon historical data but designed for systematic updating.


Accounts of 13 sightings and reports of cougars in the Nipawin area of Saskatchewan from 1934 to 1973 are provided. Two of these reports were those of tracks seen; ten were actual sightings or cougars; and 1 was an assumption of the presence of cougar due to livestock reaction.


The last recorded kill of a cougar in Missouri was in the Mississippi Lowlands in 1927. However, many reported sightings coupled with increased deer numbers indicated that the cougar was present in the state. A member of the Fish and Game Commission's staff spotted a cougar on the Floyd Tower Road north of Shirley in Washington County on May 13, 1955.


A bounty was paid for cougars as early as 1886 and continued until 1959. Until 1967, the mountain lion was unprotected with no restrictions on methods, numbers, or season of take. The history of predator control in Utah is provided and guide and harvest regulations are discussed. Depredation control is one of the biggest management problems concerning the cougar in Utah. Trapping of mountain lions was authorized in Utah until 1971. Results of research indicate that although mountain lions breed year-round, 10 of 16 litters were born from October through December and these kittens were vulnerable to mauling by dogs until several months old. These kittens were likely to be orphaned since they only occasionally accompany the adult female, and therefore, hunters would not know that the female had kittens. Juveniles dispersed at 16 to 19 months of age or late the second winter or spring.


Pursuit permits were for those who did not wish to harvest an animal but who enjoyed pursuing cougars with dogs. Five of 15 states and provincial wildlife agencies presently allowed mountain lion pursuit. The advantages and disadvantages of pursuit seasons are explored and a panel discussion is provided at the end of the paper.


The mountain lion was classified as a predator with no protection prior to 1971 when it achieved protected status. The number of mountain lions in the state was estimated at approximately 2000. Harvest information is collected by means of a pelt tag.
report. The bag limit was one cougar and the killing of a female followed by kittens is illegal.


Information is reviewed concerning the Florida panther population in and near the Everglades National Park (EVER) and Big Cypress National Preserve (BICY). Florida Game and Fresh Water Fish Commission research since 1981 involved the capture and radio-collaring of nine panthers (5 females, 4 males). Three panthers had active collars at the time of this writing. National Park Service research supported a hands-off survey in 1984-85 of EVER and BICY for signs of Florida panthers. The size of the surviving adult population continued to be about 30 panthers. From 1981-1985, 12 adults were known to have been removed from the population (11 killed, 1 injured) and recruitment of young into the population appeared to have failed to replace these adults (8 young recorded). Although sex ratios are approximately 1:1, the population is strongly skewed toward old animals, reflecting inadequate recruitment. Most adults have an extensive history of exposure to feline distemper (panleukopenia) virus, which may be killing kittens and may be responsible for this low recruitment. White-tailed deer and feral hogs are the principal prey species as determined by scat analysis. There is strong indication that Florida panthers have decreased markedly since the early 1980's in the Fakahatchee Strand, in BICY south of Alligator Alley and in EVER, west of Shark River Slough, an area comprising more than 75 percent of the known range. Possible future research parameters are presented.


A food habits study of the cougar was conducted in Utah and eastern Nevada from 1946 to 1958. A total of 227 intestinal tracts and scats and 401 stomachs were collected, but only 275 stomachs contained food. Deer (Odocoileus hemionus) was the all important food species. Next in importance were the porcupine and domestic sheep, followed by a number of lesser important species such as beaver, cottontail, hare, marmot, packrat, skunk, horse, domestic cow, dog, goat, bobcat, unidentified bird, ground squirrel, coyote, pocket mouse, elk, and grasses. Deer constituted 77% by weight of the cougar's winter diet and 64% of the summer diet by frequency of occurrence. Of 186 cougar-killed deer examined, a higher proportion of bucks to does were taken during the winter. Two possible explanations were that bucks were less wary during the rutting season of November and December, and that following the rut, many bucks prefer ledgy, broken terrain, which is also the preferred habitat of the cougar. Fifteen recorded distances over which cougars were noted to drag deer averaged 305 feet, with a range of 16 to 1,100 feet. The first feeding is commonly from the liver, heart, and lungs through an opening sheared in the ribs. The porcupine made up 8.8% by weight of the cougar's winter diet and 19% by frequency of occurrence from scat and intestinal samples for both winter and summer. A cougar kills a deer every 4-10 days and averages one deer per week in the cool winter months. It is possible that the kill could be greater in the summer months due to the increased likelihood of tainted or spoiled meat. A number of observations on the hunting habits of cougars are presented.


Records collected principally from 1946 through 1958 in Utah and Nevada have shown that the cougar may have young any month of the year. However, birth months, as determined by reference of juvenile weights from 145 litters to a growth rate curve, indicated that about 60% of the litters were probably born from June through September with a peak in July. The highest incidence of pregnancy for 199 mature females was in June and July. Forty percent of 299 females had young at the time of capture. Evidence is presented that some females apparently have young as often as 12-15 months, but a 2-year interval appeared the rule. Most young apparently remain with their mothers for at least a year. The average size of 258 postnatal litters was 2.9 (range, 1-5) and of 66 prenatal litters was 3.4 (range, 1-6). Females 80 pounds and over were considered mature. The average weight of 50 females was 94 pounds (range, 80-132). Males 125 pounds and over were considered mature. The average weight of 34 males was 156 pounds (range, 125-192). The two largest weights of males on record were 204 and 265 pounds with the intestines removed.


The published material on the chromosome morphology of felid species is reviewed. In relationship to the puma, the karyological data is reported as: haploid number-19; metacentric and submetacentric chromosomes-18; acrocentric and submetacentric chromosomes-0; number of chromosome arms-37. Five distinctive karyotypes are recognizable in the Felidae.


The puma has a haploid chromosome number of 19, with 18 meta- and submetacentric chromosomes and one acro-and subacrocentric chromosome, with a total of 37 chromosome arms. Three mutant genes are listed as probable and are defined in the text.


Known panther (Felis concolor coryi) populations in Collier, Hendry, Glades and Palm Beach Counties were monitored. Techniques involving the simultaneous survey of all parts of an area by a team consisting of at least one person to evaluate sign found and others who can consistently recognize panther sign when it is present were evaluated. Habitat used by panthers was monitored and input provided on proposed land use changes and on proposed land acquisition.


An 8-month-old intact female Western cougar (Felis concolor) was examined for vomiting, periodic regurgitation, and failure to thrive. Physical examination revealed a thin but otherwise normal animal. Survey radiographs revealed a large, saccular dilatation of the esophagus in the cranial thorax. Nonselective angiography identified a vascular ring anomaly constricting the esophagus at the heart base compatible with persistent right aortic arch (PRAA). The ligamentum arteriosum was ligated and

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divided through a left fourth intercostal thoracotomy. Recovery was uneventful. Two months after surgery the cougar had gained 9kg and had experienced no further episodes of regurgitation. Persistent right aortic arch is the most common vascular ring anomaly reported in domestic cats; however, PRAA has not been reported in nondomestic felids. The presentation of the disorder in this cougar and its management were identical to that reported for domestic dogs and cats.


During January to March of 1984 and 1985, four Florida panthers (Felis concolor coryi) were immobilized in the Fakahatchee Strand for the purposes of radiocollaring and collection of biomedical information. During immobilization, each panther’s physical and reproductive condition were evaluated and samples of blood, feces, urine, ectoparasites, and skin biopsies were collected and subsequently processed. The most relevant findings were: 1) moderate to poor physical condition and anemia in females; 2) depressed serum iron levels; 3) gastrointestinal infection with nematodes, cestodes, and trematodes; 4) acarasis; 5) microfilaremia; 6) hyperproteinemia, and the prevalence of antibody titers to parovirus and calicivirus. Forensic studies were conducted on six dead panthers. Three were hit by cars, two were illegally killed by gun shot, and one was presumed killed by another panther. Aging studies of panthers based on radiographs of cadavers and skeletal elements also were initiated. Accumulative panther mortality was examined for causes, frequency and seasonality. Seroepidemiologic studies of small carnivores were initiated. One-hundred road-killed and hunter taken specimens of bobcats, raccoons, otters, everglades mink, feral cats and grey foxes were collected and frozen for future analysis. Serum from wildlife serum banks and a limited number of carcasses indicated that bobcats, raccoons, and otters are potential reservoir hosts for parovirus. Biomedical studies were conducted on a captive Florida panther which survived fractures incurred from a traffic accident. Successful orthopedic surgery and follow up medical support was provided by staff members of the Veterinary Medical Teaching Hospital, University of Florida. The areas of additional study included: a) hematologic and clinical chemistry determinations; b) evaluation of immune response to killed feline viral vaccine; c) evaluation of the chemotherapeutic treatment for parasites; d) development of techniques for ejaculation and cryopreservation of panther semen; and e) collection of samples for future genetic evaluation.


Between January and May, 1986, seven individual Florida panthers were successfully immobilized or treed ten different times for the purposes of radiocollaring and collection of biomedical information. Several significant reproductive events were documented this year. A 5-7 month old panther kitten, born to #09 female was captured. A newly captured female (#11) conceived a pregnancy only three weeks after radio-collaring. She was impregnated by a male who had also been immobilized only one week prior and is now rearing the second documented litter in the Bear Island area. The older Fakahatchee female (#08) was in poor physical condition, anemic, and has failed to produce any documented surviving offspring in the past three years despite periodic association with males. indicating cyclical
reproductive activity. Semen from four male panthers examined all exhibit a very high percentage of abnormal spermatozoa, 94%. The significance of these male seminal traits with respect to reproductive success or genetic "health" is yet to be examined. The physical condition, body weight, and blood and serum indices (hematology and serum iron) all indicate that the three newly captured panthers utilizing Bear Island and the private lands north and west are in better health than the previously studied Southern Fakahatchee Strand (SFS) panthers. This appears to be highly associated with the type of prey taken in the respective areas as indicated by scat analysis. The panthers living primarily north of Alligator Alley in the Fakahatchee Strand, Bear Island Unit of BCNP, and private ranches to the North are deriving 83% of their diet from large prey species. Conversely, those panthers living in the SFS derive only 18% of their diet from these species and are instead feeding primarily on raccoon (45%), armadillo (16%), and panther (11%). Sero-epidemiologic studies of Florida panthers has revealed that 89% of 18 animals were positive for feline panleukopenia virus antibodies (FPL) and 50% were positive for feline calcivirus antibodies (FCV). In 58 south Florida bobcats, 48% were positive for FPL and 27% were positive for FCV. Additionally raccoons (43%), otters (13%), and grey fox (8%) indicate that they may all be involved with the circulation of parvovirus in the wild carnivore populations.


Biomedical investigations have revealed an array of extremely serious problems facing the Florida panther Felis concolor coryi. Diseases such as feline panleukopenia and calcivirus, as well as hookworm have been documented. An inadequate prey base, resulting in malnutrition in some panthers, may be acting in combination with diseases and parasites to the detriment of the panther population. The effects of inbreeding may be having a negative impact; this is most evident in potential reproductive problems in males. In addition, known highway mortalities, at least partly as a result of continuously increasing traffic, seem to be claiming a disproportionate number of young animals.


Between January and May, 1986, seven individual Florida panthers were successfully immobilized or treed ten different times for the purposes of radiocollaring and collection of biomedical information. Several significant reproductive events were documented this year. A 5-7 month old panther kitten, born to #09 female was captured. A newly captured female (#11) conceived a pregnancy only three weeks after radio-collaring. She was impregnated by a male who had also been immobilized only one week prior and is now rearing the second documented litter in the Bear Island area. The older Fakahatchee female (#08) was in poor physical condition, anemic, and has failed to produce any documented surviving offspring in the past three years despite periodic association with males, indicating cyclical reproductive activity. Semen from four male panthers examined all exhibit a very high percentage of abnormal spermatozoa, 94%. The significance of these male seminal traits with respect to reproductive success or genetic "health" is yet to be examined. The physical condition, body weight, and blood and serum indices (hematology and serum iron) all indicate that the three newly captured panthers
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Between November 1986 and June 1987, twelve individual Florida panthers (Felis concolor coryi) were successfully immobilized twenty different times for the purposes of radio-collaring and collection of biomedical information. One hundred fifty-two field days resulted in radio-collaring 6 new panthers in the Everglades National Park (ENP) and 3 new adults on private ranches (PR) north of the Bear Island Unit, Big Cypress National Preserve (BI/BCNP). The physical condition, body weight, and blood and serum indices all indicate that the panthers utilizing the PR's were in excellent health and considerably heavier than those previously studied in the Fakahatchee Strand State Preserve (FSSP): PR male weight x=141.5, s.d. = 0.7; FSSP males weight x=115, s.d. = 6.0. This north/south "health cline" continues to be highly associated with the type and abundance of prey taken in the respective areas as indicated by scat analysis. The ENP panthers were in moderate physical condition with hematology values in the low normal range for cougars. Four wild panthers were taken into captivity and successfully rehabilitated: #08F FSSP was anemic and in poor physical condition (66 lbs.); #09 female had a gun shot wound with osteomyelitis in her hind foot; #20 male was hit by a car; and #23 was orphaned and anorectic for 10 days. Morphological examination of semen from two new male panthers were strikingly similar to the four previously tested, all males exhibit a very high percentage of abnormal spermatozoa, x=92.9%, s.d. = 2.2. The significance of these male seminal traits with respect to reproductive success and genetic "health" is yet to be determined. Florida panthers are exposed to feline panleukopenia virus (FPL) (22 of 28 = 85%) and feline calicivirus (14 of 28 = 50%). However, the prevalence and intensity of exposure to FPL is considerably less on the PR's and almost nonexistent in the ENP compared to the FSSP/BI. A cougar population genetics study was initiated utilizing isozyme electrophoretic techniques. Preliminary data indicate that the species has abundant genetic diversity (minimum of 9 polymorphic loci) but F. c. coryi has less diversity than other wild subspecies examined. However, further research needs to be conducted before a definitive conclusion can be made.


Fourteen individual Florida panthers (Felis concolor coryi) were successfully immobilized for the purposes of radio-collaring and collection of biomedical information and/or for removal from the wild for rehabilitation. One hundred and five field days resulted in radio-collaring four new panthers. The physical condition.
body weight, reproductive status, and blood and serum values all indicate that the
panthers utilizing the private lands adjacent to the Bear Island Unit, Big Cypress
National Preserve were in excellent health and in better condition than those
previously studied in the Fakahatchee Strand State Preserve (FSSP). This north/south
"health cline" continues to be associated with the type and abundance of prey taken.
Seven panthers have died since December 1987 and human activity is responsible for
the majority of all documented panther deaths (road killed 52%, illegally killed
15%). Seventy-five percent of all Florida panthers were exposed to feline
panleukopenia virus, however, the prevalence was significantly higher in the
FSSP/Big Cypress Swamp ecosystem than in the Everglades National Park (p<0.05).
Panthers were also exposed to feline calicivirus (56%) but there was no significant
difference in prevalence by location (p>0.05). In addition to the above two viruses,
 bobcats have antibodies to feline rhinotracheitis virus, which has not been reported in
wild Florida felids before. In vitro fertilization experiments produced 141 oocytes
(eggs) from seven female cougars. Following insemination, ten cleaved embryos
resulted, including one sired by a captive Florida panther, which were transferred to
two recipient females. Preliminary data from the panther/cougar population genetics
study reveal that the species has abundant genetic diversity (minimum of 11
polymorphic loci), but F. c. coryi has fewer polymorphic loci than other wild
subspecies examined. The results of the genetic study coupled with an increase in
abnormal male reproductive traits (>90% abnormal spermatozoa and 33%
cryptorchidism) raise serious concern for the reproductive potential and genetic
health of this subspecies.

1988. Demographic, Genetic and Reproductive Peril of the Endangered Florida
Panther (Felis concolor coryi). Pg. 55 In: R.H. Smith (ed.), Proc. of the Third
Mountain Lion Workshop. Arizona Chapter, The Wildlife Society and Arizona
Game and Fish Department, Prescott, Arizona. 88pp.

The endangered Florida panther (Felis concolor coryi), declared the state mammal of
Florida in 1982, is estimated to number less than fifty individuals and currently is
protected under both state and federal endangered species statutes. This remnant
population of the subspecies that once occupied the entire southeastern United States
is now isolated in the remote cypress swamps and hardwood hammocks of southern
Florida, primarily in the Big Cypress Swamp and Everglades ecosystems. Human
population growth in southern Florida with the concomitant loss of suitable panther
habitat is the major threat to the continued survival of this rare mammal. Further,
direct human contact is responsible for the majority of documented panther deaths.
Road kill and illegal kill account for 67% of 35 known panther deaths since 1973.
The existing population of panthers is extremely vulnerable to demographic
catastrophes such as diseases or natural disasters that could drive the subspecies to
extinction. Further, with the current small population size, loss of genetic diversity is
inevitable. Before informed management decisions can be made with regard to the
maintenance of existing heterozygosity or perhaps enhancement through the
introduction of new genetic material from another cougar population, we need to
determine existing levels of diversity in the Florida panther compared to several other
out-bred, healthy populations of free-ranging cougars. A population genetics study of
Felis concolor was initiated in January of 1984 and thus far 115 individuals,
representing eight different subspecies, plus zoo stock of unknown origin, have been
analyzed using starch and acrylimide protein gel electrophoresis. Preliminary data
reveal that the species has abundant genetic diversity, 22% polymorphism (40 loci
examined thus far), but F. c. coryi has fewer polymorphic loci (7.5%) and the lowest
heterozygosity of all other wild subspecies examined. The results of the genetic
study coupled with an increase in abnormal male reproductive traits (90% abnormal
spermatozoa and 33% cryptorchidism) raise serious concern for the reproductive potential and genetic health of this subspecies. In vitro fertilization experiments were initiated in the spring 1988 and produced 141 oocytes (eggs) from seven female cougars. Following insemination, ten cleaved embryos resulted, including one sired by a captive Florida panther, which were transferred to two recipient females. No live young were produced. However, this technique shows distinct promise as a tool to augment the captive breeding efforts with this subspecies by utilizing non-endangered surrogate females to carry Florida panther young.


Eighteen individual Florida panthers (Felis concolor coryi) were captured 26 times and 15 were immobilized for the purposes of radio-collaring and collection of biomedical information and/or for removal from the wild for rehabilitation. One hundred and twenty-eight field days resulted in radio-collaring 6 new panthers. Two panthers were hit by cars and survived, one of which was rehabilitated and released to the wild, the other is still receiving treatment in captivity. One additional panther was successfully released back into the Everglades National Park after 11 months in captivity. Five panthers have died since July, 1988: human activity is responsible for the majority of all documented panther deaths (road killed 54%, illegally killed 14%). Florida panthers were exposed to feline panleukopenia virus (FPV) (65%) and feline calicivirus (FCV) (43%); the prevalence of FPV was significantly higher in the Fakahatchee Strand/Big Cypress Swamp ecosystem than in the Everglades National Park (p<0.05). However, there was no significant difference in prevalence of FCV by location (p>-0.05). Antibodies to 2 new potentially pathogenic viral agents were identified this year--feline immunodeficiency virus and corona virus. The significance of these viruses in free-ranging panthers is yet to be determined. Preliminary data from the panther/cougar population genetics study reveal that F. concolor has abundant genetic diversity (minimum of 11 polymorphic loci), but F. c. coryi has fewer polymorphic loci than other wild subspecies examined. The results of the genetic study coupled with an increase in abnormal male reproductive traits (>90% abnormal spermatozoa and 47% cryptorchidism) raise serious concern for the reproductive potential and genetic health of this subspecies.


Veterinary medical management has improved the safety of Florida panther (Felis concolor coryi) immobilizations. Since veterinary involvement began in January of 1983, 89 immobilizations involving 40 individuals have been accomplished with one possible capture mortality. The veterinary medical team has been involved in all Florida panther captures by the 2 agencies conducting panther research, the Florida Game and Fresh Water Fish Commission (GFC) and the National Park Service. The physical condition, body weight, reproductive status, and hematologic and serum values all indicate that the panthers utilizing land north of State Road 84, particularly the private ranches east of Immokalee, the Florida Panther National Wildlife Refuge, Bear Island Unit of the Big Cypress National Preserve (BCNP), and adjacent ranches were in excellent health and in better condition than those in the Everglades National Park (ENP) or Fakahatchee Strand State Preserve (FSSP). The north/south "health cline" in southwestern Florida appears to be associated with the type and abundance of prey taken. Nine panthers have been rescued and removed from the wild due to injuries or illness: 4 were successfully rehabilitated and released back to the wild. 3
did not survive because of the severity of their injuries or illness, and 2 are still receiving treatment in captivity or are permanent residents. Twenty panther deaths have been documented since 1 July 1986, and human activity continues to be responsible for the majority of all documented panther deaths (road killed, 46.5%; illegally killed, 16.3%). Other important causes of mortality are intraspecific aggression (11.6%) and disease (9.2%). Serologic evidence from 51 different Florida panthers indicates that they were exposed to or are infected with several potentially pathogenic agents: feline panleukopenia virus (FPV) (65%), feline calicivirus (FCV) (43%), feline enteric corona virus/feline infectious peritonitis virus (23%), feline immunodeficiency virus (25.6%), rabies virus (26%), feline syncytia-forming virus (FeSFV) (33.3%), Toxoplasma gondii (8.0%) and Brucella sp. (2.4%). All were negative for pseudorabies virus (PRV), feline leukemia virus, and feline viral rhinotracheitis virus (FVRV). The prevalence of FPV was significantly higher in the FS/Big Cypress Swamp (BCS) ecosystem than in the ENP (p< 0.05). However, there was no significant difference in prevalence of FCV by location (p>0.05). The significance of many of these agents in free-ranging panthers is yet to be determined, but an unvaccinated panther died of a raccoon rabies virus. We believe that this is the first documented case of rabies in a wild cougar. A serosurvey of bobcats (n=113) indicated that they have been exposed to FPV (44.2%), FCU (33%), FVRV (9.3%), and Toxoplasma gondii (7.1%). One hundred fifty-five other carnivores were tested for FPV antibodies, positive animals included otter (13.2%), raccoon (43.0%), and grey fox (8.3%). One hundred sixty-six non-panther carnivore sera were screened for PRV, and only raccoon (3 of 57) and black bear (2 of 20) were positive. Cytauxzoon felis was documented in both free-ranging Florida panthers and bobcats. Mercury was identified as a significant contaminant in free-ranging panthers, particularly those living on the ENP and the FSSP. Mercury was strongly implicated in the death of one female panther in the ENP with a liver mercury level of 110 ppm (wet weight). In vitro fertilization experiments produced 141 oocytes (eggs) from seven female cougars. Following insemination, ten cleaved embryos resulted, including one sired by a captive Florida panther. Transfer of the embryos to two recipient females did not result in any live births. Results from a population genetics study of Felis concolor reveal that the species has abundant genetic diversity (minimum of 11 of 41 loci are polymorphic (P), allozyme analysis, but E. g. coryi has fewer polymorphic loci (7.5%) and lower heterozygosity (0.019) than other wild subspecies examined. The results of the genetic study coupled with an increase in abnormal male reproductive traits (>90% abnormal spermatozoa and 44.4% cryptorchidism) raise serious concern for the reproductive potential and genetic health of the subspecies. Mitochondrial DNA (mtDNA) analysis of 8 North American (NA) and 3 South American (SA) subspecies of puma indicates that two groups, or clades, can be discriminated; a NA clade and a SA clade. Further, the mtDNA study has revealed a partitioning of the Florida panther into two populations with differing maternal evolutionary histories; the BCS population is largely descended from NA, historic E. g. coryi animals and the mtDNA of the ENP population is derived from Central American (CA) or SA cougars. It is possible that this introduction of foreign genetic material is the result of non-coryi cougar releases which occurred in the ENP between 1957-1967. The Florida panther may have benefitted from this introgression of SA or CA genes in that the incidence of cryptorchidism is zero in males with ENP mtDNA as compared to 63% of the males with BCS mtDNA.


Due to mercury (Hg) contamination, the entire Everglades watershed in southern
Florida has been closed to the hunting of alligators (Alligator mississippiensis), and health advisories have been issued to curtail consumption of largemouth bass (Micropterus salmoides). Other species of fish in Florida, and more recently, shark flesh, have also been determined to be contaminated at levels above those recommended by consumption by the Florida Department of Health and Rehabilitative Services (0.5-1.5 ppm wet wt., consumption no more than once per week by healthy nonpregnant adults; >1.5 ppm, no human consumption). As a result of the death of an apparently healthy, radio-collared female Florida panther (Felis concolor coryi) in Everglades National Park (ENP) in summer 1989, we began to investigate contaminant impacts on this endangered species. Examination of the dead female revealed relatively high Hg concentration (110 wet wt.) in the liver. This was comparable with levels (37-145 ppm) found to be lethal to feral cats in Minimata, Japan. Analysis of hair and blood from the dead panther revealed Hg concentrations of 130 and 21 ppm, respectively, in these tissues. The panther, a top mammalian carnivore in southern Florida, primarily preys on white-tailed deer (Odocoileus virginianus) and feral hogs (Sus scrofa). However, in some areas they also consume various small mammals, including raccoons (Procyon lotor), armadillos (Dasypus novemcinctus), and rabbits (Sylvilagus sp.) as a significant part of their diet. Therefore, we believed it was necessary not only to study Hg contamination of panthers, but of alternate prey species (raccoons) as well. Tissue samples from 52 free-ranging panthers, primarily those living in the Big Cypress Swamp and Everglades ecosystems, were collected opportunistically between 1978 and 1991. Whole blood and hair were routinely collected from living animals (n=43); liver, hair and blood were collected from dead animals at necropsy (n=21; 12 of those also sampled when alive). Six raccoons were also collected from each of 7 different sites within representative panther habitat. Muscle (caudal thigh) tissue from each of these animals was analyzed for Hg content. The majority of reports for Hg in wildlife usually present organ data only, rarely including antemortem samples such as hair and whole blood. The total Hg values for liver samples for dead panthers are presented by location. When these data are examined by location and age, striking differences are noted. The mean liver Hg level for the younger group of panthers (less than 8 years old) living in southeastern Florida was significantly higher (p=0.024; geometric mean (GM)(east)=25.8 ppm, GM (west)=0.304 ppm, 5df) than panther samples in southwestern Florida. If only the western group is considered, older animals had significantly higher liver Hg levels than did younger ones (p=0.029; GM(old)=14.6 ppm, GM(young)=0.304 ppm, 5df). The Hg burden was much higher among older animals living in the Fakahatchee Strand State Preserve (FS; 19-20 ppm) than the single animal living north of Alligator Alley (NA; 7.8 ppm). It should be noted that we have not sampled any older panthers in the eastern portion of the range due either to random chance or possibly to an absence of older animals there. The pattern of distribution by location for hair (H) and whole blood (WB) was similar to liver. Average levels of Hg in WB and H were greatest in panthers from the eastern portion of the range, particularly from the Shark River Slough (SS) area (WB=1.986 ppm, H=55.532 ppm). Lowest values were noted in panthers from western Florida (NA; mean=0.089 and 1.77 ppm, respectively; p<0.001). Panthers from Pine Island (PI) in ENP, FS, and Raccoon Point (RP) in eastern Big Cypress National Preserve all had H and WB levels significantly higher (p<0.01) than those in NA. Reproductive success in female panthers appeared to be adversely affected by elevated Hg levels. There was a significant reduction (p<0.01) in the number of surviving kittens for females with WB Hg values >0.5 ppm (mean=0.167 kittens/female yr) compared to those females with 0.00-0.25 ppm WB Hg values (mean 1.46 kittens/female yr). Mercury passes through the placenta and is concentrated at higher levels in the fetus than occurs in the mother. Disruption of normal fetal development by Hg has been documented to cause abortions, stillbirths, congenital anomalies and behavioral changes resulting in early neonatal death. The
most probable source of Hg contamination in panthers is via the food chain. The panthers in NA had the lowest levels of blood, hair and liver Hg and feed primarily on the white-tailed deer and feral hog that occur at high densities on these largely private and protected lands. Although nothing is known about tissue Hg levels in the hog, Hg has been found to be less than 1.0 ppm in liver samples from approximately 100 southern Florida deer. Panthers with the highest levels of tissue Hg were those which regularly consumed nonungulates--primarily raccoons, armadillos, rabbits, and for a couple of adult male panthers, alligators. The index panther case fed only on small prey during the 17 months that she was monitored. Of 12 kills recovered, all were raccoons. Mercury in the muscle of raccoons varied markedly between the different watersheds and habitats across the panther's range in southern Florida. Relative Hg levels in raccoon muscle were very similar to those observed for blood from panthers from the same locations. The above scenario suggests that the raccoon can be used as an indicator species for Hg contamination of the environment. Further, it predicts that if the preferred prey base for the panther is not abundant and the substitute food source is polluted (such as with Hg in the raccoon or alligator), then the panther can be expected to bioaccumulate Hg. The subsequent problem(s) for the panther will be commensurate with the magnitude of Hg in the prey of any given location and with the extent to which the panther must rely on that prey to complement its diet. This paper presents the magnitude and distribution of Hg levels in free-ranging Florida panthers sampled over the past 13 years. The data suggest that the consumption of nonungulate prey, principally raccoons and alligators, is the significant inverse relationship between the levels of Hg found in whole blood and the reproductive success of female panthers. Chronic exposure to Hg is probably responsible for lower than expected population densities of panthers in large portions of their range due to frank mortality and lowered reproductive success, and thus is contributing to the extinction of this endangered mammal.


Samples were collected from live-captured and necropsied panthers. Several agents were determined to be present in the population: feline panleukopenia virus (FPLV), feline calicivirus (FCV), and feline peritonitis virus/feline enteric corona virus (FIP/FECV) (low titers only), T. gondii, and Dirofilaria microfilaria (probably D. striata). Serologic data indicated that the majority of panthers had been exposed to FPLV (64% with positive titers of 1:50, or greater), and many had very high antibody titers (up to, or >1:10,000). Several other important infectious disease agents have been identified. Rabies virus caused the death of one panther in 1989 and retrospective analysis of banked serum revealed that nearly 30% of the population had previously encountered rabies virus and survived (titers greater than or equal to 0.6 IU/ml). Feline immunodeficiency virus (FIV) was found in 25% of the population and feline syncytia-forming virus was also discovered. Other agents were discovered during routine histopathologic (Sarcocystis sp.), parasitologic (Toxocara sp., Giardia sp.) or microbiologic (fecal pathogen: Campylobacter sp., Salmonella sp.) examinations. Four disease agents were identified that met criteria of pathogenicity and ease of control: rabies virus, panleukopenia virus, calicivirus, and the hookworm Ancylostoma pleuridentatum. Three important, non-treatable, infectious disease agents in the wild were identified which have the potential to cause morbidity and/or mortality in captive felids: FIP/FECV, Cytauxzoon felis, and FIV. The FIP/FECV titers documented were exceedingly low (generally 1:25) and are not thought to be of serious concern. To manage C. felis, all ticks are removed during the initial immobilization and blood smears are examined for infection with the
protozoan. The significance of FIV to the wild panther population and the potential impact on other captive felids is unknown at this time. All kittens selected for the captive breeding program are tested for FIV in the field so that no FIV positive animal is brought into captivity.


Habitat loss continues to be the greatest threat to extinction for the Florida panther. The core breeding population now occupies an area of approximately 2.2 million acres and only 55% of this area is protected in state and federal ownership. Acreage devoted to citrus production in prime panther habitat has increased by approximately 400% in Collier and Hendry counties during the last 20 years. Human population in Collier County continues to be the fastest growing area in the nation. Daily traffic counts on Interstate 75, running through the center of panther habitat, have increased by 220% in the past 10 years. The entire Everglades National Park is currently inhabited by only one adult male panther. The most significant causes of mortality in panthers from 1972-1990 were; automobile trauma (46.6%), illegal kills/injury (16.3%), and intraspecific aggression (11.6%). An attempt is being made to manage a minimum habitat size and maintain a maximum population density of Florida panthers. Computer modeling is underway to define the minimum threshold needed to support Florida panthers. Negotiations for additional land acquisition continue at an increasing rate. Research on developing technology for assisted reproductive techniques appears promising. Captive breeding facilities have been established and the transfer of wild born animals to these facilities is underway. Efforts to identify unoccupied historic range sites for future reintroduction are in progress. Even as the situation appears to be worsening, some hope for the future still perseveres.


SUMMARY

The endangered Florida panther (Felis concolor coryi), declared the state mammal of Florida in 1982, is estimated to number fewer than 50 individuals and currently is protected under both state and federal endangered species statutes. This remnant population of the subspecies once occupied the entire southeastern United States. Now it is isolated in the remote cypress swamps and hardwood hammocks of southern Florida, primarily in the Big Cypress Swamp and Everglades ecosystems. Human population growth in southern Florida with the concomitant loss of suitable panther habitat is the major threat to the continued survival of this rare mammal. The core breeding population lives largely on privately-owned ranches, the northern portion of the Big Cypress National Preserve (BCNP) and the Florida Panther National Wildlife Refuge. The privately-owned land presently is unprotected and is particularly vulnerable to development. The population of panthers in this area is at carrying capacity with little opportunity for animals to disperse into suitable buffer zones. Consequently, intraspecific aggression appears to be increasing and now constitutes the major cause of mortality. The breeding population of panthers in the Everglades National Park (ENP; n=7 in 1988) now is functionally extinct. The one surviving male resides primarily in the BCNP and makes only periodic forays into the ENP. There currently are only 3 known panthers in the BCNP. Intensive hunting and tract surveys on these publicly-owned lands (> 120,000 acres) have not identified
any additional animals in the area. Presently there are 3 ongoing radio-telemetry studies of the panther, one under the direction of the Florida Game and Fresh Water Fish Commission \(n=19\) panthers and 2 with the National Park Service \(n=4\). The primary thrust of the field work is to understand the natural history, food habits, social structure and critical habitat requirements of the subspecies. As an integral part of the field work, veterinary protocols have been established for handling and anesthesia of free-ranging panthers to minimize capture-related injury and mortality. Additionally, biomedical studies are being conducted in the areas of health, clinical pathology, infectious disease, reproduction, genetics and environmental contaminants. A summary of major findings is as follows. Serological evidence from 51 individual Florida panthers indicated that this subspecies has been exposed to, or is infected with, several potentially pathogenic agents including feline panleukopenia virus \(65\%\), feline calicivirus \(FCV; 43\%\), feline enteric corona virus/feline infectious peritonitis virus \(23\%\), feline immunodeficiency virus \(FIV; 25.6\%\), rabies virus \(26\%\), feline syncytia-forming virus \(FSFV; 33.3\%\), *Toxoplasma gondii* \(8.0\%\) and *Brucella* sp. \(2.4\%\). All panthers have been negative for pseudorabies virus, feline leukemia virus and feline viral rhinotracheitis virus. Rabies virus \(raccoon strain\) was isolated from an unvaccinated panther that died of rabies \(Rupretch,\ unpublished\ data\). This probably is the first documented case of rabies in a wild cougar. A puma lentivirus \(FIV\) has been isolated successfully \(Olmsted,\ unpublished\ data\). Mercury has been identified as a significant contaminant in free-ranging panthers and raccoons. Those animals with particularly high concentrations were found in the Shark River Slough of the Everglades National Park and adjacent wetlands. Panthers with elevated concentrations of mercury occur where non-ungulate prey is consumed as part or all of the diet \(raccoon is probably the primary source of mercury\). Mercury levels in panthers living in the Fakahatchee Strand State Preserve have decreased \(P<0.01\) since the fall of 1987 when land management actions were initiated to enhance deer density. Females with elevated mercury had poorer reproductive success than those with low mercury concentrations. Analysis of panther electroejaculates revealed semen samples of lower volume and sperm concentration \(compared to other puma subspecies\) with poor sperm motility and >90% abnormal sperm forms. Seventy-five percent \(9 of 12\) of free-living males that were examined were unilaterally cryptorchid. These unusual male reproductive traits very likely are due to inbreeding. The occurrence of heart defects \(atrial septal defects, n=2;\ tricuspid valve dysplasia, n=1\) also support the notion that a general loss in genetic diversity is influencing the physiological health of the subspecies. Mitochondrial DNA \(mtDNA\) analysis of 8 North American and 3 South American subspecies of puma indicates that 2 groups, or clades, can be discriminated, one in North America and another in South America. Further, the mtDNA study has revealed a partitioning of the Florida panther into 2 populations with differing maternal evolutionary histories. The Big Cypress population largely is descended from historic *P. c. coryi* animals \(North America\), and the mtDNA of the ENP population is derived from non-North American cougars. It is possible that this introduction of foreign genetic material is the result of non-coryi puma releases that occurred in the ENP between 1957 and 1967. The Florida panther may have benefited from this introgression in that the incidence of cryptorchidism is zero in males with ENP mtDNA as compared to 63% of the males with historic mtDNA. A captive breeding program was initiated in February 1991 with the capture of 6 juvenile animals \(6 to 8 months old\). Thus far in 1992 one 10 month old kitten has been added to the captive population. Twenty-seven founders were identified as potential contributors to the captive breeding program. Between 1989 and 1991, 13\(48\%)\) of these founders died, only 2 of which have offspring in captivity. Six of the remaining living founders now are represented in captivity by 3 kittens. There are several crucial and immediate actions that could help alleviate the above problems before the Florida panther suffers further loss and potential extinction. 1. Secure
vulnerable habitat, especially on private lands in Collier and Hendry Counties; 2. Proceed with the captive breeding program as planned; 3. Maximize preservation of gametes to help preserve current genetic diversity; 4. Pursue assisted reproductive technologies that will contribute to points 2 and 3; 5. Thoroughly study the incidence of mercury in the ENP, east Everglades and southern BCNP and continue to study the dynamics of mercury in the ecosystem; 6. Support the possibility of introducing surrogate, nonendangered pumas, into the ENP to determine the effects of mercury on puma physiology.


Serum samples obtained from 38 free-ranging Florida panthers (Felis concolor coryi) in southern Florida, March 1978 through February 1991, were tested for antibodies against eight bacterial, parasitic, and viral disease agents. Sera were positive for antibodies against feline panleukopenia virus (FPV) (78%), feline calicivirus (56%), feline immunodeficiency virus/puma lentivirus (37%), feline enteric coronavirus/feline infectious peritonitis virus (19%), and Toxoplasma gondii (9%). All samples were seronegative for Brucella spp., feline rhinotracheitis virus, and pseudorabies virus. In addition, all the animals tested were negative for feline leukemia virus p27 antigen as determined by enzyme-linked immunosorbent assay. Feline panleukopenia virus was considered to be a potentially significant disease agent; FPV antibodies occurred in the highest prevalences in older age classes (P = 0.096). Because <50 animals remain in this relict population and the probable resultant depression of genetic diversity and lowered disease resistance, FPV or other disease agents could contribute to the extinction of this endangered subspecies.


Information on the weights of two female pumas at 4 days and 11 days which were neglected by the mother are furnished as well as formula used (Esbilac) and amounts given.


Surveys for Florida panther (Felis concolor coryi) sign were conducted between April 1984 and March 1987 at Fisheating Creek, Glades County, and Corkscrew Swamp, Collier County. Sign was encountered regularly at Fisheating Creek and sporadically at Corkscrew Swamp. A search method involving weekly surveys from an all-terrain cycle was preferred over pick-up truck surveys.


The mountain lion was relatively abundant in Wyoming around 1900. From 1894-1914, a total of 111 lions were taken in Yellowstone National Park for predator control purposes. This predator control program continued until 1934 but no kill figures were available. It was estimated that at least a dozen lions still exist in Yellowstone, mostly confined in the northern portion of the park. The author cites examples of mountain lion sightings and killings reported primarily by game wardens in Wyoming.
The results of the 1984-85 cougar hunt and harvest in Alberta were summarized from compulsory registration forms. Cougar skulls submitted were aged and measured. Cougar license sales in 1984-85 (150) increased from 1983-84. Cougar hunting was permitted in parts of the Province for 67 days in the fall season (no dogs allowed) and 27 days in the winter season (dogs allowed). Thirty-nine cougars (19 females and 20 males) were legally harvested in the entire season with residents accounting for 87% of the kills. This represented a 39% increase in the cougar harvest from 1983-84 and was 30% greater than the 11 year average of 30 kills per year from 1973 to 1984. Forty-six percent of the cougar harvest was taken from W.M.U.’s south of the Bow River, an area that has accounted for 61% of the kill since 1971. The 1984 fall cougar harvest accounted for 18% of the annual kill compared to the average fall harvest of 16% from 1973 to 1984. Age data from skulls submitted indicated that 11%, 33% and 56% of the cougars harvested were subadult, young adult, and mature adult, respectively. Only 1 of 34 skulls submitted for measurement was of trophy status as defined by the Boone and Crockett Club.

EXECUTIVE SUMMARY

Arc Associated Resource Consultants Ltd. conducted an intensive radio telemetry study of cougars in the Sheep River area of southwestern Alberta between 1987 and 1989. The work, dubbed the Sheep River Project - Phase II, was a continuation of a study conducted by the Fish and Wildlife Division, Alberta Forestry, Lands and Wildlife between 1981 and 1986. Forty-nine cougars were captured during Phase II, 27 of them for the first time. Between 1981 and 1989, 71 cougars were captured 127 times in and around the Sheep River study area. Over 1,000 radio locations were logged during Phase II, bringing the total number of radio telemetry locations to over 3,400. The total cougar population in the vicinity of the study area on 31 March 1988 and 1989 was estimated at 35 to 37 and 33, respectively. The resident adult population was the same both years at 4 males and 12 females. Density estimates in and around the study area between 1984 and 1989 varied between 2.0 and 4.2 cougars/100 km². Between 1981 and 1989, the mean annual home range size for adult females was 140 km², while for males it was 334 km². The home ranges of neighboring male residents tended not to overlap, while those of female residents overlapped considerably at times. Summer and winter home ranges of individual males and females were contiguous; large shifts in seasonal home ranges did not occur. Females with kittens less than 6 months old had smaller home ranges than those travelling alone or with older kittens. Twenty-nine litters were born to radio collared females between 1981 and 1989. Births were recorded in all seasons of the year, although there was a marked peak in August. Average litter size of 27 litters was 2.2 and the sex ratio in 20 litters was 1 male:1.2 females. Average birth interval was 19 months and recruitment to independence was 1.8 to 1.9 kittens/female/year. Marked male kittens were never recaptured as adults in the vicinity of their maternal home ranges, but some female kittens born in the study area established residency there after independence. The deaths of 27 marked cougars were recorded between 1981 and 1989. Sport hunting accounted for 63% of those deaths. Recorded deaths in and around the study area between 1985 and 1989 annually accounted for between 3 and 14% of the estimated population. One hundred fifteen cougar kills were examined between 1981 and 1989. Mule deer, elk, and moose accounted for 77% of
Moose calves and female elk were the most preyed on components of their populations, whereas mule deer from all classes were taken regularly. Moose calves contributed 85% of all biomass consumed by male cougars, while deer and elk combined nearly equally for 79% of females’ diets.


EXECUTIVE SUMMARY

Phase III of the Sheep River Cougar Project was initiated in 1990 to investigate the relationship between cougars and their prey in the Sheep River study area. This report details progress on the project after the first of three years scheduled. In 1989-90, 163 man-days were spent in the field. Fourteen cougars were captured, bringing to 141 the total number of captures since the project started in 1981. Snow conditions were generally very poor throughout the winter. Although aerial telemetry flights were flown only 4 times during the year, intensive ground radio tracking allowed us to collect an average of 17 radio locations per collared cougar between October 1989 and May 1990. Cougars continued to be found throughout the study area and home ranges of cougars collared for more than a year remained very consistent in size and location. Pronounced seasonal shifts in home ranges did not occur. The Sheep River cougar population numbered 45 to 46 cougars on 31 March 1990, the highest estimate for the area since the project’s inception. Independent cougars accounted for 22 individuals and at least 24 dependent kittens and juveniles were travelling with 9 adult females in the study area. Eight new litters comprised of at least 22 kittens were documented during 1989-90. Two litters of 4 kittens each were documented for the first time; until this winter litter sizes had never exceeded 3. Since 1981, 37 litters have been recorded. Most litters continued to be born in late summer. Dispersal patterns seen in previous years remained; 1 female born in the study area is now an adult with a home range immediately adjacent to her mother’s, while the long range dispersal of 2 young males was documented. Seven mortalities of study area cougars were recorded including 4 deaths during the January hunting season. Forty-seven kills made by cougars were recorded and included 35 mule deer, 6 moose, 3 elk, 2 bighorn sheep, and 1 snowshoe hare. Predation sequences were collected on 10 occasions and included 24 kills. As expected, adult females travelling with large juveniles consumed prey fastest, often finishing an adult mule deer in 2 days, while subadult females travelling alone remained on kills for much longer periods. Field work during 1991 and 1992 will continue to emphasize the collection of predation rate data. Sex and age classification counts of ungulates started in 1990 will be continued. If the budget permits, aerial surveys for elk will be flown. In addition, systematic cougar track surveys will be conducted when conditions are appropriate.


We studied characteristics of a hunted cougar (Felis concolor) population in southwestern Alberta between 1981 and 1989 to support development of a species management plan. Although most cougars did not maintain separate summer and winter home ranges, the size of these ranges varied. Mean summer and winter home ranges for female residents were 87 + or - 8.5 (SE) and 97 + or - 8.2 km², respectively. Male home ranges were larger (P<0.0001); summer and winter home ranges averaged 314 + or - 62.9 and 204 + or - 34.0 km², respectively. Females with kittens used smaller (P = 0.001) home ranges than did lone females or females with
juveniles (P = 0.0003); whereas home-range sizes of lone females and those with juveniles did not differ (P = 0.37). Population estimates increased from 21-26 in 1984 to 35-37 in 1988, primarily resulting from an increase in adult females and their dependent young. Densities varied from 2.7-3.3 cougars/100 km$^2$ to 4.5-4.7 cougars/100 km$^2$. Mean size of 27 litters was 2.2 ± 0.1 kittens. Litters were born throughout the year but with a pronounced late summer peak. Six females gave birth to their first litters at a mean age of 30.0 ± 1.8 months, and the average interval between successive litters (n=12) for all females was 19.7 ± 1.9 months. Mean age of independence was 15.2 ± 0.5 months. Most cougars dispersed after independence, but 7 females established home ranges contiguous with their mothers' ranges. Annual mortality varied between 3 and 14% of the total population, with legal hunting being the most important cause. Non-dispersal of young females and fairly rapid population growth suggest that this cougar population rebounded quickly from depressed levels with a reduction in hunting pressure.


The author details his 13-year investigation of cougar ecology conducted near the Sheep River in southwestern Alberta. Cougar litters were documented in every month of the year with one quarter of the litters born in the winter, between October and March. Most litters were found in surface nests screened by vegetation which probably functions mainly to hide kittens from predators. At Sheep River, males feed primarily on young moose which may last three weeks. A female cougar’s estrus lasts about seven days and a male that stayed near the carcass until he finished eating it would risk missing the reproductive peak of one of his neighborhood females. Because estrus in cougars can occur at any time of the year, resident males must constantly be on the lookout for receptive females and be ready to drive off trespassing upstart males. Rather than risk being tied down to a kill site, males frequently gorge themselves for a day or two, then cover the carcass and leave it for up to two weeks. During that time they patrol their home ranges to hunt and possibly encounter receptive females. Violent struggles with large prey is second to human hunters as the chief causes of cougar deaths in the study area.


Three radio-collared cougars (Felis concolor) in Alberta died from injuries sustained while attacking prey, and a fourth may have died protractedly from such an injury. Injuries included a fractured vertebral column, punctured abdominal cavity, severe cranial trauma, and bacterial infection of the thoracic cavity.


Three cougars in Alberta were translocated in response to problem-wildlife complaints. One, an adult female, died within a few weeks. The other two, subadult males, survived at least 10 months and did not return to their natal areas.


Prey selection, and kill and consumption rates by cougars (Puma concolor) were studied in the Sheep River area of southwestern Alberta during winter from 1981 to
1994. We investigated 368 kills made by cougars. All 5 ungulate species available within the study area were taken by cougars. Ungulates provided >99% of the biomass consumed by both male and female cougars between November and April each year. Female cougars killed mostly mule deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*), but all males we studied specialized in moose (*Alces alces*). Of 54 moose fed upon by cougars, 4 were adults which had been found dead and scavenged. Forty-four calves (7-12 months) and 6 yearlings (13-20 months) were killed by cougars: 14 by females, 34 by males, and 2 by cougars of unknown sex. Moose comprised an estimated 12% of the biomass consumed in winter by female cougars, and 92% of that for males. A model derived from observed kill rates and estimated cougar-population structure predicted that cougars in the 515 square km study area would kill 18 moose calves and 3 yearlings each winter between December and March. This represented 16-30% of the estimated early winter calf crop.


Cougar harvest in Alberta prior to 1990-91 was regulated primarily by a short season length, with unlimited hunter numbers and harvest. This resulted in unpredictable size, distribution, and sex structure of the cougar harvest depending on local snowfall, and restrictive hunting opportunities. Specific concerns were disproportionately high harvest from areas south of the Bow River, occasional local overharvest, and overharvest of females in some areas. Beginning in the 1990-91 season, a harvest quota system was implemented. Total quotas were established at 10% of the estimated population for each of 11 Cougar Management Areas (CMA), with a female subquota set at one-half of the total. With control over harvest levels in place, hunting season length was expanded from 1 month to 3, beginning 1 December, but the season for any CMA is closed when either of its quotas is reached. Since implementation of these changes, mean total provincial harvest increased (p=0.001) from 33.0 to 51.6. Average annual harvest from areas north of the Bow River increased (p=0.005) from 9.8 to 19.4, while mean harvest south of the Bow increased (p=0.017) from 23.0 to 32.2. The percentage of the harvest taken north of the Bow River increased slightly from 29.5% to 37.6%. Province-wide, the proportion of the females in the harvest declined from .43 to .29. Persistent problems in cougar management include the establishment of reliable population estimates within individual CMAs, and exceeding quotas due to the lag period between compulsory registration of kills and informing hunters of CMA closures.


Predation by cougars (*Puma concolor*) upon bighorn sheep (*Ovis canadensis*) was studied in southwestern Alberta during winters from 1985-86 to 1993-94. We examined 320 kills and found that ungulates provided >99% of the biomass consumed by cougars in November-April. All ungulate species found within the study area were taken by cougars. Predation on bighorn sheep varied greatly from year to year; cougars were known to kill 0-13% of the November sheep population, and 0-57% of overwinter sheep mortality was due to known cougar kills. Of 29 bighorns killed by cougars, 13 were lambs. The remainder ranged in age from 1-17 years, and included 9 ewes and 7 rams. Cougar predation on bighorn sheep appears to be largely an individual, learned behavior; most cougars rarely killed sheep, but some preyed heavily upon them. One female killed 9% of the population and 26% of the lambs over a single winter. For mountain-dwelling ungulates that occur in small
groups, the presence of 1 or a few individual specialist predators may strongly and unpredictably influence demography and behavior.


Three free-ranging Florida panthers (*Felis concolor coryi*) were diagnosed with clinical dermatophytosis; two were infected with *Trichophyton mentagrophytes*, and one was infected with *Mycosporum gypseum*. Two of these panthers were juvenile males that were diagnosed with focal to focally coalescing dermatophytosis; one caused by *M. gypseum* and the other by *T. mentagrophytes*. These animals were not treated, and clinical signs resolved spontaneously over 6 months. The third panther, an adult male from southern Florida, presented with a diffuse dermatophytosis due to *T. mentagrophytes* infection. Initially, the panther had alopecia, excoriations, ulcerations, and multifocal pyoderma of the head, ears, neck, rear limbs, and abdominal region that progressed to lichenification of the skin and loss of nails from two digits. When topical therapy applied in the field at 45-day intervals was ineffective in clearing the infection, the animal was placed in captivity for intensive oral therapy to prevent further development of dermal mycosis, loss of additional nails, and spread of infection to other panthers. The panther was treated orally with itraconazole (9.5 mg/kg) in the food s.i.d. for 6 weeks. After treatment, nail regrowth occurred but the multifocal areas of alopecia remained. The panther was released back into the wild after two skin biopsy cultures were negative for fungal growth. Temporary removal of a free-ranging animal of an endangered species from its habitat for systemic treatment of dermatophytosis requires consideration of factors such as age, reproductive potential, holding facilities, treatment regimen, and the potential for successful reintroduction of the animal.


An investigation of cause-specific mortality among 91 radio collared bighorn sheep was conducted from November 1992 through January 1996 in the Peninsular Ranges of southern California. Mountain lion predation was the most significant cause of mortality and accounted for 63% (27/43) of all mortalities in the 6 sheep populations included in the study. Lions accounted for 0-100% of all mortalities within these populations, and 0-27% of the radio collared sheep within any given population were killed by lions annually. The age at capture of the sheep varied significantly among populations, and the age distribution of sheep killed by lions did not appear to differ from this pattern. Sheep of both sexes were preyed upon by lions but a statistical comparison between sexes was not possible because only a small number of rams were radio collared. Predation occurred during all times of the year except for the months of June, July, and August. Sixty-seven percent (18/27) of the predation events occurred between December and March. It appears that lion predation has been a significant limiting factor during the past three years, and sustained high levels of predation by lions may adversely affect the long-term viability of this threatened metapopulation of bighorn sheep.

The mountain lion is classified a nongame mammal and is not subject to any specific protective regulations in Texas. Lion numbers were considered to be increasing statewide due to changing land use and the public’s perception toward predators. Data was not sufficient to make a reliable statewide estimate of lion numbers. Lion sightings had been documented throughout the state except for the northern portion of the Panhandle.


The mountain lion (*Felis concolor*) is legally classified as a nongame mammal in Texas within the broad scope of wildlife regulatory authority delegated to the Texas Parks and Wildlife Department. Lions are not subject to any specific protective regulations; however, mountain lions are recognized as an important part of the native fauna of Texas. The Department is currently collecting mortality and sighting data by ecological region to determine current distribution and population status of Texas lions. Sighting data are reported by county with the date, number and estimated age of lions, and location. Mortality data includes the above information plus weight, length, and reason for death. Over 1,500 mortalities and 1,400 sightings were reported from 1983 to 1994. Sightings were recorded in all ten ecological regions and mortalities in all ecological regions except the Blackland Prairies and Post Oak Savannah. Most sightings and mortalities have occurred in the Trans-Pecos Ecological Region. Texas mountain lion management addresses a wide spectrum of issues including their impact on domestic livestock, wildlife, and encounters with human beings; while filling an ecological role as one of the largest predators in Texas and providing sport hunting opportunities.


Mountain lions once ranged throughout the southern two-thirds of the state, but is now confined to rugged parts of the Trans-Pecos and South Texas with scattered animals along the Balcones Escarpment and Edwards Plateau. Lions were found in the densely forested swamps of eastern Texas before the turn of the century (possibly *Felis c. coryi*). It was estimated that only 65-135 lions reside in the entire state, with the Trans-Pecos region probably containing the highest densities. However, many of these animals are transients from the mountains of Mexico. Other populations probably exist in other mountainous areas, but all are confined and not allowed to expand into the lower lands due to heavy trapping and hunting pressures. The South Texas Brush Country probably contains the largest remaining populations within the state, and is estimated to contain no more than 50 animals and is by no means stable or secure. A small breeding population of 5-10 animals may still exist in the Possum Kingdom section west of Fort Worth near Possum Kingdom Lake. Without a doubt, predatory animal control efforts have contributed to the decline of mountain lions within the state. Trappers have pursued the mountain lion over half a century, with major efforts being confined largely to protecting sheep and goats. Lions were bountied in two counties at $15 and $50.

The mountain lion is described and many previous authors are cited. Mountain lion ecology, distribution, habitat, food habits, movement, reproduction, mortality, diseases, parasites, behavior, natural competitors, density, abundance, and management options are discussed.


The history of the cougar in Arizona is provided. From 1948 through 1969, bounties totalling $350,685 were paid on 4957 lions. In addition, 237 lions were reported taken on the Fort Apache Indian Reservation and 233 from other areas in the state by the Division of Wildlife Services, Bureau of Sport Fisheries and Wildlife. Total removal for the period of 22 years was 5454 mountain lions. Maximum number removed in any one year was 330 in 1964. The largest number of lions bountied in one year was 286 in 1965, and the smallest number was 181 in 1951. The average take from 1948 through 1969 is 247 lions per year. The bounty system was established in 1947 with the Livestock Sanitary Board paying a reward of $50 for each mountain lion. Payment varied up to $100 in the following years.


Although mountain lions are ecologically important in national parks and can enhance recreational values for visitors, close association of mountain lions with humans can also cause conflict. Spatial data collected on 12 adult and 10 young (kitten to subadult) mountain lions on Big Bend National Park (1984-1990) indicate that adult mountain lions used human recreational areas with little or no interaction with people. Subadult mountain lions were the age group most likely to come into contact with humans. Movements of a reproductive female (Basin female) and her subadult daughter were monitored through monthly 72-h radio-tracking sessions. Mountain lion movements in recreational development areas were analyzed by season, subadult dispersal, and day versus night use. The Basin female spent most of her time in areas of low recreational development. She moved into the area of highest recreational development in the Chisos Basin during the cold dry period when her offspring were in transition from dependency to dispersal (14-16 months old). In contrast to her mother, the subadult female did not avoid the area of highest recreational development early in her dispersal. Incidents of mountain lion-human interactions occurred in the Chisos Basin campground and backcountry, and on the Basin Loop trail. Forty-eight alternative management actions were identified and evaluated. Proactive management with education of park residents and visitors and continued monitoring of mountain lions in the Chisos Mountains were recommended.


Thirteen mountain lions with a known social and behavioral history were translocated an average of 477 km from the San Andres Mountains in south-central New Mexico to 8 release sites in northeastern New Mexico. The mountain lions were captured, transported and released at separate times over a 7 month period (9 December 1990
through 22 June 1991) and radio-monitored through 7 January 1993. The average number of days that the mountain lions remained near (less than or equal to 7 km) their release site was 8 days for females and 4 days for males. Initial movement directions away from release sites ranged from 22 degrees to 313 degrees and were uniformly distributed about a 360 degree circle (P>0.50). Eight (4F:4M) mountain lions had an endpoint >40 km from their release site and had endpoint directions that were almost exclusively south, southwest, or southeast (X = 181 degrees, range = 116 degrees to 237 degrees). Endpoint directions were not uniformly distributed about a 360 degree circle (0.002<P<0.0005). Two males returned to their original home ranges in the San Andres Mountains. Distances moved from release sites to endpoints ranged from 3-285 km (X = 133.8 km) for females and 11-494 km (X = 254.0 km) for males. Three of 13 (23.0%) translocated lions (all females) established home ranges within 9 km, 19 km, and 84 km of their release sites. Five of 13 (38.5%) established home ranges at distances 176 km to 285 km from their release sites. Two female mountain lions that established home ranges near their release sites had litters of kittens. Mortality was 69.2% during the 2 year study. Establishment success near release sites was most successful for lions that were less than or equal to 2 years old (60.0%). Translocation of "problem" mountain lions to acceptable areas away from livestock and human-use areas may be successful as a large percentage of lions involved in interactions with humans were in the less than or equal to 2 year-old age class. Translocation of mountain lions for reintroduction purposes will require a high cost per effort for establishment success. The high, predominately natural mortality of the mountain lions we translocated will probably be compounded by human induced mortality associated with states, such as eastern states, that have high human densities. Several translocation/release attempts over a long period of time may provide the greatest chance of establishment success for reintroduction and/or population augmentation purposes. The maintenance of existing areas of habitat and large connective corridors for travel should be considered as part of a long-term management program for mountain lions as habitat conservation will ultimately be easier to achieve and less costly than trying to maintain populations through translocations.


We conducted a 2-year study of wild-caught translocated cougars to evaluate translocation as a management tool to: 1) re-establish cougar populations in historic ranges, 2) relieve the threat of inbreeding in isolated populations, and 3) manage nuisance cougars. Our objectives were to document orientation, movements, establishment, and survival of translocated cougars and to make comparisons with similar parameters for cougars in a reference population. Thirteen cougars were translocated an average of 477 km from the San Andres Mountains (SAM) study area in south-central New Mexico to 9 release sites in northeastern New Mexico and were monitored from 9 December 1990 through 7 January 1993. A fourteenth cougar was translocated 338 km from the SAM to northwestern New Mexico on 8 April 1989 and monitored to 29 May 1990. Initial orientation of cougars away from release sites ranged from 22 degrees-313 degrees and were uniformly distributed about a 360 degree circle. Eight (4M:4F) of 14 cougars had endpoints > 80 km from their release sites and endpoint directions that were almost exclusively south, southwest or southeast (x=181 degrees), suggesting the cougars homed toward the source population. Two males returned to their original home ranges in the SAM. Distances moved from release sites to endpoints ranged from 3-285 km for 8 females and 11-494 km for 6 males. Nine of 14 translocated cougars died during the study. Annual
survival rates for translocated cougars averaged 0.55 for females and 0.44 for males and were lower for both sexes during the second year of the study. Translocation was most successful with cougars that were 12-27 months of age. For management or conservation programs, we suggest that 12-27 month-old cougars are the best candidates for translocation.


Cougar (*Puma concolor*) populations exist in all areas of the west where wolf (*Canis lupus*) recovery is proposed or currently underway. As wolf recovery efforts continue, agencies responsible for the management of predator species will need information on how predators such as cougars and wolves interact with one another and the combined effect of predation on ungulate species. Since January 1993 we have radio-marked and monitored a total of 39 cougars in and near areas used by 2 established wolf packs. Cougar winter home ranges overlapped to a high degree with wolf winter use areas and ungulate winter ranges. During winter months, we have documented instances of wolves and bears (*Ursus arctos*) tracking and treeing cougars and displacing cougars from ungulate kills. Three cougars have been killed by wolves or bears during the past 3 years of our study. This paper will present preliminary findings of spatial-temporal relations of cougars and wolves, predation on ungulates, and discuss reproductive success and survival of cougars in the North Fork valley.


The following information is entirely based on data collected by keepers in the Lion House of the Zoological Society of London, Regents Park. Females were considered to be in heat on days in which they permitted mounting and copulation by the male. Heat was usually accompanied by increased activity, willingness to be stroked by their keepers, increased rubbing on bars and walls of the cage, and repeated rolling over on their backs. The duration of estrus was taken as the total number of days on which the above behavior was recorded. The interval between the mid-points of consecutive estrus periods is referred to as inter-estrus. The day of conception was regarded as having occurred on the second day of estrus for the purpose of estimating the gestation period since the actual time of conception was not known for species of larger Felidae. A total of eight estrus periods for three female pumas had an average length of 6.6 days (range 4-9). No inter-estrus periods could be calculated because of repeated conceptions. The average length of gestation was 93.3 days.


Stuffed skin specimens of four adult female, three immature, and one spotted juvenile Chilean forest puma (*F. c. araucanus*) were sent to the Chicago Natural History Museum. The specimens are described and information on when the animals were taken is provided.

SYNOPSIS

Documentation of human-mountain lion interactions, especially in urban settings, is rare. We surveyed Boulder County residents to obtain information about behavioral characteristics of mountain lions in interactions. Starting in January 1985, information was solicited by radio, television, newspapers, and posters. In addition to being questioned about time and locality, respondents were queried about the behavior of mountain lions before and during interactions. Behavioral profiles showed mountain lion activities around humans, the roles of pets and ungulates, and details of human-mountain lion interactions. Mountain lions dominated humans 9% of the time. Interactions were in close proximity to human dwellings, and pets had a role in interactions. Of the 261 records of behavior of mountain lions before the interaction, 31% were near houses. Fifteen percent of the interactions were in urban communities, and 8%, in rural communities. Mountain lions may be more interested in populated areas with pets. Of 71 interactions with pets, mountain lions attacked 61% of the time and killed pets 39% of the time. Only 11% of the time were pets dominant over mountain lions. Human behavior may have altered the responses by the mountain lions. Aggressive actions by humans seemed to control mountain lions. Throwing objects or yelling averted 43% of near-attacks. Mountain lions displayed many behavioral traits in interactions with humans, but no single behavioral characteristic signaled an imminent attack. Vocalization was a warning and not necessarily a signal of attack. More research is necessary to confirm behavioral patterns of mountain lions in interactions with humans.


Mountain lion habitat was best characterized by rocky ledges and pinyon-juniper, ponderosa pine, oakbrush, and other brushland vegetation types. A relatively stable population of mountain lions existed in Colorado and was estimated at a minimum of 613 to a maximum of 726. The annual take had also been relatively stable for many years and averaged 58 animals per year from 1960-1969.


Several accounts of panther sightings are presented as evidence by the author that the panther has made a comeback in South Carolina and other eastern states.


Estimates for the black bear and panther populations in the Everglades were 145 and 92, respectively, based on questionnaires. Higher numbers were recorded for both species in Collier County. The panther had been fully protected in Florida from hunting since 1958. The U.S. Fish and Wildlife Service estimated the statewide population to be between 100-300 in 1966. In 1969, there were 125 panthers (one per 10 square miles) in the Big Cypress as estimated by the U.S. Department of Interior.
One of the interesting aspects of this study was the frequent reports of black panthers.


The majority of puma attacks were in tree/wooded areas or thick brush areas. The high number of houses, cabins and people present during many attacks questions the “normal” mountain lion behavior because most cougars are rarely seen and are presumed to avoid civilization. Research indicates that children and adults are not differentially attacked. In this study, only 7 out of 69 attacks were known to be provoked and none of the seven provoked attacks involved children. Data, although incomplete, indicated that 83% of the mountain lions were starved, wounded, or sick. The research in this study was confounded by incomplete information and conclusions were difficult to reach with sparse data that has questionable validity.


A cougar was killed on November 22, 1857, 2 miles northeast of Appleton, Wisconsin, which measured 7 feet 2 inches in length. The specimen (at Lawrence College) was mounted and measured 27 inches in height at the shoulders and 85 inches in length from the end of the nose to the tip of the tail. Despite conflicting information on the card attached, it appeared that the specimen was the cougar shot in 1857 and insofar as was known was the only Wisconsin specimen of Felis concolor extant.


The cougar (F. c. couguar Kerr) was rare in the Upper Peninsula of Michigan and was last observed about 1850. There were many records from Wisconsin, especially from the Lake Winnebago district and from the valleys of the Chippewa and St. Croix Rivers. The only specimen extant for the entire region was killed in 1857 and was mounted and is located in the museum of Lawrence College at Appleton. The last acceptable record for Wisconsin was a cougar killed near Butternut, Ashland County, in 1884.


This report examines the important features of panther habitat in south Florida. Panther habitat requirements, pre-Columbian and recent distributions, food habits in relation to panther health and distribution, and habitat management practices which can improve conditions for the panther in the future are discussed.


CONCLUSIONS

Many of the important prey management actions occurred before the welfare of the Florida panther was a concern. Two important prey species are exotics which
became established as a result of actions unrelated to Florida panthers. Both wild hogs and armadillos are well established in most currently occupied panther range. Efforts to control or eliminate either species from currently occupied range could have adverse impacts on the panther. In addition, stocking, especially wild hogs, could enhance game abundance, especially in areas where low prey density has been identified as a problem for the panther. The most important action to date has been the protection of over 1,000,000 ha of contiguous landscape in the Everglades/Big Cypress areas. Most of this land is not prime habitat for the panther or its prey (Maehr 1990), and many areas are marginal at best. Nevertheless, there is little question that this large protected area greatly enhances the prospect for successful panther management. Conversely, the loss of habitat due to urban and agricultural development has been widespread. As these losses continue, new management strategies and incentives must be developed to insure that private lands will continue to provide important habitat for panther and their prey. Without effective conservation programs on private lands in southern Florida, the less productive lands in public ownership will be forced to provide a greater proportion of the panther's range. Data-based prey management actions were initiated in southern Florida only in the last decade. Initially, management was regulatory and aimed at minimizing perceived adverse impacts of recreational hunting on both prey and predator. These actions combined with the existing conservative bucks-only harvest strategy have been successful in minimizing the potential adverse impacts of overharvesting deer and hog. Examination of deer herd parameters indicate that productivity and populations are within desirable limits considering the quality of habitat. Higher prey densities may be achieved by improving habitat conditions. Increasing forage quantity and quality is the management option which has the greatest potential in the Big Cypress area. The use of prescribed fire is currently being utilized by most land management agencies primarily to prevent catastrophic wildfires by reducing fuel levels. Only recently have managers of these public lands recognized the potential for improving habitat conditions for wildlife via prescribed fire. In order to provide maximum benefits for deer and other important prey species, burning programs should be designed for these specific purposes. Burns should be conducted on fire tolerant areas on a two- to five-year rotation, depending upon fuel type and site conditions. Burn compartments should be less than 2,500 ha and annual partial compartment burns or rotating burns should be employed when possible to increase habitat heterogeneity. Other habitat management actions may also provide significant benefits for deer and/or hogs. Food plots, clearings and feeders have been effective management tools in local situations. Disturbed sites, particularly those invaded by willows, have produced good forage for deer. Establishment of mast producing species, including oak and palms, on disturbed sites can significantly increase mast production in selected areas. While the present conservative harvest strategy has been effective in maximizing deer numbers, wildlife managers need to retain flexibility in meeting tomorrow's challenges. Changing environmental conditions may lead to excessive fluctuations in prey populations. Increased harvest, including either sex hunts or conversely more conservative strategies, may be needed to provide sustained maximum benefits for panthers and their prey. Current information shows that recreational hunting does not adversely impact deer behavior or deer numbers. However, telemetry data indicates that panthers may be altering use patterns in response to human activity relating to hunting seasons. Recent regulation changes including designated trails, reduced quotas and shortened seasons may reduce these impacts. However, because the cause and effect relationships between panther and human behaviors have not been established, additional research concerning predator, prey and human interactions would be valuable.

The mountain lion was classified as a bountied predator in 1907. In 1963 it was classified as a nonprotected mammal until 1969 when it changed to game mammal status. In 1972, the Legislature placed a moratorium on the sport take of lions and they could only be taken by depredation permit until January 1, 1986. The lion was distributed over approximately 74,000 square miles (75%) of California and is void only in the Central Valley and Mojave Desert. It was estimated that 2,400 lions occupied California in 1973, and with an estimated annual growth rate of 8% per year, the population was approximately at 4,800 animals with a range of 4,100 to 5,700 in 1984.


Cougars were still in Wisconsin in 1882, with the most recent record being two cougars spotted in Marinette County on January 2, 1909. The most recent record of one being killed was in Douglas County in 1908. The only known specimen of a Wisconsin cougar is mounted in the Lawrence Museum at Appleton and was killed in December, 1857, near Appleton. Nine records of cougars killed or seen in Wisconsin between 1859 and 1878 are cited.


Predation at the University of California Hopland Field Station was evaluated for an 11-year period beginning in 1973. Of those lambs placed on range, an average of 2.7% were killed each year by predators. An average of 1.5% of the ewes were killed. When the number of missing animals which were killed was estimated, the average annual predation rate for lambs and ewes killed was 10.4 and 3.8%, respectively. For all known ewe and lamb deaths, respectively, 45% and 26% were caused by predators, 14% and 28% died from causes other than predation, and 41% and 46% died from unknown causes. Of those sheep killed by predators, 89% were killed by coyotes (Canis latrans), 8% by dogs, and 1% each by black bear (Ursus americanus), mountain lion (Felis concolor), and golden eagle (Aquila chrysaetos). More sheep were killed by coyotes from October to March than from April to September and the annual number of sheep killed by coyotes and dogs has increased since the beginning of the study. Not including the value of missing animals which were killed, the present value of livestock killed by predators was estimated to be $62,364.


Apparently the last panther was killed in the 1890's in the Adirondack's. However, numerous reports of recent panther sightings had gained alot of publicity. The author states that panther tracks average 4½ inches or more wide. The distance between tracks when walking would be about 17 inches.

EXECUTIVE SUMMARY

The objective of this plan is to prevent the certain extinction of the Florida panther and to provide for its recovery in the wild through the establishment of 130 breeding animals in a combination of wild and captive populations by the year 2000 and increasing to 500 breeding age panthers by the year 2010. Implementation of the captive population recommendations in this plan are contingent upon the continuation and, in some cases expansion, of the existing capture and tracking program. The current wild population is estimated at 30-50 animals. The recommendations in this plan call for: 1) immediate initiation of a captive breeding program as called for in the approved recovery plan dated June 22, 1987; 2) continuation and expansion of management and monitoring of the wild population; 3) continuation and expansion of the reintroduction program and 4) continuation and expansion of the habitat conservation program. The purpose of the captive breeding program is to place in captivity representative individuals from the wild population which would be selectively bred to expand their numbers. This population would serve to enhance the genetic and demographic structure of the Florida panther in captivity and serve as a source of individuals which may be used in prescribed management interventions of the wild population, as well as serve as a source of stock for re-establishment of the panther into its historic range. The captive breeding program would take from the wild 4 adults, and 6 kittens in 1990 and 1 pair of older animals (adults or juveniles) and 6 kittens per year through 1992. The purpose is to obtain genetic representation from each of the known remaining potential founder animals. There are estimated to be 19 potential founder lineages represented in the living wild population. Requirements for additional animals (1 pair of older animals and 2-4 kittens per year for 3 years may be needed) in future years (1993-1995) would depend on whether there is sufficient representation of this wild founder stock in the captive population. The captive populations would be managed cooperatively through the Captive Breeding Specialist Group of the IUCN, the participating zoos and the Florida Panther Interagency Committee (FPIC). A SSP working group comprised of biologists from these organizations would work under the leadership of the Technical Subcommittee of the FPIC. All activities would be conducted through the oversight of the FPIC consistent with the approved recovery plan and species survival plan. This approach will allow us to evaluate experimentally the results of the program without an irretrievable commitment of the wild population. An annual meeting would be held to review the past year's results and plan the next year's activities including selection of individual animals for the captive program. This plan will require an initial investment of $50,000 above existing expenditures by the involved agencies. In addition, it will be necessary to construct an expanded conditioning facility at White Oak Plantation over the next 3 years which would cost approximately 200,000. In addition, it is recommended that additional research be funded over the next 5 years to enhance the captive breeding program including: development of reproductive technology to reduce the need for future removals of animals from the wild (Wildt proposal, $136,000 total for 2 years) and 2) genetic investigations to determine lineages of the Florida Panther (O'Brien proposal, $140,000 total for 2 years). The funding of these research proposals is not considered to be a prerequisite to the captive breeding program but could increase its effectiveness in the future. Finally, the participating zoos contribution would be approximately $1,000,000 in facilities and $500,000 per year in operating costs towards the captive breeding program. This major contribution to the public interest should be fully recognized. The result of this investment would be to prevent the certain extinction of the Florida panther and provide for its recovery. Once the objective of 500 breeding adults is achieved, consideration would be given to
removing the species from the Endangered Species list. It should be clearly understood that this plan represents a biological compromise necessary that maintains the existing wild population while developing a captive population to ensure long term survival of the taxon. There is a clear biological tradeoff involved. If all the Florida panthers were removed from the wild immediately then there would be less of a loss of genetic diversity because most of the remaining founders would be protected. Our proposed strategy would capture animals at a slower rate over a 3-6 year period and it is likely that mortality of some founders would occur during this time. This loss would be minimal but clearly represents a loss of genetic diversity that could be preserved if all animals were taken immediately. The consensus of the SSP working group members and the Technical Subcommittee was that the more conservative incremental strategy was an experimental approach that would provide safeguards to the wild population and allow on going evaluation during removal. This consensus on strategy was based on the: 1) ability to protect habitat through regulatory provisions would be compromised by removal of all animals; 2) opportunities to learn more about developmental, social, and behavioral aspects of panther biology that will be important to successful reintroduction would be lost; 3) learned behavioral features, potentially critical to survival in the wild, would be compromised or lost.


The author states that the Arkansas Gazette of December 3, 1949, ran an account of a mountain lion shot about 8 miles west of Mount Ida, Montgomery County, around the latter part of November or early December. A photograph of the animal was taken and secured and revealed the record to be an authentic one. The specimen measured 7 feet in length and weighed 134 pounds according to the author and appeared to be a female from the photograph. The Arkansas Gazette account reports that this mountain lion was the second reported within a week. Another was supposedly trapped by a farmer near Warren, Bradley County, who said that the tracks indicated three more were at large in the vicinity.


The cougar was thought to have become extinct in Arkansas around 1920 when deer populations were low. However, a number of sight records since 1945 and one recorded kill in 1949 indicate that the puma was not completely exterminated. There appeared to be a rise in the puma population corresponding to the increase in deer numbers in Arkansas. Most of the pumas have been reported around areas of heaviest deer concentrations.


Two authenticated kill records of the mountain lion, Felis concolor, in Arkansas are reported as well as numerous reliable sight records spanning an approximately 30-year period. Distribution of sightings in the state is discussed in relation to an expanding deer population. The cougar probably never was exterminated in Arkansas but it still may be considered endangered.

The radio equipment and tracking procedures used to gather quantitative data on the movements and other activities of mountain lions (Felis concolor) and elk (Cervus canadensis) in the mountains of central Idaho are described.


As part of a comprehensive study of mountain lion ecology, the social organization of a lion population in the Idaho Primitive Area was investigated using radio telemetry. The general population dynamics and relationships had been established through recapture methodology over the five previous winters. After independence from the female, mountain lions dispersed showing no attachment to any particular area. The "transient" females did not reproduce, and the "transient" males only rarely bred. When an area adequate in size and resources and free of too many but not independent of other residents was located, the young lion restricted itself more and more to that area. Only with attachment to site did the lion enter the reproductive phase of its life (population component termed "resident"). Home area utilization by resident lions was influenced by the localizing effects of the large ungulate kills and, for females, kitten mobility. The localizing effect of kittens was diminished their second winter; home area utilization by females during these different stages of kitten development differed considerably as a result. In the short run, a lion's home area was in a constant state of flux in terms of location of mule deer and elk (the most important prey resource nine months of the year) in situations where they could be successfully stalked and killed. But over the long run, the conditions in certain areas were such that lions tended to be more successful there in making kills. This demonstrated the advantage of familiarity with the home area, especially for females rearing kittens. Resident lions occupied fairly distinct but usually contiguous winter/spring and summer/fall home areas. No substantial part of any resident lion's winter home area was maintained to the exclusion of all other conspecifics. Resident male home areas overlapped but little. Those of resident females often overlapped completely and were overlapped by resident male areas. Transient lions of both sexes moved about these areas but did not remain. In summer the pattern was the same. Land-tenure was based on prior right, but the system was not static. Home areas were altered in response to the death or movement of other residents. Young adults established only as vacancies became available. The mountain lion's essentially solitary existence was maintained visually and chemically. A lion's response to close approach of another was dependent upon its population and reproductive status. Over the seven winters from 1965 to 1972, the resident male portion of the lion population remained stable; resident female numbers were constant for three winters but later deaths were never quite compensated. Dispersal of young lions raised on the study area was independent of resident adult density. It was concluded that the lion land-tenure system acted to maintain the density of breeding adults below a level set by the food supply in terms of absolute numbers of mule deer and elk. Variation in lion environmental structure resulted in variation in the suitability of home areas and affected the amount of terrain a resident lion utilized. The amount of terrain used by a resident lion as well as the degree of home area overlap between resident females, i.e., density of breeding population, was set by a vegetation-topography/prey numbers-vulnerability complex. The evolution and adaptive values of mountain lion social organization are discussed.

SUMMARY

As part of a comprehensive study of mountain lion ecology, the social organization of a lion population in the Idaho Primitive Area was investigated using radio-telemetry. It was important that general population dynamics and relationships had been established through recapture methodology over the 5 previous winters. The response by mountain lions to investigators depended upon disturbance intensity and the reproductive status of the lion. It was clear from monitoring the movements of radiotagged lions that they did not respond to investigator activities in any way that would bias conclusions. After independence from the female, mountain lion kittens dispersed, showing no attachment to any particular area. The "transient" females did not reproduce, and the "transient" males only rarely bred. When an area adequate in size and resources and free of too many but not independent of other residents was located, the young lion restricted itself more and more to that area. Only after establishment of a home area did the lion enter the reproductive phase of its life (population component termed "resident"). The home area utilization by resident lions was influenced by the localizing effects of the large ungulate kills and, for females, kitten mobility. The localizing effect of kittens was diminished their second winter; home area utilization by females during these different stages of kitten development differed considerably as a result. In the short run, a lion's home area was in a constant state of flux in terms of location of mule deer and elk (the most important prey resource 9 months of the year) in situations where they could be successfully stalked and killed. But over the long run, the conditions in certain areas were such that lions tended to be more successful there in making kills. This demonstrated the advantage of familiarity with the home area, especially for females rearing kittens. Resident lions occupied fairly distinct but usually contiguous winter-spring and summer-fall home areas. No substantial part of any resident lion's winter home area was maintained to the exclusion of all other conspecifics. Resident male home areas overlapped but little. Those of resident females often overlapped completely and were overlapped by resident male areas. Transient lions of both sexes moved about these areas. In summer, the pattern was the same. Land tenure was based on prior right, but the system was not static. Home areas were altered in response to the death or movement of other residents. Young adults established residences only as vacancies became available. The mountain lion's essentially solitary existence was maintained visually and chemically. A lion's response to the close approach of another lion depended upon its population and reproductive status. Females with small kittens were most sensitive to another's presence. Females with large kittens, females without kittens, and males were less disturbed by the presence of another lion. Avoidance between adult males, males and females with small kittens, and females without kittens was total. Over the seven winters (1965-1972), the resident male portion of the lion population remained stable; resident female numbers were constant for three winters but later deaths were never quite compensated. Dispersal of young lions reared on the study area was independent of resident adult density. It was concluded that the land tenure system maintains the density of breeding adults below a level set by food supply in terms of absolute numbers of mule deer and elk. Variation in lion environmental structure resulted in variations in the suitability of areas and affected the amount of terrain a resident lion utilized. The amount of terrain used by a resident lion as well as the degree of home area overlap between resident females, i.e., density of breeding population was set by a vegetation-topography/prey numbers-vulnerability complex. The form of mountain lion sociality has been molded by a wide variety of factors. In the analysis of its adaptive value, we have considered how reproductive requirements, mobility, mode of prey acquisition, food supply (type, availability, and vulnerability), habitat
characteristics, and other predators and scavengers through the energy budget and reproductive success affected social interactions and communications, dispersal, land tenure, and home area utilization.


Four Americans have been killed and 14 injured by mountain lions in the past 21 years. On Vancouver Island and the general vicinity of Vancouver, British Columbia, 33 people have been killed or injured since 1916. A symposium on interactions between mountain lions and people was recently held in Denver, Colorado. It was reported that authentic records exist for 53 mountain lion attacks resulting in 11 deaths during the past 100 years. Standing up and "putting on a good face" may deter big cat attacks, whereas bending down and breaking off eye contact may stimulate an attack. It appeared that most people did not want to kill mountain lions but rather wanted information about how to reduce the risks of living around them.


SUMMARY

Fifty-four dog-hunting days and 25 trapping days were spent in the vicinity of the Sycamore Canyon study area. No lions were caught. Tracks and other sign indicated that as many as four lions were using the area. The only fresh lion kill found in the study area was a coyote. A freshly-killed yearling cow elk was found outside of the study area near the Beaver Creek watersheds. Helicopter surveys of prey species yielded 84 elk, 363 mule deer, 16 white-tailed deer, and 12 turkeys. Turkey counts were definitely low. At least 200 turkeys were using the area during mid-winter as determined from ground observations. Due to the large number of livestock operators with permits on the Sycamore area, extremely difficult hunting conditions, and the current low density of lions, a change of study areas has been recommended.


SUMMARY

The period reported was from 7-1-71 to 6-30-72. Six lions were marked during this segment. Four of these were fitted with transmitter collars and tracked from airplane for varying lengths of time. Four fresh deer kills and three cattle kills (only one on the study area) were inspected during the winter. Helicopter surveys indicated a density of just under 10 deer per square mile for the study area. Of 15 lion scats collected in Sycamore Canyon, five contained porcupine remains, seven contained deer and three contained squirrel (probably Abert). Of 11 scats from Spider-Cross U, three contained porcupine, five contained deer and three contained cattle remains.


The period reported was from 7-1-72 to 6-30-73. Eight adult lions and three kittens have been captured to date. Of these, four of the adults and two kittens are known to
be dead. Two large toms were killed by hunters outside of the study area. A female and her kittens were lost in capturing and handling. A second female died of unknown causes. One hundred thirty-seven radio locations of marked lions have been made. These have disclosed the overall ranges of the lions, but, with a few exceptions, have been of little help in locating kills. The home range of one female covered approximately 26 square miles. Ranges of males have covered 75-100 square miles. One tom is known to have made a long excursion outside his apparent normal range. Of 24 verified lion kills, 13 (54%) were mule deer, and 10 (42%) were cattle. One cottontail rabbit was killed by a large tom but not eaten. Of 26 lion droppings from the present study area, 12 (46%) contained deer remains and 10 (38%) contained cattle. Porcupine and javelina remains also occurred in small amounts, but no rabbit or rock squirrel remains have yet appeared in scats. Deer density estimates ranged from 5-10 deer per square mile depending upon the sampling method used.


SUMMARY

Six lions were captured and marked during the past segment. Four (three females and one male) were lions that had not been previously captured. A female was recaptured which had been handled only once very early in the study and had furnished little movement information. A large male was recaptured that had been handled twice during the previous segment. Twelve mature lions have been captured on the study area to date, six toms and six females. Three of the females are known to have had kittens at the time of capture. Radio-tracking equipment operated far more successfully during this segment than last and furnished a total of 364 air-to-ground lion-locations. The total for the study is now 501 lion-locations. One female has now been tracked for eight months. Three other radios are still active and have been functioning for three to six months. Helicopter surveys in January yielded density estimates identical to the previous year (4.8 deer/mi.²). Fawn survival appeared to be slightly improved (54%). Number of sample plots used in the survey was increased from 18 to 27 with little increase in total helicopter time. Success in locating deer or livestock killed by lions improved during the past segment. Nineteen kills were found, bringing the cumulative total for the study to 43; 23 deer, 19 cattle, and one rabbit. Seventeen kills have been attributed to 10 individual marked lions. Of these 10 lions, seven (3 males, 4 females) have been connected with at least one cattle kill, and one (male) with a rabbit. Only two lions (one male, one female) have had both deer and cattle kills attributed to them. Of the deer kills, five were bucks, 10 does, three fawns, and five unclassified. Bucks have thus shown up in the kill slightly in excess of their proportion in the herd. Sample size of kills, however, is still too small to be conclusive. Ages of deer killed have been fairly evenly distributed with three under six months, four yearlings (6 mo. - 1-1/2 yr.), two 1-1/2 - 2-1/2 years, seven 3 - 5-1/2 years, one 6 - 8 years, and three over eight years. Three deer were unaged. Cattle kills have all been in the yearling-or-under age class with the majority of the animals (all but two) under six months of age. Only one animal killed, a deer, definitely had a disabling malformation. This was a crippled leg as indicated by a long, curved, unused hoof. Many of the kills were too fully consumed or decomposed when found to allow accurate determination of the condition of the animal at death.

SUMMARY

Six new adult lions (four females, two males) were captured on the study area. Of these, two are known to be dead. This raises the total of mature lions handled on the area to 18, seven of which are known to be dead. Three litters of kittens were known to have been born on the area during the year. One of these contained three young; the exact size of the other two litters is as yet unknown. Approximately 900 radio-locations of marked lions have now been made on the study area. Detailed analyses of these movements data have not been completed. No effort was made to census deer populations on the study area during this segment. Mid-winter sex and age classification counts were made from the ground. Considerable time was spent in developing estimates of cattle numbers on the study area, using ranch and U.S. Forest Service records. These were reported in a paper presented during June covering kill data gathered to date. Twenty-three lion kills were located during the project year. Of these, 16 were deer, six were cattle, and one was a pronghorn. Eighteen of the 23 kills were located through radio-tracking of marked lions. Total kills located during the study is now 56. Sixty-four percent of these are deer, 32 percent are cattle, and the remainder is made up of pronghorns and rabbits.


During 4 years of study, 16 adult mountain lions (Felis concolor azteca) were captured on a 406 km² study area in Arizona. Eleven kittens are known to have been produced on the area. Seven adults and 4 kittens are known to have died. An average population of 7 resident adult lions were estimated for the area. The species composition of 58 kills made by lions was 64% mule deer, 32% cattle, and 4% other species. Sixty-two percent of the examined lion scats contained deer, 34% cattle, and 4% representing other species. Selection of calves over other prey was noted. Estimate of total kill per year ranged from 77 to 193 deer and 21 to 97 cattle per year, depending on the method used to estimate frequency of kill.


SUMMARY

Fifteen lions were captured or observed by project personnel. Of these, two were snared, 12 were captured with dogs, and one was observed accompanying a marked lion. Both of the snared lions were observed several months after initial capture, and both had suffered permanent foot injuries from the snares. Seven recaptures of five marked lions were made. Three of the marked lions were subsequently killed by hunters. One small kitten was killed by dogs at the capture site. Nine additional lions were known to have been killed by hunters on the Kaibab Plateau during the project year. A total of 23 lions, thus, were either captured or killed on the study area from July 1977 to June 1978. At least six additional lions were estimated to be on the Kaibab during June 1978 as evidenced by track counts, yielding at least 29 lions on the North Kaibab during some portion of the 1977-78 fiscal year. Radio tracking was conducted from a Piper Super Cub on 83 days and a total of 169 locations were made on the four instrumented lions. Only four kills, all mule deer, were located during the
One probable turkey kill was also documented. Eighteen scats were collected and analyzed. Fourteen (78 percent) contained varying amounts of mule deer remains. Eight (44 percent) contained remains of rabbits, rodents, or unknown small mammals. Three (17 percent) held remains of badger. Only one scat (6 percent) held remains of cattle.


This report is intended as a field guide to the identification of sign left by mountain lions and to the assessment of the characteristics of a lion population in an area. This guide also presents methods for interpreting evidence associated with carcasses of big game and livestock and for judging the likelihood of lion predation. There is no attempt to fully document statements and opinions presented herein. The information and recommendations presented are based on the experience and professional judgment of the author as acquired during six continuous years of intensive study and field work on mountain lions in Arizona.


SUMMARY

Over a 2-year period, existence of 36 lions on the study area has been documented. Of these, 17 have been killed by hunters, 2 have died of study-related causes, 1 emigrated from the area, and 6 are believed to have died from natural causes. This leaves a known population of 8 lions in the area. This, undoubtedly, is a minimum estimate of the population, but it suggests strongly that a decline in lion numbers on the Kaibab plateau has occurred during the past 2 years. Track counts over 169 miles of road during June 1978 yielded 7 lion tracks, or 1 track/24 miles. Similar counts over 146.3 miles of road during June 1979 yielded no tracks. This further supports the evidence of a decline in lion numbers on the area. Thirteen kills, all mule deer, have been documented during the 2-year period. One probable turkey kill was found. Of 53 lion scats analyzed to date, 45 (85 percent) contained mule deer remains, 14 (26 percent) held varying amounts of rabbit or rodent remains, and 4 (7.5 percent) contained cattle. Three scats collected during the first year of work contained badger remains. This was not repeated in the second year. Radio-location of lions has continued concurrently with work on radioed deer. Five females were tracked and yielded 155 locations. Three males were caught and collared but two of these were taken by hunters soon after capture and the third experienced radio failure within 2 weeks of capture. No radio locations of mature male lions have yet been made. Two collars remain on females and are currently being tracked. Failure of transmitter collars has plagued the radio tracking effort on the Kaibab since the study began. This year 4 of 8 transmitter collars have failed well short of anticipated life span, 3 of these within 4 months. This record is in sharp contrast to the excellent longevity of the deer collars put in service in March 1978. Only one unaccounted for collar can be suspected of failing in over 16 months. Both deer and lion transmitters have similar specifications and are of the same manufacture (Telonics, Mesa, AZ).


The mountain lion (*Felis concolor*) population on the North Kaibab declined from approximately 40 adults to approximately 15 between 1977 and 1980. A slight
increase in lion numbers may have occurred during the spring of 1980. Sport-
hunting and nutritional stress were the apparent causes of the decline. Lions
removed 15-20\% of the peak deer population during 1977-78. By 1980, they were
probably taking less than 10\%.

Shaw, H.G. 1981. Comparison of Mountain Lion Predation on Cattle on Two Study
For., Wildl., and Range Exp. Station, Univ. of Idaho, Moscow.

Predation by mountain lions (Felis concolor) on cattle and mule deer on two study
areas are compared. Use by cattle by lions varied with season and with area.
Relative availability of major prey classes was the main determinant of seasonal and
area differences. A preference of deer over cattle was exhibited by lions in both
areas. Possible deer and livestock management implications of these findings are
discussed.


A total of 1006 questionnaires were mailed to members of the Arizona Cattle
Growers Association as part of a survey to assess rancher-mountain lion problems in
the state. As of May, 1984, 188 questionnaires had been returned and tabulated
(18.7\%). Mountain lions were classified as predators with bounties paid to anyone
killing a lion until 1970 when the status was changed to Big Game. Arizona is
unique in the amount of cattle lost to lions, due to yearlong cow-calf operations in
lion country. Lions in all problem areas eat beef. The cost of lion control is
expensive and because there are probably as many lions in Arizona now, after 80
years or more of heavy hunting, indications are that lion control is physically
impossible and economically not feasible. Nearly 900 cattle were believed taken by
lions from 119 ranches in 1983. The sporting kill of lions in Arizona ranges around
250-300 each year and the 297 lions reported killed by ranchers approximate this
annual average sporting harvest taken from hunter questionnaires. Eighty-two of the
297 lions were believed to not have been reported in any way by the ranchers due to
fear of increased regulation and harassment by agencies or preservationists. Sixty
percent of the cattle kills inspected on Spider Ranch were calves under 3 months of
age and 80\% were under 6 months of age. This suggested that by keeping calves out
of lion country would help and that switching to a steer operation may be a
consideration. An option may be for some ranchers to consider lion guiding, but the
costs of hunts are low and overhead is high.

Shaw, H.G. 1987. Mountain Lion Field Guide. Arizona Game and Fish Department

This booklet provides information on mountain lion characteristics, biological
considerations, reading sign, kills, estimating populations, criteria for age estimation,
capture, and depredation problems.

Pl. 2, Job 29. Final Rep.,Arizona Game and Fish Department.

A total of 144 track count routes were run in 24 Management Units representing 11
habitat complexes. Representatives were interviewed from 29 ranches encompassing
the survey routes. Lion track densities were found to be related to habitat type and to vary significantly between Management Units. Lion track densities were related to densities of mule deer and unrelated to other prey or to additive densities of prey. Tracking condition and method of travel of observers affected track count results. Track condition was not significantly related to habitat type. Rancher impressions of losses were directly related to lion density. Highest claims of losses occurred on ranches with low-calf operations in interior chaparral habitats. Calving out of lion country and allowing calves to gain initial growth away from lion habitat reduced losses for those few ranches with ranges suitable to this management strategy. Other options (use of horned cows, steer only operations) were difficult to evaluate. In general, ranchers using such options were also exerting lion control efforts. They were also the ranchers that claimed the highest rates of cattle losses. A track count using experienced personnel appears to be a viable method to assess relative lion densities over large areas. It is probably too labor intensive to be used by regional personnel. Recommendations for refinement of the technique are included.


"Lionpop" is a computerized model for mountain lion populations. It contains three components: 1) the input component for placing acquired data into the memory of the computer, 2) the population simulator, which consists of a series of mathematical statements that represent biological processes and events that determine the size and composition of any mountain lion population, and 3) the output component, which is used to print computed results from the simulation trial. Lionpop uses reproduction, natural mortality, harvest, immigration and emigration data from any given mountain lion population to simulate that population. Information about the population size, age class structure, birth rates, and harvest statistics are outputs of Lionpop. Lionpop was tested in two phases: 1) data was used that was collected on the lion population in the Idaho Primitive Area and 2) data compiled through personal conferences with ten biologists from the western U.S. and Canada who have worked with lion populations and one who had worked with a Black Bear population. The tests of Lionpop were successful and no major errors were detected. Lionpop can be used for the management of populations of lions or other species that have life histories and biological properties similar to those of lions. It can be used to test the effects of different management regimes on a simulated population; to test mental models that the user has formulated about a given population; or to test the sensitivity of the simulated population to changes in different population parameters.


The last panther killed for bounty in Pennsylvania was taken in the Moshannon region of Centre County in 1886. Many supposed accounts of cougar sightings are listed by the author.


The panther had become a rarity in Pennsylvania by 1860. The last panther in the northern section was killed in February 1874 and was a male. A female that was with it escaped and was probably the same one which was killed in northern Berks County in August of the same year. Another hunter killed a panther on Jack's Mountain in November of 1873. Two panthers were killed on Mosquito Creek in Clearfield
County in February 1880. Four kittens were removed from their "ledge" in Treaster Valley in 1892 and two others were removed the following year.


The author states that there had been at least a hundred reputable mountaineers who would have told of having heard or seen panthers in Pennsylvania during the past five years. He reports that the last to be killed were a nest of cubs at Treaster Valley, Mifflin County, in the spring of 1893. Four cubs were usually born early in April, with the rutting season at Christmas time. In Pennsylvania, males outnumbered females five to one. In Indian days, the panther was hunted more persistently than other animals and its hide was used for many purposes. The "great medicine" was always kept in a paunch made from the hide of panthers. Its meat was relished even above the flesh of the bison. Its blood gave courage to warriors when "drunk fresh". Its claws, hung around the neck by a cord, were amulets of good luck and the teeth were much prized as decorations. Shoes fashioned from its paw made young Indians grow tall and strong. The tongue was a favorite tid-bit at banquets of the chiefs. A decoction made from its eyes prolonged life and the bones made excellent cutlery. The tuft of the tail made the warriors war plume.

Indications are that Wyoming has a widespread and increasing mountain lion population. Increased reports and complaints of livestock depredation losses is reason for concern since Wyoming reimburses livestock owners for animals killed by mountain lions. The population was estimated to range from 930 to 1173 animals. Mountain lions in Wyoming are managed on and harvested under a sustained yield basis. Any lion which damages private property may be immediately killed at any time. License income in 1987 was $12,040 compared to Department expenditures of $288,846.

No example of the cougar had been shot or seen within the New England States for a period of over 50 years. Theodore Roosevelt had hunted and killed more cougars than any man of his time. According to Roosevelt, the cougar females far outnumber the males. It was quoted that it is quite easy to follow a fleeing puma because it always travels in straight lines. The author had seen the cougar withdraw its attack by steadily staring it in the eyes.

The cougar disappeared in New Hampshire in the late 19th century. A number of recent sightings have been reported but not verified. The legislature passes a bill in 1967 that prohibited shooting, hunting, taking or possessing any mountain lion or part of the carcass in the state, except if acting in protection of his person or property. In 1850, New Hampshire was approximately 50% agriculture. However in 1971, forest...
growth had increased to the extent that about 87% of the state was now forested. The author felt that this factor contributed to the possibility of a cougar comeback in the state.


This study of food habits of the mountain lion was conducted in the Guadalupe Mountains National Park, Texas, to determine diets of local lions and assess the degree of predation on livestock on neighboring ranches. Predation upon domestic sheep has occurred on a regular basis on ranches immediately to the north of the park and on three separate occasions lions have killed sheep in excess of their feeding needs. Ninety-five lion scats were collected between 1978 and 1981 from all areas of the park. Six wildlife species and one domestic species were identified in the diets of Guadalupe mountain lions. In addition, unidentifiable feathers from medium-sized birds were found in 2 scat samples. Mule deer (65%) and elk (15%) comprised over 75% of the mountain lion's annual diet. The desert cottontail and porcupine were also frequently taken. The single scat sample which showed feeding on domestic sheep indicated that, at least for resident lions, sheep are not an important part of the diet.


The word puma is derived from the Quechua language. Most South Americans call pumas "lions" (leones) but it is generally agreed that puma is the best name for them.


The paper reviews the historical legal status of mountain lions (Felis concolor californica) within California, and outlines the study program initiated by the California Department of Fish and Game. Methods of population determination, capture and telemetric follow-up are given and accumulated data is discussed. An estimated 1,224 lions exist in 14,325 square miles of lion habitat. This is about 40% of the State's lion habitat. Project purposes and the future guidelines upon which the study will proceed are explained.


SUMMARY

Since the mountain lion was classified as a bountied predator in 1907, it has undergone reclassification a number of times. In 1963, the lion was classified as a nonprotected mammal and remained so until 1969 when it changed to game mammal status. The first lion game season was for the entire 1970-71 license year. Tag sales totaled 4,726 and 83 lions were taken. The second season lasted from November 15, 1971 through February 29, 1972. Tag sales totaled 223 and 35 lions were taken. A one-lion bag limit was also in effect during the second season. A four-year moratorium on lion hunting was established in March 1972. A population survey of the mountain lions within California began in June, 1971. Survey techniques.
included interviews, field investigation questionnaires, lion bounty records from 1907-1963, and radio tagging-monitoring studies. Over 800 interviews were conducted, and many months of actual field study were directed to investigating the claims of those interviewed. All input data was analyzed and used as the basis of material and figures presented in this paper. There are approximately 74,000 square miles of lion habitat within California with an estimated population of 2,400 lions. Three major areas of high lion concentration occur: the coast range from Mendocino County to Del Norte County, the coast range in Monterey-San Luis Obisbo-Santa Barbara-Ventura counties, and the southern Sierra Nevada in Fresno and Tulare counties. Increased sign, depredation applications, successful hunts and intrusion of lions into urbanized areas together with the opinion of those lion-knowledgeable individuals interviewed seems to indicate that the lion population has doubled in the last 12-14 years. It is felt that the elimination of the state hunter in 1959 and the bounty system in 1963 was the major factor in this increase. Five depredation permits were issued in 1971 and five lions were taken. In 1972, four permits were issued with only one lion dispatched. Thus far in 1973, six permits have been issued with two of the lions taken. It is felt that the cougar is presently near carrying capacity levels and that new recruitment into the population may result in increased depredation complaints. Self-limiting population control mechanisms resulting from the territorial needs of the lion may offer an internal control against depredation problems. Four lions were recorded road kills during the last 14 months. The effort to relocate problem lions into other isolated areas of the state resulted in one lion successfully relocated from Los Angeles County into Alpine County. Three other attempts failed when the offending lions did not return to problem sites. Two of these lions were involved in livestock losses and the other wandered into residential Palm Springs. The pursuit of lions without taking or harming them as allowed in Assembly Bill 660 was initiated October 1, 1972 and continued through February 29, 1973. Three permits were issued, two for the same individual. The purpose of the allowed pursuit was to gain data on local lion populations in two instances and for photography in the other. Popular opinion of mountain lion hunting seems to be slightly in favor of the maintenance of the moratorium in those interviewed. Most of those contacted, however, were apathetic on the question, citing lack of information or interest in the subject. A significant group of those interviewed who did have opinions favored a bag limit--season harvest concept of management for lions. The major prey species for lions throughout the state is mule deer, with incidental predation noted for horses, burro, cattle, sheep, pigs, chickens, turkeys, housecats, dogs, squirrels, skunks, beaver, porcupines, rabbits, hares, foxes, feral pigs, pigeons, peacocks, and in one instance, goldfish from a watering trough. Evidence seems to indicate that the lion is a rather opportunistic feeder. The Department has captured six lions for preliminary telemetric range studies. Five of the lions were equipped with transmitter collars and their movements monitored. Data returns on this monitoring study indicate a range of approximately 40-50 square miles for adult male and 20-30 square miles for females.


SUMMARY

The Department of Fish and Game initiated a mountain lion study in June 1971 as a Federal Aid to Wildlife Restoration Project. The objectives of this study were to obtain sound population estimates and basic information necessary for management of the species. The study was conducted in two phases:
PHASE I (Statewide Population Survey)

The Department, by contacting knowledgeable people and checking selected areas, determined that there are approximately 74,000 square miles of lion habitat in California with an estimated population of 2,400 mountain lions. Major areas for the mountain lion are: (1) The coast range of Mendocino to Del Norte counties, (2) the southern Sierra Nevada Range in Fresno and Tulare counties, and (3) the coast range from Monterey to Ventura counties.

PHASE II (Intensive Area Study)

An intensive study was conducted on 175 square miles of coast range in Monterey County to determine as precisely as possible the total mountain lion population and their range requirements. This was done by capturing and fitting the lions with radio transmitter collars that could be monitored. Fourteen lions were collared and two cubs were ear tattooed only. The population is thought to be between 16 to 20 animals where the Department had previously estimated 15 in Phase I. Significantly, there is more overlap of ranges than was expected with a density equal to 10 lions/hundred square miles. Depredation: Complaints of mountain lion depredation on livestock are investigated by Department personnel. Confirmed instances of livestock losses caused by mountain lion average 15 per year. Permits are issued to landowners that allow problem animals to be killed. Twenty-four mountain lions have been dispatched since 1971 under this system.


SUMMARY

The Department of Fish and Game estimates the mountain lion population in California is approximately 2,400 animals. This includes adult, young, and transient animals. The estimate was made after the first phase of investigations, when mountain lion habitat was examined for signs of lions and knowledgeable residents were interviewed for information on lion abundance in specific areas. With this information the mountain lion range in California and relative lion densities were determined. Major mountain lion areas are: (1) The coast range of Mendocino to Del Norte counties, (2) the southern Sierra Nevada range in Fresno and Tulare counties, and (3) the coast range from Monterey to Ventura counties. Lions were found in most other forested and brushland areas of the state, but populations were lower. Beginning in 1973 an intensive study was conducted on 175 square miles of coast range in Monterey County to determine the total mountain lion population, as a check on the original survey results, and lion range requirements. This was done by capturing and fitting the lions with radio transmitter collars. Seventeen lions were collared and two cubs were ear tattooed only. The population is 16 to 20 animals where the department had previously estimated 20 in the statewide survey phase of the project. Significantly, there is more overlap of ranges than was expected, with an estimated density equal to 9.2-11.4 lions/100 square miles. In 1976 an effort was made to gather specific information on an area in the southern Sierra Nevada range. Two volunteer houndsmen were used to tree, mark and retree mountain lions within a 130-square mile area of Tulare and Kern counties. Eleven different lions were treed in a six-month period, and it is estimated from the tracks that were found and measured during the same period that at least 17 mountain lions used the area. This represented approximately half of the Hot Springs quadrangle. In the statewide survey the lion population estimate for the entire Hot Springs quadrangle was 25.
average of about one lion per 15 square miles of habitat for Tulare and Kern counties. The intensive investigation of the Monterey and southern Sierra areas have shown that the original statewide survey estimates were reasonable and in the case of the Monterey study area and the Hot Springs quadrangle conservative. Complaints of mountain lion depredation on livestock are investigated by department personnel. Confirmed instances of livestock losses caused by mountain lions average 15 per year. Permits may be issued for landowners to kill problem animals. Thirty-two mountain lions have been killed since 1971 under this system.


The Department of Fish and Game studied depredation by mountain lions on livestock from 1971 through 1977 to determine the scope of the problem. Information was needed on the physical characteristics of a stock killer, the frequency and trend of predation, the livestock types preyed upon, and the geographic distribution of incidents to develop a sound depredation policy. Historic and contemporary records and literature on livestock predation, Department of Fish and Game necropsy reports, collaboration with mountain lion researchers in other western states, and telemetry studies on relocated livestock predators were used to compile this report. Department of Fish and Game verified 134 incidents of mountain lion predation on livestock which occurred between April 1971 and December 1977. Forty-five mountain lions (28 males and 17 females) were killed on depredation during this time. Approximately 42 percent of the predation incidents involved sheep, 22 percent goats and 16 percent cattle, with horses, pigs, poultry, and pets composing most of the remaining prey. California's south coast region from Santa Clara to Ventura County reported 44 percent of the predation incidents, 28 percent from the Sierra Nevada, 20 percent from the north coast from Napa and Sonoma Counties to Humboldt County and nearly 8 percent from southern California. There does not appear to be a stock-killer profile of common sex, age, or health factors. Present depredation policy appears adequate to handle the problem, but efficiency could be increased by coordinating incident verification investigations and available depredation resources, such as U.S. Fish and Wildlife Service and county predator control agents.


Current techniques used for mountain lion and dog track discrimination are described. The reliability of track traits was evaluated and was found that most should be used with other traits to increase differentiation. A quantitative analysis of some track traits was performed. Of the traits tried in the analysis, the angle of the long axis of the outer toes with respect to each other best discriminated dog and lion tracks and was indifferent to the front and rear track distinction. A dog and lion track classification key is provided for distinguishing between similar dog and mountain lion tracks.

Interactions of mountain lions (Felis concolor) with humans have been increasing in recent years in the western United States and Canada for unknown reasons. Multiple hypotheses are needed to identify causes to overcome investigator bias from strong political and ideological pressure. Testing the appropriate hypotheses requires accurate and precise population dynamics of mountain lions. In this paper we (1) review methods for the study of large carnivores; (2) examine factors that impede estimating mountain lion populations by track counts; and (3) use road track counts of mountain lions in California in 1986 to illustrate biases and index-population relations. Region and topography, but not dust or distance from human settlements and urban areas, affected the frequency of mountain lion track sets. We found fewer tracks at higher elevations and more in Douglas-fir (Pseudotsuga menziesii) habitat. We conclude that (1) the efficiency of mountain lion track censuses can be improved with selective route placement; and (2) biases and index-population relations need to be further investigated and understood.


We introduce a rigorous technique to make individual animal identification by tracks more objective than previously possible. With measurements from acetate tracings of two to six tracks from each rear foot of nine mountain lions Felis concolor, multiple-group discriminate analysis accurately grouped 100% and 92% of the tracks from the left and right rear feet, respectively. From bootstrap analyses we concluded that mountain lion track set discrimination was best achieved with the spread of the outer toes, heel width, and the midline width of the heel pad. After further research, this technique can be used to improve population studies of mountain lions and other large animals.


The status of the California mountain lion (Felis concolor californica May) population has been controversial and central to disputes regarding its management. Track survey methods and transects were developed during the 1980s to provide the only standard estimate of mountain lion population trends in California. In 1992, I repeated the 1986 statewide survey for mountain lion track sets, in which a track set is any continuous trail of tracks made by the same animal. Track set density increased 31.3% in the mountains of southern California, but they decreased 52% in northern California, and 61% in areas where timber was removed since 1986. Most of the areas preferred by resident mountain lions in 1986 were avoided in 1992 after they were clearcut. Whereas residents preferred unharvested and non-forest areas in 1992, track set densities of deer were the same with or without timber loss. Mountain lion track set density might have decreased due to degradation of habitat quality other than prey availability, or it might have decreased as part of a natural population cycle, which is common among species of Carnivora. When this decrease was added to the changes observed at three sites monitored since 1980, the pattern resembled nearly one complete cycle. Plans for management and research of mountain lions should include the effects of habitat loss and natural population dynamics.


Reliable estimates of status and population trend are critical for conservation of large terrestrial carnivores, but are usually lacking due to the high costs of sampling across large geographic areas. For detecting population trends of mountain lion *Felis concolor californica*, we evaluated counts of track sets on 48 randomly chosen quadrats in California. Each quadrat contained 33.8 km of transect on dusty, dirt roads, which were chosen by local wildlife biologists. A count of track sets by one person on all quadrats was more efficient than recording presence/absence by local survey teams. We estimated an efficient sample size of 44 quadrats in California after applying our data to a general formula for contagious distributions. This sample size can be reduced substantially by choosing new transect locations based on associations of tracks with topography and habitat. Tracks were most likely found on roads along 1st- and 2nd-order streams, on mountain slopes and knolls/peaks, and in oak woodland and montane hardwood-conifer forest. A changing mountain lion population can be detected with an inexpensive, periodic track survey and self-stratifying, non-parametric tests. Each track survey across California can be finished in 30 days. The many mountain lions and the variety of environmental conditions included at this extraordinarily large spatial scale permit estimates of: (1) trends among population strata in quadrats that are clustered according to typical number and age/sex class of track sets; (2) population size and demography after individuals are identified by their tracks, and after linear density on roads is calibrated from spatial density at intensive study sites; and (3) spatio-temporal associations with bobcat *Felis rufus*, black bear *Ursus americanus*, coyote *Canis latrans*, and fox *Vulpes vulpes* and *Urocyon cinereoargenteus*.


Density estimates have been considered essential for sound ecological theory and wildlife management. We therefore synthesized reported mountain lion density estimates and accompanying study attributes to assess their use in management. Habitat and other biological and physical aspects of the study site explained virtually none of the 30-fold range of variation in mountain lion density, nor did sampling methods and other aspects of study and interpretive design. Most (78%) of the variation in mountain lion density estimates can be explained by the spatial extent of study area, but the reason for this relationship remains unknown. Without making adjustments for the effect of spatial scale, mountain lion density estimates cannot be meaningfully compared and extrapolated to larger geographic areas. Field studies would contribute more to our knowledge of mountain lion by spanning larger areas, a greater variety of land uses and habitats, and more of their distributional range. Local detail in mountain lion distribution needs to be connected to the larger extent of their range, with many more studies, sampling methods that are efficient across large areas, and by not just selecting sites where the animals are known to occur.


During the summer of 1995 we conducted the fourth statewide mountain lion track survey since 1985. Surveys were conducted in 1985 and 1986 by wildlife biologists from multiple natural resources agencies, mostly from the California Department of Fish and Game. Smallwood surveyed the transects in 1986, 1992, and 1995.
Assuming the number of track sets is indicative of the mountain lion population, mountain lions in California decreased in number substantially from the mid 1980's to the 1990's. Regional trends have been dramatic, including alarming declines east of the Sierra Nevada and in southern California. Declines in 1992 were followed by an increase across the northwest part of the state, the central coast, and the Sierra Nevada. The track sets found were clustered within small geographic areas; no tracks were found across the vast majority of the mountain lion range that was sampled during 1992 and 1995. The clusters of track sets changed locations between surveys since the 1980's. Mountain lions traveled along certain aspects of the dirt roads in directions and at locations according to habitat, topographic, and interspecific (prey and competitors) conditions. The mountain lion population can be efficiently monitored across large areas, and it can serve as an indicator of large-scale ecological conditions by further developing track count methodology.


General information on the Florida panther is provided.


In the spring of 1967, a panther was killed in the Ocala National Forest. In March 1968, the Citrus County Chronicle, a weekly newspaper, carried a photograph of a full-grown panther killed by a sheriff's deputy. The panther had been reportedly attacking cattle on a farm near Iverness. The United States Fish and Wildlife Service estimated the panther's total numbers at between 100 and 300 and gave its distribution as "Collier, Lee, Levy, Hendry and Monroe counties and rumored around St. Marks Refuge in Wakulla County, Florida". The author provides a few accounts of panther sightings that are believed to be authentic.


The author states that his grandfather was probably responsible for the last panther shot in the state (Clearfield County). The author tells of how he and a companion had spotted a panther in 1906, even though they had been considered extinct for many years.


SUMMARY

Approximately 65 upper first premolars were collected from hunter-killed black bears and from bears live-captured and marked on the Four Peaks study area. The collection of javelina continued during the Three Bar pistol-only hunt. To date, teeth from all species examined, with the exception of the mountain lion, show visible incremental lines in the cementum of the tooth root. Canines from some lion teeth have shown the annulations, others known to be mature lions have had none. There are too few known-age specimens to permit a comparison between known-age and cementum-estimated age.

Smith, T.E. 1981. Food Habits and Scrape Site Characteristics of Mountain Lions in

Two hundred and twenty scat samples were collected during the study. Scats were typically deposited at the rear of the scrape mound, but occasionally were found on top or to the side. Most fresh scrapes had a faint odor of urine in the scrape pile. Although all scrapes were not measured, most were within 15-30 cm wide and 15-46 cm long. Scrape sites consisted of up to nine scrapes, usually 1 or 2 m apart. They were always located on relatively level ground, typically in leaf litter but were found in other types of debris as well. They were rarely made in bare soil or sand. Scrapes were nearly always made by resident male mountain lions. One occurrence of a female scrape was recorded and she was later found to be an older animal without kittens. Scrape associated scats were most often collected at reused scrape sites. Of the 361 known scrape sites, a minimum of 83 (23%) were reused (revisited). Most of these sites were stream side benches, intermittent creek bottoms, and ridges that were usually located where topography and/or vegetation funneled the movements of one or more lions into a common path. Fifty-nine (71%) of these reused sites were in creek bottom locations. Of the 220 mountain lion scats analyzed for prey content, 10 small volume, amorphous scats contained small amounts of felid hair only and these scats were discarded from final tabulations due to the lack of prey remains. Black-tailed deer were the most frequently occurring item in the seasonal and year-round diet. The most important alternate prey species was the introduced wild pig. Thirty-four sheep were killed as a result of attacks by three mountain lions during the study resulting in the occurrence of wool in 7 scats. Grass occurred in three scats in quantities that suggested deliberate ingestion. The frequency of occurrence of spring fawn utilization probably lies between 29 and 42 percent. Form and/or diameter were noted in 186 of the 215 scats collected. Twenty-three percent were loose, runny, amorphic fecal deposits varying in volume from an estimated 10 to 100cc. The most common volumes ranged from approximately 10 to 50cc. These scats were typically dark brown to black in color, containing small amounts of hair but rarely bone, in a tar-like matrix. The frequency of occurrence of wild pigs in the diet showed significant differences between seasons with peaks during the fall and winter months and decline during spring and total absence during the summer months. Other alternative prey species occurred most frequently in winter and declined through spring and summer. Wild pig was the only alternate prey recorded in the fall. The regional grouping of scat samples revealed a statistically significant difference in the utilization of wild pig between the chaparral-oak woodland habitats in the southeast region and the oak dominated habitats in the northwest region.


To date 12 males and 10 females comprising 14 adults, 3 yearlings, and 5 kittens had been captured and radio-collared. Nine were currently alive with functional transmitters. Home range for 4 adult males was 144km² (56mi²) while that of 3 adult females was 48km² (18mi²). A small amount of home range overlap was noted among mature adult males. A population size of 58 mountain lions was estimated to exist in the study area (1000km²). Analysis of 118 scats revealed a 78% frequency occurrence for deer. Forty-seven lions died between June, 1982 and July, 1984 in the study area. Forty-four of these were trapped or shot with the aid of hounds.


A three year study of mountain lions was conducted in the vicinity of Carlsbad Caverns National Park, New Mexico, and Guadalupe Mountains National Park, Texas in order to provide basic ecological information to the National Park Service. Accurate information was needed to enable the Park Service to refine and develop management plans in part because mountain lions were known to be killing sheep on ranches north of the boundaries of the two parks, and the role of mountain lions from these parks was not known. Twenty-two mountain lions were captured, fitted with radio-collars, released and monitored during the course of the study. The home ranges, movements, dispersal, activity, reproduction, and food habits of these animals were studied and reported. An estimated maximum of 58 lions (24 adult, 12 yearling, and 22 kittens) occupied the study area of 400 mi$^2$ (1036 km$^2$) within the two parks and sections of the Lincoln National Forest at any one time. The average home range for adult males was 80 mi$^2$ (207 km$^2$), and for females was 23 mi$^2$ (59 km$^2$). In general, adult males travelled further than adult females, and females with 5-12 month old offspring travelled even less. Deer were the principal prey species for mountain lions, occurring in 82% of all scat (feces) collected. During the study period, 65 mountain lions (including 11 radio-collared animals) were killed on or near ranches bordering the National Parks. Some of these animals were adults from within the National Parks, some were young produced within the parks, and apparently others were from outside the study area. Six of the eleven radio-collared mountain lions which were killed were known or believed to have killed sheep, but whether the others did is unknown. Despite the large numbers of lions killed bordering park lands, no detectable changes occurred in mountain lion density during the study, which suggests that reproduction and immigration from other areas replaced the mountain lions which were killed.


Three subspecies of the cougar are found and include: *F. c. oregonensis*, *F. c. missoulenis*, and *F. c. vancouverensis*. Interpretation of bounty records was difficult due to fluctuations, in part, being a response to changing bounty prices. The known harvest of 920 cougar in 1948 (725 bountied, 195 killed by Branch officers) was the highest annual kill accurately recorded. The subsequent drop in the number of cougars bountied (1952-1956) may represent a condition of over-harvest or more probably reduced deer numbers on Vancouver Island and lowered hare populations in the Chilcotin. At present most cougar populations are static or increasing, except in the South Central and Southeastern sections of the province where populations are declining. These declining populations are being over-hunted. Two people (both young boys) have been killed by cougar, and the author has accumulated a total of 23 known attacks on humans, where data on sex, age and/or condition of the cougar was known. Ten of the 17 classified to sex were females, nine of which were young animals. Ten of the 22 classified as to condition were in good physical condition. This indicated that young cougar, frequently in good condition attack humans, and there is a tendency for females to predominate in the sample. In contrast, male cougar apparently outnumber females in the wild. The cougar was recognized as a big game animal in 1966, but no restrictions were placed on hunting, harvest limits, or seasons, and no tag license was required. In 1970, harvest control was implemented with trophy fees and guides required for nonresidents. bag limits in
In some areas, and a tag license fee was required. Livestock losses are considerable and may amount to $25,000 per year.


One hundred thirty-two cougar stomachs and 73 cougar-killed mule deer were examined from 1958 to 1967 in south-central British Columbia. Deer was the predominant food item, but when other prey was abundant locally, cougars took advantage of these alternate food sources such as snowshoe hares, moose, and domestic stock. Cougars seem to take antlered mule deer, as well as the old of both sexes, in greater numbers than exist in the deer population. Of the 132 stomachs examined, 99 had identifiable food remains, 12 were empty, and 21 either contained unidentified contents or grass. The heaviest stomach weighed during this study was 3,176 grams (approximately 7.1 pounds) of mule deer. Data seemed to indicate that cougars showed a preference for bucks 1.5 years and older.


Twelve cougars were trapped and radio-collared in a protected (non-hunted) watershed in western Washington state. The cats were tracked until their death. Cats leaving the protected area incurred a higher mortality rate from both hunting and vehicle collisions. Seasonal changes in home ranges showed smaller winter home ranges and elevational changes that followed that of elk, their primary prey.


Thirty-four cougars (Felis concolor) were studied from May 1985 to November 1987 on a 540 square km study area in the Elk and Fording Valleys of southeastern British Columbia. Winter population densities were estimated as 3.5 cougars/100 square km's in 1985-86 and 3.7 cougars/100 square km's in 1986-87. Kittens comprised 55% to 58% of the population each winter. Mean litter size was 3.14 kittens/litter. Juveniles dispersed distances of 31-163 km from the study area. Sex ratios of both kittens and adults did not differ significantly from equality. Mortality the first and second winters, respectively, was 5.3% and 15%, of the population. Most mortality within the study area (57%) was human-related despite closing of the season during the study. Mortalities of resident males was quickly compensated for by immigration. Spatial distribution of seven adult cougars was determined through telemetry. Mean yearly home areas were 55 square km's (S.D. = 25.18) for 4 females and 151 square km's for two males. No overlap was noted between male home areas and only slight overlap was noted in 2 of the 4 female home areas. Cougars utilized lower elevations during winter months than during spring-summer-fall months. Cougar food habits were studied using cougar kills, and gastrointestinal contents and parasitology data collected from vehicle-killed cougars. Elk were found to be the major prey item, 66% of the sample. Selection of elk calves over cows and bulls was noted. Cougars did not appear to select for prey in poor condition. Eighty-six percent of the elk killed during winter 1985-86 were less than 1.5 years of age or 8.5 years of age or older. Rodents and other small prey were believed to have been underrepresented in the sample, a conclusion supported by parasitology data.

The Hon. R.J. Gill, Minister of Lands and Mines, declared that there are still panthers in New Brunswick in January, 1948. Much of the credit for proof of the survival of the eastern panther was given to Bruce Wright, Director of the Northeastern Wildlife Station at Fredericton. In March, 1947, Jim Robinson, a guide, showed Mr. Wright the tracks of an adult male, a female, and one cub not far from the new Fundy National Park. Tracks were also found in mud in July, 1947, and plaster casts were identified at the Smithsonian Institution in Washington. Although no specimen exists in any museum collection, several historic accounts are presented which indicate that several panthers had been seen or killed in New Brunswick.


Until 1959, California employed up to five state lion hunters at a time and continued to offer bounties on lions until 1963. In fifty-six years, the state paid bounties on 12,500 lions. Sport hunting was outlawed in 1972 and it is believed that lion numbers are increasing rapidly in California. Human/lion encounters are increasing and so are reports of lions killing livestock. In 1972 there were five livestock killings reported compared to ninety-four in 1985. The California Department of Fish and Game estimated that there were 4,800 lions in California, plus or minus 700, from a survey in 1972. Rick Hopkins, a University of California graduate student, has been studying a lion population on Mount Hamilton, east of San Jose, for eight years. His studies showed no increase in lion densities or numbers and he believes the lion population hasn't changed in the last forty years. Maurice Hornocker's mountain lion studies in Idaho, Rick Hopkins studies in California, and Don Neal's studies in the Sierra National Forest in California are discussed.


Two orphaned mountain lion kittens were radio-collared and established home ranges that resembled, in size, shape, and pattern of use, those of established adult female lions within the study area. The minimum adult lion density in the area where the kittens settled was estimated to be 7.8 per 100 mi$^2$. Telemetry records showed that eight adult female and 6 adult male lions utilized all or part of one of the kittens home range and 6 adult females and 4 adult males utilized the other kittens home range while the kittens established their new home ranges.


The results of the indirect immunohistochemical testing confirmed the presence of antibodies specific to T. gondii in these cougars, thus establishing past exposure to the parasite. Since we do not know the magnitude if titers in cougars that correlate with recent versus past exposure to T. gondii, no comment can be made as to the time of their exposures. Although the results demonstrate that cougars could reasonably be considered as potential sources of infectious oocysts on southern Vancouver Island, they do not identify cougars as the source of parasites in the 1995 outbreak in
Historical records indicate that although the mountain lion was widely distributed in Nevada, no evidence suggests that densities or numbers were high. Lion populations appeared to rise with increasing mule deer populations in the 1930's and 1940's. By the 1950's, Animal Damage Control harvests had increased from 46 animals killed between 1917 and 1931, to an average of 90 lions per year in the 1950's. The mountain lion was given game animal status in 1965, and in 1968 tags were required to harvest a lion. In 1970, a limit of one lion per hunter was set and a mandatory checkout was established. It was estimated that 6,042 square miles have high densities averaging 0.04 lions per square mile and 21,690 square miles have low densities averaging 0.025 lions per square mile. The lion population in Nevada was estimated to be 792 lions in 1983, but subsequent analysis of lion populations indicated that this is probably a conservative number. Females with spotted kittens and spotted kittens may not be taken and trapping is illegal. All lions killed must be validated by a Department representative within 72 hours of the kill.


The cougar (*Felis concolor*) is a very rare animal in New Brunswick and Nova Scotia. Yet sightings of this felid are being reported with increasing frequency. Five hundred and one cougar reports (from 1977 to 1993 inclusive) were analyzed to characterize the distribution of sightings, habitat, season and time, animal activity, vocalization, physical description and multiple sightings. Many apparently reliable observations suggest that there could be a small number of cougars, of unknown origin, in these two Maritime provinces. None are reported in Prince Edward Island.


We present the results of an ongoing volunteer-based track count project which monitors the presence of mountain lion (*Puma concolor azteca*) on the Fort Huachuca Military Reservation in the Huachuca Mountains of southeastern Arizona, and more recently, possible lion movement corridors through the neighboring Canelo Hills. The Fort Huachuca track count has been conducted yearly since 1989. Five routes that cover 15.3 miles (providing a sampling rate of about one mile of route per 2.3 square miles of lion habitat) are monitored twice during a two week period in early June. The track count has been successful in documenting the presence of lions, with an average track per route mile ratio of about 0.24. The track count in the Huachuca Mountains raised a number of questions about possible wildlife corridors to the neighboring mountain ranges and, starting in August 1995, the track count program was expanded to evaluate the inter-mountain movement of lions. Initially, we have concentrated on possible corridors through the Canelo Hills, which lie to the west of the Huachucans and form a natural link to the Santa Rita and Whetstone mountains. Using the same track count method that has proved successful on Fort Huachuca, this program has been conducted monthly between August 1995 and April 1996. Over this time period more than 110 volunteers have participated in the program and more
than 60 miles of routes have been covered. While this project is still in its infancy, lion presence has been documented along a number of routes, suggesting that the method may be a useful tool for evaluating the inter-mountain movement of lions. In addition to an analysis of the collected data, we also discuss the important social and educational role served by the track counts.


It is stated that a panther will always run from a dog no matter how small it is and a panther will always jump up in a tree when a dog is closing in. The McCloud River Indians say that the panther always kills the grizzly bear when they fight and that panthers are always trying to kill bear cubs and the bears are always seeking to kill the panther's kittens.


Arguments and evidence are presented that suggest the proper names for the Northwest Coast form of the puma should be Felis oregonensis (Raf.) and Rocky Mountain puma should be Felis oregonensis hippolestes (Merr.). The author contrasted two descriptions in the literature; that of Rafinesque (1832) and Merriam (1897).


The author was aware of only one attack of a mountain lion on a human being in California. A seven year old boy was attacked and killed on June 19, 1890 in Quartz Valley, Siskiyou County, by two lions while playing some distance from his home. A lion, evidently infected with rabies, attacked and killed two persons in 1909, including one adult near Morgan Hill, Santa Clara County. This account had only been recorded in the Morgan Hill Times on July 9, 1909 (Vol. XI, No. 8), and this article is presented verbatim except for the final paragraph which was only of local interest. After investigation it was determined that the probable cause of death of the two victims was rabies as over 7 weeks had elapsed from the time of the injury to death.


Felids are known to be susceptible to ethylene glycol toxicity resulting in renal oxalosis. A case history is presented in which a nine year-old puma became ill with the clinical picture being that of a hemorrhagic urocystitis. The animal maintained hydration but became anorectic. Urinalysis revealed numerous triple phosphate and calcium phosphate crystals. After 3 weeks of Ampicillin therapy, the cat was discharged at 4 weeks with normal urinalysis. Three weeks later the cat was presented again with partial anorexia, and became completely anorectic after one week. The cat was again placed on antibiotics for the supposed recurrence of the bacterial urocystitis. Due to recently confirmed renal oxalosis at the Knoxville Zoo, a systematic search for oxylate containing plants and/or possible unintentional uses of antifreeze containing ethylene glycol was conducted but proved negative. The puma died two days later after developing ulcerations of the tongue and gums. Upon gross examination at necropsy, an acute gastritis and a chronic active nephritis was diagnosed. Focal subendocardial hemorrhages and lingual ulcers were also noted. It
was found that the manufacturer of the prepared meat product that was used to feed the puma had been contaminated with ethylene glycol.


Although limited data was available, the author estimated the mountain lion population and allowable harvests. Habitat densities were based on Kuchler Vegetation Types and past lion observations, harvests, and sign. Statewide lion numbers were estimated to range from 930 to 1,173 animals. A conservative harvest level of 10% of the population was recommended.


The mountain lion has long been considered a serious predator on domestic livestock, primarily sheep, in the state of Nevada. For the past five years (FY 77-81), documented losses to lions have averaged 375 animals. While this number is not large, most losses are sustained by only a few individual livestock operators, and the losses constitute a serious economic hardship for these individuals. An average of 23 lions have been taken in response to livestock depredation complaints during each of these five years. Controlling livestock loss to mountain lions is the responsibility of the Animal Damage Control branch of the U.S. Fish & Wildlife Service. ADC personnel work in cooperation with the Nevada Department of Wildlife, Nevada Predatory Animal and Rodent Control Committee and livestock producers in an effort to keep both livestock losses and the number of lions taken on depredation complaints at an acceptable level.


The purpose of this 3-year study was to describe the social organization of mountain lions within the San Andres Mountains in south-central New Mexico. Fifty-one individual mountain lions were captured, marked, and released on the study area. Twenty-three were initially captured as young kittens at den sites, 1 kitten was bayed by a hound, and 27 (22 adults, 4 subadults, 1 kitten) were captured in leghold snares. The cumulative total included 12 adult males, 10 adult females, 1 subadult male, 3 subadult females, and 25 kittens (14 males, 11 females). Ninety-five percent of the entire resident lion population within the San Andres Mountains was apparently captured by the end of the third year. Thirty lions (10 adult females, 12 adult males, 3 subadult females, 2 subadult males, 3 kittens) were fitted with radio-collars with a total of 2,241 locations obtained (58.5% ground and 41.5% aerial). Adult residents and juveniles comprised an average of 53% and 41% of the lion population, respectively. Sex ratios did not differ significantly from equality. The total population density based on the area searched (1,935 km$^2$) averaged 2.0 lions/100 km$^2$ for the second and third years of the study and 1.0 lion/100 km$^2$ for adult lion density. Sixteen mortalities were documented with the largest percentage (38%) caused by intraspecific strife. Seven females gave birth to a total of 9 litters during the study with an average litter size of 2.9 kittens. Average annual home range size varied widely among individual lions and ranged from 40 to 235 km$^2$ for resident females, and 119 to 678 km$^2$ for resident males. Female home ranges averaged 36% the size of males with a general trend toward larger home range size as kittens become older. Solitary females generally had the largest home ranges. Peaks of
activity occurred during crepuscular hours. The amount of home range and core area overlap between males was significantly greater than the spatial overlap observed between adult females. The total area each adult female shared with males averaged 87%. Flight location data indicated that resident males were likely to be in closer proximity to other resident females than males and resident females were most likely to be in closest proximity to other adult males than females. A total of 352 scrape sites utilized by 4 resident male lions with adjacent home ranges were documented. Shared scrape sites ranged from 23% to 40% for each of the 4 males.


Research was conducted on a mountain lion population in the San Andres Mountains of south-central New Mexico from August 1985 through mid-September 1988. The 1,935 km$^2$ study area was characterized by Chihuahuan desert. Population characteristics and social organization were determined using capture-recapture, ground tracking, and radio-relocation data. Fifty-one lions (24 females, 27 males) were captured 71 times. A total of 2,241 locations were obtained on 30 radio-collared lions (15 females, 15 males). The population was comprised of resident adults, resident subadults, and juveniles (kittens). During the 3 years, adult residents and juveniles comprised an average of 53% and 41% of the lion population, respectively. The sex ratio for 25 kittens born to 9 litters was 44:56 and did not differ from equality (p>0.1). The sex ratio for resident adults averaged 48:52 during the 3 years. Population density averaged 2.0 lions/100 km$^2$ for the second and third years of the study; adult density averaged 1.0 lions/100 km$^2$. Sixteen lion mortalities were documented; 6 (38%) were caused by intraspecific killing. Annual home ranges (using the harmonic mean home range estimator) averaged 114 km$^2$ for 7 resident females and 317 km$^2$ for 8 resident males. Annual and seasonal home ranges for resident females were significantly smaller than home ranges of resident males (p<0.05). There was no apparent difference in spring-summer and fall-winter home ranges for males or females (p=0.5). Females with young kittens (<6 months) traveled shorter distances than solitary females or females with older kittens (p<0.025). Subadult females moved greater daily airline distances than adult females without small kittens (p<0.005). Adult males traveled greater daily airline distances than adult females (p<0.005). Daily airline distances averaged 1.82 km for 6 adult females and 4.10 km for 10 adult males. Dispersal distances for 2 female and 2 male kittens born on the study area averaged 51.5 km and 104 km, respectively. Lions exhibited crepuscular behavior. A majority (mean=67%) of lions were active during 05:00 - 07:00 and 18:00 - 20:00 hours, whereas on average, only 13% were active during 09:00 - 16:00 hours. Adult female lions demonstrated annual home range fidelity. Spatial overlap between adult females averaged 6.6% and 2.8% of the 90% core use areas, respectively. Female home ranges overlapped up to 2 other females. Annual male home range fidelity varied. Most males showed some home range shifting during the 3 year study; shifts primarily appeared to be in response to other males. Spatial overlap between adult males averaged 46.8% and 15.6% of their 90% and core use areas, respectively. Male home ranges overlapped up to 3 other males. Home range overlap between adult males was greater than that found for females (p<0.005). Resident females shared an average of 87% and 73% of their 90% and core use areas with up to 3 resident males. Social interactions outside the mother-offspring family unit were rare. Resident lions were located within 1 km of other residents (but not necessarily in association) during only 7% of the aerial locations. Simultaneous locations indicated that resident lions were most likely to be in closest proximity to residents of the opposite sex (p<0.001). Independent lions were documented in association on 38 occasions. Association frequency averaged 4.3% for each lion. At least 39% of associations involved breeding pairs, >11% involved
aggressive encounters between males and females, and >8% involved aggressive encounters between males. Scars found on all captured males indicated that fighting occasionally occurred. Three kittens from 2 litters became independent from their mothers at 10.8-14 months of age. A fourth kitten was orphaned at 10 months but managed to survive. Lions communicated through various visual, tactile, vocal and olfactory means. Scrapes were primarily made by resident males. Of 352 scrape sites used by 4 resident males with adjacent home ranges, 23-40% were shared. Males scraped throughout their home ranges. Land tenure in this study population appears to be based primarily on prior rights; however, those rights may be contested. Spacing is maintained through passive and aggressive means. Increased intraspecific aggression may be caused by a low resource base. Population regulation mechanisms and conservation strategies are discussed.


We conducted cougar research on the 2,059 km$^2$ San Andres Mountains (SAM), New Mexico from August 1985 through March 1995. The SAM was divided into a 703 km$^2$ treatment area (TA) and a 1,356 km$^2$ reference area (RA). Cougars were protected from human exploitation in the SAM except for a 6.5-month period (Dec. 1990 to June 1991) when 58% of the independent cougars were removed from the TA. Population characteristics and social organization were determined using capture-recapture, ground-tracking, and radio-location data. We counted a total of 294 cougars, of which we captured and marked 241. Radio-collars were put on 126 cougars (49 males, 77 females). We recorded a total of 13,947 cougar locations. The population was comprised of, on average, 58% adults, 7% subadults, and 35% cubs. The male:female sex ratio of adult, subadult and cub cougars did not differ significantly from 1:1 (P greater than 0.10), however the adult and subadult classes favored females. Except for a short period during and after cougar removal in the TA, January population density estimates generally increased over time; they ranged from 1.2 to 2.0 adults/100 km$^2$ from 1989 to 1995. Home ranges were estimated using both the adaptive kernel (ADK) and minimum convex polygon (MCP) home range estimators. Annual home ranges based on the 90% ADK averaged 192.2 km$^2$ for adult males and 71.9 km$^2$ for adult females. Female annual home ranges were significantly smaller than male annual home ranges (P less than 0.0001). Male home range size generally increased with increasing cougar density, whereas female home range size decreased. Female home range size during an entire reproductive cycle (birth of 1 litter to birth of subsequent litter) averaged 64.9 km$^2$. Cyclic and annual home range sizes for the same group of females were not significantly different (P greater than 0.1). Female home range size increased as the age of dependent cubs increased, and was largest when a female was solitary. Home range sizes of females with young cubs (< 6 months) were significantly smaller than those of females that were solitary (P less than 0.05). On average, adult females exhibited stronger annual home range fidelity than males. The percent of an adult male’s home range that was utilized by that same male from year to year averaged 51.6% and 57.5% based on the 90% MCP and 90% ADK, respectively. For adult females, the amount of overlap averaged 60.3% and 62.2% based on the 2 methods, respectively. Males had significantly less annual home range overlap (90% MCP, P = 0.09) than females. Distances between mean annual locations for adult males and adult females averaged 5.7 km and 2.6 km, respectively. The distances between means of annual locations were significantly greater for males than for females (P less than 0.001). Distances between means of locations when females were raising young cubs (<6 mo.), raising older cubs (7-12 mo.), and solitary averaged 3.1, 2.0, and 2.9 km, respectively, and they were not significantly different (P greater than 0.10). Cubs became independent
and dispersed at, on average, 13.4 and 15.6 months of age, respectively. All males dispersed from their natal home ranges; in contrast, some females were philopatric. Dispersal distances for males and females from their natal to independent home ranges averaged 101.3 and 28.3 km, respectively. Males dispersed significantly farther than females (P less than 0.025). The directions of dispersal were uniformly distributed around a 360 degree circle (P greater than 0.05). Dispersal duration ranged from 0.2 to 7.8 months. Annual home range overlap between adult males was generally greater than that found for adult females. The mean of means in annual home range (90% ADK) overlap was 62.8% between adult males and 49.2% between adult females. The amount of within-gender overlap increased with increasing cougar density. Adult males shared their annual home ranges (90% ADK) with, on average, 2.9 to 4.3 other adult males. Each adult female shared part of her annual home range with, on average, 2.1 to 3.9 other adult females. The percent area adult females shared with adult males was greater than the percent area each male shared with adult females, as well as greater than the percent area shared between cougars of the same sex. Adult females shared an average of 89.1 to 96.6% of their home ranges (90% ADK) with 3.0 to 3.5 adult males each year. Analysis of the movements of cougars over 6- to 12-month periods indicated that cougar home ranges (particularly those of males) were dynamic and cougars of the same gender did not generally utilize shared areas at the same time. Social interactions outside the mother-offspring family unit were rare. Independent cougars were located in association during only 4.9% of locations. The majority of associations (76.0%) were between males and females, of which 73.5% were for apparent breeding purposes. Of all the associations, 20 (7.6%) resulted in mortalities; mortalities included 5 adult males, 4 subadult males, 9 adult females, 2 subadult females, and 1 dependent cub. All mortalities were caused by adult immigrant or adult resident male cougars. Ten cubs from 5 litters were also killed by males, apparently while their mothers were not with them. Scars found on all captured adult males indicated fighting was fairly common. Cougars communicated through visual, tactual, auditory, and olfactory mechanisms. Vocalizations included apparent distress calls (mews and chirps by nursing cubs), contact calls between family members (purr, whistles), advertisement calls (ouch calls and caterwauls), and threat calls (hisses, spits and growls). Cougars, almost exclusively males, left visual and olfactory markers (scrapes) throughout their home ranges. Individual scrape sites could be utilized by more than 1 resident male, and were visited by females. Land tenure in this study population was primarily based on prior rights; however, in males, prior rights were often contested. Cougars spaced themselves through territorial behavior in males and mutual avoidance behavior in females. The territorial and avoidance components of the land tenure system may be mechanisms which regulate the rate at which the cougar population increases toward carrying capacity.

Twelve of 20 (60%) female progeny did not disperse from their natal areas, whereas all 14 of the male progeny dispersed. One of 20 females and 6-7 of 14 males dispersed outside the SAM. Distances traveled by progeny from the arithmetic center of their natal home range (NAC) to the arithmetic center of their independent home range (IAC) averaged 12.4 km for females (n=19, SD=19.6) and 101.3 km for males (n=7, SD=26.0). Dispersing males traveled by significantly further from their NACs to their IACs than dispersing females (t=2.86, df=13, P=0.007). Dispersal directions from NACs to IACs were uniformly distributed about a 360 degree circle for both females (n=7, U^2=0.08, P=0.48) and males (n=8, U^2=0.06, P>0.05). Recruitment and emigration rates were quantified based on a 5.1 year time span (February 1990 to 23 February 1995) and 114 tagged progeny (63 F, 41 M) out of 137 detected progeny born from 1 February 1988 through 19 November 1992. From 1990-1995, 21 progeny (17 F, 4 M; mean=4.1/year) and 22 immigrants (8 F:14 M; mean=4.3/year) were recruited into the adult SAM population. For the same period, we estimated that 47 progeny (26 F, 21 M; mean=9.2/year) successfully dispersed (i.e. dispersed and reached adulthood) outside the SAM. The majority of female (60%) and male (81%) cubs which are born on the SAM and survive to adulthood apparently disperse outside of the SAM. The SAM cougar population is an important source of immigrants to other cougar populations within dispersal distance of the SAM. The role of dispersal is important to the understanding of cougar metapopulation dynamics and the implementation of regional conservation strategies.


As part of an intensive 10 year study of cougar population dynamics, we quantified the reproductive biology of an unhunted cougar population on the San Andres Mountains (2060 km^2) in southern New Mexico. From 1986 through 1994 we documented the birth of 220 cubs from 79 litters by 39 females; 174 of the cubs (76%) were subsequently captured and tagged. Mean litter size for 53 litters which were first observed 9-49 days (mean=32.3, SD=8.9) after birth was 3.02 cubs (range 2-4, SD=0.7). Twenty-six of the 53 litters were observed at birth nurseries, the other 28 litters were observed at secondary nurseries. For 21 litters first observed from 52-127 days (mean=175.7, SD=112.0) after birth, litter size was smaller, averaging 2.19 cubs (range=1-3, SD=0.8). The sex ratio for cubs from 50 litters observed at 9-49 days (mean=31.6, SD=8.6) after birth was 73 F:75 M. However in 15 litters first observed at 52-427 days (mean=198.9, SD=121.6) after birth, a greater number of females were observed (20 F:14 M). The gestation period for 31 litters based on documented matings was 91.5 days (range=83-103, SD=4.0). Litters were born during every month except February (n=78). The greatest number of litters were born during the months of August and September (n=11 litters each). Sixty-five litters (83%) were born during the months of May through November. Known age females were on average 21.4 months old (n=7, range=19-27, SD=3.1) when we first documented them in association with male lions. Known age females produced their first litters at 22-40 months of age (n=12, mean=29.1, SD=6.0). Litter size for first litters (n=8) averaged 3.4 cubs and was greater than the average litter size of 3.0 for 22 subsequent litters born by 14 females (t=1.43, df=28, P=0.08). Thirty-nine of 53 adult-aged females produced from 1-5 litters each. Ten of the reproducing females (26%) produced 110 of the cubs (50%). Interbirth intervals for litters in which at least 1 cub survived to independence (n=14) or to 12 months of age (n=1) averaged 17.4 months (range=12.6-22.1, SD=2.6). On average, 75% of the adult female cougars were raising cubs each year (range=63-100%, SD=12.7). It took 5 females...
an average of 100.0 days (range=17-308, SD=118.1) to successfully rebreed after the
loss of a litter. Sport-hunting of females may adversely affect a cougar population by
killing the most productive females and/or orphaning cubs.


SUMMARY

The B chain amino terminus of one or more hemoglobins in the blood of members of
the Felidae family is substituted with an acetyl group. Such acetylated hemoglobins
occur together with nonacetylated components in variable proportions in blood of
different members of the family. In the lion, tiger, and snow leopard, the acetylated
component comprises about 90% of the total hemoglobin; in the serval and caracal it
comprises about 70%; in the cheetah, puma, fishing cat, and jungle cat it comprises
about 50%; and among domestic cats it comprises 10 to 50%. The occurrence of
such B chain-substituted hemoglobins as major components in animal blood is
unusual. Except for the minor fetal human component hemoglobin F1 and the minor
adult human component hemoglobin A1C, no animal hemoglobin thus far examined
had been found to contain amino-blocked B (non) chains. Domestic cat hemoglobins
with N-acetylated B chain amino termini are insensitive to the modifying influence of
organic phosphates on oxygen affinity, whereas cat hemoglobins with unsubstituted
B chain amino termini are sensitive.


The last authentic case of the Eastern panther in Virginia was nearly one hundred
years ago. However, recent sightings by reliable observers have stirred new interest.
There are also indications that the panther is making a comeback in other areas of the
East. If panthers do exist in Virginia, they are on the brink of extinction. Because
they are still listed as an endangered species, they are fully protected.


Laura Small, a five-year-old from El Toro, California was attacked by a mountain
lion in Ronald W. Caspers Wilderness Park in the Santa Ana Mountains on March 23,
1986. The area was searched by wildlife authorities and a lion was killed which was
found roaming the park boundaries. Six months later, another lion attacked six-year-
old Justine Melon in the same park. California's mountain lion population has been
protected since 1971 and the population has grown to an estimated 5,100 animals.
Livestock owners report about 130 lion damage incidents each year. In 1990,
Proposition 117 was passed by a 52.5 percent majority which prohibited hunting
mountain lions. There is concern that as more people move into lion habitat that
more problems will arise. Paul Beier of the Orange County Cooperative Mountain
Lion Study is monitoring 12 adult cougars of an estimated 20-25 adults and 10-15
cubs in the 800-square-mile study site in the middle of Camp Pendleton Marine
Corps base. In most states, the principle cause of mountain lion mortality is gunfire,
where in California it is cars. The Santa Ana population may be in jeopardy of going
extinct if the two corridors which allow migration of dispersing lions are blocked by
proposed construction of homes in the area. California Fish and Game estimates that
mountain lions inhabit over 80,000 square miles in California with densities ranging
from one adult per 100 square miles in the southeastern deserts to 10 adults per 100
square miles in portions of the western slopes of the Sierra Nevada. In North
America from 1890 to 1990, mountain lions attacked 58 humans. resulting in 10
fatalities. This is minuscule compared with fatalities caused by dogs, bees, rattlesnakes, and black widow spiders each year. A nine-year-old boy, Darron Arroyo of Lompoc, California, was attacked by a mountain lion as he hiked with his family about 20 miles north of Santa Barbara as the author was gathering information for this article. The boy needed 600 stitches to close 50 puncture wounds.


A new subspecies of puma, Felis concolor pearsoni, is described by skin characteristics. Taken from Santa Cruz, Patagonia, about 70 miles inland, this subspecies was distinguished from Felis puma by its different general color, shorter tail, light-colored ear backs, and the absence of dark markings around the digital pads.


The mountain lion is classified as a nongame mammal and is not subject to any specific protective regulations. The population had been estimated to number no more than 500 animals, although kill records indicate that a substantially larger population may exist.


We observed a cougar (Felis concolor) beside a freshly killed adult female elk (Cervus elaphus) near Missoula, Montana, on 13 March 1994. We returned on 12 of the next 26 mornings, including 8 April, and always observed one cougar with the kill, but on 31 March we observed two cougars. On 9 April we did not observe a cougar, but a golden eagle (Aquila chrysaetos) was present on the kill. This is evidence for the longest reported association of a cougar with a kill.


A cougar was spotted on August 13, 1973, near Highway 11, less than 10 miles west of Hearst, in the District of Cochrane, Ontario. One imperfectly registered, fist-sized footprint was all that could be found.


A mountain lion was killed in St. Clair County, Alabama, on March 16, 1948, and was positively considered a wild lion. Mountain lions have been seen in the Bankhead National Forest, Winston and Lawrence Counties, in the 1940's to 1950. In 1950, The Bankhead deer were hit hard by disease and no reports of lions have been made there since. Persistent reports of mountain lions in the Choccolocco Division of the Talladega National Forest had recently been reported, although unconfirmed.

A privately-owned, poor quality, 10-minute videotape of an unidentified felid in New Brunswick was viewed by the author and Department of Resources and Energy biologists. The videotape was made by Roger and Donna Noble in Waasis, New Brunswick. After intensive scrutiny and research, which included the services of the Royal Canadian Mounted Police crime lab in Ottawa, it was determined that the animal in question was a subadult puma, possibly representing the presumed extinct Eastern puma subspecies, Felis concolor couguar.


A synopsis and discussion of current knowledge and recent events relating to the puma in Saskatchewan, Manitoba, Minnesota, Wisconsin, North and South Dakota, Nebraska, and Kansas are presented.


The author presents evidence that the cougar may be making a comeback in the east and may not have ever been eliminated. A map of recent reports of cougar sightings in the northeast is provided.


The authors were unaware of any records of free-ranging groups of more than 6 pumas and the nocturnal gathering of 10-11 pumas is described. The pumas were observed on 26 September 1992 in a canyon 21 km south of Gypsum in west central Colorado from a car at 15 m. Three or four of the pumas were wrestling in the roadside drainage ditch and the others were laying on the road or were standing or walking around in loose association. This gathering may have been the result of two adult females with four to five full-grown kittens.


No specimen of a black mountain lion exists in North America. Several authorities on mountain lions are interviewed. About two dozen adults and 8-12 offspring are believed to live in Big Bend National Park which was about the limit that the Park would sustain. In the Southwest, cougars are doing extremely well. Habitat is not as critical of an issue as local shooting. California banned hunting of mountain lions and established a $30-million annual fund to buy and preserve habitat. The California lion population is estimated to be between 4,000-6,000 along with more than 30 million people. Yellowstone National Park lion numbers vary between 16 and 22 as they wander in and out of the park. Western lion populations may have increased 20-40 percent since the mid-1960s. More people are using remote areas where lions have retreated and it is now challenging to protect lions and people. A female jogger was killed by a lion in California in April 1994; a high school boy was killed four years ago in Colorado; and several other non-fatal attacks and near attacks have occurred in recent years. Lions have caused 11 fatalities and 48 injuries in the past century, which is a much smaller number than are attacked and/or killed by dogs each year. Another challenge is curbing attacks on livestock. The Eastern
subspecies is listed as endangered and is treated as though it has been extirpated from the Northeast in spite of sightings from Vermont, New Hampshire and Maine. Many sightings are believed to be released pets. The Florida panther, estimated to number about 50 animals, is also in severe trouble from many different sources which are discussed.


We compiled and analyzed 24 years (1972-1995) of verified incidents of mountain lions killing domestic animals (n = 2,663) to examine trend, distribution, and types of conflicts in California. To model the relationships between mountain lion depredation and various human activity and habitat factors, we tested 2 predictive models. Domestic sheep depredation in counties was significantly (P < 0.05) related to amount of suitable mountain lion habitat. We hypothesize that increasing domestic sheep depredation may reflect regional increases in the distribution and abundance of mountain lions. A regression model of percent pet depredation indicated a significant (P < 0.05) association with average annual new house development (1979-1993). Counties with significant pet depredation are in the same regions where public safety problems have occurred and reflect a radiation of human activity into mountain lion habitat. Mountain lion depredation data may be a useful index of regional mountain lion activity. Livestock and pet depredation problems are increasing in different regions of the state for different reasons; pet depredations are increasing the most rapidly. Pet depredation may be a useful indicator of mountain lion proximity to humans.


The stomach contents of 13 male and 12 female cougars (Felis concolor) killed in Oregon by hunters were examined. Mule deer (Odocoileus hemionus) or black-tailed deer (Odocoileus h. columbianus) remains occurred in amounts ranging from a trace to 4 kg in 13 of the stomachs. Elk (Cervus elaphus) remains were found in 2 stomachs and remains of porcupine (Erethizon dorsatum) including flesh, bones, and large amounts of flaccid quills, were found in 3 stomachs. No damage attributable to the ingestion of the quills was found. Weight ranges of the cougars were: males (N=12) 39.5-75.8 kg (mean 54.9); females (N=12) 28.1-48.0 kg (mean 39.6). The remains of hares (Lepus sp.) and other small mammals were not found. No evidence of domestic animal remains were found in the stomachs examined in this study even though cattle, sheep, and horses were normally available. This was perhaps attributable to the domestic animals often being confined near human habitation in December when these stomachs were collected.


We examined 87 cougars (Felis concolor oregonensis) collected from Oregon's Cascade Mountains by sport hunters and U.S. Fish and Wildlife animal control personnel between 1978 and 1984. The sex ratio favored males (1.2 males:female), but did not differ significantly from 1:1. Females were more commonly killed during
December and males were commonly taken during January. Male cougars averaged nearly 1.5 times the weight of females, and were also significantly larger in total body length and heart girth. Of 18 males whose testes were examined microscopically, 8 (44 percent) showed spermatozoa in the epididymides and were considered sexually mature. Reproductive tracts of 34 females were examined, 22 (65 percent) from animals believed to be adults. Over one-third of the 22 adult tracts examined showed no evidence of past reproductive activity. Mean litter size, based on placental scars present in the uteri of 11 cougars, averaged 2.8 kittens. Variability in numbers of Graafian follicles and corpora lutea precluded their use in estimation of individual fecundity.


Animal and nonanimal items were identified in the digestive tracts of 61 cougars (Felis concolor) collected between 1978 and 1984 from the western slopes of the Cascade Range in Oregon. Forty-two (69%) of the cougars were taken by hunters in December and January, 18 (30%) were killed at other times of the year because of their proximity to livestock, and one animal was illegally killed in November. Black-tailed deer (Odocoileus hemionus columbianus) was the most common prey item, although domestic sheep (Ovis aries), porcupines (Erethizon dorsatum), and a variety of small mammals were also recorded. Masticated grass was the most common nonanimal item.


One male cougar (Felis concolor missoulensis) was raised from approximately four days of age until it died of panleukopenia at 45 days of age. Information is presented on its behavioral development and growth.


Knowledge of reproductive characteristics and reproductive rates are a critical concern to wildlife managers, but such data are difficult to obtain for free-ranging predators. In order to obtain these data, we examined the reproductive tracts of 46 male and 51 female subadult and adult cougars (Felis concolor missoulensis) killed by hunters during the month of December, 1976-1982. Among males, 24 (52%) showed evidence of spermatogenesis. Sexually mature males may lack sperm during a portion of the year. Of the 51 females, 23 (45%) were classified as reproductively active based on evidence of corpora lutea in ovaries or sites of embryo implantations in uteri. Corpora lutea of pregnancy appear to be short-lived. Four females (8%) were pregnant in December. Placental scars of females may be used to estimate the minimal level of fecundity in the population. Estimated mean litter size based on placental scars (n=10) was 2.4 ± 1.08 kittens. These data indicate that previously published guidelines for assessing sexual maturity of cougars based on body weight may lead to erroneous conclusions. The best estimator of cougar fecundity is provided by counts of placental scars.

Using canines and small premolar teeth (PM2) located posterior to the upper canines, ages of cougar harvested in Oregon were determined by cementum analysis. Cementum bands were difficult to identify in both types of teeth, but annuli were more distinct and of a more regular pattern in PM2's than in canines. To test precision in determining ages, Matson aged 74 “blind pairs” of PM2's without knowing which members of a pair were from the same animal. In 41 of 74 pairs, the assigned ages agreed exactly; in 24, the ages varied by 1 year, and 9, by 2-5 years. Compared to age classes designated by measurements of cementum ridge lengths of upper canines in 71 cougars, ages determined from cementum annuli counts of PM2's agreed exactly in 21 of 22 cats of the 0-3 year age class, and were either the same or 1 year younger in 28 of 49 cats judged to be 4 years or older. In the remaining 22 animals, ages assigned by cementum analysis averaged 2 years younger than those assigned from cementum ridge measurements. Findings to date indicate that cementum analysis of PM2 teeth for age determination in cougar can yield consistent results and has potential for sampling age structures. Validation of the accuracy of the technique, however, must come through examination of teeth of known-age animals. In studies where free-ranging mountain lions are tagged, there may be opportunities to collect teeth from mortalities of known-age adults.


A general account of the puma is presented and many previous authors are cited. Several measurements of pumas are furnished. The puma had not been found in New Hampshire, Rhode Island, New Jersey, Delaware, Michigan, or Indiana. The puma was extirpated in Ohio prior to 1838, and probably more recently in Illinois and Indiana. The author could find no record of the puma in Nevada. With these exceptions, there were recorded instances of puma occurring in every other state and territory of the Union, dating back to 1800. The localities in several states and territories in which individual pumas have been captured or seen is provided.


SUMMARY

Respondents listed the three primary problems with research today as funding, study length/intensity, and methodology problems. These problems all impede the understanding of mountain lions and prevent us from addressing the threats which face this species. These threats are numerous and range from habitat loss and grazing pressure, which were top choices by respondents, to long-term management direction. The purpose of this survey was to help address some of the problems surrounding methodology. The results are preliminary and a final summary will be available early in 1989.


Mountain lion populations in Nevada were never very dense but appeared to rise with
increasing mule deer populations in the 1930's and 1940's. Lion harvests increased from 46 animals harvested from 1917 to 1931 to an average of 90 lions/year in the 1950's. In 1965 the mountain lion was given the status of a game animal and in 1968 tags were required to take a lion. In 1970, a limit of one lion per hunter per year was imposed and a checkout of lions harvested was mandated. Populations declined into the early 1970's until severe restrictions were implemented and populations have generally increased since the mid 1970's. A table is provided which outlines the 5-year harvest and season summary from 1979-1983. Either sex may be taken, but the taking of females with kittens is discouraged. Harvest objectives are determined by estimating lion populations and setting a 25%-30% harvest rate.


Three one-page questionnaires were sent to wildlife management agencies where cougar populations have been reported in recent literature. Four states and two provinces were liable for damage to livestock by mountain lions and compensate property owners for injury or death of livestock. Colorado had paid more per year than any other state or province. Considerable funds are also expended in damage control and the amount varies by agency. Several agencies spend considerably more for damage prevention and livestock damage claims than received from license fee income. Property owners in all states and provinces may kill mountain lions that inflict damage. The kill must be reported and, in some locations, the carcass must be presented to the agency for investigation. A kill permit is required by several management agencies, but is often issued after the fact. Domestic sheep on open range are considered the most significant problem. During 1987-1990, agency personnel took about 1,160 mountain lions, an average of 290 per year. Recommendations and tables are provided concerning damage to livestock by mountain lions.


By 1900, cougars had virtually disappeared from the eastern United States. In 1965, Colorado reclassified the cougar from predator to game animal, and most other western states quickly followed suit. Only Texas does not protect its cougars with a closed season. California claims to possess 2400 resident cougars, New Mexico 2500, Arizona 2500, Washington 2000, Oregon 1200, and Wyoming 750. University of Idaho biologist Maurice Hornocker studied cougars for ten winters and compiled the first significant scientific data on the species. The cougar is an expert stalker and creeps to within a few feet of its prey and leaps to the back of its victim. If the quarry is a deer, the lion will bite it in the head or back of the neck, instantly severing the spinal cord. However, if the prey is an elk, the cat must kill the elk by grasping the head with its paws and breaking the elk's neck with a sudden twist. Hornocker never once heard a lion scream in his 10 years of cougar studies. He has heard the birdlike whistles which they use to communicate with each other and the yowl's during the breeding season. Lions are capable of such sounds but screaming is counter to their shy and secretive nature and way of life.


The career of wildlife researcher Maurice Hornocker who pioneered the study of the mountain lion is highlighted.
A population of feral horses (Equus caballus) was studied from 1986 to 1991 to determine the demographic impact of predation by the mountain lion (Felis concolor). The population, inhabiting a 600-km² area on the central California-Nevada border comprised approximately 162 individuals > 1 year old, with an average of 9 yearlings, 8 two-year-olds, and 144 adults. Numbers of horses varied by only 4 - 8% and showed no consistent trend. The parturition peak spanned May and June, when 80% of foaling occurred. One-third of the average annual cohort of 33 foals was missing by July and only half of the cohort remained by October. The mean first-year survival rate estimated from the differential incidence of foals and yearlings in successive years was 0.27, which was less than one-third of the foal survival rate reported for other feral horse populations. A minimum of four adult mountain lions used the study area each year between May and October. Of 28 foal carcasses located from May to mid-July, at least 82% were the result of mountain lion kills. No evidence of predation on older horses was observed, but mountain lions preyed on mule deer (Odocoileus hemionus) during winter. We conclude that the growth of this horse population is limited by predation.


This final environmental assessment considers the biological, environmental and socioeconomic effects of protecting and preserving approximately 88,000 acres of Florida panther habitat in the Fakahatchee Strand area of the Big Cypress Swamp. The impacts of alternative actions and the degree to which each alternative would accomplish habitat preservation goals are examined and evaluated. The Proposed Action (Alternative 6) of the U.S. Fish and Wildlife Service provides for a "team approach" to preservation involving the Fish and Wildlife Service, the State of Florida, and the National Park Service. The primary means of preservation will be fee title and easement acquisition; however, other methods such as land exchanges, management agreements, and leases may be used.


This is the completed revision of the Florida Panther Recovery Plan which was originally approved in 1981. It was not possible to adequately summarize the Florida Panther Recovery Plan. The reader should refer to the plan for content.


Extremely high levels of mercury (100 parts per million) were found in the liver of a Florida panther that died in the Everglades on July 26, 1989 and mercury toxicosis was suspected. Analysis of tissue samples from other dead panthers recovered since 1978 also contained mercury at levels of concern. Panthers with higher elevated mercury levels were found in the Fakahatchee Strand and East Everglades area and these areas appeared to be mercury "hot spots". The presumed source of contamination was from contaminated prey, probably raccoons. The "hot spots" were
correlated with low availability of deer and hogs and high consumption rates of small mammals such as raccoons. Reproductive success was lower in these areas and could be due to poor nutritional status and possibly is compounded by mercury contamination.


The Florida Panther Recovery Team was appointed by the U. S. Fish and Wildlife Service in July 1976 to prepare and assist in coordinating the implementation of a recovery plan. Consistently documented evidence of the animal's presence was available only from the Fakahatchee Strand, Big Cypress National Preserve, Everglades National Park, and Collier-Seminole State Park in Collier, Dade, and Monroe Counties, Florida. The recovery objective was to prevent extinction and reestablish viable populations of the Florida panther in as much of the former range as feasible. The plan is outlined and steps which are necessary to complete the recovery objective are delineated. An implementation schedule is provided which lists priority actions necessary to prevent extinction, maintain population status, and other actions necessary for full recovery of the species. It was deemed vital that the Department of Natural Resources acquire the remaining acres of the Fakahatchee Strand and adjacent prairies and cypress forests to insure a unified management strategy and provide an extremely important permanent corridor of natural habitat between the Fakahatchee Strand, the Big Cypress National Preserve, and the Everglades National Park. It was recommended that hunting be discontinued in the Fakahatchee Strand and that portion of the Big Cypress National Preserve where panthers were presently known to occur.


The Florida panther seems to have had a historic stronghold in southwest Florida in the Big Cypress Swamp. Between the early 1930's and early 1950's perhaps as many as 40 panthers were killed in the Big Cypress. A deer eradication program was in effect during the late 1930's and early 1940's to help wipe out the fever tick and rancher feline hunting efforts increased due to increased livestock losses to panthers. The Everglades Wonder Gardens, a private zoological park in southern Lee County, possessed four male and four female panthers which accounted for their original breeding stock. Five or six captive raised panthers had been released into Everglades National Park.


Cougars (Felis concolor) in Utah and Arizona were studied to address problems related to the status of the eastern cougar (Felis concolor couguar). Sighting and track reports appear unreliable as indices of cougar population status. The reported sighting frequencies among professional cougar hunters, western deer hunters and western campers were low (one cougar sighting per 8.8, 13.4 and 16.2 years respectively) and statistically unrelated (P>0.15) to days afield or seasonal patterns of outdoor activity. Sixty-eight percent of western deer hunters, 59% of western campers and 74% of eastern deer hunters interviewed could not describe the
diagnostic features of a cougar track. Searches of sites which cougars had visited indicated that finding tracks or other physical evidence of cougar was independent of substrate (snow or dirt) or site age (1 to 9 days after cougar visit). However, searches were more successful where ground cover was absent (94% successful) than where ground cover was present (36% successful, P<0.05). Movements of radio-collared cougars indicated one road crossing, especially of unimproved dirt roads, every 5 to 12 days. Road crossing frequencies were related (r=0.57) to total home area road densities of cougars. Improved dirt and hard-surfaced roads occurred less often in home areas and appeared to have been crossed less frequently than unimproved dirt roads. Track searches of roads indicated that, under ideal conditions, track numbers were sensitive (r²=0.61) to changes in the density of adult females, but sensitivity was less for other cohorts and declined further under less-than-ideal conditions. All residents were detected by searches over a 14-month period, but effort required for detection varied with cougar characteristics. Logged areas were not used by long-term resident cougars up to 6 years after logging. Cougars, normally crepuscular, shifted peak activity to after sunset and before sunrise when close to human disturbance. Transient cougars encountered disturbances more often and more frequently than residents. Areas selected by cougars for residence generally had low road densities, absence of timber sales and few or no human residences. Disturbances evaluated appeared potentially most adverse to transient cougars.


Interactions of mountain lions (Felis concolor) with roads and the effectiveness of searches for tracks on roads as a means of assessing mountain lion populations were examined in Arizona and Utah on 3 study areas. Road crossing frequencies were related to total home area road densities of individual lions. Unimproved dirt roads were crossed most frequently. Improved dirt roads and hard-surfaced roads were crossed less often and were less likely to occur within lion home areas, suggesting possible avoidance. Seventy searches for mountain lion tracks on roads were conducted in southern Utah in areas where densities and distributions of radio-collared mountain lions were known and where tracking conditions on roads were measured objectively. Changes in the density of resident female lions explained 61% (r²=0.61) of the variation in track finding rates under ideal conditions. Under all tracking conditions, resident females required the least effort to detect (51.1 km searched/track set found) of all population cohorts. All resident lions, 78% of transient lions, and 57% of cubs were detected by track searches. Use of road track searches as indices of mountain lion populations is discussed.


Reactions of mountain lions (Felis concolor) to logging and to various human activities were studied in northern Arizona from 1976 to 1980 and in south-central Utah from 1979 to 1982. Resident mountain lions rarely were found in or near (1 km) sites logged within the past 6 years. Younger (2 or 3 year-old) mountain lions were found in logged areas more often than older mountain lions, but 4 of 5 young mountain lions that visited logged areas did not maintain residence there. In the absence of human disturbance, mountain lions showed peak activity less than or equal to 2 hours of sunset and sunrise. Near human presence, lion activity peaks shifted to after sunset. Other activity was concentrated during night hours and there was no peak of activity at sunrise. Dispersing juvenile mountain lions encountered
human disturbances more frequently than resident lions (P< 0.05). Established residents and young mountain lions that ultimately became residents selected home areas with road densities lower than the study area average, no recent timber sales, and few or no sites of human residence. All disturbances examined appeared to have at least potential adverse impacts on mountain lions, especially on dispersing juveniles.


SUMMARY AND CONCLUSIONS

Mountain lion sightings are rare events among individual campers and deer hunters, widely separated in time, and unrelated to amount or seasonal pattern of outdoor activity. Hunting or driving were activities most commonly associated with lion sightings. Most campers and hunters could not identify a lion track or describe its diagnostic features. Indiscreet solicitation of lion sightings by management agencies is an inefficient, inappropriate, and unreliable method of determining lion status. When combined with other presence indicators of lions, reliable sightings may contribute to a determination of lion presence, but sightings alone should never be used for describing mountain lion distribution and abundance. Sighting reports are less efficient, less systematic, and less reliable than other methods of checking for mountain lion presence. Sighting reports alone make it difficult to evaluate the reliability of an individual sighting. Current literature and research is best served by a de-emphasis of sightings as a basis for evaluating mountain lion status, especially in the East, and should never serve as a basis for describing the distribution or abundance of mountain lions.


CONCLUSION

It was proposed that agencies or individuals investigate sighting reports on sites that meet the following criteria: (1) the witness can assign the sighting to an exact location, (2) the substrate is snow or bare soil, (3) the site can be investigated within 9 days of the sighting and (4) the site is undisturbed by precipitation, high winds, or other factors between the time of the sighting and the time of the search. Criteria 2 and 4 may not always be assessable until the site is visited, but should still be used. Whenever possible, an experienced observer should go to the site to focus the search on spots most likely to yield lion sign. Sites that meet these criteria and still fail to confirm mountain lion presence render the sighting report suspect.


This booklet provides general information on Florida panther life history and ecology.


Two attacks were observed by mountain lions on javelinas in Big Bend National
The first attack was on July 16, 1971 in Ward Canyon at an altitude of 1616 meters. A large male javelina was attacked by a mountain lion which emerged from brush cover in a talus seep area and ran to the bottom of the canyon where the javelina defended itself for 15 seconds. The cat then departed. The second encounter occurred below Panther Junction at an altitude of 1022 meters on July 5, 1975. Both the mountain lion and the javelina emerged from an Arroyo and galloped at full speed for 200 meters with little regard for terrain. The female javelina was brought down with a bite around the neck and carried to the edge of an arroyo where it was partially consumed. The severed forelegs and scapulae and pieces of hide were left behind after the carcass was eventually carried to a more protected area. The cougar bounded into the air every 20-25 meters, possibly to gain better vision. The author reported hearing the pounding of the cat’s feet.


Road track counts conducted on the Boulder-Escalante study area indicated a strong relationship ($R^2=0.73$) between cougar (Felis concolor) track sets found and density, as determined by home range overlap. Monthly road track counts indicated road tracks could be used as a relative index to detect changes in cougar number over time. Numerous factors affecting road track counts limit the techniques use as an index to compare between areas. Road surface enhancement techniques did not significantly improve tracking medium and did not increase track finding frequency. A mark-recapture estimator using tracks left on roads by marked and unmarked cougars estimated 22.5 cougars (SE=6.5) in an area of 23 resident cougars. Line-intercept probability sampling using aerially located snow tracks left by cougars appeared to be a viable technique for estimating cougar numbers. One aerial survey estimated 11.5 (SE=6.5) cougars in an area with 14 resident cougars. Additional helicopter flights proved requirements of the technique could be met. Computer simulated surveys run on empirical movement patterns of a cougar population showed increased estimator precision with transects oriented perpendicular to drainages, increased density, increased transects per systematic sample, surveys conducted 2 days after snowfall, and with the exclusion of kitten tracks. The mark-recapture estimate using snow tracks left by radio collared and non-radio collared cougars was 12.5 (SE=2.2) cougars in an area of 14 known residents.


We used probability sampling of snow tracks which were located from the air as a method of estimating cougar (Felis concolor) numbers. Computer-simulated surveys were conducted on empirical movement data from a known population of cougars to evaluate survey design and the influence of density on the estimator. Estimator precision increased when transects were oriented perpendicular to major drainages, flown 2 days rather than 1 day after a snowfall, and if additional transects were included in each systematic sample. Precision also increased as density of cougars increased. An actual survey flown in an area with 14 cougars estimated 14.2 plus or minus 6.3 (SE) cougars.

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Road track surveys were a poor index of cougar density in southern Utah. The weak relationship we found between track-finding frequency and cougar density undoubtedly resulted in part from the fact that available roads do not sample properly from the nonuniformly distributed cougar population. However, the significantly positive relationship ($r^2 = .73$) we found between track-finding frequency and number of cougar home ranges crossing the survey road suggested the technique may be of use in monitoring cougar populations where road abundance and location allow the population to be sampled properly. The amount of variance in track-finding frequency unexplained by number of home ranges overlapping survey roads indicates the index may be useful in demonstrating only relatively large changes in cougar population size.


Past and present distribution of the eastern cougar is summarized. Recent sightings indicate that cougars are present in Nova Scotia, New Brunswick, Quebec and Ontario. The eastern cougar is protected by law in Nova Scotia, New Brunswick and Ontario. No reliable estimates of the number of cougars in eastern Canada exist or can be made, but numbers are probably quite low. The number of reported sightings increased in the forties and has since then leveled off or decreased slightly. Limiting factors may include low and fluctuating deer densities in the present distributional range of the eastern cougar, and human activities. However, next to nothing is known of the general biology and ecology of the cougar in eastern Canada and limiting factors cannot be identified until a field investigation is undertaken. The taxonomic status of the eastern cougar is uncertain and needs clarification. It is recommended that a field study be initiated to confirm and document the existence of a cougar population in New Brunswick and to gather ecological information that can be used in formulating management plans. Taxonomic studies should also be undertaken in due time to assess the subspecific status of the eastern cougar.


SUMMARY

Levels of mountain lion depredation should be expected to vary between pastures in an area and between years in the same pasture. Number and distribution of mountain lions and number and distribution of sheep, weather patterns, phenology of vegetation, and husbandry practices are among the variables that may influence
predation rates. The range of values for the contribution of mountain lion predation to total sheep loss within a pasture, although based on small samples, should provide insight into the potential size of this depredation problem. Although trends in total loss and percent of dead sheep attributed to mountain lion predation may appear similar, the correlation may be found to be poor. Reported total loss decreased by 21% between the 1987 and 1988 grazing seasons and 38% between the 1988 and 1989 seasons while the annual contribution of mountain lions to total loss decreased 15% and 41% respectively. Strip transects should provide relatively unbiased samples of dead sheep, but they require large amounts of effort. Our analyses were based on visually-located carcasses however, allowing the possibility that the sample from which we worked was biased if some carcasses were very difficult to detect because of characteristics related to cause of death. Because the vegetation type in which dead sheep are found may be related to cause of death, transects should be oriented to proportionately sample major vegetation types found within the area occupied by the sheep.


A female mountain lion and two kittens were observed from a lookout tower in Sequoia National Park about 200 yards away. The female was training her kittens on grasshoppers, with butterflies also attracting considerable attention. An old doe and a fawn were feeding on a hillside and she was just raising her head when the lion hit her. The lioness was spread out and landed full length on the doe with the left forefoot striking at the back of the deer's shoulder and catching into the chest or lower ribs. The lion's right foot hit the deer in the neck and knocked the head clear around toward the shoulder. The lion grasped the neck of the deer and pulling with her shoulder and back, half-carried the carcass about 10 or 15 feet to a more level area where she placed her left foot on the flank and ripped the stomach open with the right. She ate her fill and summoned the cubs and stood guard while they ate. She returned later that afternoon to feed but did not return again to this kill. All of the major activities were performed with the right foot and it was suggested that mountain lions may be "right-handed".


Nine nematode and two cestode species were recovered from the viscera of 53 mountain lions (Felis concolor) collected from four counties in southwestern Texas. The distribution patterns of the common (>20% prevalence) helminth species (Taenia omissa, Physaloptera praeputialis, Physaloptera rara, Cylicospirura subaequalis, Anclylostoma tubaeforme, Toxascaris leonina, Metathelazia californica, and Vogeloides felis) were overdispersed and did not change with host age or sex. Abundances of the common helminth species were examined relative to sex and age-groups of the lions. Significant differences were found for abundances of T. omissa, C. subaequalis, and T. leonina between host age-groups, and for T. omissa between host sexes. Only 2 of 29 were shared among the helminth communities of mountain lions from Texas, Oregon, and Florida, indicating a basic disparity of species common to this host across its geographic range in North America. Taenia omissa is regarded as the single core species across the host's range in North America. New host records are reported for the occurrence of Taenia multiceps, P. rara, Gnathostoma procyonis, A. tubaeforme, and V. felis. Cylicospirura subaequalis is redescribed and compared with Cylicospirura felineus, a species commonly found in Felis lvnx and Felis rufus. In addition to previously described bifid versus trifid
teeth in \textit{C. subaequalis} and \textit{C. felineus}, respectively, differences were noted in the length of spicules in males and the location of the vulva in females.


Information on the behavior and ecology of mountain lions (\textit{Felis concolor}) in Texas is limited. This study reports on aspects of the movements and food habits of lions from Big Bend National Park, in the Trans-Pecos region of Texas. Eleven lions were captured and radio-collared, and their movements monitored by ground and aerial radio tracking during 1984 and 1985. Aerial tracking was conducted in 3, 20-day periods in March-April, July-August, and November, representing spring, summer, and winter seasons, respectively. Six of the lions (1 adult male, 5 adult females) were resident to the study area; each exhibited a single, continuous home area. The male's area encompassed 792.3 km$^2$. The average size of the female's areas was 159.3 km$^2$ (range 76.5-192.5 km$^2$). Size and degree of overlap of the female's areas varied with the habitat type (montane versus desert) in which the home areas were located. An adult female transient and three dispersing juvenile lions (2 males, 1 female) also were collared. Movements of the collared lions, and resident and transient lions identified by track sign, indicated the resident population was socially organized, with home areas established and maintained through a system of land tenure. No significant seasonal differences were found in distances traveled, areas traversed, or elevations used by the lions. Lion food habits were determined by analysis of 546 scat and evaluation of 89 lion kills. Carmen Mountains white-tailed deer (\textit{Odocoileus virginianus carmeni}), desert mule deer (\textit{O. hemionus crooki}), and collared peccary (\textit{Tayassu tajacu}) were the primary prey of the lions. Frequency of occurrence of primary prey in scat was similar to levels reported 4 years prior to this study. Based on estimates of lion numbers and the relative abundance of the 3 primary prey species, lions appeared to be limiting the abundance of white-tailed deer. Lion predation also may have retarded increase in mule deer numbers, but abundance of peccary remained stable. In addition, a survey was conducted on helminth parasites of mountain lions from 4 counties in southwestern Texas. Nine nematode and 2 cestode species were recovered from the viscera of 53 lions. The distribution patterns of the common (> 20% prevalence) helminth species (\textit{Taenia omissa}, \textit{Physaloptera praeputialis}, \textit{P. rara}, \textit{Cyclicospirura subaequalis}, \textit{Ancylostoma tubaeforme}, \textit{Toxascaris leonina}, \textit{Metathelazia californica}, and \textit{Vogeloides felis}) were overdispersed and did not change across host age or sex. Abundances of the common helminth species are examined relative to sex and age group of the lions. Significant differences were found for abundances of \textit{T. omissa}, \textit{C. subaequalis}, and \textit{T. leonina} between age groups, and for \textit{T. omissa} between sexes. Helminth communities from mountain lions in Texas, Oregon, and Florida were compared, showing only 2 of 29 species of helminths to be common to all 3 regions. Four of 17 species were common to lions from Texas and Oregon, and 2 of 21 species common to lions from Texas and Florida. New host records are reported for the occurrence of \textit{T. multiceps}, \textit{P. praeputialis}, \textit{Gnathostoma procyonis}, \textit{A. tubaeforme}, and \textit{V. felis}. \textit{Cyclicospirura subaequalis} is redescribed and compared to \textit{C. felineus}, a common species in the genus \textit{Lynx}. In addition to previously described bifid versus trifid teeth in \textit{C. subaequalis} and \textit{C. felineus}, respectively, differences were noted in the length of spicules in males and the location of the vulva in females.


Reports continue to pour in that \textit{Felis concolor couguar}, a subspecies of cougar long thought extinct, may still roam the country's eastern woodlands. Biologist Ranier
Brocke contends that there may be a few transient animals but that no viable cougar population exists north of Florida and east of the Mississippi. Biologist Bob Downing was in charge of a five-year project searching for cougars in the southern Appalachians, mostly in Georgia and the Carolinas, but found no verifiable evidence. Biologist Virginia Fifield of the Massachusetts Eastern Cougar Survey Team leads the search in New England where she has found but a single pawprint. She is confident that there are cougars out there, particularly in the area west of the Connecticut River.


In Pennsylvania, the last known panther was killed in either 1871 or 1891, depending on which final report you consider. The largest panther on record was a 276-pound animal killed in Arizona in 1917. The largest ever bagged by Teddy Roosevelt was a 227-pounder taken in Colorado. The author compiled a list from records of the years in which panthers probably became extinct in several states. These are New York (1908), Ohio (1838), Maryland (1851), West Virginia (1936), Virginia (est. 1880), Massachusetts (1869) with one report in 1926, Michigan (1875), Maine (1891), Kentucky (1894), New Hampshire (1888) with one report in 1920-22, New Jersey (1840), Rhode Island (1848), Tennessee (1900) with one report in 1937, and Vermont (1881). The author states that there are probably 5500 panthers in the far west and fewer than 10,000 all told.


The Florida panther has been found only in the Big Cypress and Everglades regions of south Florida and just recently, signs have been confirmed which indicate panthers may also live in Volusia County. Eight panthers had been captured and fitted with transmitting collars thus far. A female in the Fakahatchee Strand was found to occupy 40 square miles of territory and a male was tracked over 200 square miles in the Big Cypress Preserve. Panthers swim readily and travel both day and night in the winter. They travel more at night during the summer to avoid the heat.


The California Department of Fish and Game studied depredation by mountain lions on livestock from 1971 through 1977 to determine the scope of the problem. Information was needed on the physical characteristics of a stock killer, the frequency and trend of predation, the livestock types preyed upon, and the geographic distribution of incidents. Department of Fish and Game verified 134 incidents of mountain lion predation on livestock which occurred between April 1971 and December 1977. Forty-five mountain lions (28 males and 17 females) were killed on depredation during this time. Approximately 42 percent of the predation incidents involved sheep, 22 percent goats and 16 percent cattle, with horses, pigs, poultry and pets composing most of the remaining prey. California's south coast region from Santa Clara to Ventura County reported 44 percent of the predation incidents, 28 percent from the Sierra Nevada, 20 percent from the north coast from Napa and Sonoma counties to Humboldt County and nearly 8 percent from southern California. There does not appear to be a stock-killer profile of common sex, age or health factors. Present depredation policy appears adequate to handle the problem, but efficiency could be increased by coordinating incident verification investigations and available depredation resources, such as U.S. Fish and Wildlife Service and
counties of predator control agents.


EXECUTIVE SUMMARY

In August of 1981, House Resolution No. 35, authored by Assemblyman Dominic L. Cortese, requested the Department of Fish and Game to report on the status of the mountain lion and to provide recommendations for its management. The purpose of this report is to review the current literature and to concisely present information to provide direction on the future management of the resource. The mountain lion (*Felis concolor*), commonly called puma, cougar, panther, is the largest and most majestic member of the cat family in California. The large cats have one of the more extended ranges than other native land mammals. The lion prefers dense vegetation or rocky terrain and ranges from the low deserts of Imperial County to the wet north coast mountains and the sub-alpine forest of the Sierra Nevada. They are usually found in association with deer (60-80 percent of their diet); but lions also select other prey species, enabling them to exist well out of prime deer habitat. The mountain lion was classified as a bountied predator in 1907, but it has since been reclassified a number of times. In 1963, the bounty was rescinded and the lion was classified a nonprotected mammal until 1969, when it was reclassified as a big game mammal. The first regulated hunting season occurred during the 1970-71 license year (July 1 through June 30). License tag sales totaled 4,726, and 83 lions were taken. A one-lion limit was in effect from November 15, 1971 through February 29, 1972. Tag sales totaled 227, and 35 lions were taken. Game animal status gave the mountain lion a measure of protection in that limited seasons and a bag limit were imposed. Public concern for this species resulted in Assembly Bill 660 (Dunlap) adopted by the Legislature in 1971. This bill amended sections of the Fish and Game Code and directed the Department to study the mountain lion population of the state. The bill also changed the status of the mountain lion from a game animal to a protected nongame animal and established a four-year moratorium on sport hunting of the species. The Legislature has extended the moratorium until January 1, 1983. Historically, mountain lions have always preyed on livestock in California. Predation is one of the reasons that the Legislature enacted bounty law in 1907. Confirmed annual depredation incidents increased from 5 in 1972 to 51 in 1979 and may reflect an upward trend in the population during that period. Forty is the average number of depredation incidents occurring annually for the last 5 years. Mountain lions are a very secretive, solitary animal and difficult to study. Following the 1971 legislation, the Department commenced a series of studies to determine the number of mountain lions in the state and to determine the most effective methods for managing this resource. During Phase I of the field investigation, the Department contacted field personnel and people who were familiar with mountain lions and their habits. As a result of this survey the statewide estimate of the number of animals was 2,400. Phase II of the field investigations consisted of an intensive study in Monterey County to verify previous estimates. Department personnel believe that the 1977 estimate of 2,400 animals is indeed reasonable and tends to be on the conservative side. Concurrent with the Department studies, Dr. Carl Koford was contracted by several private groups to independently census the lion population of the state. Koford estimated the lion population by studying tracks over selected routes for a period of time. He estimated that in 1977 there were 1,000 lions in California. The Department's initial studies and subsequent follow-up survey conflicted with Koford's findings on two issues; (1) The Department's statewide population estimate of approximately 2,400 and Koford's of 1,000 animals; and (2) our estimate of approximately 70,000 square miles of mountain lion habitat while Koford considered...
only 15,000 square miles of habitat. Subsequently, studies by the Pacific Southwest Range and Experimental Station on the North Kings Deer Range, Fresno County; the Department's track surveys in Orange, Riverside and San Diego counties; and San Diego State Universities' studies on Mount Hamilton, Santa Clara County, have verified or indicated a higher density of lions than the Department's estimate in 1977. The University researchers concluded that the population in the Hamilton Range was stable at 5 to 6 resident adult lions per 100 square miles. This density is comparable to the Department's findings in Monterey County where an estimated total population of 10 mountain lions per 100 square miles which converts to approximately 6 to 7 adults. In addition, in southern California where Dr. Koford stated that the replacement of breeding females may be inadequate, the Department's surveys found kittens 4 out of 5 years, which indicates recruitment into the population. The Department's estimate of 70,000 square miles of habitat corresponds to the known presence of deer. By contrast, Koford's figure of 15,000 square miles of lion habitat pertains only to resident animals, and he tended to dismiss other signs or sightings as that of wandering or transient animals. The Department recognizes that mountain lions inhabiting the riparian habitat along the Colorado River and adjacent desert are very uncommon. With further investigation, the Department, through the Fish and Game Commission, has the authority to afford complete protection under the California Endangered Species Act of 1970. That the mountain lion population undoubtedly was suppressed during the years that lions were bountied (1907 to 1963) and during the years that the state employed lion hunters (1919 to 1959). Since the legislature repealed the bounty law and established a moratorium on sport hunting, evidence indicates that lion populations are increasing. Data collected on depredation incidents, sightings and road kills all suggest that the lion population has increased since the moratorium. Although the actual number of mountain lions cannot be precisely determined, on the basis of current knowledge the Department can provide a reasonable estimate of the total number of lions in California. This estimate is thought to be between 2,400 and 3,000 animals. The populations cannot increase indefinitely, as there is an upper limit that any given area can support, and perhaps not more than 10 per 100 square miles as found in Monterey County. Mountain lion numbers seem to be limited by social interactions rather than by the abundance of prey and are regulated through the mortality and dispersal of the young. The lion population overall is healthy and is expected to stay that way. The number of additional lions which the various habitats could hold is unknown. In some of the better habitats, densities might sustain an increase of 2 to 4 adult lions per 100 square miles. A potential for similar increase in the good or poorer habitats also exist. This could equate to several hundred more lions than presently exists. Habitat constraints and the solitary nature of the animal are important factors that will prevent any substantial increase over this level. Therefore, under the best of conditions we would not expect maximum lion populations to exceed the 2400-3000 current population by more than 800-1000 animals. Under conditions where continued and expanding loss of critical lion habitat is occurring, a reduction in populations would be expected. Fortunately much of the wildlands preferred by lions is either in public ownership or not particularly vulnerable to development. The actual reduction in numbers below current levels could be determined by the scope and severity of habitat degradation, particularly that occurring on private lands. Major management options relate primarily to investigations into the status of lions and population controls. The Department envisions that any legislation enacted would allow population control that would take individual depredating animals and/or a limited and strictly controlled take in areas of high lion density. If this is the case, studies other than periodic investigation to provide trend information and lion population and habitat condition status would not be indicated. Current data with appropriate updates on lion population and habitat quality and quantity, are adequate for conservative management programs. Intensive studies to obtain more precise population figures
would be indicated only where more liberal harvest options were to be considered. The Department is confident that whatever management directive is provided by the Legislature, it has the management capability of assuring that the mountain lion will continue to occupy its role as the state's premier predatory animal.


The question of what price bounties and runaway predator control programs have on the health of deer herds is examined. It was estimated that California has around 1½ million deer occupying approximately 57 million acres of range including 8 million acres of private land. From 1907 to October 1963, bounties were collected on 12,461 mountain lions. Millions of dollars are spent every year for predator control and this in a state with surplus deer and few predators which means deer suffer from disease, parasites, malnutrition, and reduced productivity. In addition, deer overpopulation means overgrazing and depletion of the range which adversely affects other forms of wildlife and man. Many big game studies throughout the west indicate that the cougar is an invaluable aid in helping control excess deer and elk.


Mountain lion (Puma concolor) predation caused populations of bighorn sheep (Ovis canadensis) in 2 mountain ranges in California to decline to low densities. In the Granite Mountains in the eastern Mojave Desert, lion predation reduced the sheep population to 8 ewes and held it at that level for 3 years, after which the predation abated and the population has increased at 15%/year for 3 years. Annual survivorship of radiocollared ewes was 62.5% for the first 3 years of study and all mortalities were from lion predation. Mountain lion activity increased in the southern Sierra Nevada on winter ranges between 1976-1988. During this period, 49 sheep killed by lions were found on the winter ranges of the Mount Baxter population. Beginning in 1987, the larger subpopulation of this herd abandoned use of its low-elevation winter range. Increasing mountain lion predation is the best explanation for these habitat shifts. The Mount Baxter sheep that remained at high elevations missed a growing season on the winter range, which was reflected in lower fecal nitrogen levels. The population has declined to <20% of earlier census totals as a result. Mountain lions effectively halted a previously successful restoration program for bighorn sheep in the Sierra Nevada and reversed the overall population trend.


All radio collars that were attached to lions in previous segments quit functioning early in this segment. Six new lions were captured— one adult male, three adult females, and two female yearlings. The adult male was caught in Silver City and moved to the study area. He returned to his home range within one week. Two of the adult females were killed by dogs during capture. One of the females killed was found to be in poor condition. She had a fractured jaw, which was nearly healed. A piece of wood, presumably from a shrub or tree, was found in the wound. The radio collar worn by lion No. 31 (female) was found in October near Highway US 180. Earlier reports were received that a lion was hit by a car in that vicinity but it was not confirmed.

There were 128 mountain lion (Felis concolor) pelts tagged during the 1994-95 hunt season, this is a 23% increase over the 14 year average of 103.9 pelts. Hunter harvest questionnaires projected a large increase in the 1994 harvest, 30% over the 5-year average of 146 lions. Depredation complaints resulted in an average additional 9.5 lions harvested, annually. Game Management Unit 30, the Preventive Lion Control Program took fewer lions in 1994, 40% fewer than the 6-year average of 6.7. Lions also died from collisions with cars, poaching and accidents.


The author had written the editor to say that when he was 19 years of age (about 1904) he saw a black panther while hunting for rabbits about 3 miles west of Altoona. About 1 year later his uncle spotted a big panther while on horseback that was situated on the limb of a tree that reached out over the road.


The partly consumed body of a freshly killed cougar (Felis concolor) kitten was discovered along the tracks of a gray wolf (Canis lupus) pack in Glacier National Park, Montana. Tracks indicated that the wolves chased and killed the kitten after it left the security of a large conifer where it had been treed.


The author reports that he had recently compiled over 100 reports of sightings of cougars, their tracks, or kills over the previous few years. He believes a portion of these to be correct. The two areas in the province which have suitable cougar range conditions are the Pasqua Hills between the Carrot and Red Deer rivers and the vast forest area to the north and to the southeast in the Porcupine Hills and Riding Mountains. More than 75 alleged sightings have been reported in the Pasqua Hills and adjacent areas. Over 30 sightings were reported from the Cypress Hills area east to Avonlea and Milestone.


The author recorded stories he had collected over the previous six years. Only two of the reports could be verified by hides obtained from the animals. The author states that since 1948, the cougar appears to be expanding its range due to increased reports of sightings in Saskatchewan.


Sight reports, specimens obtained in 1939 and 1948, and plaster casts of tracks confirm that the cougar is a rare inhabitant of Saskatchewan. Sightings were made in 1970 and 1972 southeast of Moose Mountain, Saskatchewan, near the town of Antler. The 1972 sighting included two kittens. Although cougars are rare in the province, the author believes these sightings are reliable and that they provide
additional evidence of the cougar's existence in the province.


A cougar was shot and killed on November 15, 1975. One-hundred yards from where the cougar was first sighted, a deer was found with its belly slit open and the shoulder and neck cut. This cougar was a female weighing 125 pounds with a body 50 inches from tip of nose to base of tail and a further 27 inches for the tail. The cougar was given to the Museum of Natural History in Regina.


The objective of this study was to locate and determine the cause of death of domestic sheep on pastures and to determine if vegetation and topography had any affect on the detection of dead sheep. The study was conducted on the east slope of the southern Bighorn Mountains in Johnson County, Wyoming. Four pastures were included in the study which began in May 1988. A total of 52 sheep carcasses were found with 12 (23%) of these killed by mountain lions. Sixty percent of all carcasses (N=31) were lambs and all sheep killed by mountain lions were lambs. Sex of the dead lambs was determined for only 29% of the carcasses (6 males, 3 females). Only one carcass of a lion-killed sheep was intact, while 20 carcasses (50%) of sheep that died of other causes were whole when found. Carcasses of sheep that were killed by mountain lions were less visible and proportionately more carcasses of lion-killed sheep were scattered than were carcasses of sheep that died of other causes. Intact carcasses were detected at significantly greater distances. Carcasses of lion-killed sheep appeared to be found in areas of denser vegetation even within the same vegetation type.


Male cheetahs, tigers, leopards, and pumas maintained under the same conditions were anesthetized and 1) serially bled before, during, and after electroejaculation (EE); 2) serially bled only (AO); or 3) serially bled before and after receiving adrenocorticotropin hormone (ACTH). Ejaculates from leopards contained higher (p<0.05) sperm concentrations than cheetahs or pumas but lower (p<0.05) sperm motility ratings than all other species. Tigers produced a larger seminal volume and the greatest number of motile sperm/ejaculate (p<0.05). The percentage of morphologically abnormal spermatozoa was greater (p<0.05) in cheetahs (64.6%), leopards (79.5%), and pumas (73.5%) than in tigers (37.5%). The most prevalent spermatozoal deformities included a tightly coiled or bent flagellum, a deranged midpiece, or a residual cytoplasmic droplet. Mean baseline serum cortisol concentrations in leopards were 2- and 4-fold greater (p<0.05) than in tigers and cheetahs, respectively. Basal cortisol concentrations in pumas were similar to those of tigers, but irrespective of treatment increased 2-fold (p<0.01) during the bleeding period. An acute rise and fall in cortisol attributable to EE was observed only in cheetahs. In tigers and leopards, mean peak cortisol concentrations after ACTH were similar to maximal values observed after EE. However, peak cortisol levels in cheetahs and pumas after ACTH were greater (p<0.01) than the concentrations measured after EE, indicating that these manipulatory procedures were not eliciting a maximal adrenal response. In the EE groups, luteinizing hormone (LH) and
testosterone levels in cheetahs were lower (p<0.05) than in other species, whereas levels of both hormones were comparable (p>0.05) in tigers, leopards, and pumas. Elevated cortisol levels in cheetahs and pumas had no discernible effect on LH/testosterone patterns; however, the results were equivocal in tigers, and, among leopards, testosterone concentrations consistently declined over time. In this study, using a standardized approach, we identify different ejaculate and endocrine characteristics of captive cheetahs, tigers, leopards, and pumas. The data extend earlier observations and demonstrate that some, but not all, Felidae species ejaculate high numbers of pleiomorphic spermatozoa. However, inter-species differences in sperm integrity do not appear related to inter-species variations in cortisol, LH, or testosterone. The observation of continuously declining testosterone concentrations only in leopards after AO, EE, or ACTH treatment suggests that rising and/or elevated cortisol appears to exert a species-specific influence on reproductive hormone activity.


This study reviewed the morphological characters of the Florida panther (Felis concolor coryi). Physical traits of color, cranial morphology and pelage features in the context of the geographic variation expressed by the species throughout its range are examined. Measurements were taken and variation analyzed for 79 museum specimens of panther (F.c. coryi) and from 200-600 specimens (depending on the trait being examined) representing cougars throughout their range. Only adults were included in the study. Color variables were normally distributed (p less than 0.05 test for normality) in subspecies consisting of large sample sizes, and approached normality in less well represented groups. No observable color differences could be detected between males and females, or between historic and recent coryi so these classes were combined in subsequent procedures. F. c. coryi was found to be darker than western and northern inland populations from North America. There was virtually no difference in color measures between F. c. coryi and coastal populations from Oregon and Washington (F. c. oregonensis and F.c. olympus). F. c. coryi is less red than tropical subspecies from Guatemala, Costa Rica, Panama, Venezuela and Brazil (F. c. mayensis, costaricensis, concolor), although the latter cannot themselves be separated from one another. White flecking on the head, neck and shoulders is more prevalent in the Florida subspecies and the density on any particular animal increases with age. Flecking is believed to be caused by ticks, especially Ixodes scapularis. The whorl, or cowlick, is a structural reversal of hairs that occurs mid-back and/or at the base of the neck. The mid-dorsal whorl can be an abbreviated narrow ridge of only four centimeters, but is more often a pronounced oblong or tear drop shape up to 30 cm in length. The whorl at the base of the neck is chevron-shaped and may be up to 10 cm long. It is quite distinct from the usual swirl that is caused by the change in direction of hairs in this region. Whorls occur in both sexes and are present at birth. Florida animals frequently display the mid-dorsal whorl, sometimes the neck whorl, and in a few instances both are present in the same animal. The kinked or crooked tail results from a modification of the distal caudal vertebrae. Often the third vertebra from the end is shortened and curved, resulting in a 90 degree bend in the tail. The last tail vertebra is often truncated and sometimes it too is curved, resulting in a double kink. Although not linked genetically, the kinked tail with the whirling is considered a genetic marker of the Florida subspecies. Both kinked tails and whorls are more prevalent in southwestern Florida than in southeastern Florida. In the skulls of most coryi the frontal region is flat relative to the highly arched nasals, so the inflated nasal region becomes the highest point on the coryi skulls (Roman nose). Results of 18 cranial measurements taken on 18 adult
specimens are provided.


Mountain lion (Felis concolor missouensis) habitat use, foraging habits, and home area characteristics were investigated in the Sun River area of northern Montana. Twenty-five mountain lions were monitored in 1991-1992. Mountain lions selected closed-conifer, open-conifer, aspen-conifer, deciduous tree, and shrubland cover types. Mountain lions avoided grassland and vegetated rock cover types. Mountain lions preferred areas near a stream course (0-200 m). They did not avoid roads or USFS recreational trails. They were found on slopes ranging from gentle (less than 20%) to steep (greater than 69%). Mountain lions preferred eastern aspects, elevations ranging from 1219 m to 1828 m, and were located in both broken and unbroken topography. Mean annual home area size was among the smallest reported in the literature. Mean annual home area size for prairie-front mountain lions was smaller than mountain lions that utilized interior areas. Home area size for prairie-front males was larger than for prairie-front females. Interior male home area size did not significantly differ from interior females. There was considerable overlap in female home areas. Mountain lions used core areas within their individual home areas. Mountain lions primarily killed deer, bighorn sheep, and elk. Bighorn sheep, elk, and mule deer were killed more often during winter (Nov. - Apr.). White-tailed deer, and smaller mammals were killed more often during summer (May - Oct.). Overall, elk contributed more biomass to the diet of mountain lions than deer and bighorn sheep. Specifically, elk bulls, cows, bighorn sheep ewes, and mule deer bucks contributed the most biomass to mountain lion diets. Three instances of cannibalism by mountain lions were documented.


The Florida panther is described as at least 6 feet-long with feet being over 3 inches wide. Up to six kittens are born about every two or three years but most panther families contain only two or three young. Adults are promiscuous and probably do not breed until two or three years old. There were only five convincing records of Florida panthers from 1967 through 1975. Many of the more convincing records recently had been north of Lake Okeechobee. Other reports were from the Everglades, but the six tame, captive reared panthers released there since 1960 make these reports questionable as to whether they were true Florida panthers. The Everglades-Big Cypress Swamp area had produced the largest number of unverified reports of the species in Florida. It seemed unlikely that there could be more than 30 panthers in Florida. Although protected from legal hunting since 1958, the Florida panther had not recovered. Overhunting had evidently killed out the panther in spite of legal protection and no legal conviction had ever been made for shooting a panther in Florida.


The mountain lion first made it into old-world literature in 1500, when Italian explorer Amerigo Vespucci described one he had seen on a beach in what is now called Central America. Some biologists estimate that the U.S. may have as many as 50,000 lions. Of the 12 humans known to have been killed by lions since 1890, eight have died in the past 23 years. The author describes Maurice Hornocker's White
Sands Missile Range lion project which was in its 10th and final year and also provides Hornocker's reflections on past and present research and philosophy. A viable lion population according to biologists is one capable of persisting for 100 years and requires 250 breeding adults of each sex. Based on Ken Logan's data from New Mexico, 500 breeding lions would need 10,000 square miles, an area equal to 13 times the size of the San Andres mountains. A future for New Mexico lions will require sound hunting regulations and at least two large safe havens the size of the White Sands study area where lions can breed and young can disperse.


A captive adult puma developed ataxia, a hypermetric gait and whole body tremor. The signs progressed over a period of six weeks. Histopathological examination following euthanasia demonstrated spongiform encephalopathy, gliosis and mild non-suppurative meningoencephalitis. Immunostaining with a polyclonal antiserum revealed prion protein (PrP) associated with these changes in sections of cervical spinal cord and medulla. This is the first confirmed case of a scrapie-like spongiform encephalopathy described in a non-domestic cat in the United Kingdom.


**SUMMARY**

Direct observations and information from 29 puma-killed guanacos indicated that pumas generally attacked their prey from an elevated, hidden position, and killed with a throat bite. Adult and subadult males were killed less than their proportion in the population, while young were killed twice their proportion. Kills were more aggregated on the winter range than the summer range, possibly due to differences in habitat. Sex-differential mortality of female guanacos on the winter range may have been due to sex-class differences in behavior or movements.


Mountain lion classification changed from predator to a trophy game animal in 1980. During the five-year period (1979-1983) a total of 130 lions were taken. Management program goals are presented and major management problems are identified. The highest lion densities are found in northwest and northcentral Wyoming. The financial burden of mountain lion management is illustrated by 222 mountain lion licenses sold in 1983 for a revenue of $6,200, while management costs were $232,000.


From December, 1968, to April, 1969, six adult mountain lions were examined for Trichinella spiralis. Five lions originated from western Montana and one from south-central Montana. Fifty percent (3/6) of the lions were infected with T. spiralis and were from western Montana. The highest larval concentration was found in the diaphragm whereas the lowest occurred in the masseter. This was apparently the first
record of a trichina infection in a mountain lion under wild conditions.


This Participation Schedule is intended for the joint benefit and use by the Commission and the U.S. Fish and Wildlife Service toward the implementation of the Florida Panther Recovery Plan. Current implementation efforts indicated that eight (40%) of the 20 tasks identified in the Recovery Plan were ongoing to varying extents. Past, present and future Commission participation is presented and a participation schedule is provided. Appendix A furnishes panther records in Florida on file at the Florida Panther Record Clearinghouse. Appendix B is the Florida Panther Act, Section 372.0725. Appendix C provides the Program Narrative of Florida Endangered Wildlife Project E-1-5. Appendix D consists of a letter from the Commission to the Fish and Wildlife Service concerning hunting in the Fakahatchee Strand.


In 1764, a four-pound bounty was paid for killing a panther. As civilization advanced, the original forest was decimated, the deer were killed, and the cougar was retreated to the great forests to the north. As deer habitat conditions improved and numbers increased, so did the mountain lion numbers. The author tells of the comeback of the cougar by recounting reports of cougar sightings from 1926 to 1971. The cougar had never been photographed alive and all that is known is from skins, skeletons, and mounted specimens. The cougar was officially considered extinct in the northeast about 1860, but was rediscovered breeding in the Fundy Hills of New Brunswick in 1947. In 1966, the International Union for the Conservation of Nature and Natural Resources removed the Eastern panther from the extinct list and placed it on the Rare and Endangered List. In 1972, the panther was officially protected under the Endangered Species Act. The type locality of the Eastern panther is Pennsylvania and its range extends from southern Canada to where it joins the southern subspecies at the Florida state line.


The history of the "panther" in New Brunswick is presented. The presence of the panther has always been doubtful, and at best appears to have always been rare. Records of the panther in Quebec, which is the farthest north for the eastern species, end about 1880. Forty-three sight records and track reports are presented from New Brunswick, three from Maine, and the only record known to exist from Nova Scotia is cited.


SUMMARY AND CONCLUSIONS

The early panther reports from New Brunswick have been screened and any that might have originated in the sighting of a wild dog have been eliminated. Over one
hundred reports remained from New Brunswick, Maine, and Nova Scotia, and these are analyzed for physical characteristics and life history data. The accounts of the killing of six panthers in New Brunswick and Maine are given, and a number of cases where panthers have been wounded and escaped are discussed. The northeastern race is found to be similar in gross dimensions to the western races, but generally darker in color, particularly on the back and head. Accounts of calling up a panther are given, as is a report of the finding of a den. The young are described from eye-witness testimony. Food habits include deer, caribou, bobcat, otter, partridge, and frogs. The habit of standing on the hind-legs is discussed. Two incidences of predation on domestic stock, and accounts of two recent attacks on man are given. Swimming ability is discussed and the status of the species in the northeast is reviewed.


There are two subspecies of the cougar in the East. The southern subspecies, Felis concolor coryi, ranged from Florida to the South Carolina/Georgia border and westward along the southern border of Tennessee to the Oklahoma border. The country to the north and east of this to New Brunswick was the range of the northern subspecies, Felis concolor couguar. By 1850, most states and provinces along the Atlantic coast had apparently lost their cougars. By 1910, the eastern cougar was considered extinct in all of its northeastern range. The author started accumulating reports of cougars in 1938 and it became apparent that there were survivors in New Brunswick, Maine-New Hampshire-Vermont border area, in the eastern mountains, and at the head of the Great Lakes. Most reports were in direct relation to increases in deer numbers in many areas where they had historically been depleted and in a few instances where they had pioneered new territory. The cougar was unprotected at any season of the year in every state or province where it was found in the northeast.


The author reports that a specimen of the long-supposed extinct Felis concolor couguar, reported to have been the last taken in the northeast had been obtained. The specimen was described and was placed in the collection of the Northeastern Wildlife Station at the University of New Brunswick, in March 1931. The last complete specimen to be preserved in the northeast was apparently that killed near Barnard, Vermont, on 24 November 1881.


The farthest east that the cougar was known to have reached in early times in eastern Canada was New Brunswick. This suggests that in the 1840's the cougar was driven out of the greater part of the northeastern states by civilization and had retreated into the great undisturbed forests of New Brunswick. Over 200 reports of cougar in the east were collected at the Northeastern Wildlife Station at the University of New Brunswick and a systematic analysis showed that by 1960 cougars had been reported for every county of the province and appeared to be expanding its range. There were only two provinces in Canada-Newfoundland and Prince Edward Island that had not reported cougars in the previous 10 years. The only specimen taken in the east since the “comeback” of the cougar that were found was one in New Brunswick in 1931, and one from the Maine/Quebec border around 1938. The author relates a few accounts of cougar encounters selected from over 240 on file from New Brunswick alone.
The Game Act had not specifically stated that the few remaining panthers were protected in New Brunswick. A casualty list of 31 panthers killed and injured by man east of the Mississippi and north of Florida (1900-1965) is presented. The northeastern panther was still inadequately protected (if protected at all) in every state or province in its range except New Hampshire. The greatest danger to the panther was from the "shoot it to prove I saw it" philosophy of most deer hunters.


Between 1920 and 1970, panthers were reported in the southwest corner (Southwest Range) of the province 38 times. Between 1900 and 1970, panthers were reported in the areas between the St. John River and the Maine border (Western Range) a total of 45 times. Between 1937 and 1970, panthers were reported in the area contiguous with the Southwest range to the west (Base Gagetown area) a total of 38 times. Between 1904 and 1970, panthers were reported in the area along the East bank of the St. John River from Sheffield to the Becaguimec Game Refuge (Central Sector) a total of 56 times. Between 1907 and 1969, panthers were reported 24 times in the Juniper Sector. Between 1930 and 1963, panthers were reported in the watershed of both the Restigouche and Nepisiguit Rivers and the smaller rivers between a total of 12 times. Between 1900 and 1968, panthers were reported in the central highlands of northern New Brunswick along the Miramichi River from the Juniper country in the west over a hundred miles to the Bartibog in the east (Miramichi Sector) a total of 18 times. The first record of a panther shot in New Brunswick appears on page one of the St. John Telegraph Journal on November 24, 1923. A total of eight sightings were reported for the area south of the Kent-Northum Berland line to the Nova Scotia border (Kent-Westmorland Sector). Up to 1970, panthers were reported in the area between Grand Lake and the Bay of Fundy from the Petitcodiac River in the east to the St. John River in the west (St. John-Albert Sector) a total of 46 times. The author reported that "it seems evident from these records that the eastern panther has covered all of the great central forest in the Past 70 years and may be found now anywhere in this 20,000 square mile area". A greater concentration of panthers seems to be along the south forest and in the southwest corner. The author's best guess at a population estimate for New Brunswick is 25-50 maximum. Records since 1952 may constitute a recent extension of range for the panther from tide water on the Baie des Chaleurs to tide water on the upper Gulf of St. Lawrence, through the mountainous heart of the great peninsula where it had never before been recorded. Sightings of a group of panthers along the northwest end of Montral Island, in Montreal, Canada, were reported from about March 7-April 18, 1959. Panthers were never captured, but plaster casts of the track of one of them was accepted as genuine by two scientists at McGill University's Redpath Museum. Other reports have come from Quebec and the southern deer range of Ontario. Deer were not known in Nova Scotia prior to 1890, when they were introduced from New Brunswick. The first report of what appears to have been a panther in Nova Scotia was in June of 1923. Since 1923, a total of 36 sightings have been made. Plaster casts of tracks have been identified as panther at the U.S. National Museum. The author reports that the range of the supposedly extinct eastern panther runs across the Laurentians from central Ontario to the Atlantic Coast of Cape Breton Island, and between the Mississippi and the Atlantic south to where it merges with the range of F. c. coryi at the Florida line. A table gives 20 descriptions of black specimens of panthers seen at close range in
daylight in New Brunswick, Quebec, and Nova Scotia from 1951 to 1970. The author accepts the word of eye-witnesses who have seen black panthers in northeastern North America and that they are not particularly rare (about 7% in New Brunswick and Nova Scotia). Another table shows a list of 45 panthers killed or injured by man between the Mississippi and the sea north of Florida, 1900-1968.


The author surprised a cougar at Mt. Hamilton, California in 1919. The cougar fled and two fawns were found nearby. One was completely buried and partially eaten. The author returned three days later and nearly all fleshy parts were gone and concluded that the cougar had stayed in the vicinity and guarded its kill against all carrion feeders for its own consumption.


The first quantitative report on the food habits of mountain lions in Chile is presented. Mountain lion scats were collected in July and August 1983, and October 1983 through January 1984 from four sections of Torres del Paine National Park. During this same time interval, scats were also collected on four ranches adjacent to the park. The introduced European hare (Lepus capensis) was by far the most numerous prey detected in the scats in the park, followed by ungulates (mainly guanaco), birds, rodents, and carnivores, with horses being a minor fraction of the prey. The winter diet had a higher prevalence of hares, which decreased during Spring/Summer, when all other prey groups increased in occurrence. Some sheep remains were found in park scats which indicated that either resident lions sometimes hunted outside of the park on ranches or that lions from outside enter the park, or both. Hares were again the most numerous prey detected in scats outside the park on the ranches. However, there was a dramatic increase in the representation of livestock as prey (particularly sheep). It was not known to what extent these sheep were killed by mountain lions or whether they were eaten as carrion.


ABSTRACT

Occasional reports of cougars (Felis concolor) in Louisiana were known in the early 1900s after they were eliminated from most areas of the state. The reports continued through the 1930s and 1940s. In 1949-50 tracks were verified from Natchitoches Parish. On 30 November 1965, a cougar was killed near Keithville, Caddo Parish. A single track was verified in 1975 from Catahoula Parish. Sighting reports were regular and increased during the 1970s. Some were investigated, but no physical evidence was found. No clearinghouse exists in Louisiana to process reports or to verify them. Reports of "black panthers” and obviously fallacious reports cloud the issue. Seventy-one recent reports were assembled, plotted, and likely areas sampled. Many credible reports were received from biologists, foresters, and other professionals. Sign searches produced no evidence. An organized extensive search by qualified biologists is needed to resolve the questions raised by sighting reports. Many credible appearing reports suggest that a small number of cougars may still exist in Louisiana.
In February, 1925, a hunter was dispatched to the Wetmore district of the San Isabel National Forest to kill lions which were considered too abundant in the area. A nursing female was killed on February 10 and on February 11 the den of this female was found and the remnants of two lion kittens were discovered, parts of which had been devoured. It was concluded that it was the work of the male which was trapped several days later and was similar in habit to the ordinary house tom-cat which eats up the young when the female is not around to guard them.


Mountain lions may travel 25 miles or more in a night in search of food. When making a kill, the lion brings its victim to the ground by the stunning impact of its entire weight, generally attacking at the throat and breast. The use of trained hounds is the principal means employed where the control of lions is required. Kentucky fox hounds and the walker/bloodhound cross have been found most satisfactory for trailing lions. A lion that fights at bay instead of treeing may kill all the dogs. The use of poison in mountain lion control is not recommended. Techniques for setting traps to catch mountain lions are described. Catnip may also be used as a lure and its application is detailed.


Twenty-five subspecies of the puma were recognized. The puma originally occurred in every state, but is now extinct east of the Mississippi River except in Florida where it exists in limited numbers. It was a question as to whether the puma screams or not and the author presents some early citations and personal field observations and experiences which tended to verify that the puma does make a piercing scream. A critical study of the anatomy of the puma's skull revealed that the distance between the glottis and the base of the tongue is usually no more than 1 to 1-1/2 inches. This and the fact that the puma is seldom able to extend its tongue more than approximately one inch, makes possible the piercing scream.

The record weight attained by a puma was a 227 pound animal killed by Theodore
Roosevelt on February 14, 1901, near Meeker, Colorado. Thirty geographic races of the puma are recognized. The track of the puma is from 4 - 6-3/4 inches wide. The author states that Christopher Columbus was the first to bring the puma to the attention of Europeans during his fourth voyage in the year 1502. The puma was first recorded in the literature in Pennsylvania by William Penn in August of 1683.


Twenty-five recognized subspecies exist for the mountain lion and eight of the nine geographic races originally occurring in the United States are still found here. The subspecies which occurred east of the Mississippi River is considered extinct except in Florida. The mountain lion was historically found in every state of the Union with the possible exception of New Hampshire, Rhode Island, and Delaware. Pumas bring their victims to the ground by the stunning impact of their entire weight attacking at the throat, back of the neck, and breast. The author measured a broad jump of 13 feet made from a normal standing position. Columbus was the first to record the puma in the Western Hemisphere during his fourth voyage in the year 1502 while exploring the coasts of Nicaragua and Honduras. Many historic accounts of the scream of the puma are recorded. There is only about an inch or an inch and a half between the glottis and the base of the tongue making it anatomically impossible to utter anything other than a high, piercing shrill cry.


Since 1976, the Florida panther has been the most intensely studied endangered animal in the United States. Its numbers are down to less than 50 and is isolated to 6 counties in south Florida. During the two-year period of 1989-90, 44% of the genetic founders had died. This summer, the last two known breeding females in the Everglades National Park died. Mercury contamination has caused great concern over the past few years and in 1989 it was identified as the probable cause of death of female panther #27. There appears to be a correlation between mercury levels and habitat preference of individual cats as well as prey source and age. Thus far 16 deaths have been documented as road mortalities, 75% occurring on State Road 29 and 84, better known as Alligator Alley. A plan was devised to collect up to six juvenile cats per year over the first 3-6 years of the project based on genetic representation of the wild population. A lawsuit was filed by the Fund For Animals, Inc., and a Holly Jensen of Florida in order to stop the capture of panthers and placing them in zoological parks for breeding purposes. A settlement was reached and a Supplemental Environmental Assessment was produced and awaits approval in December. The survival of the Florida panther depends on the federal government’s support of zoos as valuable conservation centers.


An adult cougar (Felis concolor) died after progressive loss of appetite, weight, and eventual depression. Generalized icterus, dark red urine, collapsed lungs, a crural diaphragmatic hernia containing a 15-cm length of viable large intestine (not incarcerated), and a few adult Ancylostoma sp. in the small intestine were found upon necropsy. Two polyps were found: one in the main bronchus of the right cranial lobe and the other in the left primary bronchus. The ultimate cause of death was most likely a hemolytic crisis of unknown origin and the degree that the bronchial polyps
contributed to the hypoxia could not be determined.


This study examined public attitudes toward mountain lions and mountain lion management along Colorado’s Front Range. Three populations were surveyed using mail-back questionnaires during spring of 1995: the Denver Metro area, the Colorado Springs area, and the Foothills area west of Denver. An overall response rate of 58% was obtained. Data were tested for non-response bias and weighted appropriately. A majority of respondents had positive attitudes toward mountain lions and were likely to believe that mountain lions are a sign of a healthy environment and pose little real risk to people living near them. In a test of knowledge of recommended responses to a mountain lion encounter, two out of three people were aware of actions recommended in CDOW educational materials. Two out of three subjects agreed that steps should be taken to control the number of mountain lions coming into Front Range residential areas. Among strategies to control mountain lion populations, public hunting for mountain lions or deer was somewhat more acceptable (40%) than using trained hunters (30% - 40%) or developing sterilization techniques for mountain lions (30%). In response to incidents involving mountain lions in residential areas, monitoring a mountain lion was widely acceptable if a lion had done no harm, but less acceptable as incidents grew more severe. Capture and relocation was acceptable to a majority in all situations. Frightening a mountain lion away with rubber bullets or fireworks was unacceptable to a majority in all situations. Destroying a mountain lion was highly unacceptable unless a human had been injured or killed. Fifty percent reported that they would accept destroying a lion that had injured a person, and 60% reported that they would accept destroying a lion that had killed a person. Individuals sympathetic to the idea that wildlife should have rights similar to the rights of humans were less likely than others to believe mountain lions pose a real risk to people and less likely to accept hunting or destroying mountain lions. Results demonstrated that, in dealing with mountain lions at the population level, strategies involving public hunting were more acceptable than anticipated. Results also highlighted the importance of continued public education. Public education appears to have increased awareness of how to minimize risk in encounters with mountain lions. Public education may also widen the range of publicly acceptable options available to wildlife managers by clarifying why capture and relocation is not always used.