

ANNUAL REPORT

Bureau of Wildlife Diversity Conservation

Project: Florida Panther Research (7500)

Study: **Florida Panther Genetic Restoration and Management (7508)**

Period Covered: July 1997 - June 1998

Study Duration: July 1995 - June 2001

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Abstract: Telemetry data were collected on 31 radio-collared Florida panthers (*Puma concolor coryi*) and 7 Texas cougars (*P. c. stanleyana*) in south Florida during the reporting period. Two instrumented panthers died (ruptured aorta, intraspecific aggression), and 1 Texas cougar was illegally shot and killed during the study period. One uncollared female panther died from a collision with a vehicle and an older captive panther was euthanized due to declining health. Eight new panthers were added to our radiocollared population this past capture season. Comparing reproduction among panthers and cougars, two female panthers denned during the past year producing 4 neonate kittens (2, 2) and two female Texas cougars denned producing 3 neonate kittens (1, 2). All were marked with transponders. A total of 12 (4, 8) F1 kittens have been produced and none of these kittens have exhibited kinked tails or cowlicks. Over the same time period, 24 kittens were born to panthers and 19 had kinked tails.

Three panthers were held in captivity for several months this reporting period. Male panther #51, previously held to treat a mycotic dermatitis, was treated for a broken toe and to diagnose and remove a large mass from his hip. Female panther #61_{F1} was placed in captivity after she was found to be suffering from severe anemia and dehydration in June 1997. She was released back into her former territory after 55 days in captivity and has resumed normal movements. Female panther #69, a 10-month-old dependent kitten, was captured in an emaciated and dehydrated state following the death of her mother. She was taken to White Oak Conservation Center for maturation in preparation for release back into the wild.

INTRODUCTION

Florida panthers are endangered by a combination of population and habitat factors (USFWS 1987). Loss and fragmentation of habitat and unregulated killing over the past two centuries have reduced and isolated populations in the southeastern United States to the point where only one population estimated at 30-50 adults exists on approximately 8810 km² (2.2 million acres) of habitat in south Florida (Maehr 1990). Small population size and geographic isolation increase the chance for extinction of Florida panthers due to demographic instability inherent in small numbers and erosion of genetic diversity from restricted gene flow and inbreeding. Genetic diversity is the basis for production of fit individuals as well as providing the ability of the population to respond to changing environmental and habitat conditions. Demographic variation has been considered important in regulating populations for many years, but the role of social and genetic factors has only recently begun to be examined as modern techniques from field biology and molecular genetics have become available. Recovery of the Florida panther is complex, but not an uncommon situation as many species face similar circumstances. A unique opportunity exists to implement conservation and management strategies for Florida panthers and evaluate results that will benefit Florida panthers as well as other imperilled species.

Natural exchange of genetic material occurred historically among the Florida panther population in the southeastern United States and contiguous populations of *P. c. couguar* to the north, *P. c. hippolestes* the northwest and *P. c. stanleyana* to the west (Young and Goldman 1946). Genetic exchange between populations ceased as the coastal plain was gradually cleared and settled. Florida panthers steadily declined in abundance and distribution as a result. Gene flow occurs as individuals disperse and breed, but habitat fragmentation disrupts dispersal and natural population processes. Dispersal is not only the natural mechanism for mixing the gene pool but also minimizes inbreeding within populations. Inbreeding increases when dispersing breeders can no longer move among fragmented populations, and declining population size compounds demographic and genetic factors. Implications include inbreeding depression, loss of genetic

variation, declining health, reduced survivability, lower numbers, and eventual extinction. The compounding effects of these interrelated factors, perceived as an inward spiral or vortex (Gilpin and Soule 1986), have become a cornerstone of conservation biology. A computer program (VORTEX) has been developed and widely used to predict extinction for numerous species under similar situations (see Grier 1980, Lacy and Clark 1990, and Seal and Lacy 1989).

Genetic diversity and health of the Florida panther population needs to be restored to ensure survival, even with adequate habitat conservation and other enhancement measures. The complex interplay of social, demographic, genetic, and health factors dictates that a timely and aggressive program be implemented to address the many problems faced by Florida panthers. A plan for genetic restoration and management of the Florida panther was developed in September 1994 (Seal 1994). Genetic restoration is a direct and immediate action that will restore genetic variability and vitality for a healthier, more resilient population. Results from genetic restoration will enable implementation and refinement of management strategies to maintain levels of genetic diversity historically present in the North American population.

Our objectives are to continue monitoring of released individuals and resident panthers to evaluate translocations, to compare reproductive performance and kitten health among Texas and Florida females, and to assess phenotypical and genotypical responses of genetic restoration. The final product will be the development of a long-term management plan based on study results to maintain genetic diversity, health, and long-term survival of the south Florida panther population.

STUDY AREA

The study area encompassed most of interior southern Florida south of Orlando and extending to southern Everglades National Park. The area includes large blocks of low-lying public lands such as Everglades National Park, Big Cypress National Preserve, Fakahatchee Strand State Preserve, and the Florida Panther National Wildlife Refuge. Significant private lands, primarily used for cattle and crop production, lie on higher and more productive ground to the north of the public lands and constitute some of the most important habitat for Florida panthers.

METHODS

Florida panthers and Texas cougars were captured using trained hounds, anesthetized using a combination of Ketaset7 (ketamine hydrochloride) and Telazol7 (tiletamine HCl and zolazepam HCl) and fitted with radio-collars. Doses varied based on age, body condition, health, and capture conditions, but were approximately 7 mg/kg Ketaset7 and 0.9 mg/kg Telazol7. All animals were reinstrumented as necessary due to growth or age of transmitters.

Vital signs (temperature, heart rate, respiration rate, oxygen saturation) and depth of anesthesia were monitored and recorded. All animals underwent a physical examination to assess general health and physical condition. Sterile isotonic fluids were administered either subcutaneously or intravenously to maintain blood pressure and expedite clearance of drug metabolites. Panthers >4 months old were subcutaneously vaccinated for feline viral rhinotracheitis, feline calicivirus, and feline panleukopenia (Fel-o-vax7, 3 ml), and rabies (Imrab7, 1 ml). Additionally, these animals were dewormed with ivermectin (Ivomec7, 0.2 mg/kg) and praziquantel (Droncit7, 3.75 mg/kg). Panthers were implanted with a subcutaneous transponder identification chip (Trovan) and weighed. Biomedical samples collected from panthers included whole blood, skin biopsy, hair, and feces. Other samples, such as bacterial cultures were taken as warranted. Panthers

were left to recover from the anesthesia in a dry, shaded area away from open water and were monitored until they attained a sufficient state of consciousness.

A complete blood count (CBC) of whole blood (in EDTA) and a serum chemistry profile was performed by Diagnostic Veterinary Laboratory, Inc. (DVL), Naples, FL. Blood smears were examined for differential cell counts and for blood parasites (Cytauxzoon) at either DVL or the Veterinary Medical Teaching Hospital (VMTH), University of Florida, Gainesville, FL. Tests for the bacterium Bartonella henselae were performed at N.C. State University, Raleigh, NC. Full thickness skin biopsies (2-4 mm) were collected from the shoulder region and stored in cell media for genetic analysis using mitochondrial DNA and nuclear markers at the Laboratory of Viral Carcinogenesis, National Cancer Institute, Frederick, MD (O'Brien et al. 1990). Whole blood and hair were analyzed for mercury content by automated cold vapor technique at the Florida Department of Environmental Protection (FDEP), Central Laboratory, Tallahassee, FL. Serology for feline calicivirus (FCV), feline enteric corona virus/feline infectious peritonitis (FECV/FIP), feline panleukopenia virus (FPV), feline viral rhinotracheitis virus (FVR), feline immunodeficiency virus/puma lentivirus (FIV/PLV), and feline leukemia virus (FeLV) was performed at the Cornell University Feline Health Center, Ithaca, NY. Clinical descriptions of these diseases are found in Appendix I. Dermatophytes (ringworm) were identified by culture on dermatophyte test medium at DVL and histopathology at the VMTH. Feces were examined for parasites by direct smear and flotation at the VMTH.

Neonate kittens < 6 weeks-of-age were handled following Land et al. (1998) and all had subcutaneous transponder identification chips implanted between the shoulder blades. Pyrantel pamoate (10 mg/lb) was administered orally to all kittens and some kittens received iron dextran (10 mg/lb) and long acting penicillin (10,000 U/lb), delivered intramuscularly.

Instrumented animals were monitored approximately every other day (M, W, F) from fixed-wing aircraft. Locations were plotted on 7.5 minute USGS topographic maps and recorded as Universal Transverse Mercator points. Mating and denning behavior, aggressive encounters among males, movements

and home range shifts, dispersal, survival, recruitment, displacements and replacements of individuals, and other social and ecological interactions were interpreted from radiotelemetry data and field investigations.

RESULTS AND DISCUSSION

Status of Instrumented Florida Panthers

The study period began with 23 radio-instrumented Florida panthers (10_ and 13_) ranging in age from 10 months to 16 years of age (Appendix II). We added 8 new panthers (6_, 2_) as study animals during winter capture efforts, 4 of which were F1 progeny (3_, 1_). We lost contact with 2 panthers and 2 panthers died during the study period, leaving 27 radiocollared panthers as of 1 July 1998.

Locations of radio-instrumented panthers showed spatial use patterns similar to previous years (Figs. 1-6). Home range sizes (convex polygon method) averaged 168 km² for female panthers and 312 km² for males (Table 1).

Status of female Texas cougars

We began the study period with 7 Texas cougar females; TX104 was shot and killed 18 April 1998 on private land west of Belle Meade leaving 6 extant cougars. Locations of the seven translocated Texas cougars during the reporting period (Figs. 7-9) showed movements that were within panther habitat; home range sizes are presented in Table 1. No displacement of Florida panthers has occurred and no disruptions to the existing social organization have been observed. No Texas cougars have exhibited aberrant behaviors or unacceptable human interactions, and none have been removed from the study. We implanted a subcutaneous contraceptive into TX 101 to delay further reproduction so that we can evaluate the fates of her 4 extant offspring. This action will prevent TX 101 from becoming over-represented in the genetic restoration of the Florida panther.

Biomedical summaries of panthers and cougars handled in 1997/98

Eight panthers and 2 cougars were captured for routine replacement of radiocollars. Eight new panthers were captured, 6 of which had been handled as kittens at dens. One Texas cougar was handled for contraception implantation. Panther 61_{F1}, a juvenile female, was released back to the wild on 17 August 1998 following temporary captivity that began 24 June 1997 due to anemia, emaciation, dehydration and poor neurological signs. She continues to do well post release. Upon capture, most panthers showed mild dehydration, stress response, and muscle exertion through their blood work. Following is a brief biomedical summary and history of each panther and cougar:

Florida Panther 11.--This 16-year-old female panther was captured on 8 January 1998 for routine replacement of her radiocollar. Due to the age of this cat, this is expected to be her last routine capture. She weighed 70 lbs and appeared in good physical condition. Her canines were very worn but within normal limits for her age. She had a mild heart murmur. Her last denning event was June 1993 and the last documented litter was June 1990. She had vaginal papillomas. She was Cytauxzoon felis positive and retrospective heartworm serology revealed her to be antibody positive and antigen negative. She has a kinked tail and a cowlick.

Florida Panther 48.-- This 6-year-old female panther was captured on 9 January 1998 for routine replacement of her radio collar. She weighed 92 lbs and appeared in good body condition. Her last documented litter was June 1998. She has a kinked tail and a cowlick.

Florida Panther 54.-- This 6-year-old, 126 lb male, was handled for recollaring and a reproductive examination on 2 February 1998. He was in good body condition except that he was missing the fourth claw on his left front paw and his left ear was notched. He was Cytauxzoon felis positive. Both of his testicles were descended and the conclusion of his electro-ejaculation and subsequent evaluation was that he is a potential breeder with viable sperm. He does have a cowlick and a kinked tail.

Florida Panther 55.--This 5-year-old female panther was captured on 2 March 1998 for routine replacement of her radio collar. She was in good body condition. Her last documented litter was February 1998. She had 3 young kittens that were less than 2-weeks-old and therefore was kept under very light anesthesia and not all biomedical samples were collected. She has a cowlick and a kinked tail.

Florida Panther 57.--This 5-year-old female panther was captured 29 January 1998 for routine replacement of her radio collar. She was in good body condition and weighed 105 lbs. She has a kinked tail but not a cowlick.

Florida Panther 62.--This male Florida panther was 19-months-old and weighed 97 lbs. when handled on 25 March 1998 for routine recollaring. He was in good body condition. He has 1 testicle fully descended but he had not reached full sexual maturity. He was Bartonella henselae positive. He does not have a cowlick but has a kinked tail.

Florida Panther 64.--This 17-month-old male weighed 80 lbs when he was handled for routine recollaring on 23 January 1998. He was in good body condition outside of some facial lacerations that were healing. These wounds appeared to have been from fighting with another panther. He had 1 testicle fully descended but he had not reached full sexual maturity. He was Cytauxzoon felis positive. He has a kinked tail and a cowlick.

Florida Panther 65_{F1}.--This 11-month-old male weighed 80 lbs when he was handled for initial collaring on 19 November 1997. He is an F1 panther and was in good body condition. He has 2 descended testicles and was Cytauxzoon felis positive. He does not have a kinked tail or a cowlick.

Florida Panther 66_{F1}.-- This 1-year-old female weighed 78 lbs when she was handled for initial collaring on 9 December 1997. She is an F1 panther and was in good body condition. She does not have a kinked tail or a cowlick.

Florida Panther 67.-- This 8-month-old female weighed 36 lbs when she was handled for initial collaring on 19 January 1998. She was in good body condition but is very petite in stature for her age. She has a cowlick but not a kinked tail.

Florida Panther 68.--This 4 2 year-old male panther weighed 110 lbs when he was handled for initial collaring on 23 January 1998. He was in good body condition. Testing revealed that he was FIV equivocal. He has a kinked tail, cowlick, and both testicles were descended.

Florida Panther 69.--This 10-month-old female panther weighed 42 lbs when she was orphaned through the death of her mother on 2 February 1998. She was dehydrated and emaciated when captured 5 February 1998. Based on her young age and poor physical condition we concluded that she would not survive alone. She was placed in temporary captivity at White Oak Conservation Center. Since her arrival, she has been making prey kills and is gaining weight. It is anticipated that she will be released back to the wild in mid-August 1998. She has a kinked tail and a cowlick.

Florida Panther 70_{Fl}.--This 12-month-old female panther weighed 63 lbs when captured 30 April 1998. She was in good body condition except for some lacerations on her rear legs. These lacerations were surgically prepped and sutured. The next day she had moved two miles and based on her extensive movements since capture, the lacerations healed without complication. She is Bartonella henselae positive. Her other serological test results are pending. She does not have a kinked tail or a cowlick.

Florida Panther 71_{Fl}.--This 10-month-old female panther weighed an estimated 60 lbs when she was initially collared on 5 March 1998. She was in good body condition. Because she was a dependent kitten with a sibling, we made the decision to keep her very lightly anesthetized in order keep the family group together and minimize the risk of abandonment. No biomedical samples were collected. She does not have a kinked tail or a cowlick.

Florida Panther 72.--This 3-year-old male panther weighed 130 lbs when he was initially collared on 24 April 1998. He was in good body condition except for some healing lacerations on his neck and

shoulders. He was also missing 2 inner rear claws. These lacerations were surgically cleaned and left to continue healing. His test results are pending. He has a kinked tail, cowlick, and both testicles were descended.

Texas Cougar TX101.--This female cougar appeared in exceptionally good condition and weighed 102 lbs when handled for contraception implantation on 18 November 1997. She has had two litters with 2 kittens each. The last litter was in December of 1996. We administered a long-term contraceptive to allow time for her kittens to be recruited into the panther population, without TX 101 becoming genetically over represented.

Texas Cougar TX105.--This female cougar appeared in exceptionally good condition and weighed 88 lbs when handled for recollaring on 1 December 1997. She was in good body condition, except for some minor lacerations. Her last documented litter was September 1996.

Texas Cougar TX108.--This female cougar appeared in exceptionally good condition and weighed 88 lbs when handled for routine recollaring on 15 December 1997. She was in good body condition. Her last documented litter was February 1998.

Disease and mercury monitoring

We examined titers from panther and cougar blood samples to monitor exposure to certain infectious feline diseases (see Appendix I). We found feline immunodeficiency virus (FIV) titers in male panther #16 and Texas female TX105, both residents of Everglades National Park. Two panthers (#32, #68) and 2 cougars (TX106, TX107) had an equivocal reaction to FIV testing meaning they have a low level of antibody activity that is either below a positive response or have some other component of their serum causing a nonspecific reactivity (cross reaction). Future testing should clarify these reactions. All panthers and cougars tested negative to feline infectious peritonitis (FIP) and feline leukemia virus (FeLV).

Panthers were vaccinated for feline viral rhinotracheitis (FVR), feline calicivirus (FCV), and feline panleukopenia virus (FPV); we ran titers on serum to determine if exposure had occurred prior to vaccination and then in subsequent years to determine if the vaccine caused an immune response. These data need to undergo further analysis before conclusions can be drawn. Mercury concentrations in whole panther blood ranged from 0.015 to 0.42 ppm and in hair ranged from 0.44 to 18 ppm (Table 2). Mercury concentrations in whole Texas cougar blood ranged from 0.019 to 0.36 ppm and in hair ranged from 0.53 to 4.9 ppm (Table 2). No clinical signs of mercury toxicosis were observed. We are currently conducting a retrospective analysis of mercury levels in panthers.

Florida panther and Texas cougar reproduction

Female Florida panthers and Texas cougars have produced litters throughout the year, however, there is a decided peak of denning from March - July (Fig 10). Female panthers have bred as young as 18 months-of-age (Maehr et al. 1987) and successful reproduction has occurred up to 11 years-of-age (Fig. 11). Mean age of denning females was 5.8 years. Since 1990, more than twice as many kittens have been produced as radio-collared panthers have died (Fig. 12).

Florida panthers produced larger litter sizes that were skewed toward male kittens; 20 of 24 kittens had kinked tails (Table 3). In contrast, Texas females had smaller litter sizes that were skewed toward female kittens and none of the 12 kittens had kinked tails (Table 4). Additionally, 5 F1 progeny have been handled at > 6 months-of-age and none had cowlicks. Apparently genetic introgression is reducing the occurrence of kinked tails and cowlicks. The current status of F1 kittens is summarized in Table 5 and a list of all known panther dennings can be found in Appendix III.

Biomedical summaries of kittens found at Florida panther and Texas cougar dens

Florida Panther 55.-- She had two documented dens during this reporting period. On 25 February 1998 a den with 3 kittens was located. All 3 kittens were healthy and no cardiac murmurs were detected. The 14 day old litter consisted of 2 females (2 lbs 10 oz and 2 lbs 6 oz) and 1 male (2 lbs 12 oz). Earlier, we found a single male kitten on 2 October 1997. This kitten weighed 3 lbs 9 oz at an estimated 25 days of age. The kitten appeared in excellent physical condition. He did not have a kinked tail. No cardiac murmur was detected. We assumed that this kitten died as evidence by the subsequent denning in February 1998.

Florida Panther 40.-- On 27 June 1997, a single male kitten was located and estimated to be 30 days old. The kitten was in excellent health and weighed 3 lbs 3 oz. No cardiac murmur was detected. He had a kinked tail. Following the death of #40 in February 1998, a single female 10-month-old kitten (#69) was captured near #40's death site. We removed #69 to captivity because of poor health and to allow maturation in a controlled environment. No transponder was detected and the sex was different than the kitten handled at the den, so we assumed that there was at least 2 kittens in #40's litter. We found no sign of other siblings.

Texas Cougar 106.--On 17 February 1998, a single male kitten was located and estimated to be 7-10 days old. He weighed 2 lbs 6 oz and appeared in good body condition and health. The kitten did not have a kinked tail.

Texas Cougar 108.--Two kittens were located on 11 February 1998 and were estimated to be 21 days old. The litter consisted of a male and a female, which were estimated to 3 lbs each. They both appeared healthy.

Florida panther and Texas cougar mortality

Two radiocollared panthers and 1 Texas cougar died during the last year (1 July 1997 - 30 June 1998). Female panther #19 died of a ruptured aorta and female panther #40 died of infected bite wounds. TX 104 died of gunshot wounds inflicted by person(s) unknown. In addition to these mortalities of radiocollared cats, female Florida panther #21 was euthanized at White Oak due to declining health after 10 years in

captivity and an uncollared female Florida panther was struck by a vehicle and killed on 6/13/98 (Appendix IV).

Forty-three deaths of radiocollared panthers have occurred since 1981 and intraspecific aggression has accounted for one-third of these mortalities (Fig 13). There has been a popular misconception that vehicular collisions kills most panthers but this is just the result of sampling bias (i.e. dead, uncollared panthers are easily found if they are next to highways). No panthers have been killed by vehicles in areas protected with wildlife crossings.

We estimated survivorship curves (the probability of surviving from 1 time interval to the next) based on ages-at-death for 18 and 29 female and male panthers, respectively (Fig. 14). Female panthers exhibited low mortality rates throughout their lives as indicated by the gradual slope of the survivorship curve. Male panthers, conversely, exhibited a much steeper slope in their survivorship curve, with higher rates of mortality from 1 to 6 years-of-age, followed by more gradual mortality rate up to 12 years-of-age. These survivorship patterns were consistent with panther ecology where males compete for large home ranges that overlap with females and females being more tolerant of overlap with other females (Maehr et al. 1991).

Panther dispersal patterns

Three male panthers dispersed from their natal ranges during the last year. Panther #62 was born in #48's August 1996 den and became independent in late November to early December 1997 (15 months-of-age). Panther #62 dispersed northward into Hendry County and utilized portions of the Okaloacoochee Slough State Forest and citrus groves north of Immokalee (Fig. 15). Following a re-collaring on 3/25/98, #62 resumed northward movements and on 4/13/98 became the first radiocollared panther to be documented crossing the Caloosahatchee River. For the next 2 months, this cat exhibited large northerly movements and on 6/15/98, was located a few miles south of Interstate 4, south of Orlando. The cat returned some 10 miles

southward and by the end of June 1998, he was concentrating his activities along Catfish Creek in Polk County. Panther #62's northernmost location was 220 km away from his birth site.

Panther #64 was a littermate of #62 and became independent at the same time as #62. This young male remained within his mother's home range (Bear Island area) for his first 2 months of independence and then began exploring areas to the west (Fig 15). On 2/15/98, #64 collided with a vehicle on State Road 29 between Big Cypress National Preserve and the Florida Panther National Wildlife Refuge. The cat was not seriously injured and quickly resumed normal movement patterns. He continued dispersing west and north and by mid-March, #64 was west of Immokalee around Lake Trafford. By the end of April, #64 was utilizing the Flint Pen Strand of the Corkscrew Regional Ecosystem Watershed (CREW) and he continued to use this area through the end of June 1998. Panther #64's furthest distance from his birthplace was 60.2 km.

We first captured panther #65_{F1} on 11/19/97 as an 11-month-old dependent kitten of TX101 on the Big Cypress Seminole Indian Reservation. This cat never exhibited the close dependency with his mother that we have witnessed with other mother/kitten relationships. In late February 1998, #65_{F1} left the BCSIR and travelled north then west and by April was utilizing the Immokalee area (Fig 16). Panther #65_{F1} crossed State Road 29 to the west and north between 24-27 April 1998 and was located near Alva. For the next month and half, #65_{F1} used central Lee County, ranging north to the Caloosahatchee River, west to Interstate 75, and south into unpopulated areas of Lehigh Acres. The cat made a major eastward movement 12-15 June 1998 and was found south of SR 80 near Lake Hicopochee in eastern Hendry County. By 30 June 1998, #65_{F1} had returned to a familiar area east of Immokalee. The greatest distance #65_{F1} travelled from his birthplace was 85.5 km.

In addition to these 3 peripatetic males, 1 female panther was known to become independent and a second female may have become independent this reporting period. Panther #66_{F1}, the littermate of male #65_{F1}, was captured as an independent in December 1998. Although this female did not appear to be dependent upon her mother, #66_{F1} remained within her mother's home range. Panther #67 may have become

independent from #56, but #56's radiocollar failed in February 1998. At that time, the cats were still in close association with each other. By June 1998, #67 was utilizing areas to the north of #56's known range, but we were unable to determine whether the 2 cats were still together.

Status of captive panthers

Six Florida panthers remain in permanent captivity at White Oak Conservation Center, Lowry Park Zoo, and Jacksonville Zoo (Table 6). These animals were healthy upon annual examination.

SUMMARY

In summary, genetic restoration of Florida panthers is proceeding. Five of the 6 remaining female Texas cougars have successfully bred with panthers and produced 12 F1 kittens. Five F1 kittens have been radio-instrumented and 3 of these have become independent from their mothers. Capturing and radio-collaring kittens, regardless of their parentage, continues to be difficult, however, all F1 kittens and the majority of panther kittens were marked permanently with transponders.

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Table 1. Minimum convex polygon home range sizes (km²) of independent and established Florida panthers and Texas cougars in south Florida from 1 July 1997 to 30 June 1998.

Cat #	Sex	Age	Home Range Size (km ²)
66	F	1	18.7
19	F	12	44.8
32	F	11 ^a	73.0
TX101	F		78.3
56	F	6-7 ^{a,b}	88.6
48	F	5.5	123.2
68	M	5 ^{a,b}	126.7
40	F	10 ^a	136.3
57	F	6 ^a	146.7
49	F	8 ^a	160.2
36	F	12-13 ^a	187.7
11	F	16-17 ^a	194.7
TX106	F		198.3
TX108	F		202.0
46	M	8 ^a	226.4
60	M	2.5 ^a	228.0
TX105	F		231.1
63	M	3 ^a	254.0
16	M	12	259.3
61	F	2	259.5 (176.2) ^c
55	F	5.5	271.1
54	M	6	292.1
TX103	F		295.8
TX104	F		324.3
59	M	3	325.8
45	M	7	384.2
TX107	F		444.4
51	M	9 ^a	476.9
23	F	11.5	565.9 (302.8) ^c

^a Age estimated by tooth wear, pelage, and body condition.

^b Home range calculated with < 6 months of data.

^c Convex polygon with outliers excluded.

Table 2. Mercury concentrations in hair and whole blood (ppm) from free-ranging Florida panthers and Texas cougars, 1997 and 1998.

Panther	Hair		Blood	
	1997	1998	1997	1998
#11		2.6		0.14
#32	3.4		0.086	
#36	1.6		0.081	
#48		1.5		0.044
#49	2.6		0.086	
#54	10	7.3	0.42	0.16
#56	17		0.37	
#57		2.1		0.039
#59	18		0.35	
#60	5.4		0.15	
#61	1.4		0.038	
#62	0.44	0.64	0.026	0.015
#63	0.55		pending	
#64		0.95		0.071
#65		0.55		0.018
#66		0.45		0.016
#67		8.8		0.26
#68		3.3		0.09
#69		6.3		0.25
TX101	0.53	0.56	0.019	0.024
TX103	3.4		pending	
TX105		1.3		0.032
TX106	3.3		0.36	
TX107	1.3		0.077	
TX108		4.9		0.22

Table 3. Kittens produced by female Florida panthers from October 1995 to 30 June 1998.

Panther #	Litter Size	Sex Ratio	Prevalence of kinked tail
19	2	2 _: 0 _	2 yes: 0 no
32	1	0 _: 1 _	1 yes: 0 no
36	3	1 _: 2 _	3 yes: 0 no
40	2 (?)	1 _: 1 _	2 yes: 0 no
48	3	0 _: 3 _	2 yes: 1 no
48	1	0 _: 1 _	1 yes: 0 no
55	3	2 _: 1 _	0 yes: 3 no
56	3	0 _: 3 _	3 yes: 0 no
56	2	2 unk.	2 yes: 0 no
56	4	2 _: 2 _	3 yes: 1 no
mean/total	2.5/24	9 _: 13 _: 2 unk.	19 yes: 5 no

Table 4. F1 kittens produced by female Texas cougars from October 1995 to 30 June 1998.

Cat #	Litter size	Sex ratio	Prevalence of kinked tail
TX101	2	1 _: 1 _	2 no
TX101	2	1 _: 1 _	2 no
TX105	1	1 _: 0 _	1 no
TX106	1	1 _: 0 _	1 no
TX106	1	0 _: 1 _	1 no
TX107	2	2 _: 0 _	2 no
TX108	1	1 _: 0 _	1 no
TX108	2	1 _: 1 _	2 no
mean/total	1.5/12	8 _: 4 _	0 yes: 12 no

Table 5. Status of F1 kittens in south Florida from October 1995 to June 1998.

Cat #	Den date	Kitten(s)	Status
TX101	10/95	K18_, K19_	dispersed
TX101	12/95	#65 _{F1} (K35_) #66 _{F1} (K36_)	both radiocollared and independent
TX105	9/95	K34_	dispersed
TX106	11/95	K23_	dispersed
TX106	2/98	K47_	died at 1 month of age
TX107	5/97	#70 _{F1} (K38_) #71 _{F1} (K39_)	both radiocollared and with mother
TX108	6/96	#61 _{F1} _	radiocollared and independent
TX108	2/98	K45_, K46_	with mother

Table 6. Status and location of captive Florida panthers as of June 30, 1998.

ID#	Sex	Age (years)	Location	Status
FP 202	M	8	White Oak Plantation	Grade III/VI heart murmur, both testicles descended, Healthy upon annual exam 4/20/98.
FP 204	F	8	White Oak Plantation	Lobectomy performed in 1992 due to bacterial pneumonia. Grade III/IV heart murmur, healthy upon annual exam on 5/12/98.
FP 207	M	7	Lowry Park	Bilateral cryptorchid. Orchiopexy performed in 1992, but testicular biopsy performed in 1993 indicated he is nonreproductive. Healthy on annual exam on 2/98.
FP 208	F	6	Lowry Park	Healthy upon annual exam on 2/98.
FP 209	F	6	Jacksonville Zoo	Grade I rear leg lameness due to injury as kitten. Sibling is FP # 210. Healthy upon annual exam on 2/19/97.
FP 210	M	6	Jacksonville Zoo	Both testicles descended. Sibling is FP # 209. Healthy upon annual exam on 4/2/97.

Figure captions

- Fig. 1. Female Florida panther locations in south Florida from 1 July 1997 to 30 June 1998.
- Fig. 2. Female Florida panther locations in south Florida from 1 July 1997 to 30 June 1998.
- Fig. 3. Female Florida panther locations in south Florida from 1 July 1997 to 30 June 1998.
- Fig. 4. Male Florida panther locations in south Florida from 1 July 1997 to 30 June 1998.
- Fig. 5. Male Florida panther locations in south Florida from 1 July 1997 to 30 June 1998.
- Fig. 6. Florida panther locations in Everglades National Park from 1 July 1997 to 30 June 1998.
- Fig. 7. Female Texas cougar locations in south Florida 1 July 1997 to 30 June 1998.
- Fig. 8. Female Texas cougar locations in Big Cypress National Preserve from 1 July 1997 to 30 June 1998.
- Fig. 9. Female Texas cougar locations in Everglades National Park from 1 July 1997 to 30 June 1998.
- Fig. 10. Month of denning by Florida panthers and Texas cougars.
- Fig. 11. Number of dennings by Florida panthers by age.
- Fig. 12. Comparison of panther kitten production and panther deaths 1990-1998.
- Fig. 13. Causes of mortality for Florida panthers.
- Fig. 14. Estimated Florida panther survivorship by sex.
- Fig. 15. Locations of dispersing male Florida panthers 1 July 1997 - 30 June 1998.
- Fig. 16. Locations of a dispersing male Florida panther 1 July 1997- 30 June 1998.

APPENDICES

Appendix I. Clinical descriptions of diseases that may affect Florida panthers.

Appendix II. List of radio-instrumented Florida panthers and Texas cougars in south Florida from 10 February 1981 to 30 June 1998.

Appendix III. List of all known dens of radio-instrumented female Florida panthers in south Florida from June 1985 to June 1998.

Appendix IV. Summary of Florida panther mortalities and injuries in south Florida from 8 March 1978 to 30 June 1998.

Appendix I. Clinical descriptions of important diseases that may affect Florida panthers.

Summary of Current Disease and Toxin Testing

Feline immunodeficiency virus/puma Feline I (FIV) causes a syndrome similar to acquired immunodeficiency syndrome (AIDS) in humans. Clinical signs of this disease in domestic cats are immunosuppression and thus a resulting increased susceptibility to common infections. The FIV-positive cats are Florida panther 16 (an older male) and Texas cougar 105. Both animals reside in Everglades National Park. Currently these cats appear healthy and are not demonstrating clinical signs of this disease.

Feline infectious peritonitis (FIP) is a systemic immune-complex viral disease that is characterized by vasculitis, disseminated granulomas, and an unregulated immune response. All cats tested for this disease were negative.

Feline leukemia virus (FeLV) is an immunosuppressive disease for which all cats tested for this disease were negative.

Rabies is a fatal disease characterized by neurological signs. One panther has died from this virus. This disease is transmissible to and fatal in humans. Vaccination has potentially added protection against this disease.

Feline panleukopenia (FPV) is a disease that is characterized by multisystemic infection. Cats have shown exposure through titer testing but there have not been clinical cases of disease. Vaccination has potentially added protection against this disease.

Feline viral rhinotracheitis (FVR) is associated with upper respiratory tract and ocular infections. Cats have shown exposure through titer testing but there have not been clinical cases of disease. Vaccination has potentially added protection against this disease.

Feline calicivirus (FCV) also causes upper respiratory disease. Cats have shown exposure through titer testing but there have not been clinical cases of disease. Vaccination has potentially added protection against this disease.

Cytauxzoon felis is a blood protozoan that causes anemia in domestic cats and is essentially 100% fatal. Some of the panthers are positive for this organism. It appears that panthers are able to be chronically infected without a biologically significant effect.

Bartonella henselae is a bacterial disease carried by cats that causes cat scratch disease in humans. Presence of this bacterium was tested for to determine epidemiology.

Mercury in panthers has been studied to determine levels and if there were detrimental effects. Other studies of domestic cats report various effects and include hematologic, neurologic and reproductive abnormalities. No clinical signs or gross lesions can be attributed to direct mercury toxicity at this time.

Appendix II. List of radio-instrumented Florida panthers and Texas cougars.

Cat #	Sex	Capture Date	Age	Birth Date	Parents	Use Area	Death Date	Cause of Death
1	M	2/10/81	10	-	-	Fakahatchee	12/14/83	vehicle (SR 84 mm18)
2	M	2/20/81	10	-	-	Fakahatchee	11/29/84	intraspecific aggression
3	F	1/23/82	9	-	-	Fakahatchee	1/17/83	capture
4	M	1/27/82	7-8	-	-	Fakahatchee	4/18/85	vehicle (SR 84 mm17)
5	F	2/23/82	7-8	-	-	Fakah. Conserv. Club	11/23/82	unknown
6	M	2/27/82	6-8	-	-	Raccoon Pt. (North Swamp)	4/16/82	unknown
7	M	3/2/82	6-7	-	-	Raccoon Pt.- Fakahatchee	10/26/85	vehicle (SR 29 C. prison)
8	F	3/25/84	9-10	-	-	Fakahatchee	8/20/88	liver failure, old age
9	F	1/26/85	3-4	-	-	Fakahatchee	-	-
10	M	1/15/86	5 mos.	8/85	#09, ?	GG Estates, Fakahatchee	1/27/87	intraspecific aggression
11	F	1/21/86	4-5	-	-	Bear Island, Price's	-	-
12	M	1/28/86	5	-	-	Bear Is., FPNWR, FSSP	11/7/94	intraspecific aggression
13	M	2/27/86	4-5	-	-	Bear Is. to Alico	12/14/87	vehicle (SR 29 Sunniland)
14	F	12/07/86	5-6	-	-	Everglades	6/20/91	unknown
15	F	12/13/86	5-6	-	-	Everglades	6/10/88	unknown
16	M	1/12/87	12-14 mos.		#14,?	Everglades to Stairsteps	-	-
17	M	1/20/87	6-7	-	-	Gum Swamp to Nobles	7/20/90	unknown
18	F	1/22/87	7-8	-	-	Gum Swamp, Scofields, BCSIR	10/1/90	intraspecific aggression
19	F	2/9/87	9 mos.	5/86	#11, #12	Bear Is., Prices, FPNWR	12/2/97	aortic aneurysm
20	M	3/10/87	3-4	-	-	Alico to Bear Island	8/24/88	heart defect
21	F	3/16/87	12-14 mos.	-	#14,?	Everglades/White Oak	12/26/97	euthansia
22	F	3/18/87	5-6 mos.	-	#15,?	Everglades	7/??/91	infection

Cat #	Sex	Capture Date	Age	Birth Date	Parents	Use Area	Death Date	Cause of Death
23	F	3/18/87	5-6 mos.	-	#15,?	Everglades, Raccoon Point	-	-
24	M	1/30/88	3-4	-	-	Highlands Co.	8/22/88	unknown
25	M	2/16/88	4-5	-	-	FPNWR	8/26/88	infection from panther fight
26	M	3/1/88	5-6	-	-	BCSIR, Nobles to Bear Is.	7/8/94	intraspecific aggression
27	F	4/11/88	2-3	-	-	Everglades	7/23/89	unknown
28	M	11/29/88	1.5	-	-	Ft. Myers, Lake Hicpochee, Gum Swamp to Nobles	9/25/92	intraspecific aggression
29	M	1/3/89	6.5 mos.	5/88	#11, #20	Bear Island, Gum Swamp	5/27/92	pseudorabies
30	M	1/6/89	9 mos.	3/88	#19, #13	Bear Is., Prices, FPNWR, FSSP	1/29/90	intraspecific aggression
31	F	1/12/89	7-9	-	-	FPNWR	3/3/94	vehicle (SR 29 Sunniland)
32	F	2/3/89	2-2.5	-	(#31?)	FPNWR	-	-
33	M	3/5/89	1.5-2	-	-	Loop Rd. to Gum Swamp	11/25/89	rabies
34	M	1/8/90	10 mos.	3/89	#31, #12?	FPNWR, BCSIR, Gum Swamp	11/15/93	esophageal puncture
35	M	1/15/90	10 mos.	3/89	#31, #12?	Regency Farms	1/22/90	bacterial infection from capture
36	F	1/27/90	4-5	-	-	Nobles	-	-
37	M	1/30/90	3-4	-	-	FSSP, FPNWR, Bear Is.	11/26/90	vehicle (SR 29 Miles City)
38	F	2/8/90	4.5	-	-	Raccoon Pt., Cons. Area 3a	8/4/94	pleuritis in chest
39	M	3/19/90	3-4	-	-	Everglades	6/18/90	pyrothorax
40	F	2/26/90	1.5-2	-	-	Nobles, Bear Island	2/2/98	infection from bite wounds
41	F	2/28/90	1.5-2	-	-	Nobles, BCSIR	9/21/90	intraspecific aggression
42	M	3/6/90	11 mos.	5/89	#14, #16	Everglades, Raccoon Pt.	6/22/95	unknown
43	M	5/1/90	9.5 mos.	7/89	#19, #12	FPNWR, Nobles	11/1/91	intraspecific aggression
44	M	4/30/91	6 mos.	11/90	#40, #26	Bakers, Naples, ENP, Raccoon Pt.	7/6/93	intraspecific aggression
45	M	5/8/91	6 mos.	11/90	#19, #12	FPNWR, Nobles, BCSIR	-	-

Cat #	Sex	Capture Date	Age	Birth Date	Parents	Use Area	Death Date	Cause of Death
46	M	1/30/92	2-2.5	-	-	Bear Island, Gum Swamp, Okaloacoochee Slough	-	-
47	M	2/21/92	6 mos.	7/91	#11, #12	Bear Island, Belle Meade, FSSP	2/19/93	intraspecific aggression
48	F	2/24/92	4 mos.	10/91	#31, #12	FPNWR, Bear Island	-	-
49	F	2/25/92	2	-	-	Nobles	-	-
50	M	3/4/92	8 mos.	5/91	#36, #26	Nobles, Alico, Devils Garden	12/6/93	vehicle (CR 846 5 mi E of Immokalee)
51	M	3/26/92	3	-	-	FSSP, FPNWR	-	-
52	F	5/5/92	6 mos.	10/91	#31, #12	FPNWR, Sadie Cypress	1/14/95	vehicle (CR 846 & Dupree Rd)
53	M	2/10/93	10 mos.	4/92	#19, #12	FPNWR	2/26/93	intraspecific aggression
54	M	2/10/93	10 mos.	4/92	#40, ?	Bakers, FPNWR, FSSP, Deep Lake	-	-
55	F	1/25/94	2 yrs.	12/92	#23, #42	Raccoon Pt.	-	-
56	F	2/3/94	2-3	-	-	Nobles, Bakers	-	-
57	F	1/31/95	3	-	-	FPNWR	-	-
58	M	2/8/95	8 mos.	4/94	#56, ?	Addition Lands	-	-
59	M	1/4/96	6 mos.	6/95	#48, ?	Baker's, BI	-	-
60	M	3/6/96	5 mos.	?	#40, ?	Baker's, Add. Lands	-	-
TX101	F	4/5/95				BCSIR	-	-
TX102	F	4/5/95	-	-	-	E. Hendry County	9/22/95	vehicle (CR833 5 mi. N BCSIR)
TX103	F	5/4/95	-	-	-	Stairsteps, BCNP	-	-
TX104	F	3/24/95	-	-	-	Fakahatchee Strand	-	-
TX105	F	7/5/95	-	-	-	Everglades National Park	-	-
TX106	F	4/9/95	-	-	-	Fakahatchee Strand	-	-
TX107	F	5/4/95	-	-	-	Raccoon Pt., BCNP	-	-
TX108	F	7/26/95	-	-	-	Everglades National Park	-	-

Cat #	Sex	Capture Date	Age	Birth Date	Parents	Use Area	Death Date	Cause of Death
61 _{F1}	F	3/4/97	8 mos.	7/96	TX108,#16	Everglades National Park	-	-
62	M	3/18/97	6.5 mos.	9/96	#48,?	S Hendry Co., E Doctor's Hammock	-	-
63	M	4/13/97	2	-	-	BCSIR, Swamp Safari	-	-
64	M	5/24/97	8 mos.	9/96	#48,?	Bear Island	-	-
65 _{F1}	M	11/19/97	11 mos.	12/96	TX101,	BCSIR	-	-
66 _{F1}	F	12/9/97	1	12/96	TX101,	BCSIR	-	-
67	F	1/19/98	8 mos.	6/97	#56,	BCSIR, Add. Lands, private	-	-
68	M	1/23/98	4.5	-	-	Bear Island	-	-
69	F	2/5/98	9 mos.	5/97	#40,	Bear Island, Add. Lands	-	-
70 _{F1}	F	2/25/98	10 mos.	5/97	TX107,?	Monument Unit, BCNP	-	-
71 _{F1}	F	3/5/98	10 mos.	5/97	TX107,?	Monument Unit, BCNP	-	-
72	M	4/24/98	2.5	-	-	BCSIR Game Pen	-	-

Appendix III. List of all known dens of radio-instrumented female Florida panthers and Texas cougars. Kitten numbers preceded with K indicate natal den was visited.

Panther #	Den Date	Location	UTM Coordinates	Habitat	# of Kittens	Kittens handled	Sire
09	6/85	Golden Gate Estates	?	?	1	#10_	unknown
	6/87	upper FSSP ¹	454.4, 2891.3	hardwood hammock	1_	-	#12
	5/89	FSSP	461.1, 2878.6	mixed swamp	?	-	unknown
	7/90	FSSP	462.3, 2882.2	mixed swamp	2	#202_ ² , #203_	#37
	6/93	FSSP	456.0, 2873.8	hardwood hammock	unsuccessful?	-	#51
11	5/86	Bear Island	468.1, 2896.4	pine/palmetto	3	#19_	#12
	5/88	Bear Island	468.1, 2896.4	pine/palmetto	1?	#29_	#20
	4/90	Bear Island	469.9, 2898.7	pine/palmetto	1?	_ (roadkill)	#12
	7/91	Price's	469.8, 2907.1	hardwood hammock	1?	#47_	#12
	5/93	Bear Island	468.9, 2896.2	hardwood hammock	?	-	#12?
14	4/89	Long Pine Key	537.2, 2799.2	hardwood hammock	2	#42, ?	#16
	3/91	Long Pine Key	536.9, 2808.0	hardwood hammock	unsuccessful		#16
15	5/88	Long Pine Key	525.1, 2807.2	hardwood hammock	unsuccessful		#16
19	3/88	Price's	468.1, 2906.0	hardwood hammock	4	#30_	#13
	7/89	FPNWR ³	460.6, 2893.7	hardwood hammock	1?	#43_	#12
	11/90	Rock Spring Island	460.6, 2902.7	pine/palmetto	2	#205_ ² , #45_	#12
	3/92	NE Hog Pond	459.8, 2900.7	pine/palmetto	2	1_ (roadkill), #53_	#12
	5/94	FPNWR	464.6, 2902.9	pine/palmetto	2	K12_, K13_ ⁵	#51?
	4/96	Barfields	463.1, 2904.5	palmetto/oaks	2	K27_, K28_	#54, #51?
23		Raccoon Point			1	#55	#42
31	3/89	Catherine Island	454.0, 2907.0	pine/palmetto	3	#34_, #35_	#12
	7/90	Regency Farms	459.9, 2903.9	pine/palmetto	2	#201_ ² , #204_ ²	#12
	9/91	Barfields	464.7, 2906.0	hardwood hammock	2	#48_, #52_	#12
32	3/89	Catherine Island	457.1, 2898.6	pine/palmetto	unsuccessful?	-	unknown

Panther #	Den Date	Location	UTM Coordinates	Habitat	# of Kittens	Kittens handled	Sire
	5/92	FPNWR	457.4, 2897.4	pine/palmetto	1	#208 ₋₂	#12
	4/96	FPNWR		pine/palmetto	1	dead ₋	
36	3/90	BCSIR ⁴	492.5, 2906.2	hardwood hammock	?	-	unknown
	5/91	Addition Lands	491.1, 2899.0	pine/palmetto	2	#207 ₋₂ , #50 ₋	#26
	10/93	N of BCSIR	489.1, 2909.4	pine/palmetto	1	-	#26 or #34
	6/95	Canoe Lake Strand	502.8, 2901.3	pine/palmetto	?	-	#45?
	2/96	Wilson Cypress	499.8, 2895.4	pine/palmetto	3 (remains of 4th)	K24 ₋ , K25 ₋ , K26 ₋₅	#45
40	11/90	Baker's Grade	487.1, 2896.3	pine/palmetto	2	#206 ₋₂ , #44 ₋	#26
	3/92	Baker's Grade	485.0, 2897.7	pine/palmetto	2	#54 ₋ (K01), K02 ₋	#28?
	6/93	Baker's Grade	486.9, 2896.9	pine/palmetto	3	K03 ₋ , K04 ₋ , K05 ₋	#26
	?	?	?	?	2	#60 ₋ , tracks	?
	5/97	Addition Lands	488.1, 2899.2	pine/palmetto	1	K37 ₋₅	#45
48	10/93	Bear Island	475.9, 2901.6	pine/palmetto	3	K06 ₋ , K07 ₋ , K08 ₋	#12
	6/95	Dozier Hammock	482.1, 2903.6	pine/palmetto	2	K16 ₋ , K17 ₋₅	unknown
	9/96	NE Doctor's Ham.	480.2, 2904.0	vines/ferns	3	K31 ₋ , K32 ₋ , K33 ₋₅	?
	6/98	Bear Island	476.3, 2899.2	pine/palmetto	1	K51 ₋₅	#68, #45
52	7/93	Sadie Cypress	467.8, 2918.6	mixed swamp	2	1 ₋ (roadkill)	#46
	7/94	Sadie Cypress	469.6, 2919.0	cypress swamp	?	-	unknown
55	4/95		483.7, 2871.8	pine/palmetto	2	K14 ₋ , K15 ₋	#42
	9/97	N Burns Lake		pine/palmetto	1	K44 ₋₅	unknown
	2/98	N Monument Lake		pine/palmetto	3	K48 ₋ , K49 ₋ , K50 ₋₅	unknown
56	4/94	Baker's Grade	485.8, 2897.3	pine/palmetto	3	K09 ₋ , K10 ₋ , K11 ₋	unknown
	10/95	North BCSIR	490.7, 2901.6	pine/palmetto	3	K20 ₋ , K21 ₋ , K22 ₋₅	#45
	8/96	North BCSIR	490.7, 2907.4	palmetto	2	K29 _{-?} , K30 _{-?5}	#45
	6/97	Bakers Grade	485.9, 2897.6	pine/palmetto	4	K40 ₋ , K41 ₋ , K42 ₋ ,	#45

Panther #	Den Date	Location	UTM Coordinates	Habitat	# of Kittens	Kittens handled	Sire
						K43 ⁵	
TX101	9/95	BCSIR	500.0, 2906.9	pine/palmetto	2	K18 ⁵ ,K19 ⁵	unknown
	12/96	BCSIR	499.4, 2907.6	palmetto/oak	2	K35 ⁵ ,K36 ⁵	#45
TX105	9/96	Long Pine Key	523.2, 2808.0	tropical hardwood	1	K34 ⁵	#16
TX106	11/95	South Blocks	447.1, 2885.2	cypress/mixed	1	K23 ⁵	#51
	2/98	28th A & DeSoto	447.8, 2895.7	vines/cabbage	1	K47 ⁵	#54,#59?
TX107	5/97	N of Oasis	496.5, 2869.1	pine/palmetto	2	K38 ⁵ ,K39 ⁵	unknown
TX108	6/96	Long Pine Key	532.3, 2809.3	tropical hardwood	?	#61 ⁵	#16
	2/98	Long Pine Key		tropical hardwood	2	K45 ⁵ ,K46 ⁵	#16

- ¹ Fakahatchee Strand State Preserve.
- ² Kittens removed from wild into captive breeding program.
- ³ Florida Panther National Wildlife Refuge.
- ⁴ Big Cypress Seminole Indian Reservation.
- ⁵ Kittens marked with transponders.

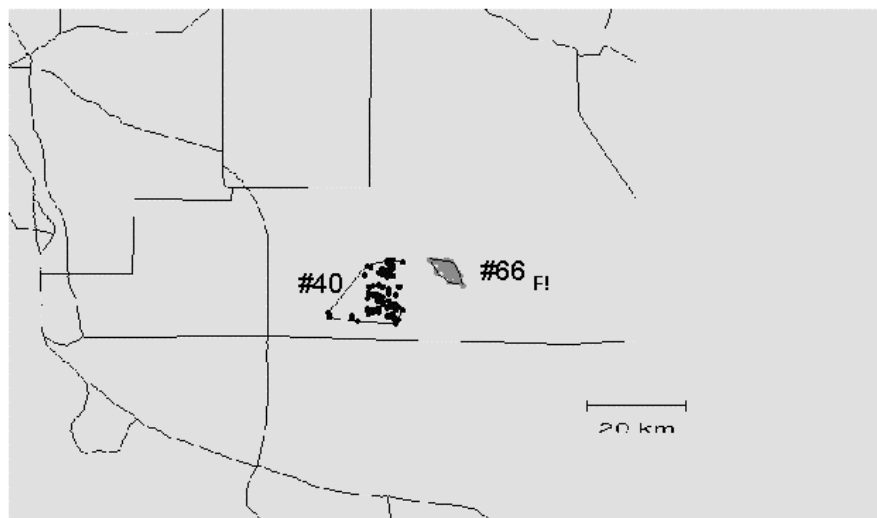
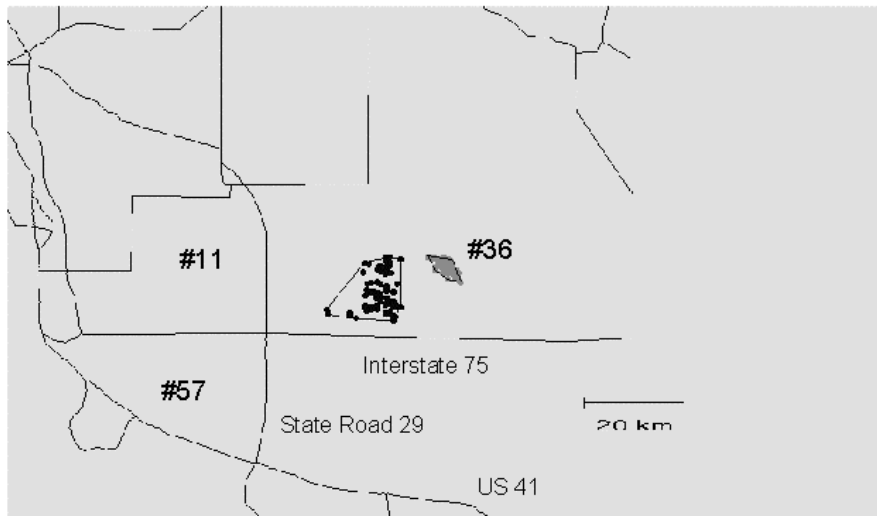
Appendix IV. Summary of Panther Mortality and Injury Since 1978 (as of 6/30/98)

ID#	DATE	SEX	AGE AT DEATH	LOCATION
Road Kills				
UF 9789	2/13/72	M	2-3	SR 25 S of Moore Haven
G 80-4	12-23-79	F	1.5-2.5	SR 29 just No. of Alligator Alley
G 80-15	07-02-80	M	1.5-2.5	SR 29 near Sunniland
G 81-19	04-19-81	F	2-3	SR 29 near Copeland
G 83-22	03-19-83	M	2-3	US 27 - Palmdale
#01	12-14-83	M	12-14	Alligator Alley mm 18
G 84-26	11-18-84	F	8-10	Alligator Alley mm 16
G 85-BNZ	01-10-85	F	18-24 mos.	Alligator Alley mm 16
#04	04-18-85	M	12+	Alligator Alley mm 17
#07	10-26-85	M	10	SR 29, 4 mi. So. of Alligator Alley
---	11-15-86	F	4-5	Alligator Alley mm 16.5
#13	12-14-87	M	6-8	SR 29 - Sunniland
RK-850	01-25-89	M	3	CR 850 near Immokalee
RK-846	06-18-90	M	10 mos.	CR 846, 1 mi. E. of 833 - Hendry Co.
#37	11-26-90	M	4-5	SR 29, 1/2 mi. No. of I-75 - Collier Co.
Kitten of #11	02-04-91	F	9 mos.	SR 29, 6 mi. No. of I-75 - Collier Co.
Kitten of #19	11-09-92	F	7 mos.	SR 29 - Sunniland
---	08-09-93	M	2-3	Daniels Rd. 1 mi. E. of I-75
#50	12-06-93	M	2.5	CR 846 - 5 mi. E. of Immokalee
Kitten of #52	02-28-94	M	8 mos.	3 mi. No. along County Line Rd
#31	03-03-94	F	12-14	SR 29 - Sunniland
#52	1/14/95	F	3.3	CR 846 4 m E Immokalee, (Dupree Road)
TX102	9/21/95	F	4	CR 833 just N CR 835(846) Hendry Co.
_ CR 832-96	4/24/96	M	3-5	CR832 5.5 mi. E of SR 29 - Keri
Kitten of #55?	5/2/96	F	1	US 41 @ Turner River
CR 846-97	7/13-16/97	?	?	CR 846 1.5 m W CR 858
UC-FP_	6/13/98	F	2	CR 846 3 miles E CR 858
Road Injuries				

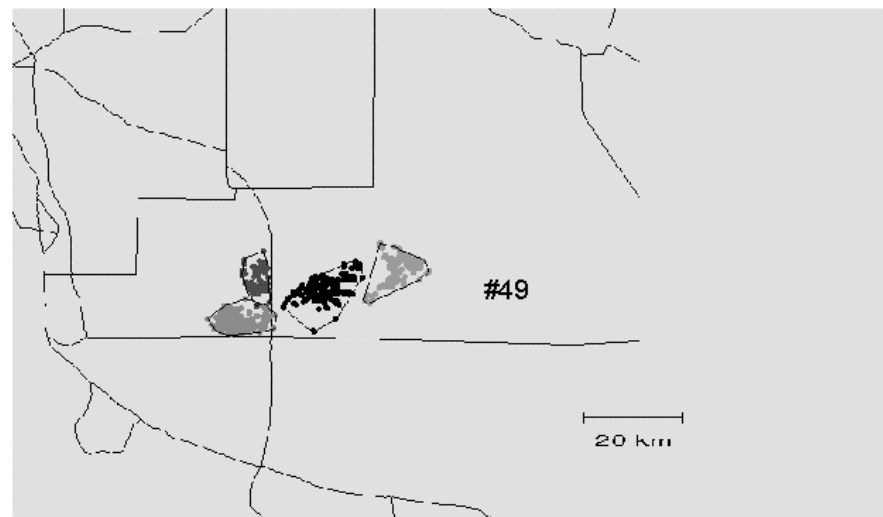
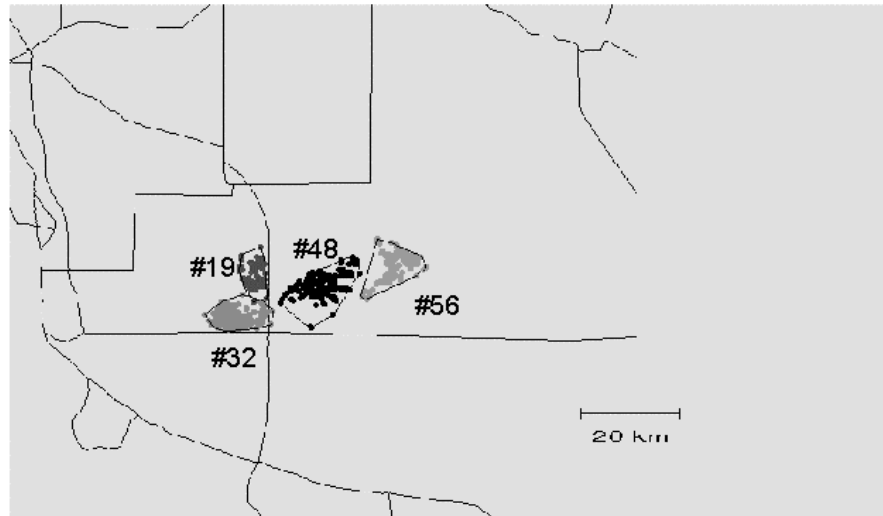
ID#	DATE	SEX	AGE AT DEATH	LOCATION
Big Guy	11-02-84	M	-	US 41, 1/4 mi. E. of Turner River Rd.
---	05-12-85	F	-	CR 951, 2 mi. No. of US 41
#20	06-17-87	M	-	CR 858, .8 mi. E. of SR 29
#28	11-29-88	M	-	Near Daniels Rd. at Ft. Myers Airport
---	04-07-92	M	-	Alico Rd. - 1/3 mi. E. of I-75
#64	02/14/98	M	1.5	SR 29 @ FPNWR clearcut
Shootings				
G 78-65	03-08-78	M	2-3	L-28, Dade County
Canal Point	05-22-83	F	adult	L-8 canal near White Belt Ranch, Palm Bch Co.
G 83-75	12-01-83	M	3-6	Seminole Indian Reservation, Hendry Co. (James Billie)
G 84-20	10-30-84	F	2-3	Corbett WMA, Palm Bch. Co. (Elmer Brooker)
G 85-CS	03-26-85	F	2-3	CSSP, Collier Co. (skeleton)
#09	??-??-86	F	not fatal	Golden Gate Estates, So. of SR 84, Collier Co.
TX104	4-18-98	F	6-7	S of Sabal Palm Road in citrus grove
Intraspecific Aggression				
#02	10-27-84	M	14+	FSSP, panther fight
#10	01-27-87	M	16-20 mos.	Mud Lake Strand - by adult male panther
#25	08-26-88	M	4-5	FPNWR - bacterial infection from panther fight
#30	01-29-90	M	22 mos.	Killed by adult male #37 - FSSP
#41	09-26-90	F	2	Hendry Co. W. of Seminole Reservation - killed by male #28
#18	10-03-90	F	9	Hendry Co. So. of CR 846 near Rock Lake - killed by male #28
#43	11-01-91	M	2	Indian Reservation, Hendry Co. - killed by adult male #26
#28	09-25-92	M	5.5	Indian Reservation, Hendry Co. - possibly killed by male #26
#47	02-19-93	M	18 mos.	Killed by male #51 in FSSP
#53	02-26-93	M	11 mos.	Killed by uncollared male No. of FPNWR
#44	07-06-93	M	2.5	Killed by adult male #42 - Raccoon Point
#26	07-08-94	M	11-12	4 mi. E. Hendry Prison - killed by male #46 - punctured skull
#12	11-08-94	M	13-14	Shouts property, Hendry County - died of infected injury from fight with #46

ID#	DATE	SEX	AGE AT DEATH	LOCATION
#40	02/02/98	F	10	Bear Island - E Harrell Strand, died of infection from bite wounds to foreleg
Other or Unknown Causes				
#06	04-16-82	M	6-7	NE BCNP - unknown cause
#03	01-17-83	F	9+	FSSP - capture mortality
#05	11-18-83	F	8-9	Fakahatchee Conserv. Club - unknown cause
#15	06-10-88	F	7-8	ENP - unknown cause
#08	08-20-88	F	13-15	Gainesville - liver failure (old age)
#24	08-22-88	M	3-5	Glades Co. near Palmdale - unknown
#20	08-24-88	M	4-5	Bear Island - congenital heart defect
#27	07-23-89	M	3-4	ENP - unknown cause
#33	11-25-89	M	3	2 mi. NW of Hendry Prison - rabies
#35	01-24-90	M	10 mos.	Gainesville - bacterial infection
#39	06-18-90	M	3-4	ENP - pyrothorax
#17	07-23-90	M	9	Addition lands near Tangerine Camp - unknown
#14	06-20-91	F	10-11	ENP - unknown cause
#22	07-00-91	F	5	ENP - infection
#29	05-27-92	M	4	Hendry Co., Gum Swamp - pseudorabies
#34	11-15-93	M	5	SE Hendry Co. next to L28 interceptor - bacterial infection from lacerated esophagus
#38	8-4-94	F	9	Conservation Area 3A - pleuritis from chest puncture
#42	6-22-95	M	6	Turner River Unit - unknown
#58	3-30-97	M	3	Sadie Cypress - septicemia with bite wounds
#19	12-02-97	F	11.5	FPNWR (Merry Xmas) - ruptured aorta
#21	12-26-97	F	11-12	White Oak - euthansia

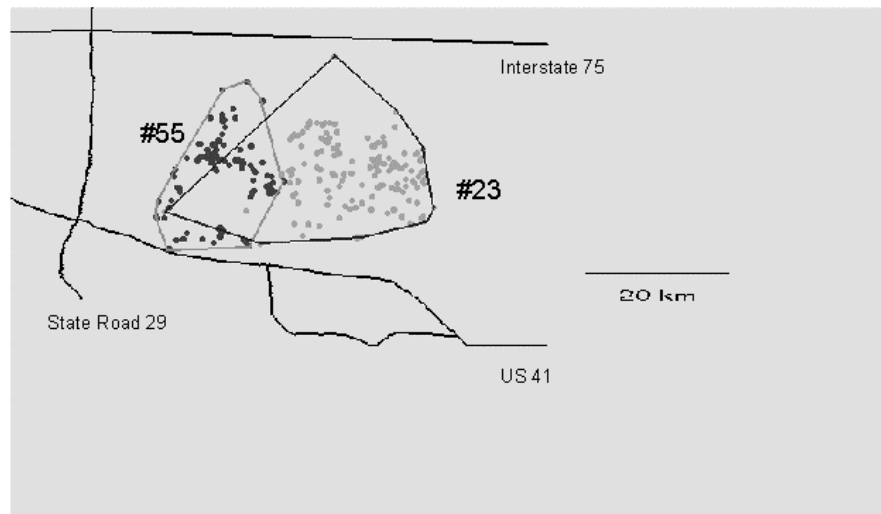
Female Panther Locations July 1997 - June 1998



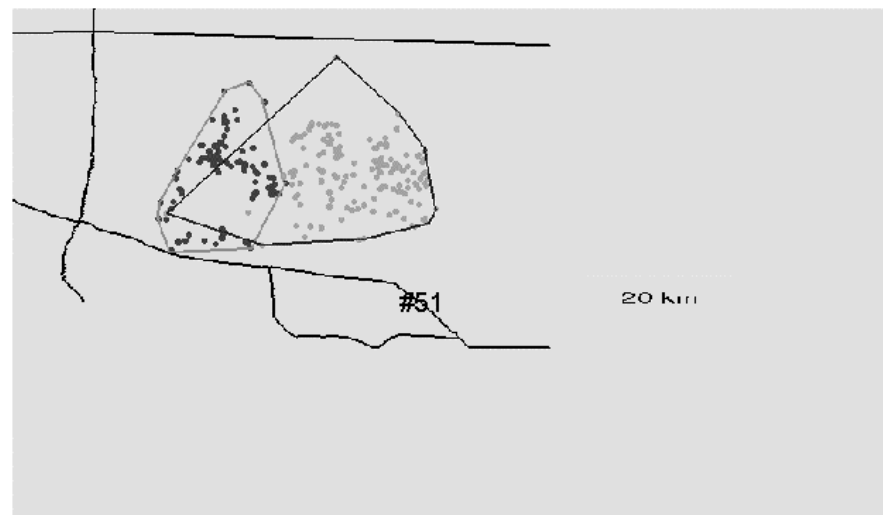
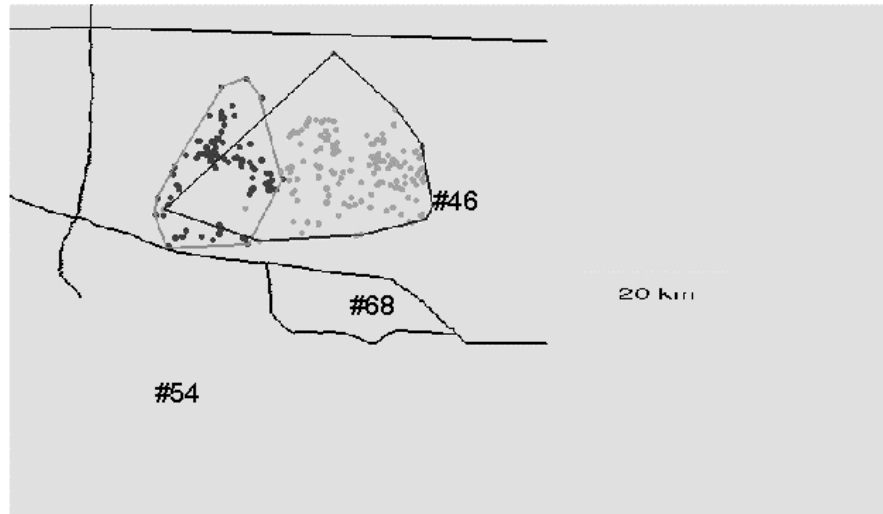
Female Panther Locations July 1997-June 1998



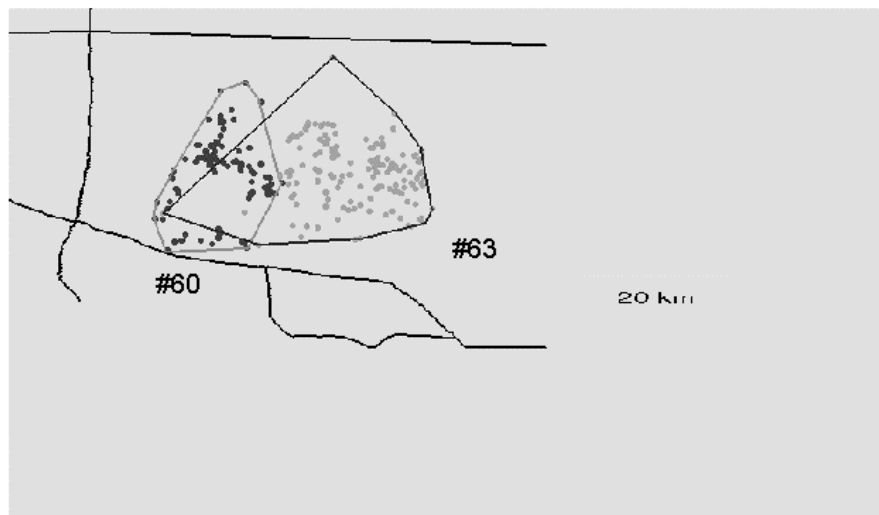
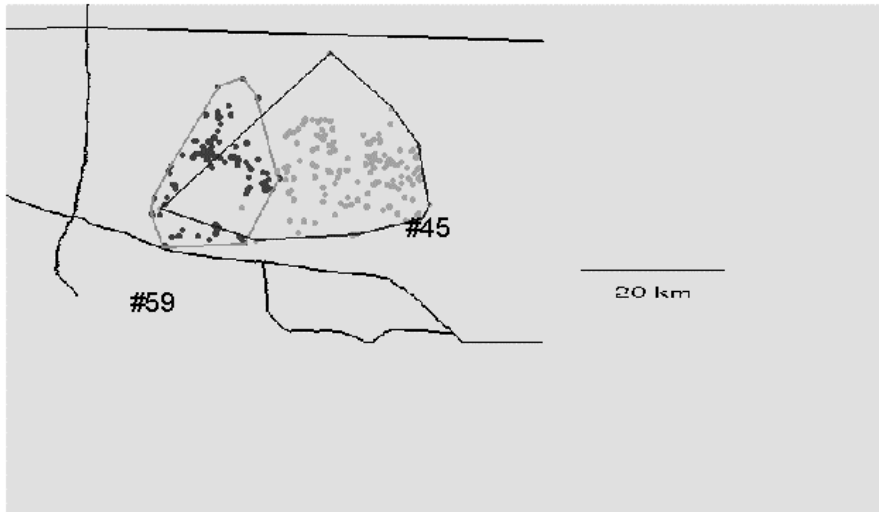
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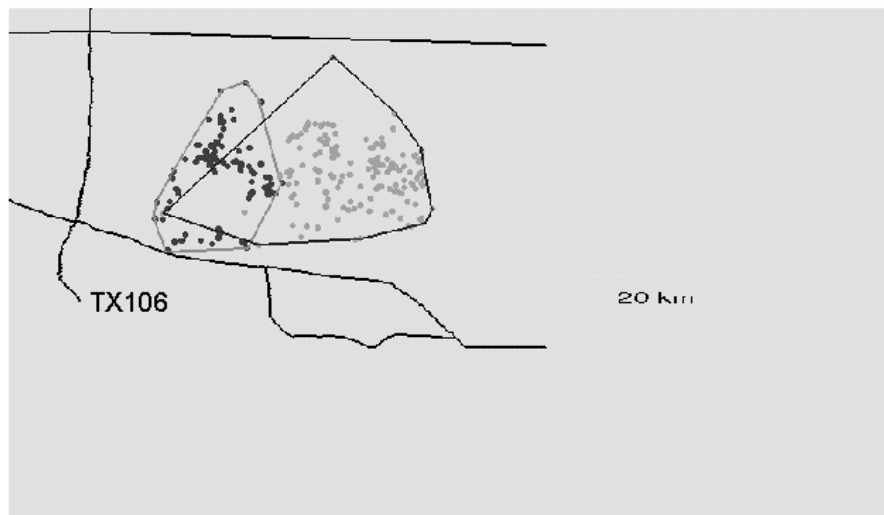
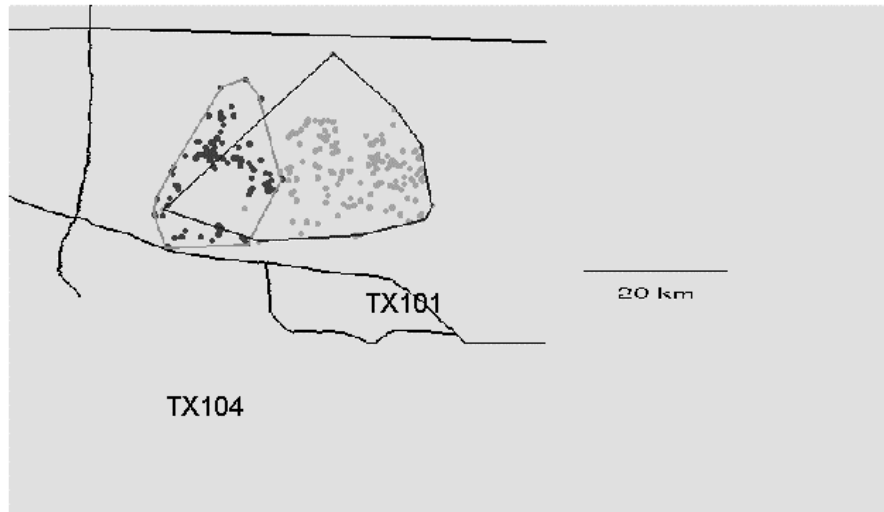
Male Panther Locations July 1997-June 1998



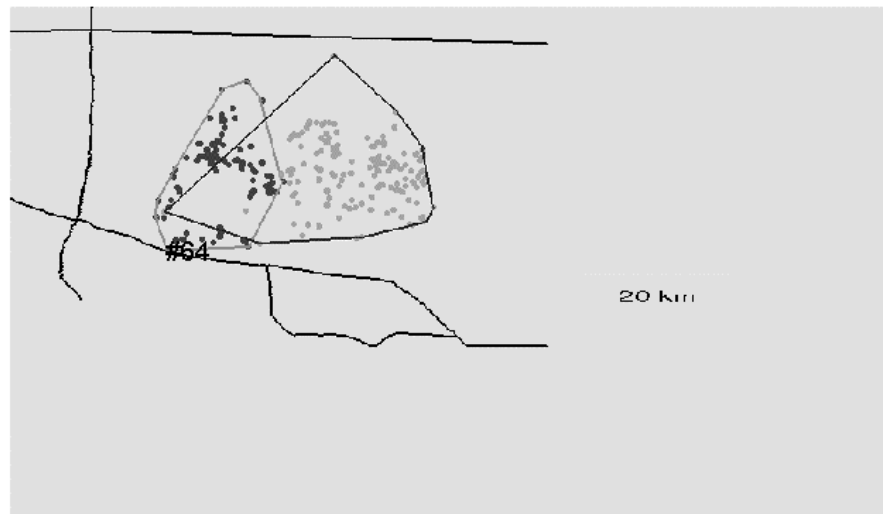
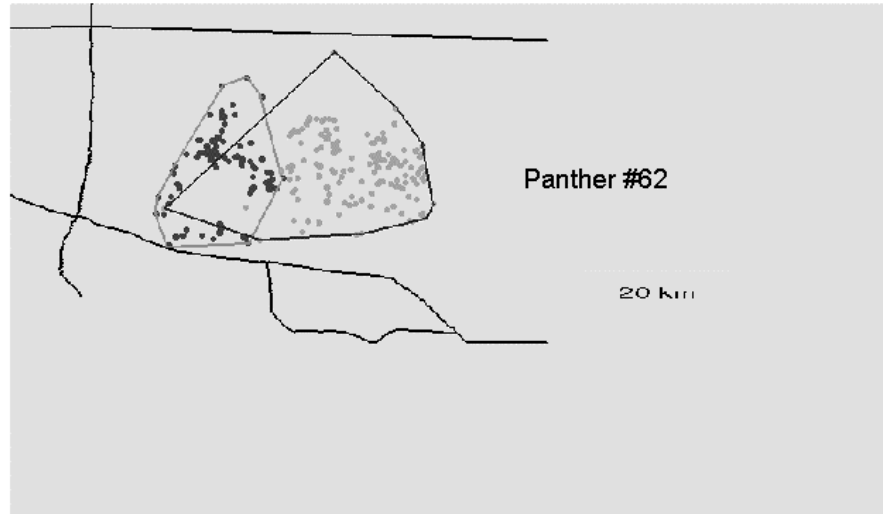
Male Panther Locations July 1997-June 1998



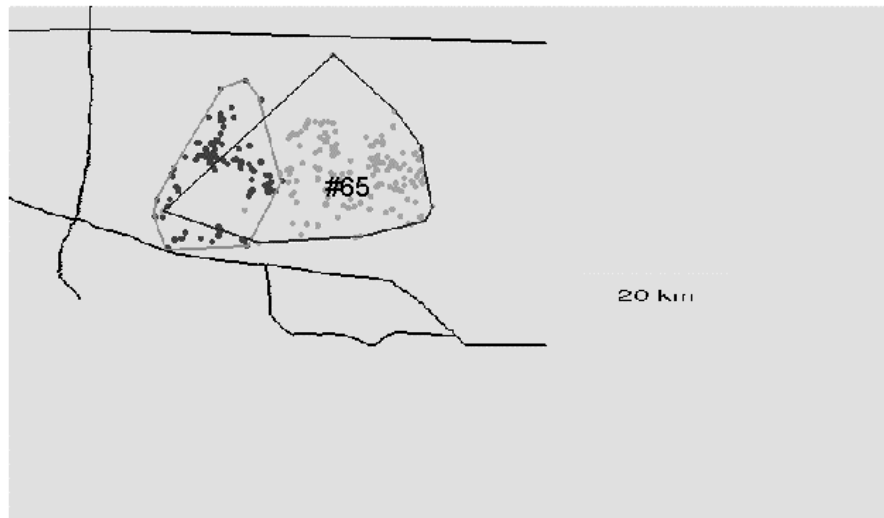
Texas Cougar Locations July 1997-June 1998



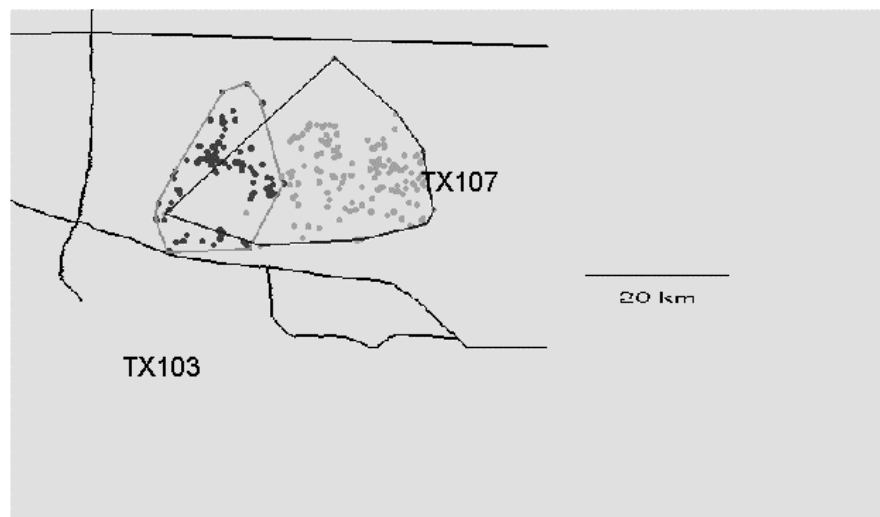
Locations of Dispersing Male Panthers July 1997-June 1998



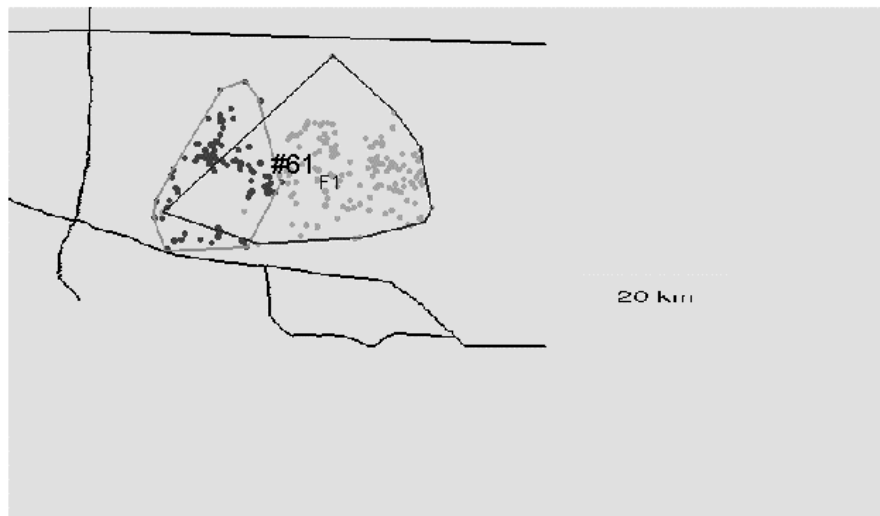
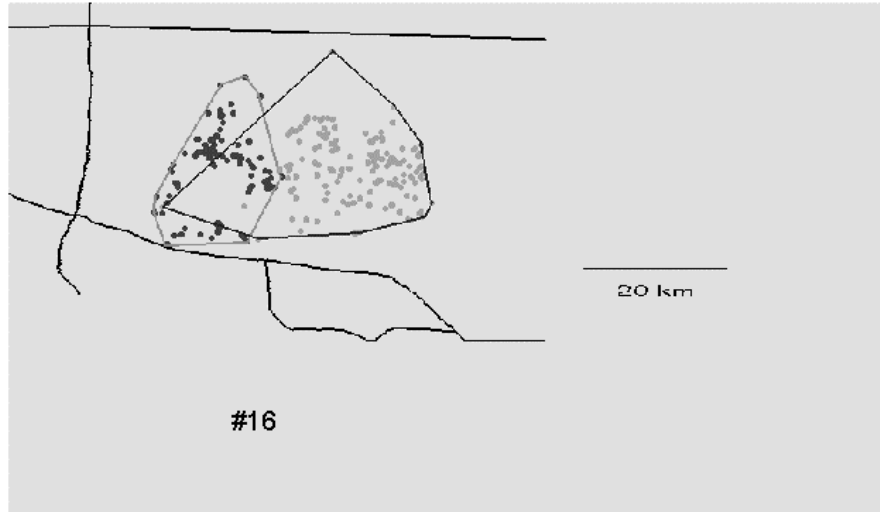
Locations of Dispersing Male Panthers July 1997-June 1998



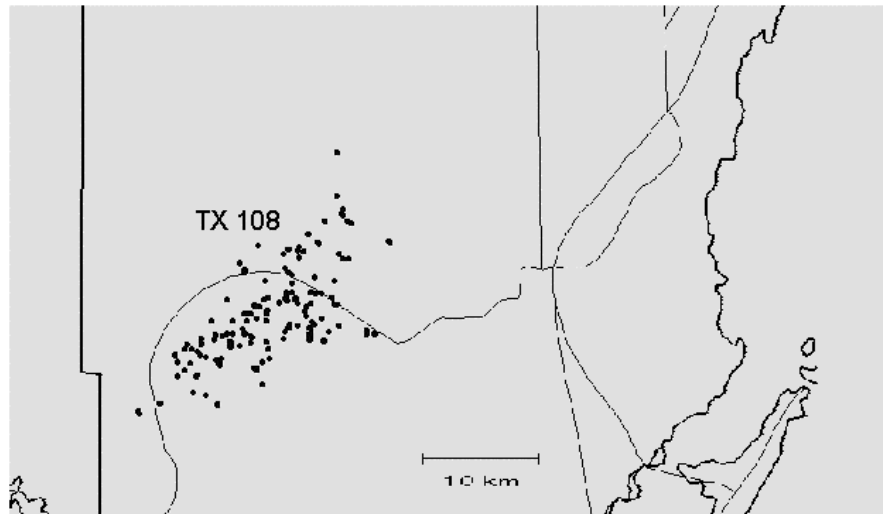
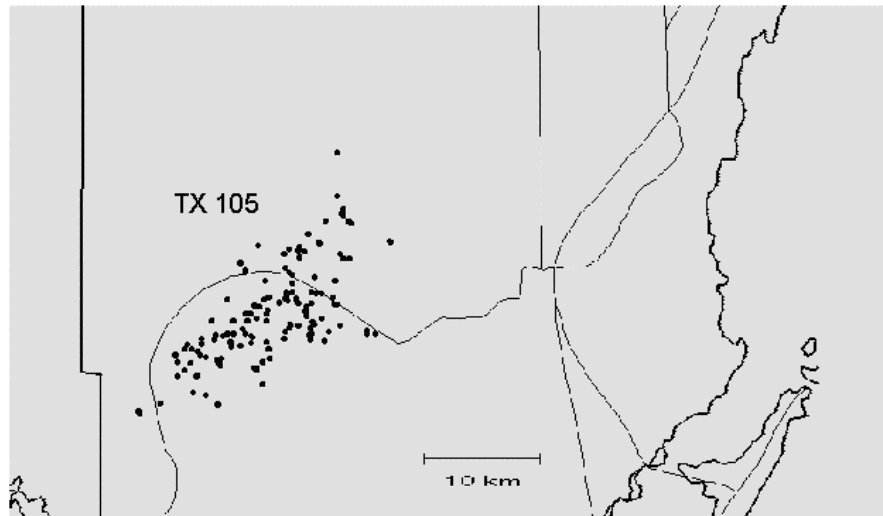
Texas Cougar Locations July 1997-June 1998



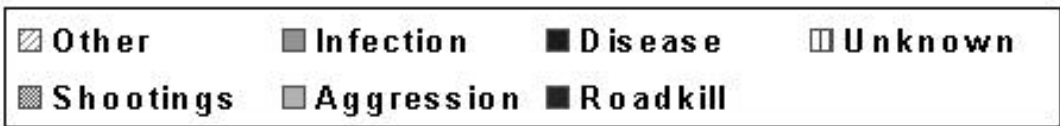
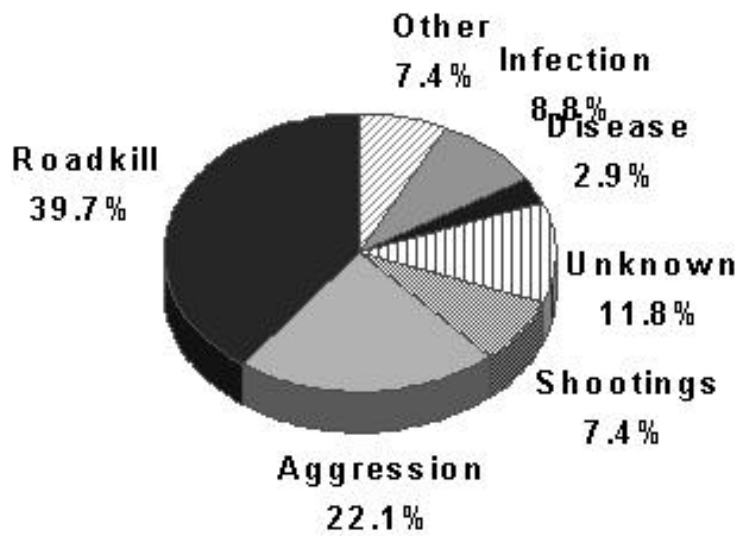
Florida Panther Locations in Everglades National Park



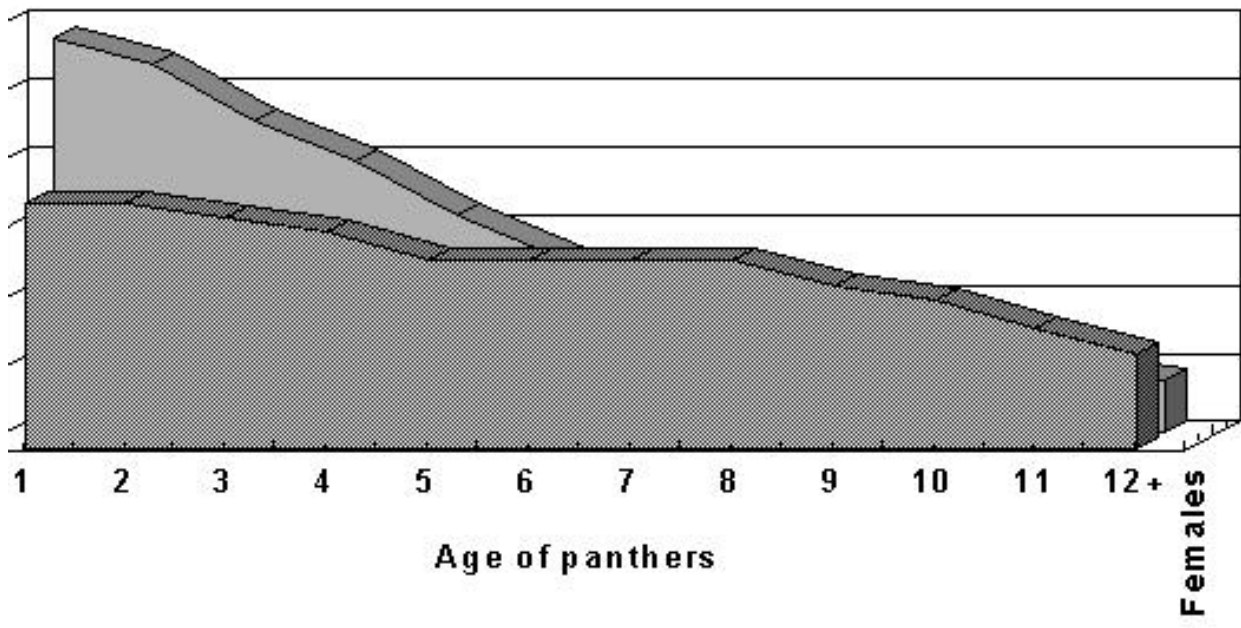
Texas Cougars in Everglades National Park



Causes of Mortality for Florida Panthers 1979-19

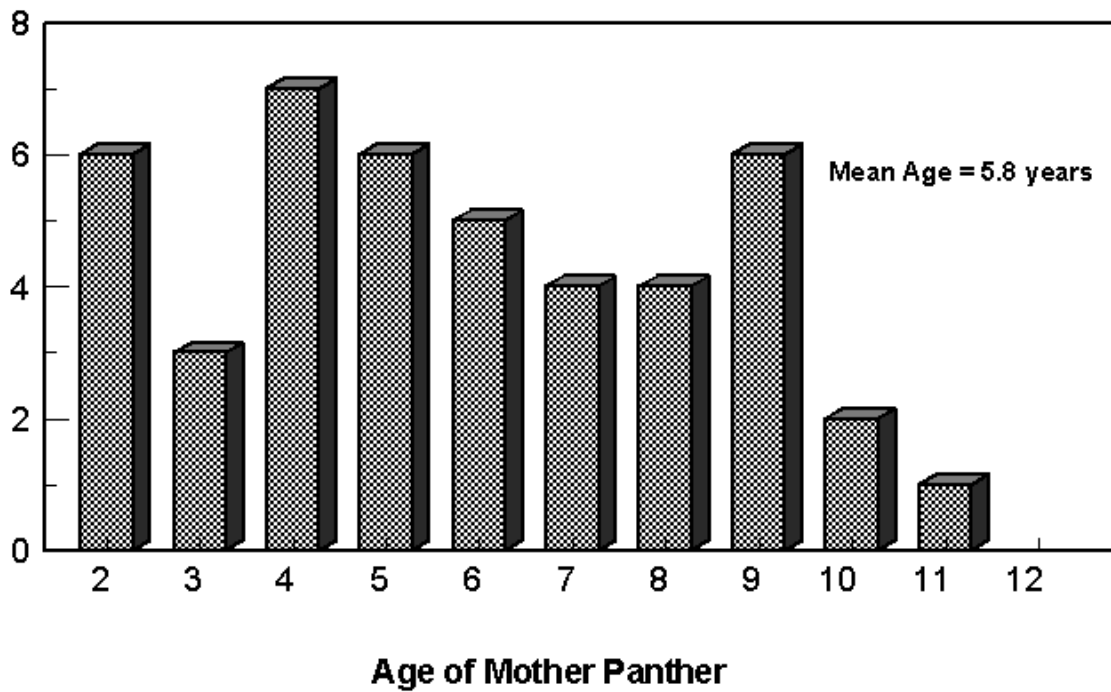


Estimated Age Structure of the Florida Panther b

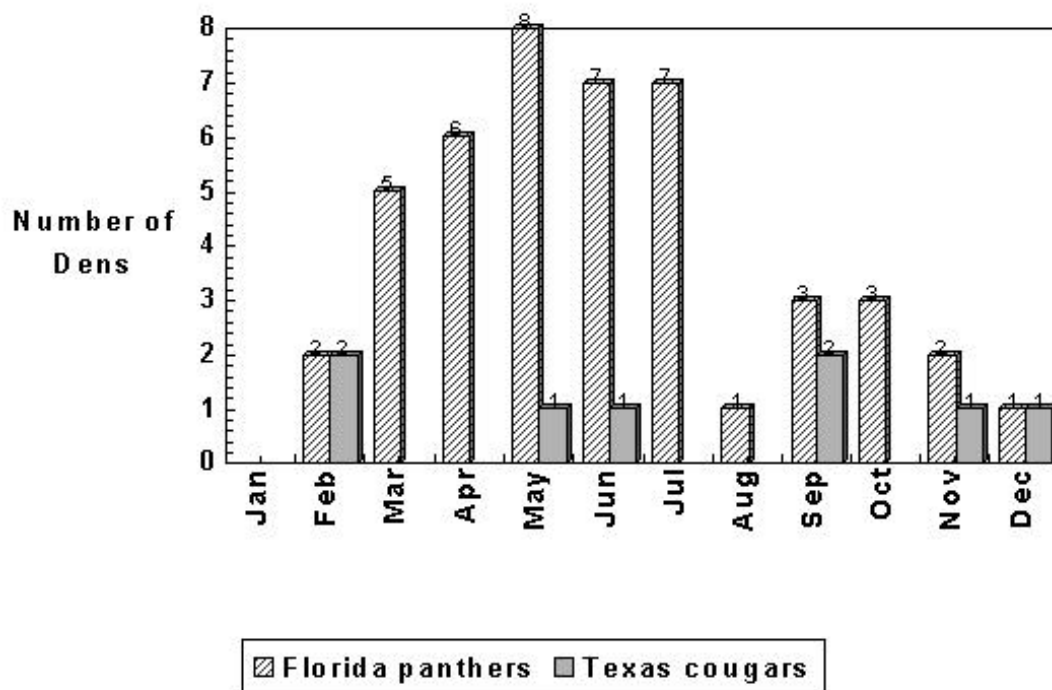


Ages of Denning Florida Panthers

Number of Dennings



Month of Denning - Florida Panthers and Texas Co



Comparison of Panther Kitten Production and Panther Deaths 1990-1998

