Release

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Florida Game and Fresh Water Fish Commission

Study Title: Florida Panther Biomedical Investigation

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Project Title: Florida Panther Research

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Abstract: Veterinary management to reduce capture-related mortality, provide medical care to individual Florida panthers (Felis concolor coryi), and conduct biomedical research continued as an integral part of Florida panther recovery. This fiscal year (FY) 2 Florida panthers were captured for initial radio-instrumentation (both juveniles), 10 for routine change of radio collars, 1 for replacement of a lost radio collar (FP# 40), and 1 for veterinary treatment (FP# 51). Eight (8M, 3F) Florida panther kittens from 3 den sites were also examined. A generalized dermatophytosis affecting FP# 51 has worsened, and treatment of the condition in the field this FY was apparently unsuccessful. All other panthers captured this period appeared healthy though parasitism, viral disease, and high mercury concentrations continue to be major health concerns. FP# 58 remains bilaterally cryptorchid and is considered sterile. Four Florida panther deaths, 2 uncollared young adults and 2 neonatal kittens, were documented this FY. Nineteen (8M, 11F) Florida panthers are currently radio-instrumented. Mean age of collared females is 8.41 yr, males 4.59 yr. Nine of 11 females have had documented litters since 01/01/94, however, only 4 are known to have successfully raised kittens to at least 10 months of age during this time.

Three (1M, 2F) F_1 Texas cougar/Florida panther kittens from 2 den sites were examined this FY, however, no juvenile F_1 or adult Texas cougars were captured. One Texas cougar died this period (vehicular collision). There are currently 7 radio-collared Texas cougars free-ranging in south Florida.

The Florida panther (F. c. coryi), an endangered subspecies of cougar, once inhabited the entire southeastern United States and was contiguous with other cougar subspecies (Goldman 1946). Today, however, the Florida panther is the only remaining F. concolor population east of the Mississippi river. This isolated population has been reduced to approximately 30 to 50 individuals inhabiting the Big Cypress Swamp and Everglades ecosystems of south Florida (Belden 1986). The Florida panther was listed as endangered by

the Department of Interior in 1967, and, in 1976, field studies began which included tracking and evaluation of habitat use, prey, and causes of mortality. Veterinary management was added to the recovery project to: 1) contribute to panther safety during captures, 2) provide medical attention to individual panthers, and 3) conduct biomedical research to assist panther recovery programs.

Perhaps the greatest threat to the future of the panther is the phenomenal human population growth in south Florida and the concomitant loss of suitable habitat. Habitat loss has contributed to the reduction in size and the isolation of the panther population. Small populations are particularly vulnerable to demographic events such as disease outbreaks or random fluctuations in social structure. Inbreeding in the Florida panther is common (Roelke 1990) and has resulted in the lowest genetic diversity of any F. concolor subspecies (Roelke et al. 1993b). Also associated with inbreeding are lowered disease resistance, congenital anomalies, increased neonatal mortality, lowered reproduction, and a decreased ability to genetically adapt to environmental changes (O'Brien et al. 1983, 1985; Lacy 1993). The Florida panther is currently experiencing many of these problems (Roelke et al. 1993b). Environmental contaminants such as mercury and organochlorines are also a major threat (Roelke et al. 1991, Facemire 1995). Other important causes of morbidity/mortality include intraspecific aggression, illegal kills, and vehicular collision. Without intervention, the panther was expected to become extinct within the next 25 to 40 years (Lacy 1989). A plan for genetic restoration (Seal 1994) was developed to

reverse the effects of inbreeding and restore genetic diversity, and, in the spring and summer of 1995, 8 Texas cougar (F. c. stanlyana) females, a formerly contiguous subspecies, were released into south Florida.

Continued veterinary management is necessary to evaluate the biomedical and genetic consequences of this restoration plan. The introduction of Texas cougars allows us not only to examine the possible benefits of interbreeding but also to better assess south Florida's environment. Veterinary management is also needed to reduce capture related mortality and to increase survival rates for individual panthers and cougars requiring medical attention.

This document also serves as the annual performance report for work conducted under the contract entitled "Studies of Certain Health and Reproductive Parameters of the Florida Panther", D. J. Forrester, principal investigator. This yearly contract, covering July 1, 1995 through June 30, 1995 was between the GFC and the Department of Pathobiology, College of Veterinary Medicine, University of Florida, Gainesville.

Personnel changes preclude complete compilation and analysis of the data collected this fiscal year and no veterinary management recommendations concerning the Florida panther are offered. This annual report was prepared in the absence of a full-time staff veterinarian.

I wish to acknowledge Dr. Mike Dunbar, GFC veterinarian from May, 1994 to January 1, 1996; and Dr. Dave Rotstein who served as interim veterinarian from January 1, through the end of the capture season and collected the majority of the data presented here. Dr. Scott Citino also provided veterinary support during the capture season. Also to be acknowledged are

biologists Ken Johnson, E. Darrell Land, Mark Lotz, Deborah K. Jansen, and O. R. Bass for their efforts in location, capture, and handling of panthers; and houndsmen Roy, Rocky, and Rowdy McBride without whom this project would be nearly impossible. Assistance in planning, coordination, and field captures was provided by Buck Thackery of the Big Cypress National Preserve (BCNP), Jim Krakowski and Larry Richardson of the U.S. Fish and Wildlife Service, and Mike Petty and Mike Owens of the Fakahatchee Strand State Preserve (FSSP). Veterinary assistants Mike Anderson and Pauline Nol also contributed greatly to the project. Veterinary care for captive Florida panthers was provided by Drs. Scott Citino of White Oak Plantation, David Murphy of Lowry Park Zoological Gardens, and Douglas Paige of the Jacksonville Zoo. Finally, I wish to recognize the scientific collaborators who have made many aspects of this project possible including Dr. Stephen J. O'Brien and Jan Martenson of the National Cancer Institute, Drs. Fred Scott and Cordell Geissinger of Cornell University, and Drs. Donald J. Forrester, Ellis Greiner, Carlos Romera, Clause Berguelt, and Bruce Homer of the University of Florida, College of Veterinary Medicine (VMTH).

METHODS

Radio-instrumented Florida panthers were located by radio telemetry from aircraft or from the ground and were treed with trained hounds for recollaring. Uncollared juvenile kittens were located using the telemetry signal of the radio-collared dam. Adult panthers without radio collars were

tracked and treed by hounds, and neonatal panther kittens were located and captured by searching the suspected den site of the radio-collared dam.

Risk factors such as climatic conditions, physical condition of the panther, site conditions, and other factors that might contribute to an unacceptable risk to the panther were evaluated before immobilization. If risk was acceptable, a compressed air Vario® dart rifle was used to inject in combination Ketoset® (ketamine HCl) 8-9 mg/kg and Telazol® (tiletamine HCl and zolazepam HCl) 2-3 mg/kg (Dunbar 1995). Immobilized panthers were removed from the tree by hand or allowed to fall into a net and inflatable "crash-bag" as described by McCown et al. (1990).

Immobilized panthers were given an initial physical examination, and vital signs and depth of anesthesia were monitored. Heart rate and arterial blood oxygen saturation were monitored with a portable pulse oximeter (Nelcor®, Inc., Hayward, Ca.). Anesthesia was deepened or maintained in some panthers with propafol administered intravenously (IV). An IV catheter was installed in the cephalic or medial saphenous vein and isotonic fluids (lactated Ringer's solution) were administered at a rate of 10-20 ml/kg/hr to maintain blood pressure and expedite clearance of drug metabolites. Juvenile and adult panthers were vaccinated for feline viral rhinotracheitis, feline calicivirus, and feline panleukopenia (Fel-o-vax®, 3 ml) and rabies (Imrab®, 1 ml). Additionally, juveniles and adults were dewormed with ivermectin (Ivomec®, 0.2 ml/kg) and praziquantel (Droncit®, 3 ml) and neonates with pyrantel pamoate. Some adult panthers and all kittens were implanted with a subcutaneous transponder chip. Biomedical samples collected from some or all

panthers include whole blood, tissue biopsy, hair, and feces. Measurements were also recorded, and, for juvenile or adult panthers, a radio collar was attached. An electrocardiogram was performed for some panthers via cellular phone to Cardiopet (Floral Park, NY). Panthers were released in a dry shaded area away from open water after attaining a sufficient state of consciousness.

Whole blood in EDTA was analyzed for complete blood count (CBC) at Diagnostic Veterinary Laboratory, Inc. (DVL), Naples, and blood smears were examined for differential cell count at DVL and for blood parasites at VMTH or DVL. A serum chemistry profile and thyroid hormone panel was also obtained for each panther (DVL). Skin biopsies were collected from some Florida panthers for genetic analysis using mitochondrial DNA and nuclear markers at the Laboratory of Viral Carcinogenesis, National Cancer Institute (O'Brien et al. 1990). Whole blood and hair was analyzed for mercury content by automated cold vapor technique at the Florida Department of Environmental Protection (FDEP), Central Laboratory, Tallahassee. Serology for feline calicivirus (FCV), feline enteric coronavirus/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. Serology tests are indicated on tables 3 and 4 and described by Roelke et al. (1993a). Dermatophytes (ringworm) were identified by culture on Dermatophyte Test Medium at DVL and histopathology (VMTH).

One Florida panther kitten was necropsied at VMTH; analysis included gross and microscopic examination of tissues, microbiology, and parasitology. Additionally, one cougar female from south Florida was necropsied at the GFC Wildlife Research Laboratory by the GFC veterinarian. Tissues collected at capture or necropsy that were not immediately analyzed were archived at -20° or -70° C.

RESULTS AND DISCUSSION

Free-Ranging Florida Panthers

Eleven juvenile/adult free-ranging Florida panthers were captured this FY; 2 for initial radio instrumentation (FP# 59 and 60), 10 for routine replacement of radio collars (FP# 16, 19, 23, 36, 46, 51, 55, 58, 59, and 60), 1 to replace a lost collar (FP# 40), and 1 for veterinary treatment (FP# 51). Eight (5M, 3F) neonatal kittens from 3 den sites were also captured.

Health and Physical Condition of Florida panthers captured this FY

Table 1 describes the status of Florida panthers currently radio-instrumented. Florida panther #16 appeared to be in excellent condition despite a 13 lb loss in weight since his previous capture in 1994 (D. Rotstein, unpubl. data). Serum chemistry showed a mild azotemia (elevation in blood urea nitrogen (BUN) and creatinine[1]), an elevated BUN was also recorded at last capture. FP# 16 had the highest blood mercury concentration (0.87 ppm) of panthers tested this FY (n = 10) (Table 6). This 5-fold

[1]Indicators of renal function.

increase in concentration since last capture a coincides with a move from BCNP to Everglades National Park (ENP). FP# 16 remains seropositive for FIV.

Florida panther #19 also appeared to be in excellent physical condition, however, she did have small papillomas[2] covering 60-70% of the vaginal epithelium and had a grade II/VI systolic right-sided heart murmur. Small oral ulcerations were also noted (S. Citino, unpubl. data). Hair mercury concentrations were highest (12 ppm) (Table 7) and blood mercury concentrations were second highest (0.41 ppm) among panthers tested this FY.

Florida panther #23 was considered to be in excellent condition with a weight gain of 11 lbs (though stomach was full). Only 1 small vaginal papilloma was noted (D. Rotstein, unpubl. data). Red blood cells were hypochromic and macrocytic.

Florida panther #36 was in excellent overall condition though evidence of Sarcocystis spp. was observed on the tongue (M. Dunbar, unpubl. data). She is the mother of 3 kittens examined at 2 weeks of age in February, 1996. A fourth kitten from this litter died of unknown causes.

Florida panther #40 was recaptured this FY after being lost to the project since January, 1994, due to loss of its collar. She was in fair to good physical condition with small vaginal papillomas noted on physical exam (D. Rotstein, unpubl. data). FP# 40 is the mother of FP# 60, captured at 7 months of age in the addition lands (ACQ) of BCNP this FY.

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[2]These "papillomas" are of unknown etiology and have been termed proliferative vestibulo-vaginitis by Dr. Bruce Homer, VMTH. For simplicity they are termed papillomas in this document.

Florida panther #46 was in excellent condition and weighed 25 lbs more than when captured in 1994, however, analysis of ECG suggested right atrial enlargement (D. Rotstein, unpubl. data). Atrial septal defect may be a possible cause.

Florida panther #51, who has suffered from progressive alopecia and dermatitis for over 2 years was diagnosed with Trichophyton mentagrophytes (a cause of ringworm) (Dunbar 1995, D. Rotstein and S. Citino, unpubl. data). This fungal infection had progressed to affect two thirds of the skin surface with folliculitis and excoriations on the chest and extremities. The nail beds were also affected with the loss of one nail and another deformed. The panther was otherwise in good condition with no weight loss since his last capture in 1994 (S. Citino, unpubl. data). Treatment on 2 occasions consisted of a chlorhexidine bath, lime-sulphur dip, and topical clotrimazole. Initial treatment occurred 1/05/96, and the condition appeared slightly worse when recaptured for a second treatment on 2/23/96 (D. Rotstein, unpubl. data). Hematological data suggested a slight hypochromic, macrocytic anemia though the hematocrit was low normal. The globulin portion of total serum protein was elevated, possibly a response to the fungal infection.

Florida panther #55 was in excellent condition with no gross abnormalities observed (D. Rotstein, unpubl. data). No evidence of kittens, born 8 months earlier, was observed at capture, however, a yearling female, which may have been one of FP# 55's kittens, was killed on US 41 near Turner River Road on 5/2/96.

Florida panther #58 was in good condition despite skin lesions produced by a tight collar. Body weight was up 40 lbs since his last capture 8 months previous (13 mo. age), and his overall condition had improved. Ringworm (T. mentagrophytes) was cultured from skin lesions following his previous capture (Dunbar 1995), however, these lesions appeared to have resolved, and his hair coat was in good condition at last capture (D. Rotstein, unpubl. data). Blood parameters were improved since last capture, though RBCs were slightly hypochromic and macrocytic. At 2 years of age, FP# 58 remains bilaterally cryptorchid and is considered sterile.

Florida panther #59 was in good condition at initial collaring (7 mo. age) and had gained 30 lbs by the time of recollaring 4.5 months later. Both testes are descended, though the right testis is smaller (S. Citino and D. Rotstein, unpubl. data). Fecal analysis revealed extremely high numbers (reported as too many to count) of hookworm eggs (Ancylostoma spp.). This kitten, offspring of FP #48, is one of 2 neonates examined in June, 1995. No evidence of the other kitten was observed during these captures.

Florida panther #60 was in excellent condition at initial capture (7 mo. age), though small for his age. Ringworm, Microsporum gypseum, was cultured from areas of hair loss on the tail, however, the condition appeared to be resolving at recapture 3 months later (D. Rotstein, unpubl. data).

Neonatal kittens of FP# 19, 36, and 56 were examined at their den sites this FY. FP# 19 had 2 kittens (K27♀ and K28♀) on private land (2/96) and FP# 36 had 3 kittens (K24♀, K25♂, and K26♂) in ACQ. Kittens of FP# 19 and 36 appeared to be in good condition. Fecal analysis for kittens of FP# 36

revealed no parasite eggs, however, egg shedding for most intestinal parasites does not occur until the host is greater than 3 weeks of age. FP# 56 had 3 kittens (K20♂, K21♂, and K22♂) on the Big Cypress Seminole Indian Reservation (SIR). All 3 had a mild dermatitis of unknown etiology consisting of dry, crusted, well demarcated, raised lesions without hair loss over the head, neck, and limbs (M. Dunbar, unpubl. data). These lesions are suggestive of dermatophytosis, however, samples were not collected for culture.

No Florida panther injury or mortality due to capture, immobilization, or handling occurred this FY.

Mortality

Four Florida panther deaths were documented this FY. Two adult uncollared panthers died of vehicular collision; a 3 to 5 year old male was killed 4/24/96 on CR 833, and a 1 year old female was killed 5/2/96 on US 41 near Turner River Road . The female may have been a kitten of FP# 55. Both panthers were recovered and necropsies are pending. N96-157, a 1.5-2 week old kitten of FP# 32, was found dead outside the den in the Florida Panther National Wildlife Refuge (FPNWR). This kitten was the only panther necropsied this FY, however, the cause of death was undetermined. Hair mercury levels in N96-157 were 5.9 ppm. The remains of another Florida panther kitten were found during examination of it's siblings FP# 36-K24, 25, and 26. Death occurred before 2 weeks of age, and the cause is unknown.

Hematology and Serum chemistry

Overt anemia was not observed in panthers captured this FY although RBC's for some cats were macrocytic and hypochromic. The latter condition is often seen with chronic blood loss associated with parasitism (Duncan et al. 1994). In some cases, dehydration, probably capture related, may have masked the presence of borderline anemia. Serum chemistry values were considered normal for captured panthers considering the stress and exertion of capture, however, some panthers did exhibit a mild azotemia and signs of dehydration emphasizing the need for isotonic fluid administration following immobilization. Thyroid hormone (triiodothyronine and thyroxine) levels were within normal limits for captured panthers (Table 8). Serum progesterone concentrations were not evaluated for females captured this FY.

Reproduction

Nine of 11 free-ranging female Florida panthers had documented litters since January, 1994, however, only FP# 40, 48, 55, and 56 are known to have successfully raised kittens to at least 10 months of age during this time. FP# 9 and 11, both between 14 and 16 years of age, are not believed to have had kittens since 1990 and 1991, respectively, and FP# 57, an apparently healthy 4 year old in FPNWR, has not had a litter since accession to the project in January, 1994. No Florida panthers were electro-ejaculated for semen analysis this FY. The reproductive potential of FP# 58 is unknown, however, in other species bilateral cryptorchidism usually results in sterility. One captive panther (FP# 207) is also bilaterally cryptorchid and considered sterile (D. Murphy, unpubl. data).

Disease

Viruses--High antibody titers to FPV were found in all panthers captured this FY (Table 3 and 4). Although not usually an important disease in adult felids, it can be devastating to kittens. The effect of FPV on Florida panther kittens is unknown, however, Roelke et al. (1993a) suggests that it may be a significant cause of kitten mortality.

Bacteria--No morbidity or mortality associated with bacterial disease was observed this FY.

Protozoan Diseases--No overt morbidity or mortality associated with protozoan disease was observed this FY, though oocysts and/or protozoa were found in the feces and blood, respectively, of some panthers (Table 5).

Mycotic Diseases--Three Florida panthers (FP #51, 58, and 60) have been diagnosed with dermatophytosis (ringworm). Dermatophytosis is a fungal infection of the keratinized structures of the skin (stratum corneum, nails, and hair) that is transmitted by direct contact with an infected individual or, in the case of M. gypseum, by contact with contaminated soil. Young or immunocompromised animals are most susceptible to infection. Alopecia and skin lesions on FP# 58 and #60, caused by T. mentagrophytes and M. gypseum, respectively, appeared to be resolved at their last capture (D. Rotstein, unpubl. data). Florida panther #51 had no evidence of dermatophytosis when originally captured at 2 years of age, however, alopecia and skin lesions affected approximately 25% of the skin surface when captured 2 years later. The condition was originally diagnosed as notoedric mange (resembling the condition in FP# 32), however, repeated treatments with ivermectin were

ineffective (Dunbar 1995). Trichophyton mentagrophytes has since been cultured from skin lesions. Progression of the disease may result in further loss of nail beds, jeopardizing the panther's ability to capture prey and recovery is unlikely without prolonged, aggressive treatment in captivity.

Helminths--Ancylostoma spp., presumably A. pluridentatum, continues to be found in large numbers in Florida panthers and may be a significant cause of morbidity or mortality in kittens (Dunbar 1995, Dunbar et al. 1994). No new species of helminth in panthers were identified this FY although small numbers of unidentified fluke eggs were recovered from the feces of some cats.

Arthropods--No morbidity or mortality associated with arthropod infestation was observed in Florida panthers captured this FY.

Environmental Contaminants-- Whole blood mercury concentrations increased significantly in 4 of 7 Florida panthers captured this FY (Table 6). One Florida panther kitten (N96-157) found dead had hair mercury levels of 5.9 ppm. See Dunbar (1995) for more complete listing of mercury concentrations in Florida panthers.

Anomalies--Three of 7 (43%) living free-ranging male Florida panthers are cryptorchid[3] and one of these, FP# 58 (2 yr), is bilaterally cryptorchid. Two of 11 free-ranging panthers (FP# 19 and 59) captured this FY had detectable heart murmurs, and one panther receiving an ECG (FP# 46) had evidence of right atrial enlargement. Roelke et al. (1993b) reported heart

[3]Cryptorchidism is the retention of at least one testis in the abdominal cavity or inguinal canal. The retained testis is usually sterile.

murmurs in approximately 80% of Florida panthers, and atrial septal defects (ASD) were found in 3 of 4 necropsied panthers last FY (Dunbar 1995). Atrial septal defect was not seen in the one Florida panther necropsied this FY.

Trauma--Vehicular collision accounted for both known cases of adult mortality this FY (See mortality). There was no known mortality due to intraspecific aggression this FY.

Genetic Restoration - Free-Ranging Texas Cougars

Texas cougars #106 and 101 had litters of 1 (F) and 2 (1M, 1F) kittens, respectively. The 1 kitten of TX# 106 (TX106K23), believed to be sired by FP# 51, was captured at 3 weeks of age in Golden Gates Estates just west of FSSP. Kittens TX101K19♂ and TX101K20♀ were captured in SIR at 3 weeks of age. All 3 kittens appeared to be alert, active, and in excellent condition (M. Dunbar, unpubl. data). These first generation crosses were neither vaccinated nor dewormed to better assess their relative survivability. See Table 2 for more data on kittens.

Texas cougar #102 died of vehicular collision on 09/22/95 in Hendry County at the junction of CR 833 and CR 846. The cougar was in good condition and had 3 fetuses (2F, 1M) approximately 6 weeks into gestation (M. Dunbar, unpubl. data).

Captive Florida Panthers

Nine Florida panthers remain in captivity (see Table 9 for status and location). Reproductive research is being conducted by the National

Zoological Park, Washington, D.C., on female panthers at White Oak Plantation. Results of this study are currently unavailable.

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Table 1 (continued)

Table 1. Status of living, free-ranging, radio-collared Florida panthers as of June 30, 1996.

FP#	Sex	DOB	Age (years)	Genetics[1]	Date[2]	Location[3]	Wt. (lbs.)	Cryptorchid	Cowlick/ Kinked tail	Comments
9	F	80-82	14-16	A	01/21/94	FSSP	75	-	Y/Y	thin, no kittens since 7/90
11	F	80-82	14-16	A	05/09/95	FPNWR	78	-	Y/Y	thin, poor haircoat, severe papillomas
16	M	6/85-12/85	10.5	P	03/14/96	ENP	99	N	Y/Y	112 lbs in Feb. 1994, FIV+
19	F	86	10	A	01/09/96	FPNWR	88	-	Y/Y	
23	F	8/86	10	P	02/12/96	CDU	72	-	Y/N	
32	F	87	9	A	01/11/95	FPNWR	70	-	Y/Y	thin; large papillomas; believed to have had a failed litter 3/96
36	F	85-88	8-11	A	12/06/95	ACQ	102	-		
40	F	87-88	8-9	A	03/21/96		80	-	Y/N	lost collar 1/94, recollared 3/96, mother of FP# 60
45	M	10/90	5.5	A	01/12/95	ACQ	152	Y	Y/Y	
46	M	89-90	6-7	A	03/13/96	PL	150	Y	Y/Y	
48	F	10/91	4.5	A				-	Y/Y	mother of FP# 59
51	M	89-90	6-7	A	01/05/96[4]	BI	123	N	Y/Y	severe alopecia over 70% of skin - ringworm[5]
54	M	3/92	4	A	01/17/94	FPNWR	116	N	N/Y	collar not changed since 1/94
55	F	1/93	3.5	P	03/07/96	CDU	72	-	N/Y	
56	F	92	4	pending	02/03/94	ACQ	68	-	Y/Y	Mother of FP #58

Table 1 (continued)

FP#	Sex	DOB	Age (years)	Genetics[1]	Date[2]	Location[3]	Wt. (lbs.)	Cryptorchid	Cowlick/ Kinked tail	Comments
57	F	92	4	pending	01/31/95	FPNWR	83	-	N/Y	
58	M	4/94	2	pending	01/31/96	PL	92	Y	N/Y	bilaterally cryptorchid - probably sterile
59	M	7/95	1	pending	05/20/96[6]	BI	70	N	Y/N	
60	M	9/95	9 mo	pending	05/29/96[7]	ACQ	52	N	/Y	

Florida panther #49, not included in this table, is a radio-collared female whose signal was lost in 1990.

[1] A = authentic, P = descendent of South American puma/Florida panther intergrades (termed "Piper" stock) (O'Brien et al. 1990).

[2] Latest capture date.

[3] ACQ = addition lands, BI = Bear Island Unit, and CDU = Corn Dance Unit of BCNP; ENP = Everglades National Park; FPNWR = Florida Panther National Wildlife Refuge; FSSP = Fakahatchee Strand State Preserve; and PL = private land north of I-75.

[4] FP# 51 also captured for treatment 02/23/96.

[5] Trichophyton mentagrophytes.

[6] FP# 59 also captured 01/04/96.

[7] FP# 60 also captured 03/06/96.

Table 2. Florida panther neonatal kittens captured July 1, 1995 - June 30, 1996.

Kitten	Wt (lb)	Dam	Sire	Genetics[1]	Location[2]	Date	Est. Age (Days)	Comments
K18♀	3.56	TX# 101	?	F_1	SIR	10/10/95	21	Alert, active, and in excellent condition.
K19♂	3.69							
K20♂	2.07	FP# 56	FP# 45	FP	SIR	10/31/96	21	Kittens had numerous skin lesions of unknown etiology.
K21♂	2.38							
K22♂	2.75							
K23♀	3.69	TX# 106	FP# 51	F_1	GGE	12/01/96	21	Active and healthy.
K24♀	1.56	FP# 36	FP# 45	FP	ACQ	02/06/96	14	Remains of a fourth kitten found at the den site.
K25♂	1.44							
K26♂	?[3]							
K27♀	2.44	FP# 19	FP# 54 or FP# 51	FP		04/17/96	24	Active and healthy.
K28♀	2.75							

[1] F_1 refers to first generation crosses between Texas cougar females and Florida panther males; FP = pure Florida panthers. Florida panther genetics are not differentiated due to unknown paternity.
[2] GGE = Golden Gate Estates, SIR = Big Cypress Seminole Indian Reservation. For other locations see table 1.
[3] K26 not weighed but was heavier than siblings.

Table 3. Serum antibody titers[1] for feline panleukopenia (FPL), feline viral rhinotracheitis (FVR), and feline calicivirus (FCV) in free-ranging Florida panthers captured July 1, 1995 through June 30, 1996[2].

FP#	Previously vaccinated	FPL[3]	FVR[3]	FCV[3]
16	Y	5,000	<2	384
19	Y	>10,000	3	768
23	Y	5,000	<2	128
46	Y	1,000	2	3,072
51	Y	5,000	<2	32
55	Y	10,000	<2	<2
58	Y	500	2	4
59	N	500	<2	<2
60	N	500	<2	4

[1] FCV, FPV, and FVR titers were determined by serum neutralization. Titers were considered positive for FCV if > 1:4, for FPL if ≥ 1:50, and for FVR if ≥ 1:2.

[2] Titers not run for FP# 36 and 40.

[3] Serum neutralization, Cornell Feline Health Center (CFHC).

Table 4. Seroprevalence of infectious disease agents in free-ranging radio-collared Florida panthers, January 1, 1991 through June 30, 1995[1], and July 1, 1995 through June 30, 1996[2].

Disease or pathogen	01/01/91 - 06/30/95			07/01/95 - 06/30/96		
	Number of panthers:			Number of panthers:		
	Tested	Pos.	% Pos.	Tested	Pos.	% Pos.
Bacteria	27	0	0%	-	-	-
Brucella spp.[3]						
Protozoa	5	0	0%	-	-	-
Toxoplasma gondii[4]						
Viruses						
Bluetongue[5] (Orbivirus)	28	3	11%		pending	
Feline calicivirus[6]						
not vaccinated	14	4	29%	2	0	0%
vaccinated	29	20	69%	7	5	71%
Feline enteric coronavirus/ Feline infectious peritonitis						
KELA[7]	24	0	0%	-	-	-
IFA[8]	13	6	46%	-	-	-
Feline immunodeficiency virus/ puma lentivirus[9]	17	1	6%	9	1	11%
Feline leukemia virus[10]	23	0	0%	1[11]	0	0%
Feline panleukopenia virus (parvovirus)						
not vaccinated	14	3	21%	2	2	100%
vaccinated	29	29	100%	7	7	100%
Feline viral rhinotracheitis (Alphaherpesvirus)						
not vaccinated	14	5	36%	2	0	0%
vaccinated	29	12	41%	7	3	43%
Pseudorabies virus[12] (Alphaherpesvirus)	6	0	0%			

1 (Dunbar 1995).
2 Data presented represents latest capture date.
3 Card test - performed at the University of Florida College of Veterinary Medicine (UFVMTH).
4 Indirect hemagglutination - performed at Colorado State University.
5 Agar gel immunodiffusion - UFVMTH.
6 Serum neutralization - performed at Cornell University Feline Health Center (CFHC).
7 KELA, kinetics enzyme-linked immunoabsorbent assay - CFHC.

Table 4 (continued).

[8] IFA, indirect immunofluorescent assay - CFHC.
[9] ELISA, Enzyme-linked immunoabsorbent assay.
[10] ELISA - CFHC.
[11] FP# 59, ELISA - Professional Animal Laboratory, Irvine, CA.
[12] Latex agglutination - UFVMTH.

Table 5. Prevalence of parasites from Florida panthers (Felis concolor coryi)[1], 1990-94 and July 1, 1995-June 30, 1996.

Parasite	July 1990-June 1995[2]		July 1995-June 1996	
	Parasites	Parasite eggs from feces	Parasites	Parasite eggs from feces
	No. panthers Exam/Pos (%Pos)	No. panthers Exam/Pos (%Pos)	No. panthers Exam/Pos (%Pos)	No. panthers Exam/Pos (%Pos)
Trematodes				
Alaria marcianae	9/6 (67%)	28/23[3] (82%)	- -	6/4[3] (67%)
Heterobilharzia americana	9/1 (11%)	- -	- -	- -
Cestodes				
Spirometra mansonoides	9/6 (67%)	28/16[3] (57%)	- -	6/4[3] (67%)
Taenia omissa	9/4 (44%)	20/1[3] (5%)	- -	- -
Nematodes				
Ancylostoma pluridentatum	9/9 (100%)	28/23[3] (82%)	- -	6/6[3] (100%)
Ancylostoma caninum	9/1 (11%)		- -	
Capillaria aerophila	9/0 (0%)	20/2[3] (10%)	- -	6/1[3] (17%)
Dirofilaria striata[4]	52/37 (71%)	NA NA	7/2 29%	NA NA
Molineus barbatus	9/1 (11%)	20/0 (0%)	- -	6/0 (0%)
Strongyloides spp.	9/3 (33%)	20/3 (15%)	- -	6/0 (0%)
Toxocara spp.	9/1 (11%)	28/7 (25%)	- -	6/1[3] (17%)
Protozoans				
Cytauxzoon felis[5]	33/8 (24%)	NA NA	7/3 43%	NA NA
Isospora spp.	9/1 (11%)	NA NA	- -	6/1 (17%)
Sarcocystis spp.[6]		NA NA	- -	NA NA
Mites				
Lynxacarus spp.	9/1 (11%)	NA NA	- -	NA NA
Notoedres cati[7]	/1 -	NA NA	- -	NA NA

Table 5. (continued)

[1] Only data from panthers greater than 5 months of age is included.

[2] Dunbar 1996.
[3] Eggs identified only to genus.
[4] Data in first column was collected 1986-1993 (Lamm et al., 1995). Data collected July 1994-June 1995; blood was examined at VMTH, College of Veterinary Medicine, University of Florida.
[5] Reported positive if the individual panther tested positive at any time during the study period.
[6] *Sarcocystis* spp. found in many panthers though not quantified.
[7] Kitten of FP# 32 - recovered with treatment (Maehr et al. 1995).

Table 6. Mercury concentrations in whole blood (ppm) from living free-ranging Florida panthers 1990 to 1996[1,2].

FP #	1990	1991	1992	1993	1994	1995	1996[3]
09	0.140	1.33		0.500	0.140		
11	0.058		0.160				
16	2.80	0.210	.0260		0.160		0.87
19	0.110	0.053		0.400			0.41
23		0.350		0.100			0.059
32	0.022			0.760		0.230	
36	0.035		<0.048		0.180		
40	0.039		0.154		0.47		
45		0.185	0.067	0.130		0.090	
46			0.147		0.059		0.034
48			<0.047	0.140		0.130	
51			0.049				0.28
54				0.130	0.510		
55					0.050		0.19
56					1.60		
57						0.530	
58						0.038	0.13
59							0.090
60							0.11

[1] Data from 1988-1995 (Roelke 1990, Dunbar 1995).
[2] For mercury concentrations from previous years see Roelke (1990).
[3] Analysis of whole blood by automated cold vapor technique at FDEP.

Table 7. Mercury concentrations in hair (ppm) from living free-ranging Florida panthers 1990 to 1996[1].

FP#	1990	1991	1992	1993	1994	1995	1996[3]
09	5.8						
11	0.60						
16	80.9[2]	67.0	31.8				8.4
19	21.0		1.75		6.5		12.0
23	19.8[2]						1.6
32							
36	0.77		1.04		3.8		
40	0.90		9.90		10.0		
45			2.21				
46			11.1		0.90		0.73
48			0.68				
51			6.25		3.3		7.6
54							
55					1.7		7.6
56							
57							
58							
59							9.3
60							2.9
							5.8

[1] Data for 1990-92 from Roelke (1990) and Roelke and Glass (1992); for mercury concentrations in previous years, see Roelke (1990).
[2] Value shown is the mean of reported concentrations.
[3] Analysis of hair by automated cold vapor technique at FDEP.

Table 8. Thyroid hormone levels in free-ranging Florida panthers captured this FY.

FP#	T_3[1] (ng/ml)	T_4[2] (g/ml)
16	0.75	1.2
19	-	-
23	0.95	2.4
36	0.8	2.3
40	0.65	1.8
46	0.31	0.87
51	NR[3]	2.4
55	0.65	1.8
58	NR	1.2
59	NR	2.3
60	0.95	1.8

[1] T_3 = triiodothyronine.
[2] T_4 = thyroxine.
[3] NR = not reported.

Table 9. Status and location of captive Florida panthers as of June 30, 1996 (Dunbar 1995).

ID#	Sex	Age (years)	Location	Status
FP21	F	10	White Oak Plantation	FiV Positive. Healthy upon annual exam.
FP201	M	6	White Oak Plantation	Unilateral cryptorchid. Grade I/VI heart murmur. Healthy upon annual exam.
FP202	M	6	White Oak Plantation	Grade III/VI heart murmur, otherwise healthy upon annual exam.
FP203	M	7	White Oak Plantation	Small left testicle. Healthy upon annual exam.
FP204	F	6	White Oak Plantation	Lobectomy performed in 1992 due to bacterial pneumonia. Grade III/IV heart murmur, otherwise healthy upon annual exam.
FP207	M	5	Lowry Park	Bilateral cryptorchid. Orchiopexy performed in 1992. Testicular biopsy performed in 1993 and is sterile.
FP208	F	4	Lowry Park	Healthy upon annual exam.
FP209	F	4	Jacksonville Zoo	Grade I rear leg lameness due to injury as kitten. Placed into captivity 08-20-92. Sick twice in 1993 (no diagnosis). Healthy upon annual exam.
FP210	M	4	Jacksonville Zoo	Placed into captivity 08-20-92. Healthy upon annual exam. Separated 10/93 from sibling FP209 due to near breeding age.