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Statewide Wildlife Research

State: Florida

Study No. 7506

Project Title: Florida Panther Research

Study Title: Florida Panther Biomedical Investigation

Period Covered: 1 July 1994 - 30 June 1995

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Abstract: Veterinary medical management to reduce capture-associated mortality; provide medical care to promote health and increase survival; and to conduct biomedical research to further the understanding of disease, nutrition, and reproductive physiology continued as an integral part of Florida panther (Felis concolor coryi) recovery. Nine panthers were captured this period; 6 adults, 1 juvenile, and 2 kittens. Parasitism and high blood mercury concentrations continue to be major health concerns. Apparent immune system depression caused by a combination of factors including genetic depression, chronic mercury toxicosis, and pesticide toxicosis led to a variety of health problems in panthers. This study found high levels of certain organochlorines and PCB's in some panthers upon necropsy. A plan for genetic restoration was approved this fiscal year and led to the release of eight young female western cougars into south Florida to breed with Florida panthers. Veterinary involvement in this project included the health screening and quarantine of these animals. Five panther deaths were documented this period; three of four had cardiac atrial septal defects.

The endangered Florida panther (Felis concolor coryi) is estimated to number less than 50 adult individuals and currently is protected under both state and federal endangered species statutes. This remnant population of the subspecies that once occupied the entire southeastern United States is now isolated in the remote cypress swamps and hardwood hammocks of southern Florida, primarily in the Big Cypress Swamp and Everglades ecosystems (Belden 1986). Human population growth in southern Florida and the concomitant loss of suitable panther habitat have been and continue to be major threats to the continued survival of this rare mammal. A detailed review of the life history and status

of the panther is presented in the United States Fish and Wildlife Service Recovery Plan (USFWS 1987).

The critically small population size of the Florida panther makes the subspecies particularly vulnerable to demographic catastrophes. Chance events such as periodic road-kills, illegal hunting, or loss of prey species can be devastating to very small populations. In addition, disease outbreaks caused by adventitious agents are a constant threat to small populations, especially when those populations become relatively inbred over time (O'Brien and Evermann 1988). Decreased genetic diversity, increased neonatal mortality, abnormal reproductive traits, and lowered disease resistance often accompany such inbreeding in mammals (O'Brien et al. 1983 and 1985). There is reason to believe that the Florida panther is presently experiencing many of these problems (Roelke and Glass 1992; Seal et al. 1992; Dunbar 1994).

Consequently, genetic variability and health of the Florida panther must be restored for the taxon to survive even with adequate habitat preservation and other enhancement measures. Genetic restoration of the Florida panther is possible and feasible because its historic source of genetic variability, from which it is now isolated, still exists abundantly throughout much of western North America.

A plan for genetic restoration and management of the Florida panther was developed in September, 1994 (Seal 1994), and a Final Environmental Assessment for the Genetic Restoration of the Florida Panther (USFWS 1994) was approved by the U.S. Fish and Wildlife Service on 20 December 1994. The goal of genetic restoration is to reverse the consequences of inbreeding by introducing western

cougars (*E. c. stanleyana*) into the south Florida panther population for intercrossing (Florida Game and Fresh Water Fish Commission 1995) and to monitor various aspects of population parameters including an anticipated increase in genetic variability and the resulting reduction in frequency of maladaptive traits.

The genetic restoration project involves initially introducing eight, and later, additional female Texas cougars into south Florida to establish and breed with free-ranging Florida panthers. The threat of infectious disease in translocation programs is an issue of major concern because of the inherent risks involved with the introduction of pathogens into wild populations of naive animals or visa versa. Therefore, health screening of candidates prior to release will be essential.

Preliminary research on the diseases and parasites of wild panthers was initiated in 1978. This was expanded in 1983 through a collaborative effort between the College of Veterinary Medicine at the University of Florida and the Florida Game and Fresh Water Fish Commission (GFC), which supported a 3-year veterinary residency position in Wildlife Medicine from 1983 to 1986 funded by the GFC. The continuation of biomedical research since 1 July 1986 was facilitated by the creation of a full-time wildlife veterinarian position with the GFC in 1986.

One of the primary objectives for the newly established veterinary position was to provide high-quality medical care and insure safe handling during the capture and immobilization of free ranging and captive panthers. Since that time, the intensity and scope of the project's objectives have expanded to

encompass many facets of medical management and biomedical research, including the study of infectious diseases and parasites, mortality, pathology, environmental contaminants, reproductive physiology, and genetics. Many data have been generated dealing with these topics, and some are presented here, the breadth of which is unparalleled in most free-ranging carnivore studies.

The primary objective of this study is to document and elucidate the various biomedical factors that are contributing to the extinction of the Florida panther. It is hoped this objective will be met through the present multi-disciplinary approach. Furthermore, management strategies will be developed that will promote the recovery of the Florida panther.

Continuation of this project should reduce capture-related mortalities, increase survival rates for individual panthers requiring veterinary medical attention, and promote an understanding of the role that disease, parasites, nutrition, and genetic diversity play in the population dynamics of the Florida panther.

This document also serves as the annual performance report for work conducted under the contract entitled "Studies on Certain Health and Reproductive Parameters of the Florida Panther", D. J. Forrester, principal investigator. This yearly contract, covering 1 July 1994 through 30 June 1995, was between the GFC and the Department of Infectious Diseases, College of Veterinary Medicine, University of Florida, Gainesville, FL.

I wish to thank the many individuals who contributed their time and effort to the Florida Panther Biomedical Investigation over the past year including field biologists Ken Johnson, Chris Belden, Walter McCown, E. Darrell Land, Jayde

Roof, Mark Lotz, and Deborah K. Jansen for their efforts in location, capture, and handling of panthers and Roy and Rowdy McBride, houndsmen, without whose expertise and efforts this project would be nearly impossible to accomplish. I thank Buck Thackary of the Big Cypress National Preserve for this assistance in planning, organization, and field assistance. I also acknowledge Jim Krakowski and Larry Richardson of the U.S. Fish and Wildlife Service and Mike Petty and Mike Owens of Fakahatchee Strand State Preserve for their willing assistance in planning, coordination, and field captures. I express my appreciation to veterinary assistants Mark Cunningham, Randy Roth, Pauline Nol, and Dr. Dave Rotstein for their hard work and support given to the panther project throughout the past year. 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, Dr. Charles Facemire of the U.S. Fish and Wildlife Service, Dr. Jim Evermann of Washington State University, Dr. Fred Scott of Cornell University, Laurie Wilkins of the Florida Museum of Natural History, and finally, Drs. Donald Forrester, Ellis Greiner, Paul L. Nicoletti, and Paul Gibbs of the University of Florida. I wish to thank Grace McLaughlin for her assistance with parasite collection and data analysis. Also thanks to Drs. Scott Citino of White Oak Plantation, David Murphy of Lowry Park Zoo, and Douglas Paige of Jacksonville Zoo for their care of captive Florida panthers.

METHODS

Radio telemetry from aircraft and ground tracking with dogs were used to locate radio-instrumented panthers. Non-radio-collared panthers were also

located using dogs. Panther kittens were located by visual search of an area where a suspected parturient female had been repeatedly located.

Environmental factors, as well as health and level of stress of each panther, were evaluated at each capture site to determine potential risk of immobilization and capture. If risk was acceptable, a compressed air Vario® dart rifle (Telinject® USA, Inc.) was used to inject immobilizing drugs, Ketamine hydrochloride (Ketamine®), 8-9 mg/Kg, and Tiletamine hydrochloride and Zolazepam hydrochloride (Telazol®, Fort Dodge), 2-3 mg/Kg in combination.

Tranquilized panthers were removed from the tree by hand or allowed to fall into a net and cushioned "crash bag" as described by McCown et al. (1990). Panthers were monitored for vital signs and depth of anesthesia. Arterial blood oxygen saturation was measured using a portable pulse oximeter (Nellcor®, Inc., Hayward, California). Additional immobilizing drugs were administered as needed to maintain appropriate anesthesia enabling sample collection. An intravenous catheter was installed in the cephalic or saphenous vein, and isotonic fluids (lactated ringers) were administered to maintain adequate blood volume and pressure. Each panther was examined and, after stabilization, was radio-instrumented and released. Additionally, body measurements and biological samples including blood, urine, skin biopsy, feces, hair, saliva, viral and bacterial culture swabs, and ectoparasites were collected as previously described (Roelke 1990). Samples were collected predominantly between January and May.

Each panther and quarantined Texas cougar received vaccinations for antibody protection against the viral agents feline panleukopenia, feline calicivirus, feline viral rhinotracheitis (Fel-O-Vax®, Fort Dodge), and rabies

(Imrab®, Pitman Moore); all killed virus vaccines. Additionally, injectable anthelmintic drugs praziquantel (Droncit®, Haver) and ivermectin (Ivomec®, Merk & Co.) were administered to reduce parasitic infection.

Serum, collected from blood clot tubes, was analyzed for chemistry profiles and antibodies to the following disease agents: Feline calicivirus (FCV), feline enteric corona virus/feline infectious peritonitis virus (FECV/FIP), feline immunodeficiency virus/puma lentivirus (FIV/PLV), feline panleukopenia virus (FPV), feline viral rhinotracheitis virus (FVR), and feline leukemia virus (FeLK). Feline calicivirus, FPV, and FVR values were reported for samples obtained prior to vaccination with the killed preparation of these 3 viral vaccines.

Whole blood in EDTA was analyzed for complete blood count (CBC) and smears were prepared on glass slides for microscopic evaluation for intracellular parasites and microfilaria.

Skin biopsies were taken as described by Roelke (1990) from some Florida panthers and from eight quarantined Texas cougars for genetic analysis using mitochondrial DNA and nuclear markers at the Laboratory of Viral Carcinogenesis, National Cancer Institute (Frederic, Maryland) according to techniques described by O'Brien et al. (1990).

Hair and/or whole blood were collected from free-ranging panthers captured during routine immobilizations and from quarantined cougars and was analyzed for mercury. Liver, kidney, muscle, brain, hair, and blood were collected at necropsy from dead panthers. All samples were stored at either -10°C or -75°C until submitted for analysis. The reference laboratory used this period to

analyze panther and cougar tissue was the Mississippi State Chemical Laboratory, Mississippi State University, Mississippi State, Mississippi, and the Chemistry Laboratory, Florida Department of Environmental Protection, Tallahassee, Florida, both using the Cold Vapor Atomic Adsorption Method.

Dead Florida panthers were subjected to complete post mortem examination by board-certified pathologists at VMTH, University of Florida. Analysis included gross and microscopic examination of tissues, serology, bacteriology, parasitology, and radiography. Attempts were made to collect and preserve living spermatozoa, ova, and skin from fresh specimens. Hides and skeletal remains were deposited in the Florida Museum of Natural History, Gainesville, Florida.

Ten fat samples which had been collected from panthers that died from 1983 through 1992 and stored at -70°C were sent to Mississippi State Chemical Laboratory, Mississippi State, Mississippi, for analysis of organochlorine pesticides and polychlorinated biphenyls (PCBs) this fiscal year.

The 10 samples were extracted by two methods, the "micro" method and the conventional Soxhlet method. The Soxhlet method is more universally accepted and provides lipid values, while the micro method would hopefully recover kepone, a suspected estrogen mimic. Both methods involve extraction, liquid-liquid partition, and open column chromatographic clean-up prior to analysis by dual-megabore column, electron capture gas chromatography (EC/GC).

Florisil clean-up (6%, 15%, and 50% fractions) was performed on all the samples by both methods, and the 6% florisil fraction of all samples was subjected to further clean-up by silicic acid.

The lower levels of quantitation (LLQ) for the various analytes are listed at the bottom of the report sheets. This is the lowest level of an analyte that can be quantified with confidence, typically 3-5 times the limit of detection. The values reported as "trace" amounts are detected but are below the LLQ. Results are reported on a whole tissue/wet weight basis.

Eight western cougars (F. c. stanleyana) were captured in western Texas for genetic restoration of the Florida panther and transported either to Houston Zoological Gardens, Houston, Texas (n=4) or to GFC, Wildlife Research Laboratory (WRL), Gainesville, Florida (n=4), for examination and quarantine. Cougars were quarantined for a period of at least 30 days. Close observation was made to note appetite, attitude, behavior, and condition of each animal. The attending veterinarian took appropriate samples to diagnose any abnormal condition and administer appropriate therapy.

Each animal received a complete physical examination including body weight, measurements, dental exam (prophylaxis if needed), note of any congenital abnormalities, pregnancy determination, and examination for heart murmurs upon quarantine. Appropriate biomedical samples were collected for various analyses including CBC, serum chemistry, serology, parasite evaluation, and genetic analysis during the initial examination. Animals were given appropriate treatments including vaccinations and anthelmintics.

RESULTS AND DISCUSSION

Free-Ranging Florida Panthers

Nine Florida panthers were captured this period; four (FP#32, 45, 48, and 52) for routine changing of radio collars, one (FP#11) to replace a radio collar that previously had failed, two (FP#57 and 58) newly captured to attach radio collars, and two kittens (FP#48K16 and FP#48K17) of FP#48 which were approximately two weeks old. Florida panther #51 was treed and given anthelmintic treatment on three occasions but was not captured.

Health and Physical Condition--Florida panther #32 which has not recently produced any kittens, was examined and found with a severe case of vaginal papillomas. Two of the nine living radio-collared female panthers, two have severe vaginal papillomas, three have minor cases, and four have none. This condition has been studied by Dr. Bruce Homer, University of Florida, and others, and no etiology could be found. Immunohistochemical screening for papillomavirus group-specific antigens was conducted on two biopsy specimens, but results were negative. Lesions appear to be progressive over time, however spontaneous regression has occurred (Dunbar, unpub. data). Dr. Homer has given the term "Proliferative Vestibulo -Vaginitis" to the condition. Investigations will continue on this problem.

Florida panther #51 was believed to have an infestation of the mange mite Notoedres cati because alopecia (hair loss) was severe, and FP#32 and FP#208 were diagnosed earlier with this condition. However, repeated treatment with the anthelmintic ivermectin has yielded negative results. It is now believed that ringworm, a fungul infection of the skin, may be the cause of this condition.

Florida panther #58, a juvenile male, was recently diagnosed with an infection of the fungus Trichophyton sp., causing alopecia in this cat. Treatment options are limited for panthers infected with Trichophyton sp. and usually consists of long-term (6-8 weeks) treatment.

Florida panther #58, a 13-month-old male, was found to be thin and underweight (52 lbs compared to a normal of 80 lbs). Also, blood values indicated the cat was anemic. Internal parasitism especially by Ancylostoma pluridentatum and Alaria sp. was severe even 3 months after anthelmintic treatment. Ancylostoma pluridentatum can be detrimental to young panthers (Dunbar et al. 1994). Although mercury concentrations were relatively low (0.038 ppm) in the blood of this cat, hair levels were high (13.0 ppm). The blood mercury concentration in the dam (FP#36) of this cat was also quite high (1.60 ppm) and may have affected the health of this juvenile, FP#58.

Florida panther #11, a 13-15-year-old female, was found thin and in poor condition, probably related to old age.

Florida panther #57, a young breeding-age female, captured for the first time this year was found to be in apparently good condition except for elevated blood levels of mercury (0.53 ppm).

No biomedical problems due to capture, immobilization, or handling were encountered this period.

General information on radio-collared panthers can be found in Table 1.

Hematology and Serum Chemistry--Blood values of four of the seven non-kitten panthers captured this period were considered normal and three were considered anemic. All but one of seven panthers had high eosinophil values

ranging from 7 to 15% of the total white blood cell count. High eosinophil counts are often considered to be a sign of above-average parasitism.

Hematological values for the 2-week-old kitten (FP#48K17) indicated the kitten was anemic with a low RBC value (4.9×10^3) and a low Hgb value (7.0 gm/dl).

Values for serum chemistries of all cats captured were considered normal considering the animals apparent stress due to immobilization and capture.

Mean ($\pm$ SD) hematological and serum chemical values for free-ranging Florida panthers analyzed from data collected from 1983 to 1994 can be found in Table 2. These data are being presently incorporated into a manuscript for publication.

Sero-epidemiology--Seven panthers captured this period were tested for antibodies to FCV, FECV/FiP, FiV/PLV, FPV, FVR, and FeLV. All were negative for FiV (by Western Blot and Elisa Tests) and negative for FeLV (by Elisa Test). Results for other viruses were unremarkable, except FP#32 had a high titer (1:512) to FCV. Data on seroprevalence to selected disease agents can be found in Table 3.

Florida panthers #51 and #12 were positive for antibodies to bluetongue virus (or epizootic hemorrhagic disease virus). This is the first known report of positive titers to Bluetongue virus found in panthers or in any carnivore in North America (Alexander et al. 1994). This disease has been reported to be fatal in pregnant domestic dogs (Akita et al. 1994). Its significance to Florida panthers is unknown. Research into the prevalence and significance of bluetongue infection in Florida panthers will continue. Blood samples will be obtained upon the next capture of FP#51, and an attempt will be made to isolate the virus.

Parasites--Fecal samples were collected from eight panthers this period and analyzed for parasite eggs. No new species of parasites, not previously found in panthers, were identified. Occurrence and prevalence of endoparasites in panthers from July 1990 to June 1995 can be found in Table 4.

Notoedres cati was suspected as a cause of alopecia in FP#51. However, response to treatment was negative. It is suspected this panther may have a fungal infection due to Trichophyton sp.

Alaria sp. continues to be found in panther kittens ≤ 2 weeks of age. It is believed this trematode is passed to the kitten from the dam via colostrum. However, no adverse effects due to this parasite have been identified.

The hookworm, Ancylostoma pluriidentatum, continues to be found in large numbers in most panthers and may be causing poor growth and mortality in some kittens (Dunbar et al. 1994).

Toxicology--Concentration of mercury in free-ranging panthers (Table 5) varies by individual panther rather than geographic area when four areas were compared (Table 6, 7, 8, and 9). However only one panther (FP#16) now frequents the Everglades National Park, where mercury has traditionally reached high levels in panthers. Mercury concentration in the blood of FP#16, collected in 1994, is the lowest in 5 years (Table 7).

Blood mercury concentrations have been found to be high in some panthers in areas such as the FPNWR and in the "addition lands" of the BCNP. However, high blood mercury levels cannot be found in all panthers inhabiting these areas, suggesting that individual diet as well as geographic area of panthers may influence mercury levels.

Mercury concentrations in dead panthers determined at necropsy can be found in Table 10.

Mercury contamination in free-ranging Florida panthers still poses a major health problem. Its source remains unknown. Continued aggressive research by GFC as well as other state and federal agencies is needed to determine the source and curtail its contamination of the ecosystem.

Pesticides studies in the 1970's in the Big Cypress National Preserve detected only small amounts in water and sediments. However, this study on pesticides in Florida panthers has detected very high levels of some PCB's, especially Arochlor 1260, and organochlorines, especially P, P' -DDE. Highest concentrations (PPM, wet weight) in fat of dead panthers (Table 11) were found in those inhabiting Everglades National Park. However, panthers in other areas also had significant concentrations of the compounds.

Florida panther #27, which inhabited the ENP and is believed to have died from mercury toxicosis, had very high levels of Arochlor 1260, which apparently contributed to her death. Based on these data and high levels of these chemicals found in other panthers that inhabited ENP, it seems reasonable to assume that the extinction of the Florida panther in the ENP may have been caused to a large extent by exposures to lethal concentrations of PCB's and organochlorines as well as mercury. Although these organochlorines and PCB's are not considered as estrogen mimics as was suggested by Facemire et al. (1995), they may be of sufficient concentration to cause direct mortality and loss of production. Further research into the effects of environmental contaminants and possible ways to reduce any on-going contamination of this ecosystem is necessary. Regardless

of the success of the genetic restoration program, the environmental contamination issue must be addressed to prevent extinction of the Florida panther.

Panther Mortality--Five Florida panther deaths were documented this fiscal year and included FP#12, 26, 38, 42, and 52. Florida panther #12, a 13-year-old male, died as a result of injuries sustained in a fight with another male (intraspecific aggression). He had a small cardiac atrial septal defect. Florida panther #26, an 11-year-old male, also died of intraspecific aggression. Florida panther #38, an 8-year-old non-producing female, died of pleuritis, a bacterial infection of the thoracic cavity. No cause of this infection could be found. She had a high hair mercury concentration (11.0 ppm) and a small atrial septal defect. A necropsy of Florida panther #42 is pending. Florida panther #52, a four-year-old female, died as a result of injuries sustained in a collision with a vehicle. She also had an atrial septal defect.

Captive Florida Panthers

Nine Florida panthers remain in captivity. See Table 12 for their status and captive location. Reproductive research is being conducted by the National Zoological Park, Washington, D.C., on captive female panthers at White Oak Plantation. Results of the study are unavailable.

Western Cougars

Eight western cougars (E. c. stanleyana) were captured this period in west Texas for release into south Florida as part of the genetic restoration program.

These cougars underwent extensive medical examination, testing, and quarantine before release into south Florida. See Table 13 for information on status, quarantine facility, and release site and date.

Data on hematology and serum chemistry can be found in Table 14. Tables 14 and 15 can be used to compare blood values among Florida panthers and western cougars.

Data on blood mercury concentrations in western cougars prior to release are presented in Table 16. Data on parasites found in western cougars before and after anthelmintic treatments can be found in Table 17. Data on antibody titers to selected diseases and on other tests performed on unvaccinated western cougars for determination of exposure to selected diseases can be found in Table 18. Western cougars quarantined in Florida prior to release in south Florida contracted Cytauxzoon felis from ticks carrying the protozoan intracellular blood parasite. This organism was detected upon examination of fresh blood smears. Hematological values reflected the severe anemia that occurred after infection. However, no obvious clinical signs were observed. Blood values reached near normal levels 2 to 3 weeks after initial infection. Cougars were then carriers of the disease, as are Florida panthers.

Blood hormone concentrations found in western cougars can be found in Table 19. Pregnancy status of the eight females was determined by using serum progesterone levels. Values ≥ 5.0 ng/ml progesterone were considered diagnostic for pregnancy (Dunbar, unpub. data). Only one of the eight cougars was determined to be pregnant, and is pregnant as of this time.

Six of eight cougars have been released into south Florida by the end of this reporting period; the remaining two will soon be released. All were young breeding age females and were in excellent health.

Data collected prior to release will be compared to data collected after release to determine suitability of habitats and adaptability of cougars to south Florida. The production of F¹ generations by these females will mark the beginning of a successful genetic restoration program that should benefit the Florida panthers.

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Table 1. Status of living, free-ranging, radio-collared Florida panthers as of 30 June 1995.

FP#	Sex	Dob	Age (years)	Gene- tics ¹	Date ²	Loca- tion ³	Wt. (lbs.)	Crypt- orchid	Cow- lick	kinked Tail	Special Problems
9	F	80-82	12-14	A	1/21/94	FSSP	75	-	Y	Y	thin, dehydrated
11	F	80-82	13-15	A	5/9/95	FPNWR	78	-	Y	Y	thin, poor haircoat severe papillomas
16	M	6/85- 12/85	8.5	P	2/5/94	BCNP	121	N	Y	Y	
19	F	86	8	A	2/21/94	FPNWR	90	-	Y	Y	
23	F	8/86	8	P	6/2/93	CDU	61	-	Y	N	
32	F	87	8	A	1/11/95	FPNWR	70	-	Y	Y	thin, large papillomas
36	F	85-88	6-9	A	2/22/94	SIR	83	-	Y	N	
40	F	87-88	5-6	A	1/24/94	ACQ	70	-	Y	N	lost collar
45	M	10/90	4	A	1/12/95	SIR	134 ⁴	Y	Y	Y	right auricular nerve damage
46	M	89-90	4-5	A	1/26/94	PL	125	Y	Y	Y	
48	F	10/91	3	A	1/9/95	BI	70	-	Y	Y	
49	F	90	4	A	2/25/92	ACQ	72	-	Y	N	collar not working
51	M	89-90	4-5	A	1/19/94	FPNWR	116	N	Y	Y	Alopecia (fungal) ⁵
54	M	3/92	2	A	1/17/94	FPNWR	108	N	N	Y	
55	F	1/93	1.5	P	1/25/94	CDI	58	-	N	Y	
56	F	92	2	A	2/3/94	ACQ	68	-	Y	Y	
57	F	92	3	A	1/31/95	FPNWR	83	-	N	Y	
58	M	4/94	1	A	5/16/95	ACQ	52	-	N	Y	<i>Trichophyton</i> ⁶

¹ A=Authentic Florida panther P=Hybrid Florida panther of Piper stock² Date of last capture³ Location of last capture⁴ Weight recorded in 1993⁵ Presumptive diagnosis⁶ Definitive diagnosis (fungal)

DATA NOT FOR PUBLICATION

Table 2. Mean hematological and serum chemistry values from free-ranging (non-kitten) Florida panthers samples 1983-1994¹.

Parameter	n	Mean	SD	Minimum	10th percentile	Median	90th percentile	Maximum	Lower limit of 95% CI	Upper limit of 95% CI
Albumin (gm/dl)	97	4.549	8.102	2.800	3.200	3.700	4.100	83.400	0.000	20.633
Alkaline phosphatase (u/l)	97	35.047	38.210	4.000	6.000	15.000	98.000	158.000	0.000	110.894
Basophils (%)	19	0.895	0.567	0.000	0.000	1.000	2.000	2.000	0.000	2.086
Basophils (x 10 ³ /mc1)	19	0.099	0.063	0.000	0.000	0.111	0.180	0.238	0.000	0.232
Blood urea nitrogen (mg/dl)	97	38.075	14.210	13.000	23.000	35.000	59.000	73.000	9.869	66.282
Calcium (mg/dl)	97	9.836	0.926	3.700	9.000	9.900	10.800	11.600	7.998	11.674
Cholesterol (mg/dl)	97	147.774	26.381	84.000	112.000	151.000	182.000	207.000	95.408	200.140
Chloride (meq/l)	97	115.381	4.415	103.000	110.000	115.000	121.000	127.000	106.619	124.144
CO2 (meq/l)	97	14.434	4.012	2.000	10.000	14.000	19.000	27.000	6.470	22.398
CPK (u/l)	91	544.473	490.174	110.000	249.000	402.000	865.000	3494.000	0.000	1518.288
Creatinine (mg/dl)	97	1.854	0.547	0.900	1.100	1.800	2.500	3.500	0.768	2.939
Eosinophils (x 10 ³ /mc1) ²	79	0.419	0.307	0.000	0.098	0.333	0.834	1.314	0.000	1.031
GGT (u/l)	83	1.488	1.090	0.000	0.000	1.000	3.000	4.000	0.000	3.657
Glucose (mg/dl)	97	155.030	51.703	77.000	95.000	144.000	237.000	324.000	52.401	257.659
Hemoglobin (g/dl)	98	12.185	1.791	7.900	10.200	12.050	14.500	16.900	8.630	15.739
Inorganic phosphorus (mg/dl)	97	5.741	1.490	2.700	3.700	5.600	7.800	10.100	2.783	8.700
Potassium (meq/l)	97	4.587	0.476	3.600	4.100	4.500	5.200	7.200	3.641	5.532
Lactic dehydrogenase (u/l)	95	276.074	176.124	60.000	120.000	215.000	523.000	862.000	0.000	625.773
Lymphocytes (%)	97	28.867	14.421	3.000	11.000	28.000	48.000	70.000	0.241	57.493
Lymphocytes (x 10 ³ /mc1)	97	3.442	1.763	0.378	1.386	3.256	5.760	8.460	0.000	6.943
Mean cell hemoglobin (pg)	96	16.657	3.383	13.000	15.000	15.800	18.700	37.500	9.940	23.374
Mean cell hemoglobin conc. (g/dl)	96	34.385	5.512	15.100	29.800	33.800	37.600	73.200	23.443	45.328
Mean cell volume (fl)	98	47.331	2.972	35.600	44.700	46.850	51.200	57.000	41.431	53.230
Monocytes (%)	81	3.563	4.078	0.000	1.000	3.000	7.000	32.000	0.000	11.679
Monocytes (x 10 ³ /mc1)	81	0.427	0.472	0.000	0.106	0.320	0.869	3.360	0.000	1.367
Sodium (meq/l)	97	152.513	3.481	142.000	149.000	153.000	157.000	167.000	145.604	159.423
Segmented neutrophils (%)	96	64.211	14.249	24.000	48.000	65.000	82.000	96.000	35.923	92.500
Segmented neutrophils (x 10 ³ /mc1)	96	8.054	3.074	1.800	4.042	8.063	12.546	17.146	1.952	14.157
NUC (/100)	11	1.455	1.036	1.000	1.000	1.000	3.000	4.000	0.000	3.762
Packed cell volume (%)	98	36.005	5.747	19.300	29.800	35.250	43.300	55.200	24.600	47.410
Platelets	83	394.530	133.572	37.000	244.000	403.000	541.000	867.000	128.812	660.248
RBC (x 10 ⁶ /mc1)	98	7.557	1.141	3.780	6.110	7.620	9.000	10.870	5.293	9.822
rdw	85	21.891	5.619	11.400	17.700	20.800	30.600	46.000	10.716	33.065
Reticulocytes (%)	67	1.067	0.795	0.100	0.300	0.900	2.400	3.900	0.000	2.654
Serum glutamic-oxalacetic transam. (u/l)	97	73.509	76.747	26.000	37.000	53.000	106.000	559.000	0.000	225.851

Table 2. (continued)

Serum glutamic-pyruvic transam. (u/l)	97	59.680	34.576	21.000	33.000	52.000	92.000	230.000	0.000	128.313
Total bilirubin (mg/dl)	97	0.311	0.715	0.000	0.100	0.170	0.440	5.800	0.000	1.731
Total protein (g/dl)	96	7.361	0.663	5.400	6.400	7.400	8.200	8.700	6.045	8.678
Uracil (mg/dl)	95	0.557	0.589	0.000	0.200	0.400	1.100	5.100	0.000	1.727
WBC ($\times 10^3/\text{mcl}$)	98	12.281	3.248	5.100	8.100	12.350	16.200	23.000	5.835	18.726
Weight (lbs)	89	87.955	29.519	33.000	47.000	86.000	128.000	148.000	29.293	146.618
Eosinophils (%) ³	79	3.367	2.125	0.000	1.000	3.000	6.000	9.000	0.271	8.668
Iron (mcg/dl)	91	66.593	39.866	10.000	33.000	62.000	101.000	271.000	13.882	145.293
Triglycerides (mg/dl) ⁴	88	59.903	116.464	0.000	4.000	18.500	135.000	754.000	0.186	1802.760

¹All samples included in computations (possibly more than one observation per animal).

²Confidence limits for Eosinophils were obtained by backtransformation from analysis in square-root transformed scale.

³Confidence limits for Iron were obtained by backtransformation from analysis in square-root transformed scale.

⁴Confidence limits for Triglycerides were obtained by back-transformation from analysis in log transformed scale.

Table 3. Seroprevalence of infectious disease agents in free-ranging, radio-collared Florida panthers, 1 January 1991 through 22 February 1994, and 23 February 1994 through 30 June 1995.¹

<u>Disease Agent</u>	<u>03/01/91-02/22/94</u> <u>Number of Panthers</u>		<u>02/23/94-06/30/95</u> <u>Number of Panthers</u>	
	Examined/Pos.	% Pos.	Examined/Pos.	% Pos.
Bacteria				
<i>Brucella</i> spp. ²	27/0	0%	NA ¹¹	NA
Protozoa				
<i>Toxoplasma gondii</i> ³	5/0	0%	NA	NA
Viruses				
Bluetongue ⁴	28/3	11%	NA	NA
Feline calicivirus ⁵				
not vaccinated	13/4	31%	1/0	0%
vaccinated	24/16	67%	5/4	80%
Feline enteric coronavirus/ Feline infectious peritonitis				
KELA ⁶	18/0	0%	6/0	0%
IFA ⁷	13/6	46%		
Feline immunodeficiency virus/ puma lentivirus ⁸	11/1	9%	6/0	0%
Feline leukemia virus ⁹	17/0	0%	6/0	0%
Feline parvovirus (panleukopenia virus) ⁵				
not vaccinated	13/3	23%	1/0	0%
vaccinated	24/24	100%	5/5	100%
Feline rhinotracheitis virus (herpesvirus) ⁵				
not vaccinated	13/5	38%	1/0	0%
vaccinated	24/7	29%	5/5	100%
Pseudorabies virus ¹⁰	6/0	0%	NA	NA

Table 3. (continued)

¹Table presents data from the latest capture date for individual panthers.

²Test: Card test. Performed at the College of Veterinary Medicine, University of Florida

³Test: Indirect hemagglutination. Performed at Colorado State University.

⁴Test: Agar gel immunodiffusion. Performed at College of Veterinary Medicine, University of Florida.

⁵Test: Serum neutralization test. Performed at Cornell Feline Health Center.

⁶Test: KELA, kinetics enzyme - linked immunosorbent assay. Performed at Cornell Feline Health Center.

⁷Test: IFA, indirect immunofluorescence assay. Performed at Cornell Feline Health Center.

⁸Test: ELISA, Enzyme-linked immunoabsorbant assay; Western Blot. Performed at Cornell Feline Health Center.

⁹Test: ELISA. Performed at Cornell Feline Health Center.

¹⁰Test: Latex agglutination test. Performed at the College of Veterinary Medicine, University of Florida.

¹¹NA=no test performed.

Table 4. Prevalence of parasites from Florida panthers (*Felis concolor coryi*)¹, July 1990–June 1994 and July 1994–June 1995.

Parasite	July 1990–June 1994		July 1994–June 1995	
	Parasites		Parasite eggs	
	No. panthers Exam/Pos (%Pos)	Parasite eggs from feces No. panthers Exam/Pos (%Pos)	Parasite eggs from feces No. panthers Exam/Pos (%Pos)	
Trematodes				
<i>Alaria marcianae</i>	9/6 (67%)	20/17 (85%)	8/6 (75%)	
<i>Heterobilharzia americana</i>	9/1 (11%)	20/- -	- -	
Cestodes				
<i>Spirometra mansonoides</i>	9/6 (67%)	20/12 (60%)	8/4 (50%)	
<i>Taenia omissa</i>	9/4 (44%)	20/1 (5%)	- -	
Nematodes				
<i>Ancylostoma pluriidentatum</i>	9/9 (100%)	20/17 (85%)	8/6 (75%)	
<i>Ancylostoma caninum</i>	9/1 (11%)	20/- -	- -	
<i>Capillaria aerophila</i>	9/- -	20/2 (10%)	- -	
<i>Dirofilaria striata</i> ²	47/35 (74%)	- -	5/2 (40%)	
<i>Molineus barbatus</i>	9/1 (11%)	20/- -	- -	
<i>Strongyloides</i> spp.	9/3 (33%)	20/3 (15%)	- -	
<i>Toxocara cati</i> & <i>T. Leonina</i>	9/1 (11%)	20/6 (30%)	8/1 (13%)	
Protozoans				
<i>Cytauxzoon felis</i> ³	33/8 (24%)	- -	- -	
<i>Isospora</i> spp.	- -	- -	9/1 (11%)	
<i>Sarcocystis</i> spp. ⁴	- -	- -	- -	
Mites				
<i>Lynxacarus</i> spp.	- -	- -	9/1 (11%)	
<i>Notoedres cati</i> ⁵	/1 -	- -	/1	

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

²Data in first column was collected 1986–1993 (Lamm et al., 1995, in press). Data collected July 1994–June 1995; blood was examined at VMTH, College of Veterinary Medicine, University of Florida.

³Reported positive if the individual panther tested positive at any time during the study period.

⁴*Sarcocystis* spp. found in many panthers though not quantified.

⁵FP#51 is the only living panther that currently has signs suggestive of this disease. FP# 32 has recovered from the disease.

Table 5. (continued)

FP#/Sex location	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
29σ e29					0.210	0.076					
30σ e29					0.300						
31♀ w29					0.350		0.024		0.08 3		
32♀ w29						0.022			0.76 0		0.23 0
33σ e29					0.260						
34σ e29						0.073	0.050		0.03 5		
35σ w29						0.060					
36σ e29						0.035		<0.048		0.180	
37σ w29						0.046					
38♀ rp						0.490		0.070	0.08 0		
39σ enp						2.20					
40♀ e29						0.039		0.154		0.47	
41♀ e29						0.096					
42σ enp/ rp						0.320	0.120		0.08 0		
43σ w29						<0.03 7	0.142				
44σ enp							0.172	0.147	0.11 0		
45σ e29							0.185	0.067	0.13 0		0.09 0
46σ w29								0.147		0.059	
47σ w29								<0.047	0.18		

Table 5. Mercury levels measured in whole blood (ppm; wet weight)¹ in free-ranging Florida panthers from 1985-1995.

FP#/Sex location	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
07♂ rp ²	1.70										
08♀ w29	0.500	0.740	0.920	0.210							
09♀ w29 ³						0.140	1.33		0.50 0	0.140	
11♀ e29 ⁴						0.058		0.160			
12♂ e29					0.240		0.310		0.05 2		
14♀ enp ⁵				0.230		1.10	10.5				
15♀ enp		0.210									
16♂ enp				1.80		2.80	0.210	0.260		0.160	
18♀ w29					0.160						
19♀ w29					0.100	0.110		0.053		0.400	
20♂ e29			0.044								
21♂ enp				0.540							
22♀ enp			0.160	0.220							
23♀ rp				0.510			0.350		0.10 0		
24♂ w29				0.230							
25♂ w29				0.062							
26♀ e29				0.069		0.053		<0.047		0.100	
27♀ enp				1.70							
28♂ e29				0.320		0.024		<0.047			

Table 5. (continued)

FP#/Sex location	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
48♀ w29								<0.047	0.14 0		0.13 0
49♀ e29								0.199			
50♂ e29								<0.046	0.03 2		
51♂ w29								0.049			
52♀ w29									0.10 0		0.11 0
53♂ w29									0.06 0		
54♂ w29									0.13 0	0.510	
55♀ rp										0.050	
56♀ e29										1.60	
57♀ w29											0.53 0
58♂ e29											0.03 8

¹blood samples were sent to the following laboratories for mercury analysis:

Patuxent Analytical Control Facility

Mississippi State Chemical Laboratory

Department of Environmental Protection, Tallahassee, FL

²rp: Principal ranges are located in Raccoon Point of the Big Cypress National Preserve and vicinity

³w29: Principal ranges are located in areas west of State Road 29 and north of State Road 41, including Fakahatchee Strand State Preserve and the Florida Panther National Wildlife Refuge.

⁴e29: Principal ranges are located in areas east of State Road 29 and north of State Road 41, including Bear Island of the Big Cypress National Preserve, private lands, acquisition lands and the Seminole Indian Reservation.

⁵enp: Principal ranges are located in the Everglades National Park.

Table 6. Mercury levels measured in whole blood (ppm; wet weight) in free-ranging Florida panthers west of State Road 29 and north of State Road 41 (Florida Panther National Wildlife Refuge, Fakahatchee Strand State Preserve and vicinity) from 1989-1995.

FP#/Sex	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
08♀	0.500	0.740	0.920	0.021							
09♀						0.140	1.33		0.500	0.140	
18♀					0.160						
19♀					0.100	0.110		0.053		0.310	0.400
24♂				0.230							
31♀					0.350		0.024		0.083		
32♀						0.022			0.760		0.230
35♂						0.060					
37♂						0.046					
43♂						<0.037	0.142				
46♂								0.147		0.059	
47♂								<0.047	0.180		
48♀								<0.047	0.140		0.130
52♀									0.100		0.110
53♂									0.060		
54♂									0.130	0.510	
57♀											0.530
$\bar{x}$	0.50	0.74	0.92	0.13	0.20	0.08	0.50	0.07	0.24	0.25	0.28

Table 7. Mercury levels in whole blood (ppm; wet weight) in free-ranging Florida panthers of the Everglades National Park and vicinity from 1985-1995.

FP#/Sex	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
14♀				0.230		1.10	10.5				
15♀		0.210									
16♂				1.80		2.80	0.210	0.260		0.160	
21♂				0.540							
22♀			0.160	0.220							
27♀				1.70							
39♂						2.20					
42♂						0.320	0.120		0.080 ¹		
X	-	0.21	0.16	0.90	-	1.6	3.61	0.26	0.08	0.16	-

¹FP#42 was captured at Raccoon Point when this blood sample was taken.

Table 8. Mercury levels measured in whole blood (ppm; wet weight) in free-ranging Florida panthers east of State Road 29 and north of State Road 41 (Bear Island, BCNP and vicinity) from 1985-1995.

FP#/Sex	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
11♀						0.058		0.160	0.140		
12♂					0.240		.0310		0.052		
20♂			0.044								
25♂				0.062							
26♀				0.069		0.053		<0.047		0.100	
28♂				0.320		0.024		<0.047			
29♂					0.210	0.076					
30♂					0.300						
33♂					0.260						
34♂						0.073	0.050		0.035		
35♂						0.060					
36♂						0.035		<0.048		0.180	
40♀						0.039		0.154		0.47	
41♀						0.096					
45♂							0.185	0.067	0.130		0.090
46♂								0.147		0.059	
49♀								0.199			
50♂								<0.046	0.032		
56♀										1.60	
58♂											0.038
X	-	-	0.04	0.15	0.26	0.06	0.09	0.10	0.08	0.48	0.06

Table 9. Mercury levels measured in whole blood (ppm; wet weight) in free-ranging Florida panthers of Raccoon Point and vicinity on the Big Cypress National Preserve from 1985-1995.

FP#/Sex	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
07♂	1.70										
23♀							0.350		0.100		
33♂					0.260						
38♀						0.490		0.070	0.080		
42♂						0.320 ¹	0.120 ¹		0.080		
55♀										0.050	
X	1.70	-	-	-	0.26	0.40	0.23	0.07	0.09	0.05	-

¹FP#42 was captured in the Everglades National Park when blood sample was taken.

Table 10. Mercury levels measured in post mortem whole blood (ppm; wet weight) of deceased free-ranging Florida panthers from 1983-1994

FP#	Sex	Location ²	Sample year	Hg (ppm)
01	♂	w29	1983	0.040
07	♂	rp	1985	0.390
13	♂	e29	1987	<0.020
08	♀	w29	1988	0.310
15	♀	enp	1988	0.150
20	♂	e29	1988	0.130
25	♂	e29	1988	0.120
17	♂	e29	1989	0.018
27 ¹	♀	enp	1989	4.10
N8964	♂	w29	1989	0.310
30	♂	e29	1990	0.460
35	♂	w29	1990	0.120
37	♂	e29	1990	0.110
39	♂	enp	1990	10.00 ³
14	♀	enp	1991	1.37
22	♀	enp	1991	1.20
43	♂	w29	1991	0.142
28	♂	e29	1992	0.240
29	♂	e29	1992	0.060
N92742	♀	w29	1992	0.430
N93726	♂	w29	1993	3.40
CC2994	♂	e29	1994	0.520

¹ FP# 27 is believed to have died due to elevated mercury levels.

² See Table 5 for footnote on location.

³ Mercury level in hair was 44 ppm.

DATA NOT FOR PUBLICATION

Table 11. Concentrations (PPM) of environmental contaminants in fat of dead Florida Panthers collected 1983-92.

Residues Found	#01	#13	#14	#27	#30	#35	#37	#39	#206 ³	#205 ³
β-BHC	ND ¹	ND	ND	ND	ND	ND	ND	ND	ND	ND
γ-BHC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
α-Chlordane	Trace ²	ND	0.010	0.016	ND	ND	ND	ND	ND	ND
Cis-Nonachlor	ND	0.012	0.053	0.20	0.027	0.013	ND	0.24	ND	ND
o,p'-DDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o,p'-DDT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDD	ND	0.067	ND	ND	ND	ND	ND	ND	ND	ND
p,p'-DDE	1.1	6.7	1.2	23.	0.98	0.80	0.62	13.	0.36	0.21
p,p'-DDT	0.010	0.24	ND	ND	ND	ND	ND	ND	0.017	0.011
Dieldrin	ND	ND	ND	0.20	0.010	ND	ND	0.084	0.050	0.026
Endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Kepone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mirex	0.058	0.079	0.12	0.39	0.038	0.026	0.020	0.89	0.011	ND
Oxychlordane	0.088	0.19	2.1	0.90	1.1	0.35	0.016	0.71	0.031	0.063
PCBs (Ar 1260) ¹	1.2	2.7	9.4	15.	1.7	1.5	1.3	22	0.40	0.32
Trans-Nonachlor	0.12	0.28	2.1	1.5	0.63	0.31	0.023	1.5	0.024	0.056
HCB	ND	0.010	Trace	ND	Trace	Trace	ND	ND	0.010	0.010
Heptachlor Epoxide	0.019	0.010	0.071	0.12	0.032	0.027	Trace	0.11	0.037	0.035
Chlorpyrifos	Nd	0.010	0.010	ND	ND	0.024	0.020	ND	0.012	ND
Sample Wt (g)	0.6287	0.9092	0.7160	0.2334	0.9507	0.8012	0.8769	0.5459	0.6267	0.7630

Table 11. (continued)

% Lipid	94.2	92.1	59.2	83.8	98.7	85.6	96.3	93.2	95.4	95.0
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¹ND = None Found @ the following Lower Limits of Quantitation (LLQ):

Organochlorines (except Kepone) = 0.010 ppm

PCBs = 0.050 ppm

Kepone = 0.10 ppm

²Trace = Below LLQ but detected

³Captive at time of sampling

Table 12. Status and location of captive Florida panthers as of 30 June 1995.

ID#	Sex	Age (years)	Location	Status
FP21	F	9.0	White Oak Plantation	FiV Positive. Healthy upon annual exam.
FP201	M	5.0	White Oak Plantation	Unilateral cryptorchid. Grade I/VI heart murmur. Healthy upon annual exam.
FP202	M	5.0	White Oak Plantation	Grade III/VI heart murmur, otherwise healthy upon annual exam.
FP203	M	6.0	White Oak Plantation	Small left testicle. Healthy upon annual exam.
FP204	F	5.0	White Oak Plantation	Lobectomy performed in 1992 due to bacterial pneumonia. Grade III/IV heart murmur, otherwise healthy upon annual exam.
FP207	M	4.0	Lowry Park	Bilateral cryptorchid. Orchiopexy performed in 1992. Testicular biopsy performed in 1993 and is sterile.
FP208	F	3.0	Lowry Park	Healthy upon annual exam.
FP209	F	3.0	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	3.0	Jacksonville Zoo	Placed into captivity 08-20-92. Healthy upon annual exam. Separated 10/93 from sibling FP209 due to near breeding age.

Table 13. Status of female western cougars captured in west Texas and released in south Florida in 1995.

TX#	Date of capture ⁶	Quarantine facility	Duration of quarantine	Date of release	Location of release
101		Houston Zoological Gardens, Houston, TX	02/16/95-03/27/95	04/05/95	Bear Island, BCNP ¹
102		Houston Zoological Gardens, Houston, TX	02/16/95-03/27/95	04/05/95	Bear Island, BCNP
103		FGFC ² , Research Lab, Gainesville, FL	03/22/95-04/26/95	05/04/95	Stair Steps Unit, BCNP
104		Houston Zoological Gardens, Houston, TX	02/16/95-03/24/95	03/30/95 ³	FSSP ⁴
105		FGFC, Research Lab, Gainesville, FL	05/31/95-06/30/95	07/05/95	Long Pine Key, ENP ⁵
106		Houston Zoological Gardens, Houston, TX	02/16/95-03/24/95	04/09/95 ³	FSSP
107		FGFC, Research Lab, Gainesville, FL	03/20/95-04/26/95	05/04/95	Raccoon Point, BCNP
108		FGFC, Research Lab, Gainesville, FL	05/31/95-07/26/95	07/26/95	Long Pine Key, ENP ⁵

¹BCNP=Big Cypress National Preserve.

²FGFC=Florida Game and Freshwater Fish Commission.

³Held in GFC pen in Fakahatchee Strand State Preserve until release. TX#104 was prematurely released.

⁴FSSP=Fakahatchee Strand State Preserve.

⁵ENP=Everglades National Park.

⁶Data on capture dates not yet available.

Table 14. Mean values and ranges of initial hematological and serum chemistry results from female western cougars (n=8) captured in west Texas before release into South Florida in 1995¹.

BLOOD PARAMETER	MEAN	RANGE
Red blood cells x 10 ⁶	7.79	5.92-9.20
Hemoglobin g/dl	12.81	9.56-15.8
Hematocrit %	35.9	29-41
White blood cells x 10 ³	6.60	3.55-8.44
Neutrophils x10 ³	4.52	1.92-5.81
Lymphocytes x 10 ³	1.61	1.04-2.35
Monocytes x 10 ³	0.345	0.106-0.590
Eosinophils x 10 ³	0.061	0-0.220
Sodium mEq/l	158.4	153.3-163.6
potassium mEq/l	4.44	3.71-5.1
² Chloride mEq/l	121	118-124
² Carbon dioxide mEq/l	20.1	16.8-24.3
² Anion Gap mEq/l	18.9	15.5-23.3
Blood Urea Nitrogen mg/dl	34.9	23.2-85.9
Creatinine mg/dl	1.9	1.2-2.3
Calcium mg/dl	10.3	9.4-11.5
Glucose mg/dl	105.3	72.1-135
² Phosphorous mg/dl	5.5	4.7-6.9
Total bilirubin mg/dl	0.2	<0.1-0.3
Cholesterol mg/dl	133.1	95-155
Total protein g/dl	7.1	6.1-7.4
² Albumin g/dl	2.8	2.5-2.9
² Globulin g/dl	4.0	3.3-4.4
Alkaline phosphatase U/l	18	12-21
ALT U/l	60.8	34.3-90
ALP U/l	48.1	28.7-63.2

¹Lengths of time in captivity prior to blood sample taking are variable.

²Only four samples were measured for this parameter.

DATA NOT FOR PUBLICATION

Table 15. Mean hematological and serum chemistry values for free-ranging (2-<4 years old), female, Florida panthers sampled 1983-1994¹.

Parameter	n	Mean	SD	Minimum	Median	Maximum	Lower limit of 95% CI	Upper Limit of 95% CI
Albumin (gm/dl)	8	3.688	0.455	3.100	3.700	4.300	2.612	4.763
Alkaline phosphatase (u/l)	8	12.000	4.504	5.000	12.000	19.000	1.350	22.650
Basophils (%)	2	1.000	0.000	1.000	.	1.000	1.000	1.000
Basophils (x 10 ³ /mc1)	2	0.119	0.031	0.097	.	0.141	0.000	0.514
Blood urea nitrogen (mg/dl)	8	34.000	8.751	23.000	32.500	45.000	13.308	54.692
Calcium (mg/dl)	8	9.625	0.462	9.000	9.700	10.200	8.532	10.718
Cholesterol (mg/dl)	8	134.875	21.656	112.00	128.00	177.000	83.667	186.083
Chloride (meq/l)	8	113.875	4.612	104.00	114.50	120.000	102.970	124.780
CO2 (meq/l)	8	14.875	2.696	10.000	15.500	18.000	8.500	21.250
CPK (u/l)	8	414.750	177.617	252.00	370.00	789.000	0.000	834.748
Creatinine (mg/dl)	8	1.950	0.316	1.400	1.900	2.400	1.202	2.698
Eosinophils (x 10 ³ /mc1) ²	8	0.346	0.232	0.080	0.349	0.750	0.000	0.894
GGT (u/l)	6	1.833	0.753	1.000	2.000	3.000	0.000	3.768
Glucose (mg/dl)	8	135.875	37.506	77.000	134.50	201.000	47.188	224.562
Hemoglobin (g/dl)	8	12.013	1.758	10.800	11.400	16.200	7.856	16.169
Inorganic phosphorus (mg/dl)	8	5.225	1.187	3.600	5.200	7.800	2.419	8.031
Potassium (meq/l)	8	4.588	0.285	4.200	4.700	4.900	3.913	5.262
Lactic dehydrogenase (u/l)	8	206.875	140.481	60.000	151.50	457.000	0.000	539.060
Lymphocytes (%)	8	23.875	9.978	12.000	24.500	43.000	0.282	47.468
Lymphocytes (x 10 ³ /mc1)	8	2.527	0.982	0.996	2.498	3.807	0.205	4.850
Mean cell hemoglobin (pg)	8	18.738	6.404	14.300	16.150	33.200	3.595	33.880
Mean cell hemoglobin conc. (g/dl)	8	35.925	7.067	29.400	33.400	48.900	19.214	52.636
Mean cell volume (fl)	8	46.763	5.350	35.600	46.700	52.600	34.112	59.413

Table 15. (continued)

Monocytes (%)	8	3.875	2.232	1.000	4.000	8.000	0.000	9.153
Monocytes (x 10 ³ /mc1)	8	0.411	0.272	0.132	0.386	1.000	0.000	1.055
Sodium (meq/l)	8	151.000	2.138	149.00	150.50	154.000	145.944	156.056
				0	0			
Segmented neutrophils (%)	8	65.875	7.661	54.000	65.500	80.000	47.759	83.991
Segmented neutrophils (x 10 ³ /mc1)	8	7.171	2.046	4.320	7.403	9.372	2.334	12.009
NUC (/100)	1	1.000	.	.	.	.	.	.
Packed cell volume (%)	8	35.063	2.546	32.200	34.550	38.500	29.042	41.083
Platelets	6	437.833	85.777	327.00	430.00	590.000	217.335	658.331
				0	0			
RBC (x 10 ⁶ /mc1)	8	7.343	0.738	6.120	7.135	8.590	5.597	9.088
rdw	6	21.500	6.083	15.000	20.950	32.800	5.864	37.136
Reticulocytes (%)	6	1.050	0.513	0.600	1.000	2.000	0.000	2.368
Serum glutamic-oxalacetic transam. (u/l)	8	44.125	9.372	32.000	42.500	63.000	21.963	66.287
Serum glutamic-pyruvic transam. (u/l)	8	44.750	11.399	24.000	47.000	58.000	17.797	71.703
Total bilirubin (mg/dl)	8	0.173	0.067	0.100	0.175	0.300	0.014	0.331
Total protein (g/dl)	8	7.575	0.713	6.200	7.850	8.300	5.890	9.260
Uracil (mg/dl)	7	0.271	0.138	0.100	0.200	0.500	0.000	0.609
WBC (x 10 ³ /mc1)	8	10.750	2.312	8.000	10.350	14.100	5.283	16.217
Weight (lbs)	5	69.800	9.338	55.000	72.000	80.000	43.873	95.727
Eosinophils (%) ³	8	3.000	1.690	1.000	3.000	6.000	0.219	8.201
Iron (mcg/dl)	7	55.429	23.572	36.000	44.000	100.000	13.917	119.022
Triglycerides (mg/dl) ⁴	7	26.714	23.563	1.000	19.000	76.000	0.624	440.841

¹All samples included in computations (possibly more than one observation per animal).

²Confidence limits for Eosinophils were obtained by backtransformation from analysis in square-root transformed scale.

³Confidence limits for Iron were obtained by backtransformation from analysis in square-root transformed scale.

⁴Confidence limits for Triglycerides were obtained by back-transformation from analysis in log transformed scale.

Table 16. Mercury (Hg) levels measured in whole blood (ppm; wet weight) collected from female Texas Cougars captured in western Texas and before release into south Florida in 1995.

ID#	Hg in ppm (wet weight)-1995
TX101	0.026
TX102	0.024
TX103	0.032
TX104	0.021
TX106	0.015
TX107	0.018
X	0.023

Table 17. Occurrence of Parasites found in western cougars captured in west Texas prior to and after anthelmintic treatment and prior to release into south Florida in 1995¹.

TX#	Date	Lab ²	Parasite ³				Parasite ⁴	
			<i>Ancylostoma</i> spp.	<i>Toxascaris</i> spp.	<i>Physaloptera</i> spp.	<i>Spirocerca</i> <i>lupi</i>	<i>Cytauxzoon</i> <i>felis</i>	<i>Dirofilaria</i> <i>striatus</i>
101	02/16/95	HZG	Neg	Pos	Pos	Neg	Neg	Neg
101	03/24/95	HZG	Neg	Neg	Neg	Neg	-	-
101	03/30/95	HZG	-	-	-	-	Neg	Neg
102	02/20/95	HZG	Neg	Neg	Pos ⁵ Pos ⁶ Pos ⁷	Neg	Neg	Neg
102	03/23/95	HZG	Neg	Neg	Neg	Neg	-	-
103	03/19/95	VMTH	-	-	-	-	Neg	Neg
103	03/22/95	VMTH	-	-	-	-	Pos	Neg
103	03/25/95	VMTH	-	-	-	-	Pos	Pos
103	03/27/95	VMTH	Neg	20 epg ^{8,6} 20 epg ⁹	Neg	Neg	-	-
103	04/11/95	VMTH	Neg	Neg	Neg	Neg	Pos	Pos
104	02/16/95	HZG	-	-	-	-	Neg	Neg
104	02/17/95	HZG	Neg	Pos ⁵ Pos ⁷ Pos ⁶ Pos ¹⁰	Pos ⁷ Pos ⁶	Pos ⁷ Pos ⁶	-	-
104	03/25/95	HZG	Neg	Neg	Neg	Neg	-	-
105	06/01/95	VMTH	-	-	-	-	Neg	Neg
105	06/16/95	VMTH	Neg	Neg	Neg	Neg	Pos	Neg

Table 17. (continued)

TX#	Date	Lab ²	Parasite ³				Parasite ⁴	
			<i>Ancylostoma</i> spp.	<i>Toxascaris</i> spp.	<i>Physaloptera</i> spp.	<i>Spirocerca</i> <i>lupi</i>	<i>Cytauxzoon</i> <i>felis</i>	<i>Dirofilaria</i> <i>striatus</i>
106	02/16/95	HZG	-	-	-	-	Neg	Neg
106	02/21/95	HZG	Neg	Pos ¹⁰	Pos ¹⁰	Pos ¹⁰	-	-
106	03/24/95	HZG	Neg	Neg	Neg	Neg	-	-
107	03/21/95	VMTH	Neg ¹⁰	2 epg ⁶ 2 epg ⁹ Neg ¹⁰	Neg ¹⁰	Neg ¹⁰	Neg	Neg
107	04/11/95	VMTH	Neg	Neg	Neg	Neg	Pos	Neg
107	04/19/95	VMTH	Neg	Neg	Neg	Neg	Pos	Neg
107	04/25/95	VMTH	-	-	-	-	Pos	Neg
108 ¹¹	06/16/95	VMTH	Neg	Neg	Neg	Neg	Neg	Neg
108 ¹²	07/11/95	VMTH	Neg	Neg	Neg	Neg	-	-

¹Initial dates represent samples taken prior to anthelmintic treatment.

²Laboratory or facility at which fecal or blood sample was processed. HZG=Houston Zoological Gardens, Houston Texas; VMTH=Veterinary Medical Teaching Hospital, University of Florida, Gainesville, Florida.

³Parasites found on fecal exam.

⁴Parasites found on blood smear.

⁵Direct fecal examination.

⁶Fecal floatation.

Table 17. (continued)

⁷Fecal centrifugation.

⁸epg=eggs per gram of feces.

⁹Fecal sedimentation.

¹⁰Baermann sedimentation.

¹¹Sample was taken after anthelmintic treatment.

¹²TX 108 was positive for Alaria sp. (6EPG) on 07/11/95.

Table 18. Seroprevalances and reciprocal titers for antibodies to infectious disease agents found in unvaccinated female western cougars captured in west Texas prior to release into south Florida in 1995.

TX#	Pathogen ¹							
	Feline parvovirus (panleukopenia virus) ²	Feline rhinotracheitis virus (herpes) ³	Feline enteric coronavirus/Feline infectious peritonitis ⁴	Feline calicivirus ⁵	Feline Immunodeficiency virus/puma lentivirus ⁵	Feline Leukemia virus ⁶	Brucella spp. ⁷	Pseudorabies virus ⁸
101	>1:10,000	Neg	Neg	1:3,072	Neg	Neg	Neg	Neg
102	1:10,000	Neg	Neg	1:192	Neg	Neg	Neg	Neg
103	1:5,000	Neg	Neg	1:16	Neg	Neg	Neg	Neg
104	1:10,000	Neg	Neg	1:48	Neg	Neg	Neg	Neg
105	1:1,000	Neg	Neg	Neg	Neg	Neg	-	-
106	>1:10,000	Neg	Neg	Neg	Pos	Neg	Neg	Neg
107	1:50,000	Neg	Neg	1:8	Pos	Neg	Neg	Neg
108	1:5,000	Neg	Neg	Neg	Neg	Neg	-	-

¹Positive results are recorded as antibody titers except for feline immunodeficiency virus, feline leukemia virus and Brucella spp..

²Test: serum neutralizing antibody titer which detects and cross reacts with all parvoviruses. Performed at Cornell Feline Health Center.

³Test: serum neutralizing antibody titer. Performed at Cornell Feline Health Center.

⁴Test: KELA, kinetics enzyme-linked immunofluorescence assay.

⁵Test: ELISA, enzyme linked immunoabsorbant assay; Western Blot. Performed at Cornell Feline Health Center.

⁶Test: ELISA, enzyme linked immunoabsorbant assay. Performed at Cornell Feline Health Center.

⁷Test: Card Test. Performed at the College of Veterinary Medicine, University of Florida.

⁸Test: Latex agglutination test. Performed at the College of Veterinary Medicine, University of Florida.

Table 19. Thyroid hormones and progesterone levels in female western cougars captured in west Texas prior to release in south Florida in 1995.

ID#	T ₃ ¹ (ng/dl)	T ₄ ² (mcg/dl)	Progesterone (ng/ml)
TX101	-	-	2.0
TX102	-	-	2.4
TX103	130	1.5	2.6
TX104	-	-	3.8
TX105	162	1.6	1.0
TX106	-	-	1.3
TX107	121	1.1	0.6
TX108	158	1.4	7.3 ³

¹T₃=Triiodothyronine

²T₄=Thyroxine

³Pregnant