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Study Title: Diseases and Parasites

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Abstract - Examinations were conducted on 95 specimens representing 17 species of diseased and normal mammals and birds. An epizootic of canine distemper occurred in Citrus County in which over 50 gray foxes (Urocyon cinereoargenteus) are known to have died. In addition, a number of individual cases of diseased birds and mammals from scattered localities was studied. Of special interest were cases of dracunculiasis in two Florida panthers (Felis concolor coryi), demodectic mange in a black bear (Ursus americanus), malaria in a great blue heron (Ardea herodias), Babesia infection in a white-tailed deer (Odocoileus virginianus) and periodontal disease in a white-tailed deer. Serologic tests were conducted on 34 black bears sampled between 1980 and 1987; one was positive for Leptospira interrogans serogroup icterohaemorrhagiae and 13 (38%) were positive for Toxoplasma gondii. The book manuscript on parasites and diseases of wild mammals in Florida was accepted for publication and final revisions of each chapter were made. A chapter on eagles was written for a second book on the parasites and diseases of wild birds in Florida. The sixth year of a long-term study of the health and reproductive status of white-tailed deer from Big Cypress National Preserve, Fakahatchee Strand, and private lands to the north of Big Cypress was completed.

In order to properly manage Florida's unique and valuable wildlife resources, it is important to understand the significance of diseases and to monitor disease outbreaks. It is also necessary to conduct research on healthy animals in order to establish baseline data on the occurrence, prevalence, and distribution of disease agents in their enzootic state. To achieve these goals, research was conducted this year with the following objectives: (1) to examine sick and dead specimens of wildlife as they become available and determine the causes of

morbidity and/or mortality, especially in relation to epizootics; (2) to conduct a serosurvey of selected infectious diseases of black bears in Florida by utilization of blood samples from road-killed animals; (3) to revise and finalize the manuscript for the book on parasites and diseases of wild mammals in Florida and continue preparation of a similar manuscript on wild birds; (4) to obtain comparative information on the physical condition, reproduction, and various aspects of health and diseases of white-tailed deer in Big Cypress National Preserve (BCNP), Fakahatchee Strand, and private lands to the north of BCNP where Florida panthers are known to occur.

I wish to acknowledge the professional and technical assistance of Dr. Marilyn G. Spalding, Dr. Sam R. Telford, Jr., Mr. Paul Humphlett, Ms. Sylvia Tucker, Ms. Jessie Lowe, and Ms. Sara Ross in many aspects of the studies. Dr. Steve Sundlof helped with the toxicosis problems. Mr. Jim Brady, Mr. John Wooding, and Dr. Melody Roelke assisted with the acquisition of blood samples from black bears. A number of people cooperated in the collection of deer in southern Florida including Walt McCown, Jayde Roof, Darrell Land, and David Maehr. Jim Brady was especially helpful in coordinating many administrative and logistic aspects of this cooperative effort. I am grateful for the help provided by all of these people.

METHODS

Carcasses and various samples from wild animals were processed according to standard laboratory procedures in order to determine cause-of-death (where possible) and to obtain information on parasites and diseases. These procedures included pathological, microbiological, serological, toxicological, and parasitological analyses.

Samples of serum were obtained from 34 black bears from Columbia/Baker (n=6), Lake (n=3), Putnam (n=13), Marion (n=8), Orange (n=1), and Calhoun (n=3) counties from 1980-87. These came from hunter-killed animals, road-killed animals, and animals live-trapped for various purposes. Serologic tests were conducted in several laboratories to detect antibodies to various viral, bacterial, and protozoan disease agents.

Each chapter of the book on parasites and diseases of wild mammals in Florida was revised and new information added to some. A large number of tables and photographs were prepared in final form. A chapter on eagles was written and sent to several specialists for their comments.

Reproductive and health/disease information was obtained from 39 white-tailed deer from Big Cypress National Preserve (BCNP), Fakahatchee Strand, and private lands north of BCNP. Deer were collected by personnel of the Florida Game and Fresh Water Fish Commission. Necropsies were performed to determine weights, measurements, and condition values as well as to evaluate lesions, parasitism, and APCs. Serologic tests were conducted to determine the presence or absence of antibodies to a number of viral and bacterial disease agents. Results were compared to data obtained during the first 5 years of this study.

RESULTS

During the course of the year 95 specimens representing 17 species of wildlife were examined for parasites and disease conditions or causes of death. Many of the animals, including 39 white-tailed deer (Odocoileus virginianus), 12 nine-banded armadillos (Dasypus novemcinctus), 1 southeastern pocket gopher (Geomys pinetis), 5 woodrats (Neotoma floridana), 2 black bears (Ursus

americanus), 1 opossum (Didelphis marsupialis), and 4 white-crowned pigeons (Columba leucocephala) were considered normal and information on these specimens was used as baseline data. Other animals or samples were submitted for evaluation because of disease conditions or other reasons. These are summarized in Table 1.

Most of these were incidents involving one or two animals except for the gray fox epizootic of distemper. This die-off involved at least 50 gray foxes and occurred during January, February, and March of 1990 in Citrus County. Apparently raccoons were not involved.

Serum samples from the 34 black bears were negative for antibodies to Brucella abortus. Only two of the samples could be tested for antibodies to pseudorabies virus due to the toxicity of the samples to the serologic test; both were negative. One of the bears was positive (titer = 1:50) for Leptospira interrogans serogroup icterohaemorrhagiae. The positive bear was a 3-year-old male from Osceola National Forest. Thirteen (38%) of the samples were seropositive for Toxoplasma gondii. Positive bears originated from the following counties: Columbia/Baker, Putnam, Marion, Orange, and Calhoun (Table 2). Titers varied from 1:64 (n=7) to 1:128 (n=5) to 1:512 (n = 1). The bear with the highest titer was a 1-year-old male from Ocala National Forest. Tests for several arboviruses are still pending.

The book on parasites and diseases of wild mammals was reviewed and accepted for publication by the University of Florida Press. They returned the manuscript for final revisions which were done for each chapter. In a number of sections new information was added, especially in the chapters on white-tailed deer, black bears and Florida panthers. Several new tables and figures were added to various chapters. A chapter on eagles was written for the volume on parasites and

diseases of wild birds in Florida and copies were sent to three specialists to obtain their suggestions and comments.

The results of this year's work on the health of white-tailed deer in various panther habitats in southern Florida are presented in Appendix I. Data on diseases, parasites, viruses, bacteria, reproduction, and physical condition were collected on 39 deer from BCNP, Fakahatchee Strand, and private lands in northern Collier County.

DISCUSSION AND CONCLUSIONS

Examination of sick and diseased wildlife has continued to prove valuable as a system for monitoring the health of various species of wildlife in Florida. The epizootic of distemper in gray foxes in Citrus County involved a large number of animals. This disease seems to be common in foxes and raccoons along the west-central coastal counties of Florida. Such epizootics also occurred in foxes in 1987 in Pasco and Hernando counties. In 1972-73 an outbreak of distemper occurred in Sarasota, Manatee, De Soto, and Charlotte counties. The disease was first noticed in foxes and then occurred in raccoons. Distemper appears to be a significant disease among both foxes and raccoons in Florida. Avian pox and eustrongylidosis were seen again in wild turkeys and great blue herons, respectively, and seem to be common diseases in these species. Unusual findings this year included demodectic mange in a black bear, dracunculiasis in two Florida panthers, babesiasis in a white-tailed deer, gingival hyperplasia and periodontitis in a white-tailed deer, and malaria in a great blue heron. All of these were recorded for the first time; their pathologic significance to wildlife populations is not known.

Toxoplasma gondii was the most common and widespread disease agent identified in the serologic survey of black bears. This protozoan is of considerable public health significance, but its importance to populations of black bears is unknown. The prevalence of infection (38%) found in this survey is considerably higher than has been found in previous studies where 19%, 18%, and 13% prevalences were measured in samples of armadillos, raccoons, and black rats in Florida. The factors contributing to this high prevalence in bears are not understood.

The publishing of the book on parasites and diseases of wild mammals of Florida will result in the assemblage of valuable information in a format in which it can be used effectively for future management decisions as they pertain to diseases of wildlife, domestic animals, and man. Progress continues on a similar book on wild birds.

White-tailed deer from the Florida Panther National Wildlife Refuge were in the best physical condition and had the lowest APC (210), and deer from Collier Enterprises land were the largest and had the highest fecundity and prevalence of twinning. Raccoon Point deer had the poorest physical condition and reproductive status. APCs overall were low in 1989 as were also lungworm counts indicating an effect of low rainfall and water levels. Other parasites and infectious diseases had prevalences similar to previous years.

Table 1. Diagnosed cases of infections, debilitation and/or death of wildlife examined between July 1, 1989 and June 30, 1990.

Species	County	No. cases	Diagnosis
1. Gray fox (<u>Urocyon cinereoargenteus</u>)	Citrus	4	Canine distemper
	Citrus	1	Trauma
2. Black bear (<u>Ursus americanus</u>)	Lake	1	Trauma
	Washington	1	Trauma
	Union	1	Demodectic mange
3. Florida panther (<u>Felis concolor coryi</u>)	Dade	2	Dracunculiasis
4. White-tailed deer (<u>Odocoileus virginianus</u>)	Columbia	1	Cerebral abscess
	Collier	2	Predation
	Citrus	1	Nephritis and <u>Babesia</u> infection
5. Common loon (<u>Gavia immer</u>)	Clay	1	Trauma/cachexia
6. Great Horned owl (<u>Bubo virginianus</u>)	Alachua	1	Trauma
7. Burrowing owl (<u>Athene cunicularis</u>)	Lee	2	Toxicosis ^a
8. Swallow-tailed kite (<u>Elanoides forficatus</u>)	Dade	1	Cachexia
9. Sandhill crane (<u>Grus canadensis</u>)	Putnam	1	Trauma
10. Great blue heron (<u>Ardea herodias</u>)	Alachua	1	Trauma
	Alachua	1	Eustrongylidosis and leucocytozoonosis
	Alachua	1	Eustrongylidosis
	Marion	1	Eustrongylidosis and malaria
11. Great white heron (<u>Ardea herodias</u>)	Monroe	1	Trauma
12. Wild turkey (<u>Meleagris gallopavo</u>)	Lake	2	Open ^b
	Lake	1	Dermatitis
	Hamilton	1	Pox
	Columbia	1	Pox
	Lake	1	Pox and bacterial dermatitis

^a Presumptive; toxic agent not identified

^b Diagnosis not possible due to poor condition of samples

Table 2. Results of serologic tests (indirect haemagglutination) for Toxoplasma gondii in black bears from Florida, 1980-87.

Locality (county)	Year	Number of bears		
		Examined	Positive	%
Columbia/Baker	1980	6	4	67
Lake	1985	3	0	0
Putnam	1985-87	13	3	23
Marion	1985-86	8	4	50
Orange	1985	1	1	100
Calhoun	1985	3	1	33
Totals	1980-87	34	13	38

APPENDIX I

Health/Disease Study of white-tailed deer in Southern Florida

July 1, 1989 through June 30, 1990

Abstract - Reproductive and health/disease information was collected from 39 white-tailed deer Odocoileus virginianus from five distinct areas in the Big Cypress National Preserve (BCNP), the Fakahatchee Strand, and private land to the north of BCNP. Of these deer, 37 were collected by shooting at night by personnel of the Florida Game and Fresh Water Fish Commission and two were radio-collared deer which were killed by predators. The deer were evaluated via examinations for external and internal parasites, lesions, serologic tests for a number of infectious disease agents, determination of physical condition (weights, measurements, fat indices, etc.) and reproductive status. Deer from the Florida Panther National Wildlife Refuge had the best condition values and APCs and deer from Collier Enterprises land were the largest and had the best reproductive status. Raccoon Point deer, as in past years, were in the poorest physical condition and had the worst reproduction. Three deer, one from Bear Island, one from the Panther Refuge and one from Collier Enterprises land, had pathogenic intensities of Haemonchus. Prevalences of abomasal nematodes (Haemonchus and Spiculopteragia) and lungworms (Dictyocaulus viviparus) were low compared to previous years, probably as a reflection of low rainfall and water levels. Most other parasites and diseases remained the same as far as prevalences are concerned when compared to previous years. Several infectious disease agents (i.e. hemorrhagic disease viruses, parainfluenza-3 virus, and Leptospira interrogans) were prevalent in areas where range cattle occur, but were virtually absent from deer at Raccoon Point and Fakahatchee Strand State Preserve, where there are no range cattle.

White-tailed deer (Odocoileus virginianus) are important as food for the Florida panther (Felis concolor coryi) in southern Florida. Because of this, the health status of deer in the Big Cypress National Preserve (BCNP), the Fakahatchee Strand, and nearby private lands is of considerable concern. In 1984, a multifaceted study was initiated to obtain information on the diseases, parasites, and general physical and reproductive condition of deer in several areas inhabited by Florida panthers. These areas included Bear Island (BI) and Raccoon Point (RP) in BCNP, Fakahatchee Strand State Preserve (FS), the Florida Panther National Wildlife Refuge (PR), and private lands owned by Collier Enterprises (CE) to the north of BCNP. This is a report of the 1989-90 research activities during the sixth year of that study.

METHODS

Since the initiation of the study in 1984, the methods have not changed to any great degree. This was judged to be important so that data collected could be compared from year to year and would be comparable to similar types of information obtained from deer in other parts of Florida and the Southeast by the Southeastern Cooperative Wildlife Disease Study (SCWDS). Some minor modifications have been implemented and from time to time additional tests have been conducted, but the format essentially has remained the same.

Information was obtained from 37 deer of which 30 were does and 7 were bucks (Table 1). All were collected by shooting at night by Florida Game and Fresh Water Fish Commission personnel. Two additional radio-collared does were found dead and were subsequently examined at necropsy. Reports have been issued to appropriate personnel on these deer and they will not be discussed further in this report.

Blood samples were obtained from each deer by cardiac puncture soon after death and chilled with the carcass. Blood work-ups were completed within 6-8 hours and complete necropsies were performed, usually within 10 hours of death. Necropsies included weights, measurements, and evaluations of condition using fat and organ indices. Ages were determined by analysis of tooth development and wear by Game Commission personnel. Parasitism by arthropods, helminths, and protozoans were evaluated by a number of standard methods. Total counts of some parasites were made; for others estimates were determined. Abomasal parasite counts (APCs) were made by procedures as determined by SCWDS. Serum samples were tested for antibodies to a number of viral and bacterial disease agents.

RESULTS AND DISCUSSION

Physical Condition

The weights and measurements of the deer collected from Bear Island (n=8), Raccoon Point (n=7), Fakahatchee Strand State Preserve (n=7), the Panther Refuge (n=8), and Collier Enterprises land (n=7) are presented in Tables 2-4. In general, deer from Collier Enterprises (CE) were larger than those from the other areas. In Table 5 the values for 24 to 48-month-old does are compared. Does from CE averaged 21 lbs heavier and were 5 cm longer than does from Raccoon Point. Does from other areas were between these extremes. In Table 6 similar values are compared for deer collected each October from 1984 through 1989. The trends for this 6-year-period indicated that does from CE and BI were the largest and does from RP the smallest. Data on fat indices and condition values are presented in Tables 7-9. Fat indices and condition values were converted to numbers (i.e. P= 1, P+ =2, F- =3, F =4, F+ =5, etc. and L =1, L+ =2, M- =3, M=4, M+ =5, etc.) and mean values for 24 to 48-month-old does were determined as shown in Table 10. When bucks and does over 12 months of age were compared (Table 11), deer from the Panther Refuge ranked first with an E- and those from Raccoon Point were last with an F+. Deer from other areas were between these extremes.

Data on heart weights (with and without the pericardium) and kidney weights (with and without the capsule) were collected from each deer and are presented in Tables 12-14. In Table 15 the values for 24 to 48-month-old does are compared. The heaviest hearts and kidneys were in deer from Collier Enterprises land, whereas the smallest hearts were from Raccoon Point deer and the smallest kidneys from Bear Island deer. When data on hearts and kidneys of deer collected in other years were compared (Table 16), the heaviest hearts and kidneys were in deer from Collier land and the lightest in deer from Raccoon Point.

Reproductive Status

Reproductive data on 30 does are presented in Table 17. Of these does, three were eliminated from further consideration since they were 7 to 9 months of age. They would have been 5-7 months old during the rut, and although white-tailed deer can breed as young as 6-7 months, this is not common. Of 27 does which were 18 months old or older, 85% were pregnant when examined in October (Table 18). Five (22%) of these were carrying twins. No twinning occurred in deer from Raccoon Point and the Panther Refuge; 2 of 5 (40%) does each from Bear Island and Collier Enterprises land had twins. Ages of fetuses varied from 6.0 to 16.5 weeks (mean = 11.5). Conception dates were latest for deer at Raccoon Point as was seen in previous years as well. The sex ratio of the fetuses was 15 males to 9 females. In Table 19 reproductive data are presented for 18-month-old or older does during the entire 6-year-period of the study. Similar trends were seen as for 1989 with 89% fecundity and a twinning rate of 19%.

Parasitism

A number of parasites were identified including helminths, protozoans, and arthropods. Each was evaluated to determine its significance to the health of deer in southern Florida.

Numbers of abomasal nematodes (abomasal parasite counts or APCs) were determined for each deer (Tables 20-22). Most of the nematodes were Spiculopteragia odocoilei and secondarily Haemonchus contortus. Three deer, an 18-month-old doe from Bear Island, a 6-month-old buck from the Panther Refuge, and a 7-month-old doe from Collier Enterprises land had HPFs higher than 75. These values would indicate that haemonchosis may have been a serious pathogenic factor in these three deer.

APCs in 1989 were lower in all areas except Bear Island when compared to values

of 1988. This may have been a reflection of the extremely dry season last year. The high APC for Bear Island was due to one animal (an 18-month-old doe) which had an APC of 3260; if this animal was not included in the calculation of the APC it would be 696 which would be more in line with the other trends in 1989 and would agree more with the condition values for these deer. Deer from the Panther Refuge had the lowest APC (210) which correlated with their high condition value rating (E-) (Table 11). In Table 23 APCs and condition values are compared for the 6-year-period from 1984 through 1989.

Data on other helminths and on arthropods and protozoans are given in Tables 24-27. As in previous years infections of the following pathogenic nematodes were not found: threadworms (Strongyloides papillosus), meningeal worms (Parelaphostrongylus tenuis), and arterial worms (Elaeophora schneideri). Cysticerci of the tapeworm Taenia omissa (adults of which occur in Florida panthers) were found in one deer, a 42-month-old doe from the Panther Refuge. Sucking lice (Solenopotes binipilosus) were found on one deer, a 9-month-old doe from Raccoon Point. The prevalences of muscleworms, liver flukes, rumen flukes, bots, ticks, keds, coccidia, sarcocysts, and trypanosomes were similar to those of 1988, but the prevalence of lungworms was considerably lower (14%) in 1989 compared to 1988 (74%). This decrease in lungworms parallels the decrease in abomasal nematodes, both of which have similar life cycles. The extreme drought was probably a factor in this decrease.

Viruses

Deer were tested serologically for six viruses. Thirty-six percent were positive for bluetongue virus and 21% for epizootic hemorrhagic disease virus (Table 28). No reactors were found in deer from Raccoon Point and Fakahatchee Strand State Preserve. Evidence of infections by infectious bovine rhinotracheitis virus, bovine virus

diarrhea virus, and parainfluenza-3 virus was found in 48%, 39% and 12% of the deer examined (Table 29). These are increases over prevalences in previous years, especially 1987 and 1988. All deer were seronegative for bovine respiratory syncytial virus.

Bacteria

Serologic tests were conducted in order to detect antibodies to Brucella abortus and twelve serogroups of Leptospira interrogans. All deer were negative for antibodies to B. abortus. Five serogroups of L. interrogans were identified and included autumnalis, ballum, bratislava, pyrogenes, and canicola (Table 30). Canicola was the most prevalent serogroup which was a similar finding in past years.

CONCLUSIONS

Overall, deer from the Panther Refuge had the best condition values and APCs, and deer from Collier Enterprises land were the largest and had the best reproduction (i.e. highest fecundity and percent twinning). Raccoon Point deer, as in past years, were in the poorest physical condition and had the worst reproduction (60% fecundity and no twinning).

A continuing trend was the observation that several infectious disease agents (hemorrhagic disease viruses, parainfluenza-3 virus, and Leptospira interrogans) occurred in the areas where range cattle occur (Bear Island, the Panther Refuge, and Collier Enterprises land), but were virtually absent from Raccoon Point and Fakahatchee Strand State Preserve where there are no range cattle.

Many of the parasites and diseases remained the same as far as prevalences are concerned or have fluctuated without any apparent pattern in comparison to other years. Others such as lungworms and abomasal nematodes decreased in prevalence,

most likely due to the effects of low rainfall and water levels. Considerably more study of the data that have been collected since 1984 will be necessary before the health and disease status of deer in southern Florida can be understood.

ACKNOWLEDGMENTS

Many people provided assistance in various aspects of this study. The deer were collected and bled by Walt McCown, Jayde Roof, Darrell Land, Dave Maehr, and Jim Schortemeyer and other personnel of the Florida Game and Fresh Water Fish Commission. Walt McCown determined the ages of deer by analysis of tooth development and wear. Others helped in the numerous laboratory analyses conducted on the deer and included Sam Telford, Sylvia Tucker, Jessie Lowe, Paul Humphlett, and Sara Ross. Jim Brady of the GFC Research Lab in Gainesville provided logistic and administrative support. I thank all of the above people for their assistance and cooperation.

Prepared by Donald J. Forrester

Table 1. Total numbers of white-tailed deer examined from southern Florida during the fall of 1989.

Area	No. bucks	No. does	Total
Bear Island	1	7	8
Raccoon Point	1	6	7
Collier Enterprises	1	6	7
Panther Refuge	2	6	8
Fakahatchee Strand State Preserve	2	5	7
Totals	7	30	37

Table 2. Physical characteristics of white-tailed deer collected from Bear Island and Raccoon Point during the fall of 1989.

Deer number	Sex	Age (mo)	Weight (lbs)	Tail length (cm)	Girth (cm)	Total length (cm)
Bear Island						
310	F	18	75	25	69	146
311	F	30	100	25	75	160
312	F	30	80	21	70	139
314	F	54	110	24	82	152
315	M	7	58	22	67	133
318	F	7	60	22	64	126
329	F	30	ND ^a	22	ND	131
331	F	54	95	23	77	149
Raccoon Point						
332	F	54	81	22	74	136
333	F	30	80	21	73	141
334	F	9	43	20	57	118
335	F	30	72	23	68	142
336	F	18	56	22	64	127
337	F	54	75	24	72	137
338	M	42	120	24	81	152

^aND = not determined

Table 3. Physical characteristics of white-tailed deer collected from Fakahatchee Strand State Preserve and the Florida Panther National Wildlife Refuge during the fall of 1989.

Deer number	Sex	Age (mo)	Weight (lbs)	Tail length (cm)	Girth (cm)	Total length (cm)
Fakahatchee Strand State Preserve						
346	F	30	77	22	72	136
347	M	7	67	25	73	130
348	F	30	82	21	70	139
349	F	54	100	20	83	144
350	F	18	75	20	71	137
351	F	30	112	19	81	151
352	M	7	67	26	68	142
Panther Refuge						
322	F	42	86	19	77	145
323	F	42	105	25	81	150
324	M	6	57	23	64	127
325	F	30	77	17	75	131
326	F	42	77	17	80	143
327	F	54	95	19	82	140
328	M	9	65	18	65	122
330	F	42	93	24	77	150

Table 4. Physical characteristics of white-tailed deer collected from Collier Enterprises land during the fall of 1989.

Deer number	Sex	Age (mo)	Weight (lbs)	Tail length (cm)	Girth (cm)	Total length (cm)
339	F	30	100	20	83	144
340	F	30	83	20	79	141
341	F	30	102	20	82	145
342	F	7	56	24	66	132
343	F	30	105	22	80	144
344	F	30	95	24	74	163
345	M	7	70	21	75	129

Table 5. Mean weights and measurements of white-tailed deer collected in southern Florida during the fall of 1989. All deer are does between 24 and 48 months of age.

Sample site	No. deer	Weight (lbs)	Tail length (cm)	Girth (cm)	Total length (cm)
Bear Island	3	90	23	73	143
Raccoon Point	2	76	22	70	142
Collier Enterprises	5	97	21	79	147
Panther Refuge	5	88	20	78	144
Fakahatchee Strand State Preserve	3	90	21	74	142

Table 6. Mean weights and measurements of white-tailed deer from southern Florida during the fall of the years 1984 through 1989. All deer are does between 24 and 48 months of age.

Area	No. deer	Weight (lbs)	Tail length (cm)	Girth (cm)	Total length (cm)
Bear Island	18	92	23	76	147
Raccoon Point	11	77	23	71	141
Collier Enterprises	16	93	22	78	146
Panther Refuge	16	88	22	77	142
Fakahatchee Strand State Preserve	8	87	23	75	142

Table 7. Fat indices and condition values of white-tailed deer collected from Bear Island and Raccoon Point during the fall of 1989.

Deer number	Tail fat ^a	Heart fat ^a	Pericardial fat ^a	Kidney fat ^a	Condition value ^b
Bear Island					
310	L	L	L-	L	F
311	M	M-	M	M	G
312	M+	M	H	H-	G+
314	L+	M	H	M	G
315	L+	L+	L	O+	F
318	L+	L	L	L	F+
329	L	L-	L-	O	P
331	M+	M+	H	H	E
Raccoon Point					
332	O	L+	L	O	F-
333	M-	M-	H	M	G
334	L-	L	L	O	F
335	O	L-	L-	O	F
336	L	L+	L+	O	F
337	L	M-	M	L+	G-
338	L	H-	M	L	G-

^a O = no fat, L = light, M = moderate, H = heavy

^b P = poor, F = fair, G = good, E = excellent

Table 8. Fat indices and condition values of white-tailed deer collected from Fakahatchee Strand State Preserve and Panther Refuge during the fall of 1989.

Deer number	Tail fat ^a	Heart fat ^a	Pericardial fat ^a	Kidney fat ^a	Condition value ^b
Fakahatchee Strand State Preserve					
346	L	L	M	L	F
347	L	L-	L-	L-	F
348	L	L+	M	L+	G
349	M	M	H	M+	G
350	L+	M	M	L+	F+
351	L	M	M	L+	G
352	O	L	L-	L-	F
Panther Refuge					
322	L	H	H	M	G+
323	M	H	H	M	E
324	L	L-	L	L-	G
325	H	M	H	H	E
326	H	M	H	H	E
327	L+	M+	H	M	G
328	L	L+	L	L-	G
330	H	H-	H	H	E

^a O = no fat, L = light, M = moderate, H = heavy

^b P = poor, F = fair, G = good, E = excellent

Table 9. Fat indices and condition values of white-tailed deer collected from Collier Enterprises land during the fall of 1989.

Deer number	Tail fat ^a	Heart fat ^a	Pericardial fat ^a	Kidney fat ^a	Condition value ^b
339	H	H-	H	H	E
340	L+	L+	M	M	G
341	H	H-	H	H	E
342	L	L-	L-	L-	F
343	M+	M+	M	M	G
344	L+	M	M-	L	F+
345	L+	L+	L	L	F+

^a O = no fat, L = light, M = moderate, H = heavy

^b P = poor, F = fair, G = good, E = excellent

Table 10. Mean fat indices and condition values of white-tailed deer collected in southern Florida during the fall of 1989. All deer are does between 24 and 48 months of age.

Area	No. deer	Tail fat ^a	Heart fat ^a	Pericardial fat ^a	Kidney fat ^a	Condition value ^b
Bear Island	3	M-	L+	M	M-	F+
Raccoon Point	2	L	M-	M	L+	G-
Collier Enterprises	5	M+	M+	M+	M+	G+
Panther Refuge	4	M+	H-	H	H-	E
Fakahatchee Strand State Preserve	3	L	L+	M	L+	G-

^a O = no fat, L = light, M = moderate, H = heavy

^b P = poor, F = fair, G = good, E = excellent

Table 11. Condition values and APCs of bucks and does (12 months of age and older) collected in southern Florida during the fall of 1989.

Area	No. deer examined	Condition		APC ^c
		Mean no. ^a	Value ^b	
Panther Refuge	6	8.5	E-	210
Bear Island	6	6.0	G-	1123 ^d
Fakahatchee Strand State Preserve	5	6.0	G-	596
Collier Enterprises	5	5.6	G-	424
Raccoon Point	6	5.0	F+	913

^a See text for description of the derivation of these numbers.

^b F = fair, G = good, E = excellent

^c APC = abomasal parasite count

^d This APC is high because of one 18-month-old doe which had an APC of 3,260. If this animal was omitted, the APC would be 696.

Table 12. Heart and kidney weights of white-tailed deer collected from Bear Island and Raccoon Point during the fall of 1989.

Deer number	Heart wt. (gm)		Kidney wt. (gm)	
	with pericardium	without pericardium	with capsule	without capsule
Bear Island				
310	355	337	44	40
311	489	446	54	53
312	350	304	67	44
314	451	383	72	53
315	239	223	33	31
318	172	167	40	37
329	336	293	48	43
331	358	297	66	50
Raccoon Point				
332	328	309	50	47
333	343	305	63	56
334	136	129	25	23
335	276	259	49	47
336	229	210	36	34
337	257	237	39	34
338	456	407	74	66

Table 13. Heart and kidney weights of white-tailed deer collected from Fakahatchee Strand State Preserve and Panther Refuge during the fall of 1989.

Deer number	Heart wt. (gm)		Kidney wt. (gm)	
	with pericardium	without pericardium	with capsule	without capsule
Fakahatchee Strand State Preserve				
346	314	268	45	38
347	184	177	45	41
348	325	291	52	44
349	443	373	73	54
350	265	231	48	39
351	394	348	75	64
352	289	242	42	38
Panther Refuge				
322	636	536	82	62
323	415	371	63	49
324	195	183	43	40
325	296	254	61	41
326	363	311	75	49
327	367	338	53	46
328	214	190	46	42
330	393	330	72	54

Table 14. Heart and kidney weights of white-tailed deer collected from Collier Enterprises land during the fall of 1989.

Deer number	Heart wt. (gm)		Kidney wt. (gm)	
	with pericardium	without pericardium	with capsule	without capsule
339	489	408	133	76
340	453	411	73	57
341	474	379	75	53
342	208	196	38	36
343	337	303	70	60
344	406	383	76	65
345	300	277	59	53

Table 15. Mean weights of hearts and kidneys of white-tailed deer from southern Florida during the fall of 1989. All are does between 24 and 48 months of age.

Area	No. deer	Heart wt. (gm)		Kidney wt. (gm)	
		with pericardium	without pericardium	with capsule	without capsule
Bear Island	3	392	348	56	47
Panther Refuge	4	367	317	71	51
Collier Enterprises	5	432	377	85	62
Raccoon Point	2	310	282	56	51
Fakahatchee Strand State Preserve	3	344	302	57	49

Table 16. Mean weights of hearts and kidneys of white-tailed deer from southern Florida during the fall of 1985 through 1989. All are does between 24 and 48 months of age.

Area	No. deer	Heart wt. (gm)		No. deer	Kidney wt. (gm)	
		with pericardium	without pericardium		with capsule	without capsule
Bear Island	9	416	372	17	66	47
Panther Refuge	9	408	353	13	69	52
Collier Enterprises	16	450	387	16	91	66
Raccoon Point	7	315	293	10	54	46
Fakahatchee Strand State Preserve	5	341	306	8	60	50

Table 17. Reproductive data on does collected from southern Florida during the fall of 1989.

Deer number	Doe age (mo)	Fetuses			
		No.	Sex	Age (wks)	Weight (gms)
Bear Island					
310	18	1	U ^a	6.0	1.2
311	30	2	F,F	11.0	39.1,34.8
312	30	1	M	12.0	91.6
314	54	2	M,F	13.5	187.5,204.5
318	7	0	not pregnant		
329	30	0	not pregnant		
331	54	1	F	9.0	10.7
Panther Refuge					
322	42	1	F	11.0	61.8
323	42	1	F	12.0	96.3
325	30	1	M	13.0	112.3
326	42	1	M	12.8	85.7
327	54	1	F	13.5	130.5
330	42	0	not pregnant		
Raccoon Point					
332	54	0	not pregnant		
333	30	1	M	13.0	215.6
334	9	0	not pregnant		
335	30	1	U	6.5	1.9
336	18	0	not pregnant		
337	54	1	U	7.0	3.6
Collier Enterprises					
339	30	1	F	9.0	13.4
340	30	2	M,M	8.3	16.3,15.1
341	30	1	M	12.5	100.2
342	7	0	not pregnant		
343	30	1	M	12.5	94.4
344	30	2	M,M	12.0	67.6,73.2
Fakahatchee Strand State Preserve					
346	30	1	M	16.5	>500.0
348	30	1	M	16.0	>500.0
349	54	1	M	15.0	335.4
350	18	1	U	7.5	6.4
351	30	2	M,F	15.0	276.8,282.9

^a U = unknown (the fetus was so small that the sex could not be determined)

Table 18. Reproductive data on does 18 months of age or older from southern Florida, October, 1989.

Area	Number of deer			Ages of fetuses (wks)	
	Examined	Pregnant (%)	with twins (%)	Mean	Range
Bear Island	6	5 (83)	2 (40)	10.3	6.0-13.5
Raccoon Point	5	3 (60)	0 (0)	8.8	6.5-13.0
Fakahatchee Strand State Preserve	5	5 (100)	1 (20)	14.0	7.5-16.5
Panther Refuge	6	5 (83)	0 (0)	12.5	11.0-13.5
Collier Enterprises	5	5 (100)	2 (40)	10.9	8.3-12.5
Totals	27	23 (85)	5 (22)	11.5	6.0-16.5

Table 19. Reproductive data on does 18 months of age or older from southern Florida, during October, 1984-1989.

Area	Number of deer					Ages of fetuses (wks)	
	Examined	Pregnant (%)		Twins (%)		Mean	Range
Bear Island	30	27	(90)	7	(26)	10.9	5.5-20.0
Raccoon Point	23	20	(87)	1	(5)	8.9	4.0-13.0
Fakahatchee Strand State Preserve	15	12	(80)	3	(25)	13.3	7.5-17.0
Panther Refuge	21	18	(86)	3	(17)	13.5	11.0-21.0
Collier Enterprises	17	17	(100)	4	(24)	10.7	4.0-15.0
Total	106	94	(89)	18	(19)	11.5	4.0-21.0

Table 20. Abomasal parasite counts (APCs), numbers of larval nematodes, and Haemonchus Pathogenic Factors (HPFs) of white-tailed deer collected from Bear Island and Raccoon Point during the fall of 1989.

Deer number	Sex	Age (mo.)	Weight (kg)	APC	No. of larvae ^a	No. of adult <u>Haemonchus</u>	HPF ^b
Bear Island							
310	F	18	34.1	3260	0	3260	96 ^c
311	F	30	45.1	340	0	80	2
312	F	30	36.4	660	0	380	10
314	F	54	50.0	20	0	20	<1
315	M	7	26.4	1120	0	1000	38
318	F	7	27.3	900	0	620	23
329	F	30	39.6	2280	0	1040	26
331	F	54	43.2	180	0	120	3
Means	-	-	-	1123 ^d	0	815	-
Raccoon Point							
332	F	54	36.8	700	0	100	3
333	F	30	36.4	480	40	100	3
334	F	9	919.5	860	0	600	31
335	F	30	32.7	680	20	200	6
336	F	18	25.5	1320	20	280	11
337	F	54	39.1	540	0	0	0
338	M	42	54.5	1760	40	760	14
Means	-	-	-	913 ^d	17	291	-

^a Larvae are not included in the APC.

^b The HPF is calculated by dividing the number of adult Haemonchus by the weight (kg) of the deer. Values of 75 or greater indicate pathogenicity.

^c Above the pathogenic level for Haemonchus.

^d Mean APCs do not include animals less than 12 months of age.

Table 21. Abomasal parasite counts (APCs), numbers of larval nematodes, and Haemonchus Pathogenic Factors (HPFs) of white-tailed deer collected from Fakahatchee Strand State Preserve and Panther Refuge during the fall of 1989.

Deer number	Sex	Age (mo.)	Weight (kg)	APC	No. of larvae ^a	No. of adult <u>Haemonchus</u>	HPF ^b
Fakahatchee Strand State Preserve							
346	F	30	35	1040	60	480	14
347	M	7	30	2140	40	1280	43
348	F	30	37	420	80	0	0
349	F	54	46	120	0	20	<1
350	F	18	39	980	100	80	2
351	F	30	51	420	20	40	<1
352	M	7	31	540	0	380	12
Means	-	-	-	596 ^c	43	326	-
Panther Refuge							
322	F	42	39	220	0	220	6
323	F	42	48	220	0	220	5
324	M	6	26	2160	0	2160	83 ^d
325	F	30	35	160	0	140	4
326	F	42	35	340	0	20	<1
327	F	54	43	280	0	100	2
328	M	9	30	3120	160	1580	54
330	F	42	42	40	0	20	<1
Means	-	-	-	210 ^c	20	558	-

^a Larvae are not included in the APC.

^b The HPF is calculated by dividing the number of adult Haemonchus by the weight (kg) of the deer. Values of 75 or greater indicate pathogenicity.

^c Mean APCs do not include animals less than 12 months of age.

^d Above the pathogenic level for Haemonchus

Table 22. Abomasal parasite counts (APCs), numbers of larval nematodes, and Haemonchus Pathogenic Factors (HPFs) of white-tailed deer collected from Collier Enterprises land during the fall of 1989.

Deer number	Sex	Age (mo.)	Weight (kg)	APC	No. of larvae ^a	No. of adult <u>Haemonchus</u>	HPF ^b
339	F	30	46	320	20	20	<1
340	F	30	38	660	40	60	2
341	F	30	46	540	0	20	<1
342	F	7	26	3900	420	2300	90 ^c
343	F	30	48	180	20	40	<1
344	F	30	43	420	40	20	<1
345	M	7	32	1720	40	940	30
Means	-	-	-	424 ^d	83	486	18

^a Larvae are not included in the APC.

^b The HPF is calculated by dividing the number of adult Haemonchus by the weight (kg) of the deer. Values of 75 or greater indicate pathogenicity.

^c Above the pathogenic level for Haemonchus.

^d Mean APC does not include animals less than 12 months of age.

Table 23. Mean abomasal parasite counts (APCs) and condition values (CVs)^a for white-tailed deer collected from Bear Island, Raccoon Point, Fakahatchee Strand State Preserve, Panther Refuge, and Collier Enterprises land during October of 1984-1989.

Area ^b	1984		1985		1986		1987		1988		1989	
	APC	CV	APC	CV	APC	CV	APC	CV	APC	CV	APC	CV
BI	362	F+	392	G-	847	G+	628	G+	531	G+	1123	G-
RP	938	F	1008	G-	-	-	1060	F+	2164	F	913	F+
FSSP	-	-	-	-	1562	F+	495	G-	987	F+	596	G-
PR	997	F-	1164	F	1730	F	1058	G-	1148	F	210	E-
CE	-	-	-	-	-	-	2422	G-	843	G	424	G-

^a CV = Condition value; F = fair, G = good, E = excellent, +, - = intermediate values

^b BI = Bear Island; RP= Raccoon Point; FSSP = Fakahatchee Strand State Preserve; PR= Panther Refuge; CE = Collier Enterprises land.

Table 24. Prevalences of lungworms and muscleworms in white-tailed deer from southern Florida in October 1989.

Area	Lungworms ^a		Muscleworms ^b	
	No. deer exam.	No. inf.	No. deer exam.	No. inf.
Bear Island	8	0	8	6
Raccoon Point	7	2	7	5
Fakahatchee Strand State Preserve	7	1	7	4
Panther Refuge	8	1	8	3
Collier Enterprises	7	1	7	3
Totals	37	5 (14%)	37	21 (57%)

^a Dictyocaulus viviparus; mean intensity = 3 (range = 1 - 5)

^b Parelaphostrongylus andersoni

Table 25. Prevalences of liver flukes and rumen flukes in white-tailed deer from southern Florida in October 1989.

Area	Liver flukes ^a		Rumen flukes ^b	
	No. deer exam.	No. inf.	No. deer exam.	No. inf.
Bear Island	8	4	8	5
Raccoon Point	7	6	7	6
Fakahatchee Strand State Preserve	7	5	7	6
Panther Refuge	8	5	8	6
Collier Enterprises	7	5	7	5
Totals	37	25 (68%)	37	28 (76%)

^a Fascioloides magna; mean intensity = 9 (range = 2 - 35)

^b Paramphistomum liorchis

Table 26. Prevalences of bots, ticks, and keds in white-tailed deer from southern Florida in October, 1989.

Area	No. deer exam.	No. positive for		
		Bots ^a	Ticks ^b	Keds ^c
Bear Island	8	7	2	6
Raccoon Point	7	6	1	7
Fakahatchee Strand State Preserve	7	4	6	6
Panther Refuge	8	4	1	8
Collier Enterprises land	7	5	0	6
Totals	37	26 (70%)	10 (27%)	33 (89%)

^a Cephenemyia sp.; mean intensity = 4 (range = 1 - 21).

^b Ixodes scapularis, I. affinis, and Amblyomma maculatum.

^c Lipoptena mazamae

Table 27. Prevalences of protozoan parasites in white-tailed deer in southern Florida in October, 1989.

Area	Intestinal coccidia ^a		Sarcocysts ^b		Trypanosomes ^c	
	No. deer exam.	No. inf.	No. deer exam.	No. inf.	No. deer exam.	No. inf.
Bear Island	8	2	8	3	8	8
Raccoon Point	7	0	7	7	7	7
Fakahatchee Strand State Preserve	7	1	7	4	7	7
Panther Refuge	8	0	7	1	7	7
Collier Enterprises	7	0	7	5	5	4
Totals	37	3 (8%)	36	20 (56%)	34	33 (97%)

^a Eimeria odocoilei and E. virginianus

^b Sarcocystis spp. (represents two or more species)

^c Trypanosoma cervi; results determined by culture techniques.

Table 28. Seroprevalence of bluetongue virus and epizootic hemorrhagic disease virus in white-tailed deer from southern Florida in October 1989.

Area	No. deer exam.	No. deer seropositive for	
		Bluetongue virus ^a	EHD virus ^a
Bear Island	7	3	1
Raccoon Point	7	0	0
Fakahatchee Strand State Preserve	6	0	0
Panther Refuge	7	4	3
Collier Enterprises	6	5	3
Totals	33	12 (36%)	7 (21%)

^a Seven deer were positive for both viruses.

Table 29. Seroprevalence of IBR, BVD, and PI-3 viruses in white-tailed deer from southern Florida in October 1989.

Area	No. deer exam.	No. deer positive for:		
		IBRV ^a	BVDV ^b	PI-3V ^c
Bear Island	7	3	3	1
Raccoon Point	7	4	3	0
Fakahatchee Strand State Preserve	6	2	2	0
Panther Refuge	7	4	2	1
Collier Enterprises	6	3	3	2
Totals	33	16 (48%)	13 (39%)	4 (12%)

^a Infectious bovine rhinotracheitis virus

^b Bovine virus diarrhea virus

^c Parainfluenza-3 virus

Table 30. Seroprevalence of serogroups of Leptospira interrogans in white-tailed deer in southern Florida during October, 1989.

Area	No. deer tested	No. deer seropositive for serogroups ^a				
		<u>autumnalis</u>	<u>ballum</u>	<u>bratislava</u>	<u>pyrogenes</u>	<u>canicola</u>
Bear Island	7	1	4	1	0	2
Raccoon Point	7	1	0	0	0	0
Fakahatchee Strand State Preserve	6	0	1	0	0	0
Panther Refuge	7	0	2	0	0	2
Collier Enterprises	6	0	1	1	1	1
Totals	33	2	8	2	1	5

^aAll 33 deer were seronegative for serogroups australis, bataviae, grippotyphosa, hardjo, icterohemorrhagiae, pomona, and tarassovi.