

2933 ~~Panther-biomedical~~

ANNUAL PERFORMANCE REPORT
STATEWIDE WILDLIFE RESEARCH

Deer Herd Health

State: Florida

Study No. W-41-32 IX

Project Title: Wildlife Disease and Parasite Research

Study Title: Diseases and Parasites

Period Covered: 1 July 1986 - 30 June 1987

Abstract - Examinations were conducted on 107 specimens of diseased and normal mammals and birds. Four mortality episodes were investigated. Two involved brown pelicans (Pelecanus occidentalis), one involved raccoons (Procyon lotor), and one involved both raccoons and grey foxes (Urocyon cinereoargenteus). In addition, a number of individual cases of diseased birds and mammals from scattered localities was studied. Work continued on a book on the parasites and diseases of wildlife in Florida. The third year of a long-term study of the health and reproductive status of white-tailed (Odocoileus virginianus) deer in the Big Cypress National Preserve and in the Fakahatchee Strand was completed. An ecological survey of the helminth parasites of river otters (Lutra canadensis) throughout the state of Florida was conducted and resulted in the identification of two trematodes, one cestode, six nematodes and one acanthocephalan.

In order to manage Florida's wildlife resource, it is essential to understand the significance of disease and to monitor disease outbreaks. It is also important to conduct research on apparently healthy animals in order to establish the occurrence and prevalence of disease agents. To achieve these goals, research was continued this year with the following objectives: (1) examine sick and dead specimens of wildlife as they become available and determine the causes of morbidity and/or mortality; (2) determine the helminth fauna of river otters (Lutra canadensis) in Florida; (3) prepare rough drafts of a number of chapters for the book on wildlife diseases of Florida; and (4) obtain information on the physical condition, reproduction and other aspects of health and diseases of white-tailed deer (Odocoileus virginianus) in the Big Cypress National Preserve and Fakahatchee Strand.

METHODS

Specimens of dead and dying animals and various samples from wild animals were processed according to standard laboratory procedures in order to determine the cause of death or to obtain certain information on various parasites and diseases. These procedures included pathological, microbiological, toxicological, and parasitological analyses.

Carcasses from 65 river otters (Lutra canadensis) were obtained as road-kills or were procured from fur-trappers from various parts of Florida and stored frozen until processed. After thawing each organ was examined separately and all helminths were recovered using fine-mesh screens for recovery of small specimens. Helminths were then fixed, preserved and examined using standard techniques.

Information on various species of wildlife was collected from published reports, unpublished records and from other sources and compiled into chapters which were organized by hosts. Rough drafts of chapters were prepared and circulated to various people for their critical comments and suggestions for improvement. Revisions were prepared on several chapters.

Reproductive and health/disease information was obtained from 27 white-tailed deer (Odocoileus virginianus) from Big Cypress National Preserve and Fakahatchee Strand. Fourteen of these deer were collected (seven from Bear Island and seven from Fakahatchee Strand State Preserve) and complete necropsies were performed to determine weights, measurements, and condition indices as well as to evaluate lesions, parasitism, and APCs. Serological tests were conducted to detect antibodies to a number of viral and bacterial disease agents. Limited information was obtained from 13 hunter-killed deer and tests were conducted where possible to obtain some of the types of information indicated above. Results were compared to data obtained during the first two years of the study.

RESULTS

During the course of the year 107 specimens representing 15 species of wildlife were examined for parasites and disease conditions or cause of death. These included 3 wood storks (Mycteria americana), 1 fulvous whistling duck (Dendrocygna bicolor), 1 wild turkey (Meleagris gallopavo), 2 sandhill cranes (Grus canadensis), 6 brown pelicans (Pelecanus occidentalis), 1 American kestrel (Falco sparverius), 1 bald eagle (Haliaeetus leucocephalus), 1 double-crested cormorant (Phalacrocorax auritus), 28 white-tailed deer (Odocoileus virginianus), 2 grey foxes (Urocyon cinereoargenteus), 3 raccoons (Procyon lotor), 1 wild hog (Sus scrofa), 4 black bears (Ursus americanus), 2 Everglades mink (Mustela vison evergladensis), and 51 river otters (Lutra canadensis). Most of these animals (86) were considered "normal" and information on these specimens was used as baseline data. Twenty-one other animals (representing 12 species) were submitted for evaluation because of disease conditions. These are summarized in Table 1.

Four mortality episodes were investigated during the year. Two of these involved brown pelicans, one involved raccoons, and one involved both raccoons and grey foxes. The first episode was studied in conjunction with the Game Commission's investigation of an oil spill in the Jacksonville Beach area during March and April, 1987. It was determined that the brown pelicans submitted died from causes incidental to the oil spill. The other situation concerned a die-off of 19 brown pelicans near Ft. Myers Beach. It was suspected that copper sulfate was involved in the mortality, but tests of tissues from three pelicans and a double-crested cormorant failed to confirm this suspicion. No cause of the mortality was discovered, but it was suspected that a toxin was involved. The two other epizootics involved raccoons in Alachua County and raccoons and grey foxes in Pasco County. Both were determined to be caused by canine distemper.

The helminth fauna of river otters in Florida was found to consist of 10 species. These included two trematodes, one larval cestode, six nematodes and one acanthocephalan (Table 2). Otters for this study came from 19 counties and were obtained over a period of time from 1972 to 1985 (Table 3). Several of the helminths are specific for otters and are not found in other hosts.

Nine chapters were written for the book on parasites and diseases of Florida wildlife. These included chapters entitled Mustelids, Opossums, Armadillos, Insectivores, Bats, Pocket Gophers, Old World Rats and Mice, Seals and Sea Lions and Manatees. Research on an additional chapter on New World rats and mice was completed and the manuscript was partially written. Newly discovered information was added to a number of other chapters which have already been written in rough-draft form.

The results of this year's work on the health of white-tailed deer in Big Cypress National Preserve and in the Fakahatchee Strand are presented in the attached document. Data on parasites, viruses, bacteria, reproductive status and physical condition were collected for 27 deer.

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. During this past year canine distemper flared up again and outbreaks were documented in Alachua and Pasco Counties. One raccoon in Alachua County had both distemper and toxoplasmosis. Cases of dermatitis, trauma, emaciation, sarcosporidiosis, enterocolitis, and neoplasia were documented in various birds and mammals. Of particular interest were the findings of sarcosporidiosis in an American kestrel and an undifferentiated hepatic tumor in a fulvous whistling duck.

Of the ten species of helminths that occur in otters in Florida, Crenosoma goblei is probably the most significant pathogen. Other related species, such as C. vulpis in dogs and foxes, are known to cause bronchopneumonia which can be fatal (Anderson, 1971). Strongyloides lutrae may also be a serious pathogen, but that has not been investigated.

Progress on the parasite/disease book was good this year. Writing progressed to the half way mark and new information was added to a number of chapters as well. The coverage of the book was enlarged somewhat with several new topics and chapters being added.

It was concluded that the deer from the southern part of Fakahatchee Strand were in poor condition compared those examined from Bear Island. Condition values, APCs and a number of other comparisons substantiated this conclusion.

Literature Cited

Anderson, R.C. 1971. Lungworms. In: Parasitic Diseases of Wild Mammals.

J.W. Davis and R.C. Anderson (eds.) Iowa State Univ. Press, Ames, pp. 81-126.

Prepared by Donald J. Forrester

Table 1. Diagnosed causes of debilitation and/or death of wildlife examined
between July 1, 1986 and June 30, 1987.

Species	Location (county)	No. cases	Diagnosis
1. Wild turkey (<u>Meleogris gallopavo</u>)	Hendry	1	Dermatitis
2. Sandhill crane (<u>Grus canadensis</u>)	Alachua	1	Trauma
3. Wood stork (<u>Mycteria americana</u>)	Alachua	1	Emaciation
4. Wood stork (<u>Mycteria americana</u>)	Lee	1	Emaciation
5. Wood stork (<u>Mycteria americana</u>)	Lafayette	1	Emaciation
6. American kestrel (<u>Falco sparverius</u>)	Alachua	1	Sarcosporidiosis
7. Brown pelican (<u>Pelecanus occidentalis</u>)	Duval	1	Emaciation and esophageal perforation
8. Brown pelican (<u>Pelecanus occidentalis</u>)	Lee	3	Toxicosis
9. Double-crested cormorant (<u>Phalacrocorax Auritus</u>)	Lee	1	Toxicosis
10. Fulvous whistling duck (<u>Dendrocygna bicolor</u>)	Palm Beach	1	Hepatic tumor
11. White-tailed deer (<u>Odocoileus virginianus</u>)	St. Lucie	1	Enterocolitis
12. Grey fox (<u>Urocyon cinereoargenteus</u>)	Alachua	1	Trauma
13. Grey fox (<u>Urocyon cinereoargenteus</u>)	Collier	1	Hemorrhagic disease due to liver dysfunction
14. Raccoon (<u>Procyon lotor</u>)	Alachua	1	Distemper and toxoplasmosis
15. Raccoon (<u>Procyon lotor</u>)	Alachua	2	Distemper
16. Everglades mink (<u>Mustels vison evergladensis</u>)	Collier	2	Trauma
17. Wild hog (<u>Sus scrofa</u>)	Collier	1	Porcine stress syndrome

Table 2. Helminths of 65 river otters (Lutra canadensis) in Florida.

Helminth (site) ^a	Prevalence			Intensity	
	No. exam.	No. inf. (%)		Mean	Range
Trematoda					
<u>Baschkirovitrema incrassatum</u> (SI)	61	34 (56)		27	1-248
<u>Enhydridiplostomum alarioides</u> (SI)	61	13 (21)		149	1-1640
Cestoda					
<u>Spirometra mansonoides</u> (SC) (sparganum)	10	1 (10)		ND ^b	ND
Nematoda					
<u>Crenosoma gobleii</u> (LU)	65	40 (62)		13	1-72
<u>Strongyloides lutrae</u> (SI)	61	38 (62)		96	1-992
<u>Gnathostoma miyazakii</u> (KI)	63	20 (32)		3	2-18
<u>Capillaria plica</u> (UB)	57	7 (12)		9	1-49
<u>Dirofilaria lutrae</u> (SC)	10	7 (70)		ND	ND
<u>Capillaria hepatica</u> (LI)	61	1 (2)		ND	ND
Acanthocephala					
<u>Oncicola</u> sp. (SI)	61	4 (7)		2	1-2

^aSI=small intestine, LU=lungs, KI=kidneys, UB=urinary bladder, SC=subcutaneous tissues, LI=liver.

^bND=not determined

Table 3. River otters (*Lutra canadensis*) sampled for parasites in various regions in Florida, 1972-1985.

Area (sample size)	County	No. otters examined
<u>Panhandle</u> (n=21)	Wakulla	7
	Washington	1
	Calhoun	1
	Gulf	1
	Franklin	7
	Leon	2
	Jefferson	1
	Jackson	1
<u>North-central</u> (n=20)	Columbia	5
	Baker	6
	Gilchrist	1
	Alachua	7
	Putnam	1
<u>Southern</u> (n=23)	Okeechobee	2
	Glades	5
	Collier	13
	Broward	2
	Dade	1
<u>Central</u> (n=1)	Pasco	1
Total		65

Appendix A

Health/Disease Study of White-tailed Deer
in Southern Florida

(July 1, 1986 thorough June 30, 1987)

Abstract--Reproductive and health/disease information was collected from 27 white-tailed deer (Odocoileus virginianus) from the Big Cypress National Preserve and Fakahatchee Strand State Preserve. Seven deer were collected from the Bear Island unit and 7 from the Fakahatchee south area by Game Commission personnel. In addition, limited information was obtained from hunter-killed deer as follows, 4 deer from Bear Island, 5 deer from other areas of Big Cypress, and 4 deer from Fakahatchee strand north. In order to collect data for comparative purposes, deer were processed in accordance with methods established from the beginning of the study in 1984.

As a result of analysis of data for this study period it was apparent that deer from Bear Island were in the best health of all deer examined which was a consistant finding in previous reports. Indeed, over the three-year study period, Bear Island has remained the most favorable location for deer. In a comparison of animals collected during October of each of the last three years, the average overall condition value of deer from Bear Island has steadily increased. Interestingly, so have their abomasal parasite counts (APC). The prevalence of bluetongue and EHD viruses as well as Leptospira interrogans has also remained high throughout the study.

Deer collected from Fakahatchee south did not have as high condition values and their APCs were greater, but they had a reduced prevalence of hemorrhagic disease viruses and L. interrogans infections compared to deer from Bear Island. Deer from Fakahatchee north had lower overall condition values and higher APCs than animals from Bear Island, but they also had a similar prevalence of infection with hemorrhagic disease viruses and L. interrogans as Bear Island.

Overall there was almost no difference in the reproductive rates of deer from Bear Island and Fakahatchee strand.

This report is the continuation of a long-term study of the health and diseases of the white-tailed deer populations in the Big Cypress National Preserve (BCNP) and nearby areas in southern Florida. Beginning in 1984, the study has consisted of examination of various biological parameters of deer herds found in different plant communities of the Preserve as well as animals living in the adjacent Fakahatchee Strand. Notable areas include Bear Island and Raccoon Point of the BCNP and the separation of the Strand into north and south regions using Alligator Alley as the dividing line. In a parallel

study of the biology and ecology of the endangered Florida panther, these above areas have been shown to be frequented by panthers which prey on the deer. It is hoped that information obtained in the deer study in combination with land management techniques will provide a healthier deer herd which in turn will be a better prey base for panthers. This report includes data on the October collection of deer from Bear Island and Fakahatchee south as well as hunter-killed deer from Bear Island and Fakahatchee north.

METHODS

There has been considerable effort expended to collect data in a similar manner in order to validate comparisons of information with respect to different geographic areas within the study. During October, 1986, Game and Fish Commission personnel collected 7 deer each from Bear Island and Fakahatchee south totaling 14 animals (Table 1). Hunters provided another 4 animals from Bear Island and 4 from Fakahatchee north. An additional 5 deer were killed by hunters from other regions of the BCNP. Therefore there was a total of 27 deer examined for the fall 1986 season.

Deer collected by the Game Commission usually were necropsied within 10 hours after death. Blood samples were collected via cardiac puncture at the time of death and chilled as was the carcass until later processing. All morphometric determinations, condition values, and gross pathologic findings were assessed and recorded at necropsy. A more rigorous analysis of material including serology, histopathology and parasitology was conducted in Gainesville at several laboratories of the College of Veterinary Medicine (UF) as well as the Animal Disease Diagnostic Laboratory in Kissimmee, Florida and the National Animal Disease Laboratory in Ames, Iowa.

Hunter-killed deer were processed in a similar manner, but because the condition of the carcass was so variable some information was unavailable.

RESULTS AND DISCUSSION

The physical characteristics of deer collected from the BCNP and the Fakahatchee Strand are summarized in Tables 2,3 and 4. The mean values for total length and weight of collected deer were nearly identical between Bear Island and Fakahatchee south. The Fakahatchee deer had a lower overall condition value and a higher abomasal parasite count than Bear Island deer. By comparison, weights and lengths of 2-year-old does from Fakahatchee north were only slightly less than those of Bear Island deer, whereas Raccoon Point does were lighter and shorter than deer from either area (Table 16). APC values were highest for 2-year-old deer living in Raccoon Point followed by Fakahatchee north with the lowest values for Bear Island does. Indeed, the mean APC value for Fakahatchee south deer collected this past fall was nearly double that of Bear Island does collected at the same time.

A comparison of fat indices and blood values of deer from Bear Island and Fakahatchee south revealed that Bear Island deer had more fat and better blood values than their Fakahatchee counterparts (Table 5). Mean adrenal weights were similar for deer from both Bear Island and Fakahatchee south. Kidney weights were also similar between the two areas, however the fat and kidney capsule weights were slightly greater for the Bear Island deer (Table 6). This finding is in concert with total body weights, fat indices, and overall condition values.

Reproductive activity of the deer from Fakahatchee north and south as well as Bear Island was nearly the same (Table 7). The sex ratio of the fetuses was equal and the estimated fetal age ranged from 6 weeks to 21 weeks. The doe with the 21 week old fetus was 2.5 years old and was collected during mid-November in the Fakahatchee north area. The youngest

fetus found was conceived either in the last week of August or the first week of September. There was no twinning observed from any area for this collection period.

There were some regional differences in prevalence of viral infectious agents for this collection period (Table 8). The hemorrhagic disease viruses, namely bluetongue and epizootic hemorrhagic disease, virus had a similar prevalence in both Bear Island and Fakahatchee north while Fakahatchee south deer had a reduced prevalence of both viruses. The Fakahatchee south 2-year-old deer had a similar yet slightly lower prevalence than Raccoon Point 2-year-olds. Bear Island had the highest prevalence of Leptospira interrogans infection (Table 8). These infections consisted of two serotypes namely canicola and grippotyphosa. Only grippotyphosa is limited to Bear Island deer while canicola occurred in all areas. The lowest prevalence of Leptospira infection occurred in the Fakahatchee south deer. All deer were tested for antibodies directed against Brucella abortus and none was positive.

Ectoparasite infestation prevalences were dissimilar for Bear Island and Fakahatchee deer (Table 9 and 10). Bear Island deer were infested mainly with louse flies (keds) while Fakahatchee strand deer were infested with all four groups of ectoparasites. Interestingly, infestation of deer from Bear Island from previous collections included all four groups of ectoparasites.

The species composition of endoparasites with the exception of tapeworm cysticerci was the same reported previously (Forrester and Roelke 1986). The prevalence of liver flukes in Fakahatchee deer was slightly higher than in Bear Island deer. Lungworm prevalence was similar for deer from Bear Island and Fakahatchee north (Tables 11 and 12), however Fakahatchee south deer had a lower prevalence of lungworms. The prevalence of coccidia was uniformly

low for all deer. The abomasal nematode Haemonchus contortus constituted the highest percentage of the abomasal parasites in deer from Bear Island. In fact, the percentage of Haemonchus found in the APC of Bear Island deer was over twice that observed in Fakahatchee deer. Haemonchus contortus is a blood-feeder that in sufficient numbers can be fatal to deer. Experimental work has demonstrated that at a particular number of parasites per kilogram body weight a threshold is achieved where the worm infection becomes pathogenic (Davidson et al. 1980). This threshold value is 75 worms per kilogram body weight and was documented in at least four deer over the past 3 years of the study (Table 13). The most severe case was animal number 88 from Raccoon Point which was a 7-month-old deer that had a total APC over 5000 and weighed only 16Kg (35 lbs). The most dramatic evidence of the high number of worms was seen in the blood values of PCV (packed red cell volume) and PP (plasma proteins). Both values are well below normal suggesting that the deer was anemic. At least four deer had parasite numbers above threshold, three from Raccoon Point and one from Bear Island. Another Bear Island deer, #162, had a parasite count within five worms of the threshold level.

In order to determine a trend in parasitism and condition values, data from deer collected in October during the last three years were summarized in Table 14. Where data are available there appears to be a steady increase in APC values from 1984 to 1986 in all areas. Unfortunately, the largest APC is only known for one sample year namely Fakahatchee south for 1986. Surprisingly, overall condition values have increased uniformly paralleling APC values. Classically, APC values have been utilized as measurable indices that correlated with the ability of a habitat to support a deer herd. Typically, as the APC values increase the condition values decrease

substantiating the the reduced ability of the habitat to support the herd (Davidson et al. 1982). Interpretation of these data in southern Florida is complex because of various factors (such as water levels) that influence the relationship of animal health and APCs. These will require further evaluation before they can be understood completely.

CONCLUSIONS

Some general observations can be inferred from data collected for the study thus far. Generally, as shown by condition values and morphometrics, deer from Bear Island are in the best shape for the region followed closely by deer from Fakahatchee north. This observation is not surprising considering the ecological similarity of the two areas. Raccoon Point and Fakahatchee south are more similar to each other ecologically than they are to Bear Island and this is reflected in the similar condition of deer. Deer from both areas are not as healthy as deer from Bear Island and Fakahatchee north. These observations are supported by APCs, fat indices, ectoparasite infestations and reproductive parameters. However, some infectious agents that have the potential of being serious pathogens to deer are located in the areas where deer are in the best of health. The hemorrhagic disease viruses and Leptospira have their greatest prevalence in the Bear Island unit and this most likely results from the deer's association with cattle. While it is true that there is no current evidence that these disease agents are severely affecting the deer, they are nevertheless present and may certainly become more significant as deer densities increase, habitat quality decreases, and/or an unforeseen ecological catastrophe occurs.

ADDITIONAL COLLABORATIVE RESEARCH

In order to more clearly understand the biological dynamics of the BCNP deer herds, there are several ongoing studies. In our own laboratories, we have initiated a more intense histopathologic examination of numerous tissues of all deer between 2 and 3 years of age to further evaluate their health. By comparing the same age class from different areas throughout the study and over the entire study period we hope to uncover any health trends that may otherwise be overlooked. In collaboration with Dr. John Bell (Dept. of Physiological Sciences, College of Veterinary Medicine, U of F), select deer tissues from throughout the entire study are being examined for concentrations of iron, copper, cadmium, zinc, arsenic, chromium, lead, and mercury. The purpose in looking for these metals is not only to determine if they are at dangerous concentrations but also to establish reference concentrations for the area at this point in time. In addition, we are collaborating with Dr. Lee McDowell (Dept. of Animal Science, College of Agriculture, U of F) to determine the concentrations of selenium, molybdenum, and cobalt in the deer herds. If these critical nutrients are deficient they can be provided as a part of a management program of supplemental feeding. The effects of deficiencies are subtle and most often have their dramatic effect on very young animals. Measuring concentrations of nutrients gives us an additional and more precise indication of health that supplements the more subjective observations of fat indices, etc. In collaboration with Dr. Mary Brown (Dept. of Infectious Diseases, College of Veterinary Medicine, U of F), we will be looking for Mycoplasma infections in does and fawns. Mycoplasma can jeopardize deer reproductive efforts by reducing fecundity in does and by severely debilitating fawns particularly during their first 6 weeks of life. We will be examining the reproductive tract of the doe and her milk to see if she is infected and if she would pass her infection to her fawn.

We will be intensifying our examination of bluetongue and EHD viruses in collaboration with two laboratories, namely those of Dr. Paul Gibbs and Dr. Ellis Greiner. We have observed a high prevalence of both viruses at Bear Island and a reduced prevalence along a continuum south of Bear Island. We will attempt to isolate these viruses and determine their identity relative to other strains. It is possible that these viruses are a unique strain because of their apparent reduced pathogenicity. In addition, we are interested in the arthropod vector involved in the area and its affect on the viruses. In other parts of the U.S., the vector of these viruses is viruses is Culicoides variipennis. This midge has not been found in the Big Cypress however, another species (C. insignis) does occur there and has been shown to vector the viruses. The most severe acute cases of hemorrhagic disease in Florida have occurred outside the range of C. insignis and within the range of C. variipennis.

We have also noted an increased regional prevalence of Leptospira interrogans in Bear Island and to some degree in the Fakahatchee north area. The canicola strain is the most prevalent and the number of infected deer has increased. In cooperation with Dr. David Miller of the National Veterinary Services Laboratories in Ames, Iowa, we will isolate the spirochete organisms further study. The serotype canicola typically infects carnivores, but not deer and therefore we wish to determine if deer are infected with canicola or if we are dealing with some other closely related serotype which may be cross-reacting with canicola antigen in the serologic tests.

ACKNOWLEDGEMENTS

We would like to acknowledge the field support of the following GFC personnel: Walt McCown, Daryl Land, Jayde Roof, Mike Ramsey, and Deb Jansen. Drs. E.P. Gibbs and P.L. Nicoletti assisted in the serological aspects of this study. We are also thankful for the technical support of John Bogue, Ben All, Paul Humphlett, Sara Ross, Diane Daughtridge, Ronnie Bell and Dr. Qi-Yun Zeng.

LITERATURE CITED

Davidson, W.R., M.B. McGhee, V.F. Nettles and L.C. Chappell. 1980.

Haemonchosis in the white-tailed deer in the southeastern United States.

J. Wildl. Dis. 16:499-508.

Davidson, W.R., J.S. Osborne and F.A. Hayes. 1982. Abomasal parasitism and physical condition in southeastern white-tailed deer. Proc. Annu. Conf.

Southeast. Assoc. Fish and Wildl. Agencies 36:436-444.

Forrester, D.J. and M.E. Roelke. 1986. Health/disease study of white-tailed deer in the Big Cypress. Annual Progress Report of Research, Florida Game and Freshwater Fish Commission. 60 pp.

Prepared by Scott D. Wright and Donald J. Forrester

Table 1. Numbers of white-tailed deer collected in the Big Cypress National Preserve and Fakahatchee Strand State Preserve during the Fall of 1986.

Date	Area				
	Big Cypress		Fakahatchee		Total
	Bear Island	Other	North	South	
October 1986	7			7	14
Fall Hunting 1986	4	5	4		13
Total	11	5	4	7	27

Table 2. Physical characteristics of 11 white-tailed deer collected on the Bear Island Unit of the Big Cypress National Preserve, Fall 1986.

Deer Number	Sex	Age	Weight	Total Length	Condition Value	APC ^a
159	F	2.5	100	174.0	G	510
160	F	3.0	94	147.5	G+	1,370
161	F	2.0	90	156.0	G	590
162	M	6 mo	48	125.0	G	1,767
163	F	8 mo	52	120.5	G	2,993
164	F	2.5	90	153.0	E	630
165	F	2.5	100	155.0	E	1,133
Mean Values		2.0	82	147.0	G+	847
Hunter-Killed Deer						
168	M	2.5	110	ND ^b	G	480
168B	M	2.5	75	ND	ND	ND
170	M	>1.0	ND	ND	ND	370
174	M	1.0	ND	ND	ND	770
Mean Values		1.7	93	ND	G	540
Overall Means		1.9	88	147.0	G	1,051

^aAPC = Abomasal parasite count

^bND = not determined

Table 3. Physical characteristics of white-tailed deer collected from the Fakahatchee Strand State Preserve, Fall 1986.

Deer Number	Sex	Age	Weight	Total Length	Condition Value	APC ^a
154	M	10 mo	66	144.5	F-	1,560
155	F	2.5	72	146.0	F+	426
156	F	5.5	82	154.5	F	1,340
157	F	8 mo	40	120.5	F	127
158	M	2.25	116	154.0	G+	1,660
166	M	3.5	116	158.5	F-	3,930
167	F	2.5	84	145.5	F	453
Mean Values		2.0	82	146.0	F	1,562
Hunter-killed Deer						
177	M	1.5	60	113.0	F	2,590
178	M	---	70	148.0	F	260
179	F	2.5	87	149.0	F	1,170
180	F	2.5	83	143.0	F+	110
Mean Values		2.0	75	113.0	F	1,730
Overall Means		2.0	79	130	F	1,646

^aAPC = Abomasal parasite count

Table 4. Physical characteristics of white-tailed deer collected by hunters from units of the Big Cypress National Preserve, Fall 1986.

Unit	Deer Number	Sex	Age	Weight	Condition Value	APC
Monument	172	M	---	75	--	--
Stairsteps	169	M	2.5	60 ^a	--	1,160
	173	M	---	70 ^a	--	1,790
Loop	171	M	---	67	--	966
	175	M	---	100	--	666

^adressed weight

Table 5. Blood values and fat indices for white-tailed deer collected from the Bear Island Unit of the Big Cypress National Preserve and the Fakahatchee Strand State Preserve, Fall 1986.

Deer Number	Unit	Fat Indices				Blood Values		
		Tail	Heart	Peri cardial	Kidney	PVC	PP	WBC
159	BI	M+	M	M	M	42	7.8	2,800
160	BI	M	H	H	M+	44	7.8	1,375
161	BI	M+	M	M	L	34	6.6	1,150
162	BI	L	M-	L	L	39	7.2	2,000
163	BI	L	L	L	L	43	5.6	2,300
164	BI	H	M	M	M	48	7.2	2,500
165	BI	M+	M	H	M	34	8.0	4,850
Mean Values		M	M	M	M-	40	7.2	2,096
154	FK	L	L	O	L-	30	7.0	1,850
155	FK	L	M	M-	L	42	6.4	950
156	FK	L	M	M	L	44	6.0	1,600
157	FK	L-	L-	O	O	33	6.0	1,750
158	FK	M+	M+	M+	M	52	7.2	1,850
166	FK	L	M-	L	L-	32	6.6	525
167	FK	L+	L+	M	L-	31	7.2	775
Mean Values		L+	M-	L+	L	38	6.6	1,328

BI = Bear Island Unit
 FK = Fakahatchee Strand
 PVC = packed red blood cell volume
 PP = plasma proteins
 WBC = white blood cell count

Table 6. Adrenal, renal and thymus values for white-tailed deer collected from the Bear Island unit of the Big Cypress National Preserve and the Fakahatchee Strand State Preserve, Fall 1986.

<u>Bear Island</u>			<u>Kidney weight (gm)</u>						
<u>Deer No.</u>	<u>Sex</u>	<u>Age</u>	<u>Adrenal weight (gm)</u>		<u>Fat & capsule</u>		<u>Kidney</u>		<u>Thymus</u>
			<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>	<u>Left</u>	<u>Right</u>	<u>Weight (gm)</u>
159	F	2.5	2.0	1.8	14.2	10.4	59.5	60.8	8.7
160	F	3.0	1.8	1.4	16.2	15.1	47.3	49.4	---
161	F	2.0	1.8	1.8	6.4	4.9	46.0	47.0	14.1
162	M	6 mo.	.8	.9	1.8	1.9	39.6	38.8	17.1
163	F	8 mo.	.8	.6	1.8	2.2	28.4	29.1	11.0
164	F	2.5	2.2	1.6	16.4	15.6	57.8	57.6	6.8
165	F	2.5	1.6	1.3	11.4	10.5	51.6	49.8	8.0
*Mean			1.9	1.6	13.0	11.3	52.4	53.0	9.4
<u>Fakahatchee Strand (South)</u>									
154	M	10 mo.	1.5	1.5	2.5	3.3	48.5	51.7	13.1
155	F	2.5	2.5	1.8	4.0	4.1	42.4	40.9	5.8
156	F	5.5	2.0	1.7	4.8	4.2	50.3	48.6	3.7
157	F	8 mo.	1.0	.8	.8	1.1	23.7	22.2	5.8
158	M	2.25	2.0	1.6	23.7	19.4	67.2	69.8	6.2
166	M	3.5	2.3	2.7	5.5	3.3	66.8	66.6	---
167	F	2.5	1.0	1.2	15.3	13.9	46.7	46.5	7.6
*Mean			2.0	1.8	10.7	9.0	54.7	54.5	5.8

*mean values do not include deer less than 12 months old

Table 7. Reproductive data collected from white-tailed deer from the Bear Island unit, Fakahatchee Strand State Preserve and Fakahatchee Conservation Club, Fall 1986.

Bear Island Unit			Fawns			
Deer No.	Age	No.	Sex	Age	Weight	Crown/Rump Length
159	2.5	1	ND ^b	6 wks	.8 gm	2.3 cm
160	3.0	1	F	15 wks	277.8 gm	21.4 cm
161	2.0	1	M	13 wks	108.6 gm	15.6 cm
163	8 mo.		NOT PREGNANT			
164	2.5	1	F	12 wks	83.7 gm	14.0 cm
165	2.5	1	F	13 wks	146.7 gm	17.0 cm

Fakahatchee Strand State Preserve

155	2.5	1	M	8 wks	11 gm	6.7 cm
156	5.5		NOT PREGNANT			
157	8 mo.		NOT PREGNANT			
167	2.5	1	M	15 wks	352.3 gm	22 cm

Fakahatchee Conservation Club

179	2.5	1	F	21 wks	1300 gm	43 ^a cm
180	2.5	1	M	16 wks	NA ^a	NA

^aNA = not available

^aND = not determined

Table 8. Prevalence of antibodies to infectious disease agents in white-tailed deer from the Bear Island unit and Fakahatchee Strand, fall 1986.

Etiologic Agent	<u>Bear Island</u>		<u>Fakahatchee Strand</u>			
	n=11		North n=4		South n=7	
	no.	pos. (%)	no.	pos. (%)	no.	pos. (%)
<u>Viruses</u>						
Bluetongue	9	81	4	100	2	28
EHD	7	63	4	100	1	14
PI3	0	0	0	0	0	0
BVD	0	0	0	0	0	0
IBR	0	0	0	0	0	0
VS	0	0	0	0	0	0
BRSV	0	0	0	0	0	0
<u>Bacteria</u>						
<u>Leptospira interrogans</u>	9	81				
<u>canicola</u>	5	45	2	50	2	28
<u>pomona</u>	0	0	0	0	0	0
<u>grippotyphosa</u>	4	36	0	0	0	0
<u>Brucella abortus</u>	0	0	0	0	0	0

EHD = Epizootic hemorrhagic disease
 PI₃ = Parainfluenza virus 3
 BVD = Bovine viral diarrhea
 IBR = Infectious Bovine Rhinotraechnitis
 VS = Vesicular stomatitis
 BRSV = Bovine respiratory syncytial virus

Table 9. Ectoparasites from white-tailed deer from Bear Island unit of the Big Cypress National Preserve, Fall 1986.

Deer No.	Sex	Age	Ticks	Lice	Louse Flies	Chiggers
159	F	2.5	L	0	0	0
160	F	3.0	0	0	L	0
161	F	2.0	0	0	M	0
162	M	6 mo.	0	0	L	0
163	F	8 mo.	0	0	L+	0
164	F	2.5	0	0	L	0
165	F	2.5	0	0	L+	0

Hunter-killed deer

168	M	2.5	L	0	M	0
168-B	M	2.5	L	0	L	0

0 = none found
 L = Light infestation
 M = Moderate infestation
 H = Heavy infestation
 +, - = Intermediate values

Table 10. Ectoparasites from white-tailed deer from Fakahatchee Strand State Preserve, Fall 1986.

Deer No.	Sex	Age	Ticks	Lice	Louse Flies	Chiggers
154	M	10 mo.	L	0	M	0
155	F	2.5	L	L	L	L
156	F	5.5	0	0	L	0
157	F	8 mo.	L	M	M	L
158	M	2.25	L	0	M	0
166	M	3.5	L	0	L+	0
167	F	2.5	L	0	L	0

0 = None found

L = Light infestation

M = Moderate infestation

H = Heavy infestation

+, - = Intermediate values

Table 11. Occurrence and prevalence of endoparasites from white-tailed deer from the Bear Island Unit of the Big Cypress National Preserve, Fall 1986.

Deer				Liver	Rumen		Lung		total	% APC
No.	Sex	Age	Bots	Flukes	Flukes	Coccidia	Worms	APC	<u>Haemonchus</u>	<u>Haemonchus</u>
159	F	2.5	3	3	L	0	4	510	60	12
160	F	3.0	1	4	L	0	2	1370	800	58
161	F	2.0	0	4	L	+	7	590	140	24
162	M	6 mo.	0	0	0	0	0	1767	1540	87
163	F	8 mo.	0	0	L	0	5	2993	2840	95
164	F	2.5	2	0	L	0	3	630	80	13
165	F	2.5	0	1	L	0	1	1133	620	55

Hunter-killed deer

168	M	2.5	0	2	L	0	1	480	193	40
170	M	<1.0	ND	0	0	0	0	367	168	46
174	M	1.0	ND	0	L	+	0	770	240	31

ND = Not determined

L = Light infection

Table 12. Occurrence and prevalence of endoparasites from white-tailed deer collected from the Fakahatchee Strand State Preserve and the Fakahatchee Conservation Club, Fall 1986.

Deer No.	Sex	Age	Bots	Liver Flukes	Rumen Flukes	Coccidia	Lung Worms	APC	total <u>Haemonchus</u>	% APC <u>Haemonchus</u>
154	M	10 mo.	1	0	0	0	0	1560	660	42
155	F	2.5	0	2	L	0	0	426	40	9
156	F	5.5	0	0	L	0	0	1340	120	9
157	F	8 mo.	0	0	L	0	0	127	20	16
158	M	2.25	0	5	L	+	2	1660	270	16
166	M	3.5	3	3	L	0	5	3930	1780	45
167	F	2.5	1	8	L	0	0	453	60	13

Hunter-killed deer (Conservation Club)

177	M	1.5	0	5	L	0	0	2590	990	38
178	M	ND	0	4	ND	0	5	260	28	11
179	F	2.5	0	6	0	0	6	1170	20	2
180	F	2.5	0	ND	ND	ND	2	ND	ND	--

ND = Not determined

L = Light infection

Table 13. Physical and physiologic characteristics of white-tailed deer with total Haemonchus contortus abomasal counts above 1000.

Area	Year	Deer No.	Age Mo.	Wt Kg.	Condition Valve	Total <u>Haemonchus</u>	HPF*	PCV (Vol%)	PP (g/dl)
<u>Bear Island</u>									
	1985	73	16	40	G	1,550	39	42	5.4
	1986	150	12-13	32	F	1,200	38	38	6.6
	1986	162	6	22	G	1,540	70	39	7.2
	1986	163	8	24	G	2,840	118+	43	5.6
<u>Raccoon Point</u>									
	1984	20	6	23	F-	1,073	47	60	4.8
	1985	70	15	22	F-	1,927	87+	70	5.4
	1985	88	7	16	P	5,394	337+	19	2.6
	1986	129	10-11	23	P+	1,010	44	40	5.0
	1986	135	12	18	P+	2,993	166+	22	3.8
<u>Fakahatchee Strand</u>									
South	1986	166	42	53	F-	1,780	34	32	6.6

*HPF = Haemonchus pathogenic factor is calculated by dividing the total number of Haemonchus contortus nematodes by the deer weight obtaining a worm/kg body weight value.

+ = Values of HPF exceeding 75 are considered pathogenic (Davidson et al. 1980).

PCV = Packed red blood cell volume; normal range = 39-58%

PP = Total plasma proteins; normal values range = 5.0-7.8 g/dl

Table 14. Average abomasal parasite counts and overall physical condition values of white-tailed deer collected from the Bear Island and Raccoon Point units of the Big Cypress National Preserve and the Fakahatchee Strand, in the month of October 1984, 1985, and 1986.

Area	1984		1985		1986	
	APC	CV	APC	CV	APC	CV
Bear Island	362(5)	F+	392(5)	G-	847(5)	G+
Raccoon Point	938(4)	F	1008(5)	G-		
Fakahatchee Strand						
North	997(4)	F-	1164(6)	F		
South					1562(5)	F+

() = Sample size

F, Fair; G, good; condition values; +,- indicate intermediate values

CV = Overall physical condition value

APC = Abomasal parasite count

Table 15. Prevalence of cysts of Sarcocystis odocoileocanis in tongues of white-tailed deer from Big Cypress National Preserve and Fakahatchee Strand, 1984 through Fall 1986.

Area	No. Deer Examined	No. Deer Positive	Prevalence (%)
Raccoon Point	56	7	13
Bear Island	57	13	23
Fakahatchee Strand Preserve	11	3	27
Fakahatchee Conserv. Club	4	0	0

Table 16. Comparative health and disease values of 2-to 3-year-old white-tailed deer from Bear Island, Raccoon Point, Fakahatchee Strand north and south, 1984-1986.

Health Values*	Big Cypress National Preserve				Fakahatchee Strand			
	Bear Island		Raccoon Point		North		South	
	M	F	M	F	M	F	M	F
1. Number	3	19	2	12	2	6	2	2
2. Weight (lbs)	103	91	93	68	---	86	116 ^a	78
3. Total Length (in)	154	150	143	136	---	146	154 ^a	146
4. Condition Value	F+	G-	F	F	F+	F+	G+ ^a	F+
5. Fecundity (%)	---	91	---	100	---	100	---	100
6. Prevalence								
a. Ticks	L-	L-	---	L-	---	---	L ²	L
b. Lice	0	0	---	L-	---	L ^a	0	
c. Keds	M-	L	---	L	---	L ^a	M ^a	M-
d. Chiggers	0	0	---	L-	---	---	0 ^a	L
7. Cysticerci	0	0	0	17	0	0	0	0
8. Liver Flukes	66(2.6)	38(4.8)	2 ^a	66(3.5)	100(3.5)	40(1.6)	100(3.5)	100(5)
9. Rumen Flukes	0	M-	M ^a	L	L	L	M-	M-
10. Lungworms (%)	33(1.0)	44(2.0)	9 ^a	64(14)	100(1.0)	40(1.4)	50(1.0)	0
11. Muscleworms (%)	10	50	100 ^a	25	50	17	NE	0
12. APC	235	636	606 ^a	1199	2180	845	900	440
13. Sarcocystis (%)	30	22	0	8	0	50	50	0
14. Bluetongue virus(%)	60	95	50	25	100	83	0 ^a	50
15. EHD virus (%)	60	89	50	8	100	50	0 ^a	50
16. Leptospira (%)	60	47	0	0	0	0	0	50

* Unless otherwise indicated these values are averages

^a not average values

() Intensity values