

THE UNIVERSITY OF GEORGIA
SCHOOL OF FOREST RESOURCES
ATHENS, GEORGIA 30602

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CUMBERLAND ISLAND NS

cc: Grover Henderson 10/22/70

Mr. Ken Morgan
Superintendent
Cumberland Island National Seashore
P.O. Box 806
St. Marys, Georgia 31558

Dear Mr. Morgan:

Enclosed is an analysis of the 1987-88 deer harvest based on data from Cumberland Island submitted to the School of Forest Resources Wildlife Techniques class by Dr. Larry Marchinton and Dr. Bob Warren. All eight undergraduate students participated by aging the jaws and organizing the data on the population structure, herd health, and reproductive analysis. The final report was written by the four graduate students. The undergraduates also read the report and will write letters to you summarizing their own analyses and opinions regarding the deer harvest data.

We hope that you will find our interpretations of the data and our conclusions helpful in your deer management program on Cumberland Island.

Sincerely,

Lynn Hayes

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Graduate Student, Parasitology

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A POPULATION ANALYSIS OF THE WHITE-TAILED DEER
HARVESTED ON CUMBERLAND ISLAND
IN 1987-1988

INTRODUCTION

Managed quota hunts for white-tailed deer (Odocoileus virginianus) on Cumberland Island (CUIS), Georgia have been sponsored by the National Park Service since 1980. For the past 3 years, an analysis of the deer population based on these hunter-killed deer has been made annually by the Wildlife Techniques class at the School of Forest Resources, University of Georgia. This report continues that analysis and follows a similar format in order to maintain continuity. Population structure, average weight, antler development, and hunter success are discussed. Additional information on herd health and reproductive status obtained from research collections has been included to provide a more comprehensive understanding of the deer population. When possible, data were compared with those from previous years to assess general trends in population structure and herd health.

As stated in previous reports (Nelson et al 1986), population analysis based on hunter-killed animals requires the assumptions that hunting mortality was random and that the kill was equal in both sexes and in all age classes. Therefore, a hunter-killed sample is assumed to be representative of the entire population in this report.

METHODS

Managed hunts occurred on CUIS on the following dates:

- 1) November 2-4, 1987: quota 125 hunters; archery only.
- 2) November 16-18, 1987: quota 100 hunters; archery, primitive weapons, and handguns.
- 3) December 7-9, 1987: quota 100 hunters; archery, primitive weapons, and handguns.
- 4) December 28-30, 1987: quota 65 hunters; parent-child; only child may shoot.

- 5) January 4-6, 1988: quota 100 hunters; archery, primitive weapons, and handguns.

Bag limits were set at 3 deer, only 1 antlered and 2 antlerless. Sex, eviscerated weight, date, kill location, and antler development were recorded by National Park Service staff. Jawbones were removed from all deer and aged according to tooth attrition and wear (Severinghaus 1949, Marburger et al 1964) by the UGA Wildlife Techniques class. An error of +/- 1 year is possible due to the 2-month hunting season. Jaw deformities attributable to genetics, malnutrition, or parasitism were also noted.

Age structure polygons were constructed based on the ages determined from the jawbones. Tables and figures were made using sex, eviscerated weight, and antler development data.

Reproductive data were obtained during a UGA research study of the white-tailed deer on CUIS conducted during 1986-1988. Attempts were made to collect 24 deer, 12 males and 12 females, every 2 months for the 2-year period, and reproductive tracts were collected from both male and female deer.

Information on herd health was available from the research collection taken in late summer of 1987 and compared with data from a collection taken during the same seasonal period in 1979 by the Southeastern Cooperative Wildlife Disease Study (SCWDS) at the University of Georgia.

RESULTS AND DISCUSSION

Population Structure

Table 1 lists the age, sex, eviscerated weight, number of antler points, harvest date, and location for each deer killed during the 1987-88 hunting season. Of the 134 deer harvested, 96 jawbones were submitted for aging.

There were fewer numbers of jaw abnormalities than in the two previous years. In 1985-86 and in 1986-87 approximately 7% of the harvested deer were 0.5-years-old. In contrast, the proportion of 0.5-year-old deer harvested in the 1987-88 season was approximately 33%. In comparison with the 2 previous seasons, the current harvest of 7.5+ -year-old deer was higher, and the proportion of 5.5- and 6.5-year-old deer was lower. Based on this sample, the age structure of the herd indicates that the population is increasing (Fig.1). This differs from the 2 previous seasons where the populations were stable or declining.

The proportion of males to females varied among age classes, but the overall sex ratio was 1:1 (Fig. 2). There was a marked decrease in the harvest of 1.5- and 2.5-year-old females as compared to 1986-87. Also, larger proportions of 0.5 and 7.5+ female age classes were harvested in 1987-88.

In general, the average eviscerated weights of males and females were less in 1987-88 than in the previous year with the exception of 0.5- and 1.5-year-old females (Fig. 3). A sample size of 1 in the latter category may be a limiting factor. Mean eviscerated weight for 0.5- and 1.5- year-old females was higher than for males in the same age classes. Again the sample size of the 1.5-year-old age class must be considered.

Button antlers were present in 0.5-year-olds only, in contrast to the presence of buttons in 0.5- and 1.5-year-olds in 1986-87 and 0.5-, 1.5-, and 4.5-year-olds in 1985-86 (Fig. 4). Spike antlers occurred in 1.5- and 4.5-year-old bucks which is also the same distribution as the previous 2 years. Antlers with 4 points or better were present in bucks 2.5 years or older. This is similar to the past 2 years with the exception that the greatest number of points was 8 in 1987-88, 9 in 1986-87, and 10 in 1985-86. Figure 5 illustrates the relationship of eviscerated weights to antler development.

Button through 5-point bucks weighed less in 1987-88 than in the 2 previous years. Older age classes were comparable to those of the two previous harvests.

A total of 346 hunters killed 134 deer for a success rate of 0.39 deer per hunter. This is an increase over the rate of 0.23 deer per hunter for the 1986-87 hunting season, the lowest rate for the past 3 years. The increased hunter success could be a result of the increased productivity of the herd which is indicated in Figure 1.

Reproductive Data

Although a complete analysis of reproductive data is available only for 1985, general comparisons can be made for the 3 years. A summary of the data is as follows (Susan Miller, pers. comm.):

1985-86 Breeding Season

Length of season from mid-September to late
December with peak mid- to late October.
13/15 females (86.7%) were pregnant with no
twins.

1986-87 Breeding Season

Length of season from mid-September to mid-
November with peak late September to
early October.
19/21 females (90.5%) were pregnant with 2
sets of twins.

1987-88 Breeding Season

No data on season length or peak.
12/12 females (100%) were pregnant with
no twins.

Lengths and peaks of breeding seasons were based on conception dates taken from fetal age estimates (Hamilton et al., 1985). Between 1985 and 1986 a shift of about 2-4 weeks was seen in the breeding peaks. This difference may be due to changes in the mast crop from poor in 1984 to good in 1985-1986 (Charles Ford, pers. comm.). The low incidence of twins indicates poor productivity. Mean age of females collected during the 3 years was 5 years old which could be due to the low hunting pressure. Until 1987, natality had been relatively low, supporting the view of a herd suffering from poor nutrition coupled with heavy parasitism. However, a relatively large number (29) of 0.5-year-old deer were harvested indicating a slight increase in productivity.

Herd Health Analysis

Data collected by the University of Georgia School of Forest Resources in August 1987 were used to assess herd health status. Information from twenty white-tailed deer was available for evaluation. Ten deer were collected from the northern end of the island and ten from the southern end. Analytical methods were adapted from those used by SCWDS to incorporate the data available. Data from these research collections were compared to data from a herd health evaluation conducted by SCWDS in August 1979.

Table 2 summarizes age, sex, weight, and physical condition for deer collected in 1979 and 1987. Kidney fat indices were included for 1987 but were not available for 1979. Information on abomasal and pulmonary helminth parasites for both years is summarized in Tables 3 and 4. Serologic tests for selected infectious diseases are included in Table 5 for 1987. Serologic

information was not available from 1979. Because there were few significant differences between the northern and southern deer herd data, most of this information is combined and evaluated in the same tables. Differences in physical condition were apparent between the northern and southern portions of the deer herd, so that information is summarized in separate tables.

The overall physical condition of the deer in 1979 was fair as determined by SCWDS personnel using subjective evaluation of endogenous fat stores as the criteria for classification into 1 of 4 categories (poor, fair, good, or excellent). A rough estimate of physical condition was determined for the 1987 deer using kidney fat index (KFI) alone because other parameters were not currently available. The overall condition of the deer from the southern part of the island was rated fair (Average KFI=15), and the overall condition of the deer from the northern part of the island was rated good (Average KFI=42) (SCWDS unpubl.data).

The mean abomasal parasite count (APC) for the 1987 collection was 672, and the mean APC for the deer herd in 1979 was 1098. The prevalence of Haemonchus contortus had not changed significantly between years. However, the numbers of worms per infected deer were slightly decreased in 1987 as compared to 1979.

Lung washes were not performed on deer taken in the research collections. The presence of worms was determined by gross examination alone, and numbers of worms were expressed only as rough estimates. Numbers of lungworms cannot be compared between years, but information on prevalence can be used. One-hundred per cent of the deer in 1979 were parasitized with large lungworms (Dictyocaulus viviparus), and only 45% of the deer taken in 1987 had visible lungworm infections.

Serologic testing for several major infectious diseases was negative in a majority of the deer taken in August 1987. One deer had detectable antibody to parainfluenza 3 virus, and one deer was positive for antibody to Leptospira interrogans variety hardjo, indicating past exposure of these two deer to these two agents. There was no serologic information available from 1979 for comparison.

CONCLUSIONS

Unpublished reports to the National Park Service by the Southeastern Cooperative Wildlife Disease Study (1979), the Georgia Game and Fish Division (1979), Southeastern Wildlife Services, Inc. (1980), and the UGA Wildlife Techniques classes (1985,1986,1987) have all concluded that the CUIS deer population is at or exceeding the long-term capacity of the habitat to support it. The general view of the herd is one that is overpopulated, heavily parasitized, malnourished, and highly susceptible to infectious diseases, especially epizootic hemorrhagic disease (EHD). However, the 1987-88 data shows that the deer herd has improved slightly. The population is stable or increasing with increased natality in comparison with the previous two years.

The average weights for the population as a whole were lower than the previous two seasons. This is probably a result of the poor mast crop in the fall of 1987.

An overview of the data indicates that parasite burdens in the Cumberland Island deer herd are moderate at this time, and overall herd health appears to have improved somewhat when compared to data from 1979. It may be that the reduction in herd numbers produced by the yearly managed hunts and the monthly research collections have benefited the herd. Although improved, the APC still

shows a herd at the middle to upper limit of the carrying capacity of its range. The large stomach worm, Haemonchus contortus, is often implicated as a contributor to fawn mortality. As the numbers of this parasite per deer were slightly decreased in 1987, fawn mortalities from this source may not be as great as that experienced in previous years. The decrease in prevalence of lungworm infection also is an encouraging factor as losses of adult deer on the coastal islands have been shown to result from the combined effects of verminous pneumonia, tick infestation, and malnutrition. Serological information shows that this deer herd is relatively naive with respect to several infectious agents important in deer. Of particular note in this regard are bluetongue and epizootic hemorrhagic disease. Introduction of these diseases into a herd with little or no immunity can result in significant mortality. Even so, the herd appears to be in better shape and in a less precarious position should a disease be introduced than it was in previous years.

LITERATURE CITED

Hamilton, R.J., T.L. Ivey, and M.L. Tobin. 1985. Aging fetal white-tailed deer. 39th Ann. Conf. Southeast. Assoc. Fish and Wildlife Agencies.

Marburger, R.G., J.W. Thomas, and B.D. Loving. 1964. A tale of teeth. Tx. Game and Fish. November 15-18.

Nelson, M.I., C.R. Ford, and T. DeSanto. 1986. The Cumberland Island deer herd: population analysis from the 1985-1986 hunting harvest. CPSU Tech. Rep. 30.

Severinghaus, C.A. 1949. Tooth development and wear as criteria of age in white-tailed deer. J. Wildl. Manage. 13:195-216.

COLLECTION DATA

Date	Hunt	Station or Zone	Deer	Sex	Age	Weight	Comments
2 Nov. '87	1	7-8	1	F		27	
		7	2	M		52	
		7	3	F		15	
		13	4	M		62	
		18	5	M		57	4 point
		South End	6	F		28	
		16	7	F		42	
		9	8	F		37	
		Old House	9	F		25	
		Nitehgale Trail	10	M		54	
		" "	11	M		65	
		Coleman ?	12	F		30	
		"	13	F		30	
		Lk. Whtny.	14	M		65	5 point
		OysterPd.	15	M		80	6 point
		"	16	F		45	
		"	*				
		Sea Camp	21	M		27	
3 Nov. '87		Squaw Town	17	F		37	
		Buick Hill	18	F		37	
		Stafford	19	M		50	spike
		Dungeness	20	M		30	button
		16	22	F	yr1	17	
		Dungeness	23	M		65	6 point
		"	24	M	yr1	12	button
4 Nov. '87		Terrapin Point Tr.	25	M		57	
		?	26	M	yr1	28	button
16 Nov. '87	2	12	1	M		77	8 point
		1	2	F	3.5	?	
		11	3	M		79	7 point
		BrickHl.	4	F	.5	19	
		9	5	M		66	4 point
		?	6	M		33	spike
		13	7	F		48	
		17	8	F		50	
		17	9	M		67	8 point
		13	10	M		42	spike
		10	11	M	4.5	53	6 point
		10	12	M	7.5	72	8 point
		10	13	M	1.5	46	spike
		?	14	F	5.5	52	
		?	15	M	7.5	?	6 point
		?	16	M	1.5	?	spike
		North Brick Hill	17	M	3.5	65	8 point
		?	18	M	4.5	73	6 point
		9	19	M	6.5	54	8 point
		1	20	F		54	
		?	21	M	1.5	25	spike
					.5		

	11	22	M	43	
	17	23	M	2.5 56	5 point
	10	24	M	1.5 32	spike
	?	24b	F	40	
	?	25	F	.5 40	
	?	26	F	39	
	8	27	M	2.5 50	2,2 spike
	14	28	F	2.5 42	
	6	29	M	.5 24	spike
		*			
	17	32	F	.5 25	
17 Nov. '87	17	30	F	.5 20	
	6	31	M	2.5 75	
		*			
	South Cut.	33	F	43	
	17	34	F	4.5 45	
	?	35	F	7.5 57	
18 Nov. '87	Southeast Pond	36	M	48	spike
	" "	37	M	50	spike
	13	38	M	.5 10	button
	8	39	F	1.5 49	
	10	40	M	4.5 66	8 point
	14	41	M	4.5 70	4 point
	14	42	F	7.5 54	
	14	43	M	2.5 47	spike
	?	44	M	2.5 43	spike
	?	45	F	7.5 50	
		NA		3.5	
		NA		7.5	
7 Dec. '87	3	1	F	4.5 50	
	6	2	M	1.5 44	
		*			
	18	4	F	6.5 51	
	18	5	F	52	
	14	6	F	49	
	14	7	F	3.5 48	
	2	8	M	3.5 40	
8 Dec. '87	Brick Hill	3	F	2.5 21	
		*			
	17	9	F	.5 26	
	17	10	F	6.5 62	
	18	11	M	.5 37	
		11b		5.5	
	?	12	F	7.5 55	
	14	13	M	22	button
	16	14	M	3.5 49	spike
	18	15	F	3.5 42	
	?	16	F	7.5 50	

28 Dec. '87	4	South End	1	F	4.5	44	
		11	2	M	.5	23	button
29 Dec. '87		9	3	M	2.5	50	spike
		14	4	M	4.5	68	spike
30 Dec. '87		5	5	M	5.5	75	7 point
			NA		2.5		
4 Jan. '88	5	3	1	M		60	
		South End	2	M		52	
		2	3	F	.5	60	
		2	3b	F		32	
		18	4	F		50	
		Sea Camp	5	F		52	
		2	6	F	.5	48	
		6	6b	F		30	
		1	7	M	.5	28	button
		17	8	M		30	button
		South End	9	M	.5	24	button
		"	10	F		40	
		1	11	F	.5	21	
		1	12	F	.5	23	
		2	13	F	.5	54	
		?	14	F		48	
		8	15	F		50	
5 Jan. '87		13	16	F		60	
		13	17a	F		32	
		South Pond	17b	M		72	8 point
		1	18	F		48	
		1	19	M		70	R:0 L:4
		?	20	?	.5	?	
		?	24	F	.5	28	
			25		.5		
			25b		3.5		
			NA				
			NA				
			NA				
			NA				
		?	27	F	6.5	53	
		?	28	F	4.5	44	
		12	29	F	7.5	48	
			*				
		Old House	31	F	4.5	52	
6 Jan. '87		?	30	M	.5	25	
			*				
		?	32	M	3.5	64	
		12	33	F	5.5	60	
		8	34	F	7.5	52	
		8	35	M		44	spike
		South Pond	36	M	1.5	54	
		South End	37	M		52	spike

4
5
8

38	M	.5	27
39	M	7.5	63
40	F	7.5	54
41		6.5	

Figure 1

Age Structure 1987-88 Cumberland Island Deer Harvest

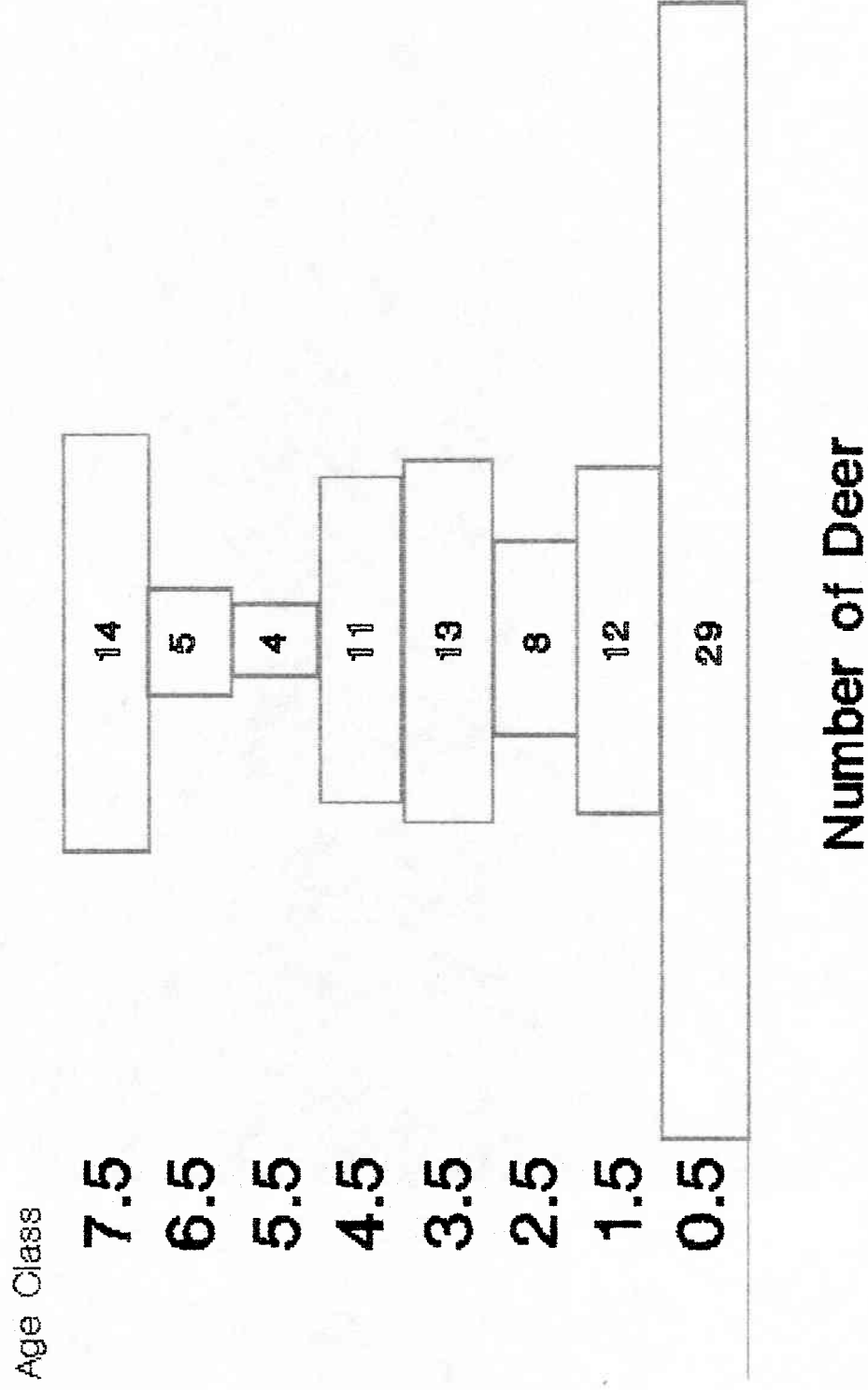


Figure 2

Age Structure of Males and Females

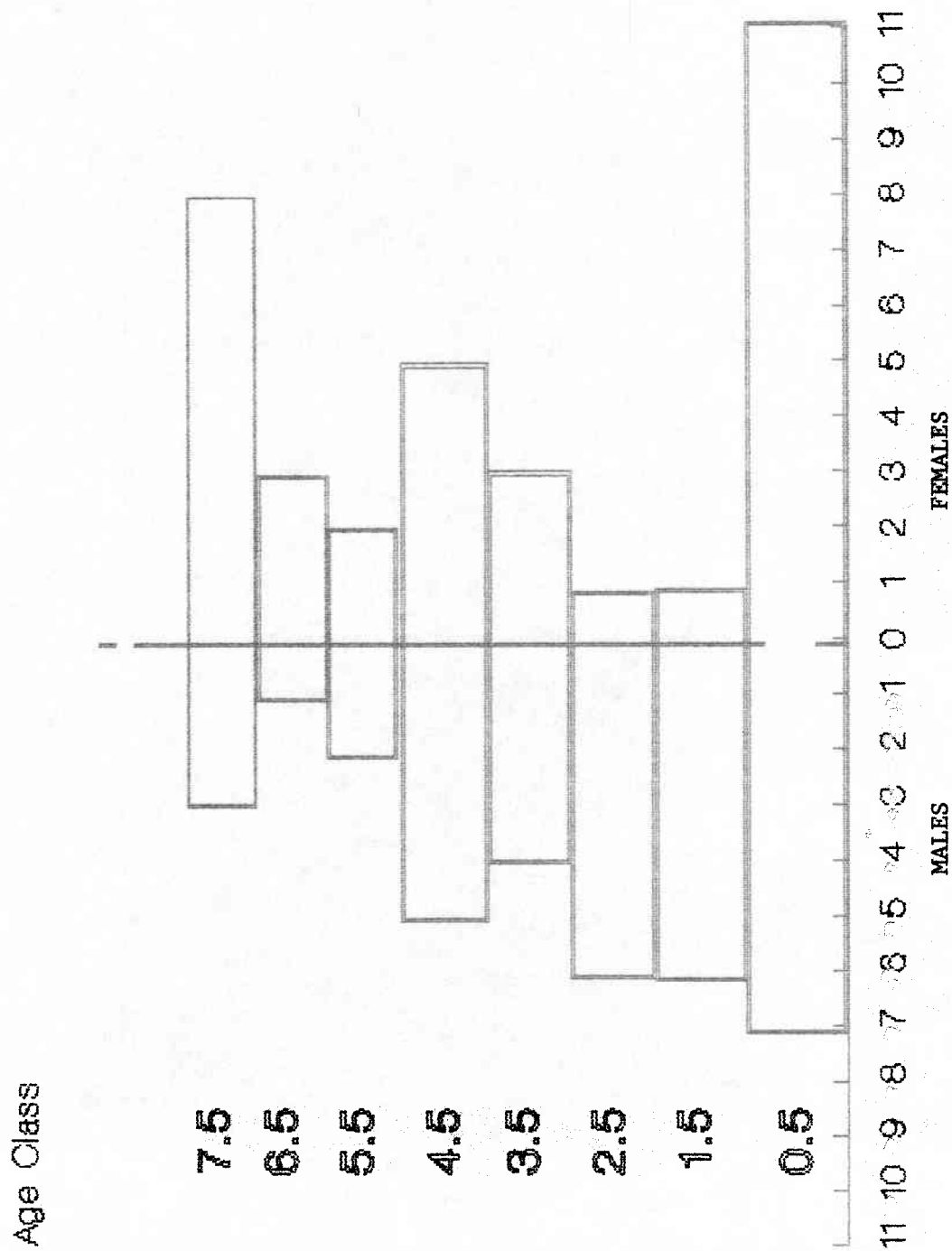


Figure 3

Dressed Weight vs. Age

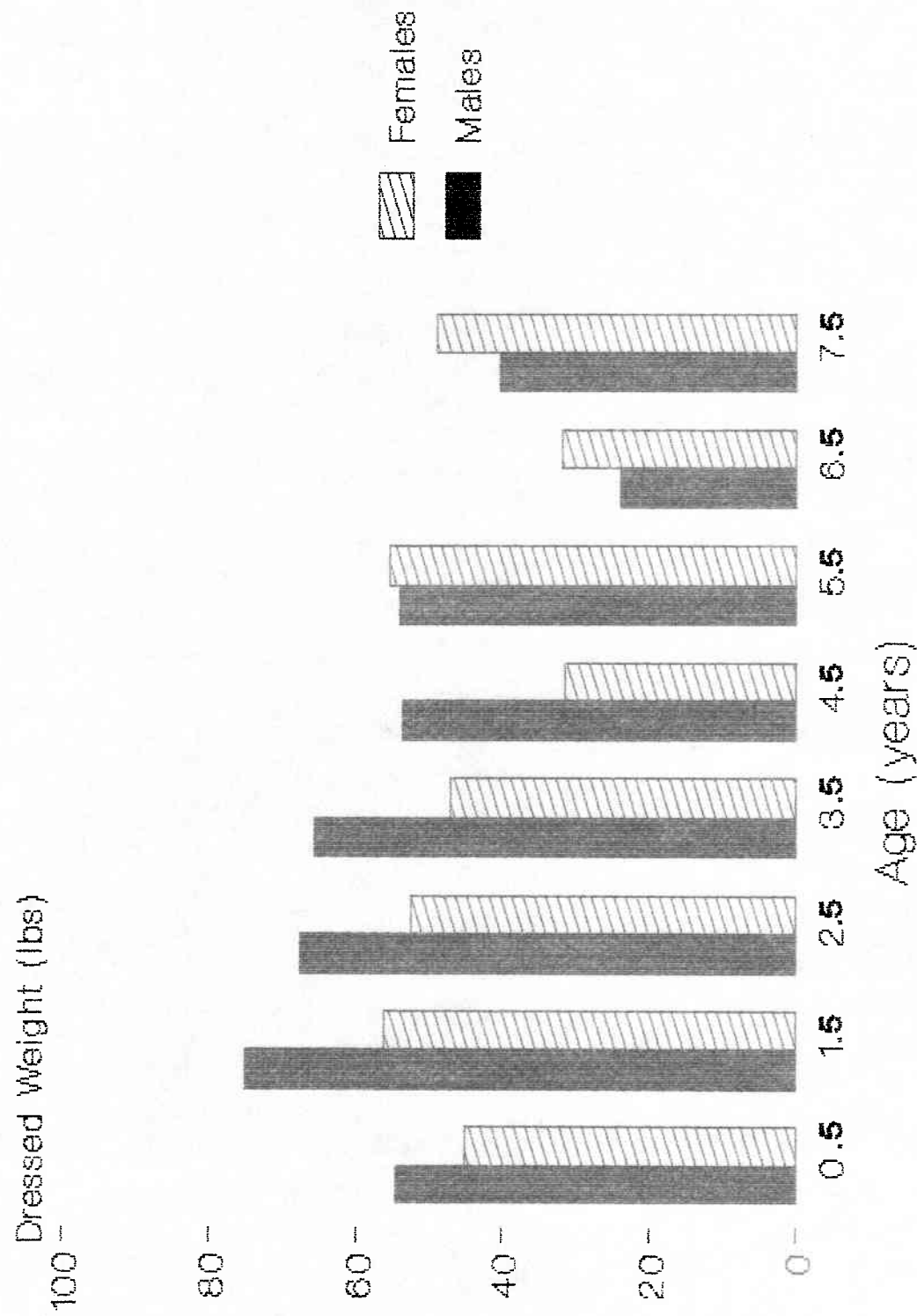


Figure 4

Antler Points vs. Age

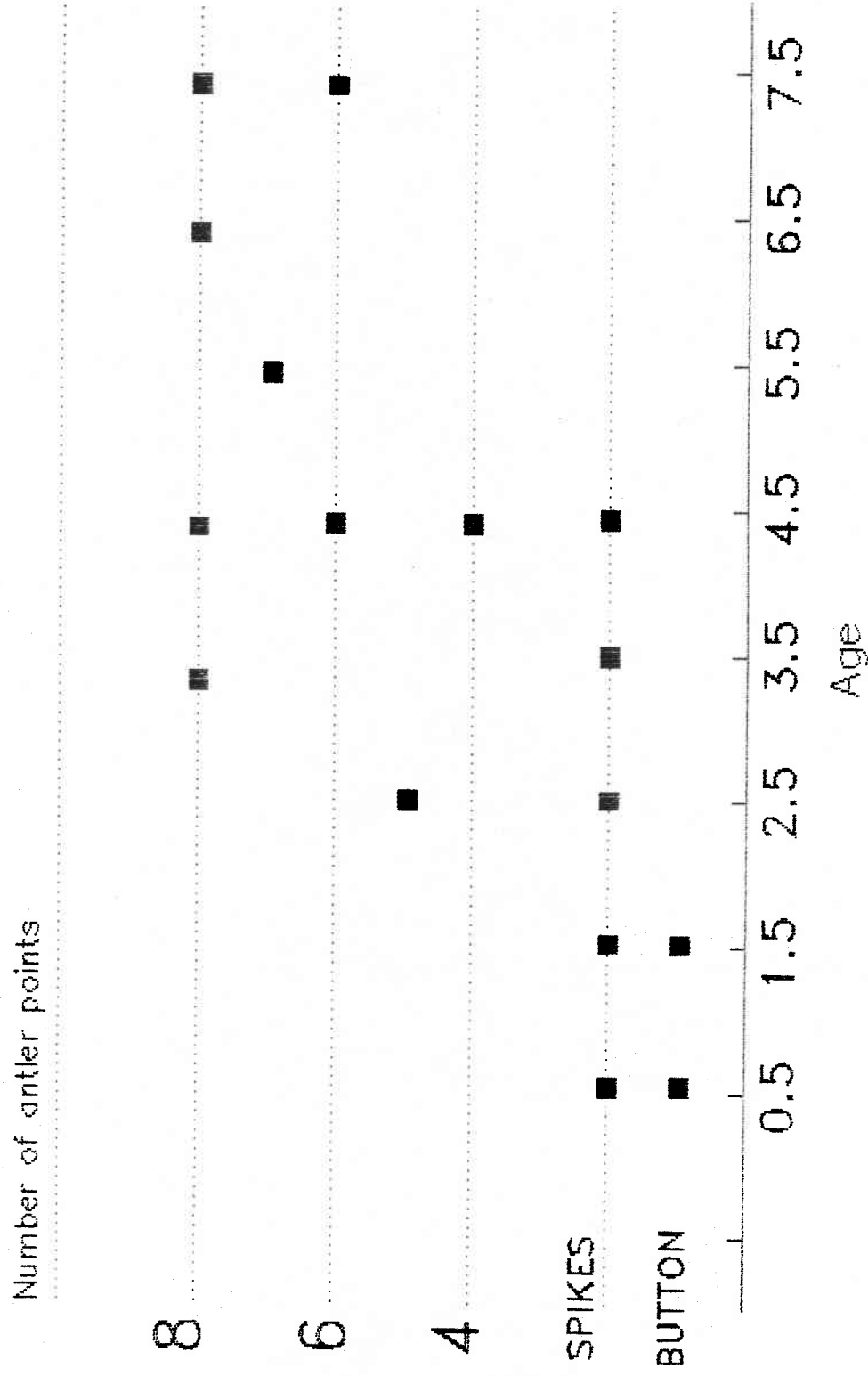


Figure 5

Eviscerated Weight vs. Antler Points

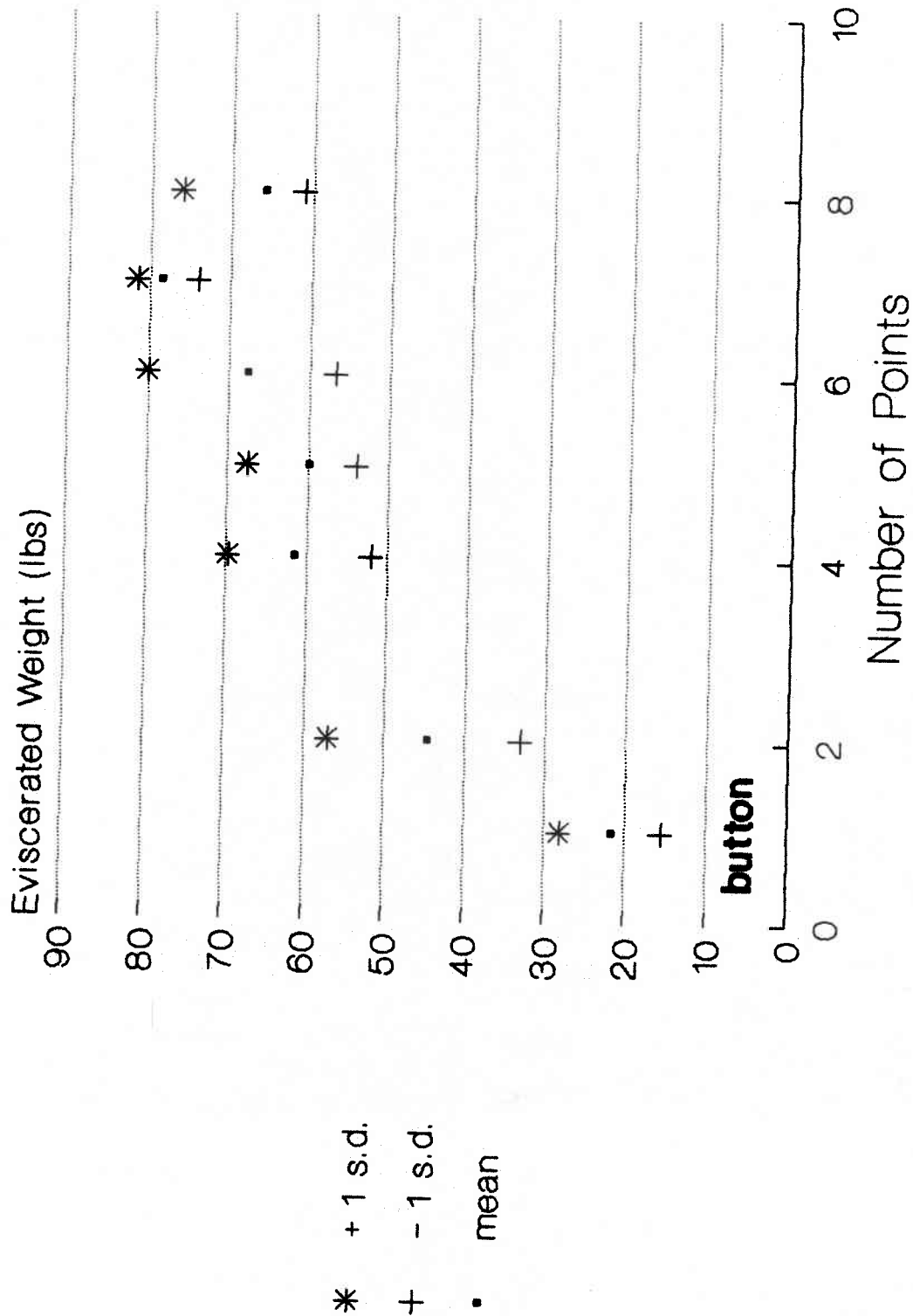


Table 2: Age, sex, weight, kidney fat indices(RKFI), and physical condition of white-tailed deer collected from Cumberland Island, Georgia, in August, 1979 and August, 1987.

1987
SOUTH

Deer No.	Age (years)	Sex	Live weight (lbs)	Riney (RKFI)	Physical condition
CIS-31-87	1	M	45.9	*	*
CIS-32-87	1	M	37.8	*	*
CIS-33-87	1	M	45.9	7.4	Poor
CIS-34-87	3	F	37.8	4.5	Poor
CIS-35-87	6	M	113.4	62.3	Good
CIS-36-87	1	F	32.4	11.5	Fair
CIS-37-87	4	F	59.4	11.4	Fair
CIS-39-87	4	F	60.7	6.1	Poor
CIS-40-87	1	F	43.2	9.2	Poor
CIS-41-87	3	F	56.7	7.6	Poor
Average			53.3	15	Fair

1987
NORTH

Deer No.	Age (years)	Sex	Live weight (lbs)	Riney (RKFI)	Physical condition
CIN-34-87	3	F	62.1	107.6	Good
CIN-35-87	1	F	32.4	17.9	Fair
CIN-36-87	2	F	47.2	13.8	Fair
CIN-37-87	2	M	55.3	38.6	Good
CIN-38-87	3	M	99.9	14.6	Fair
CIN-39-87	6	M	75.6	8.3	Poor
CIN-41-87	8+	F	43.2	7.4	Poor
CIN-42-87	4	M	113.4	182.5	Good
CIN-43-87	1	M	35.1	16.6	Fair
CIN-45-87	3	F	51.3	13.4	Fair
Average			61.5	42.0	Good

* values not available

1979

Deer No.	Age (years)	Sex	Live weight	Physical condition
1	4	F	62	Poor
2	3	M	70	Fair
3	2	M	80	Fair
4	5	F	80	Fair
5	4	F	65	Fair
Average			71.4	Fair

Table 3: Abomasal parasites of white-tailed deer collected from Cumberland Island, Georgia, in August, 1979 and August, 1987.

1987

Deer No.	No. of <u>H. contortus</u>	No. of other worms	Total Worms
a CIS-31-87	160	920	1080
CIS-32-87	140	420	560
CIS-33-87	140	240	380
CIS-34-87	40	680	720
CIS-35-87	20	1820	1840
CIS-36-87	0	680	680
CIS-37-87	0	740	740
CIS-39-87	40	920	960
CIS-40-87	0	140	140
CIS-41-87	0	400	400
b CIN-34-87	0	280	280
CIN-35-87	20	100	120
CIN-36-87	120	640	760
CIN-37-87	120	580	700
CIN-38-87	80	880	960
CIN-39-87	0	340	340
CIN-41-87	0	1260	1260
CIN-42-87	0	320	320
CIN-43-87	560	500	1060
CIN-45-87	0	60	60

Range	0 - 560	60 - 1820	60 - 1840
Prevalence	55%	100%	
Average	72	596	668 (APC)

a= (CIS) Cumberland Island South

b= (CIN) Cumberland Island North

1979

Deer No.	No. of <u>H. contortus</u>	No. of other worms	Total Worms
1	309	671	980
2	0	587	587
3	260	1142	1402
4	107	2133	2240
5	0	280	280

Range	0 - 309	288 - 2133	280 - 2240
Prevalence	60%	100%	
Average	135.2	963	1098 (APC)

Table 4: Helminth parasites present in the lungs of white-tailed deer collected from Cumberland Island, Georgia, in August, 1979 and August, 1987.

1987

Deer No.	* Lung Worms
----------	--------------

CIS-31-87	0
CIS-32-87	<10
CIS-33-87	<10
CIS-34-87	0
CIS-35-87	6
CIS-36-87	0
CIS-37-87	<10
CIS-39-87	1
CIS-40-87	0
CIS-41-87	4
CIN-34-87	0
CIN-35-87	0
CIN-36-87	<10
CIN-37-87	0
CIN-38-87	0
CIN-39-87	0
CIN-41-87	10 - 20
CIN-42-87	<10
CIN-43-87	0
CIN-45-87	0

Range 0 - 20

Prevalence 45%

* The presence of lungworms was confirmed by gross exam only and numbers are estimates.

1979

Deer No.	Lung Worms
----------	------------

1	4
2	3
3	9
4	7
5	13

Range 3 - 13

Prevalence 100%

Table 5: Results of serologic tests for selected diseases in white-tailed deer collected from Cumberland Island, Georgia, in August 1987.

1987

Deer No.	Disease										
	Leptospirosis					BRU	EHD	BT	IBR	BVD	PI3
	1	2	3	4	5						
aCIS-31	c N	N	N	N	N	N	N	N	N	N	N
CIS-32	N d P	N	N	N	N	N	N	N	N	N	N
CIS-33	N	N	N	N	N	N	N	N	N	N	N
CIS-34	N	N	N	N	N	N	N	N	N	N	N
CIS-35	N	N	N	N	N	N	N	N	N	N	N
CIS-36	N	N	N	N	N	N	*	*	*	*	*
CIS-37	N	N	N	N	N	N	N	N	N	N	N
CIS-39	N	N	N	N	N	N	N	N	N	N	N
CIS-40	N	N	N	N	N	N	N	N	N	N	N
CIS-41	*	*	*	*	*	*	*	*	*	*	*
bCIN-34	N	N	N	N	N	N	N	N	N	N	N
CIN-35	N	N	N	N	N	N	N	N	N	N	N
CIN-36	N	N	N	N	N	N	N	N	N	N	N
CIN-37	N	N	N	N	N	N	N	N	N	N	N
CIN-38	N	N	N	N	N	N	N	N	N	N	N
CIN-39	N	N	N	N	N	N	N	N	N	N	P
CIN-41	N	N	N	N	N	N	N	N	N	N	N
CIN-42	N	N	N	N	N	N	N	N	N	N	N
CIN-43	N	N	N	N	N	N	N	N	N	N	N
CIN-45	N	N	N	N	N	N	N	N	N	N	N

* = no data available

a CIS = Cumberland Island South

b CIN = Cumberland Island North

c N = Negative

d P = Positive

1 = Pomona

2 = Hardjo

3 = Grippotyphosa

4 = Icterohemorrhagiae

5 = Canicola

BRU = Brucellosis

EHD = Epizootic Hemorrhagic Disease

BT = Bluetongue

IBR = Infectious Bovine Rhinotracheitis

BVD = Bovine Virus Diarrhea

PI3 = Parainfluenza 3