

**The Cumberland Island deer herd:
population analysis from
the 1985-1986 hunting harvest**

CPSU Technical Report 30

**Martin I. Nelson, Charles R. Ford
School of Forest Resources
Toni DeSanto
Institute of Ecology
University of Georgia
Athens, GA 30602**

**U.S. National Park Service
Cooperative Park Studies Unit
Institute of Ecology
University of Georgia
Athens, GA 30602**

November 1986

Purpose and Content of the Report Series

The U.S. National Park Service Cooperative Park Studies Unit at the Institute of Ecology (University of Georgia) produces the *CPSU Technical Report* series. Its purpose is to make information related to U.S. national parks and park-related problems easily and quickly available to interested scientists and park staff. Each contribution is issued in limited quantities as a single number within the series. Contributions are from various sources, not all federally funded, and represent data matrices, bibliographies, review papers and scientific project reports. They may supply scientific information or describe resources management activities. They are not intended to determine park policy, although management recommendations are sometimes provided.

CPSU Technical Reports are subject to technical editing and review for scientific accuracy by Institute staff. They are not necessarily refereed by external experts and are not evaluated in regard to overall quality or importance to the scientific community.

ABSTRACT

Ninety-one deer killed in 5 managed hunts on Cumberland Island National Seashore, Georgia in 1985-1986 showed evidence of overpopulation in their age composition, low average body weight, and poor antler quality. Additional data from future hunts are necessary to determine population structure with acceptable accuracy. Hunt data should be standardized for thoroughness and consistency in order to provide a reliable basis for management decisions. Currently, Cumberland Island hunts offer hunters a relatively high chance of success, but harvests have been insufficient to regulate deer numbers.

INTRODUCTION

This report presents an analysis of the white-tailed deer population of Cumberland Island National Seashore (CUIS) based on data from the 1985-1986 legal sport harvest. We compared these data to the harvest of the 2 preceding years and to data from 2 other Georgia barrier islands. Population structure, average weights, antler development, and hunter success were examined.

Population analysis that relies solely on hunter-killed animals requires the assumption that the kill is a representative sample of the entire population. Biases are inherent because of deer behavior as well as hunter behavior and selectivity (Maguire and Severinghaus 1954, Roseberry and Klimstra 1974, Coe et al. 1980). Unequal bag limits, such as the 1-buck and 2-deer total limit on CUIS, compound the problem. However, other survey techniques are also subject to sampling bias (Downing et al. 1977), and are neither as economical nor as readily available as hunt data. Furthermore, bias does not invalidate hunt data as an index of population status when used consistently over several years (Downing 1980, Hayne 1984). Since at least 2 successive years of data are necessary to model a population, conclusions presented herein need to be verified by repeated annual sampling. Thus, the primary purpose of this report is to preserve the 1985-1986 hunt data, to point out inadequacies of the data set, and to establish guidelines for future record-keeping.

METHODS

CUIS managed hunts took place on 5-7 November 1985 (archery), 19-21 November 1985 (archery), 10-12 December 1985 (primitive weapons and handguns), 30 December 1985 - 1 January 1986 (parent-child), and 7-9 January 1986 (primitive weapons and handguns). Charles Ford and CUIS staff recorded sex, eviscerated weight, kill location and date, and antler development of hunter-killed deer. One jawbone of each deer was removed and taken to the University of Georgia for aging. Deer were aged according to criteria of tooth eruption and wear (Severinghaus 1949, Marburger et al. 1964). Because of the 2-month hunting season and extended breeding season on CUIS, an error of ± 1 year is possible in some cases. Difficulties were presented by mandibular deformities of some deer, which may be due to genetics, malnutrition, or, in a few cases, parasitic arterial roundworms (*Elaeophora schneideri*) (Couvillion et al. 1986). Despite these problems, ages should be accurate with minor variation of ± 1 yr.

We used pooled sample t-tests to compare body weights of yearling bucks vs. does and 2.5-yr-old vs. 3.5-yr-old bucks, linear regression to relate body weight to antler development, and chi-square analysis to examine the distribution of ages of deer killed among the hunts. Statistical methods are from McClave and Dietrich (1982).

RESULTS AND DISCUSSION

Table 1 lists the sex, age, eviscerated weight, kill location and date, antler development, and jaw deformities of deer killed in the 1985-1986 hunting season. From the total harvest of 91 deer, 90 jaws were available for aging. Based on this sample, the classic interpretation of the herd's age structure (Fig. 1) is that the population is stable or declining, with high average age (≥ 3.7 yr) and low recruitment. These population attributes are often indicative of deteriorating habitat quality brought about by overcrowding (Alexander 1958, Smith 1977). The small number of fawns and yearlings may be due to low reproduction, high early mortality, or both; hunter selection for larger deer was also a factor early in the season. Since the age of an adult deer is not discernible to a hunter, the harvest should reflect adult age structure with reasonable accuracy. The paucity of deer ≥ 6.5 yr old in the harvest suggests heavy natural mortality among older deer, but may be due to wariness (Maguire and Severinghaus 1954). In general, the size of the intermediate age classes was proportional to their representation in the previous 2 harvests. Incomplete 1983 and 1984 data made thorough comparisons untenable.

The proportion of males and females in each age class was quite variable (Fig. 2), but overall the sexes were nearly even (45 males and 46 females). The observed sex ration of adults (≥ 1.5 yr) was 90:100, indicating high reproductive potential. Sex ratio at birth may be density dependent in white-tailed deer, with male fawns predominating at extreme population density (McCullough 1979, Verme 1983). In support of this theory, 8 of the 13 fawns killed in the 1985-1986 hunt were male. Another small male (CI-20-86), whose jaw was not collected, was probably a fawn. Among yearlings, however, only 4 of 11 were male, even though yearling bucks are usually over-represented in the harvest (Roseberry and Klimstra 1974, McCullough 1979).

Average eviscerated weights were 61.6 lb for bucks ≥ 2.5 yr old, 52.7 lb for does ≥ 2.5 yr. old, and 51.1 lb overall. Average weights of both sexes in each age class are shown in Table 2 and Fig. 3. As a group, does attained nearly maximum weight by age 2.5. Bucks attained maximum average weight at age 5.5. Yearling bucks were smaller than yearling does, but the difference was not significant (one-tailed t-test, $t=0.708$, $p>0.10$), and was probably an artifact of sample size. Average weights of both sexes declined after age 5.5-6.5, suggesting general infirmity of older

deer.

The small size of 3.5-yr-old bucks is puzzling. The very poor mast crops of 1983 and 1984 (Ken Morgan, pers. commun.), coupled with the energetic demands of rut and antler growth, may have stunted this cohort (R.L. Marchinton, pers. commun.). Only 2 bucks from this cohort were aged in 1984-1985, and they were both of moderate size ($\bar{x}$ =61.5 lb.) Age specific weights were not recorded in 1983-1984, so the cohort's prior history cannot be examined. Factors that could have stunted 3.5-yr-old bucks should have affected 2.5-yr-old bucks as well, yet 2.5-yr-old bucks were significantly larger (one-tailed t-test, $t=2.659$, $p<0.01$) and also had more antler points ($t=1.938$, $p<0.05$) than 3.5-yr-old bucks. Confounding factors of previous mast crops (superlative in 1982), yearly population size and cohort size, and hunt demographics complicate analysis, emphasizing the need for thorough annual data collections.

Antler development of CUIS bucks was of low quality. Age was poorly correlated with number of antler points (Fig. 4). The occurrence of spike and button bucks older than 2.5 yr, and the low proportion of young bucks with multiple antler points, strongly indicate poor nutritional status of the deer herd (Newsome 1984, Sauer 1984).

Antler size and number of antler points are positively correlated with body size of white-tailed deer (McCullough 1982, Sauer 1984). Linear regression of eviscerated weight on number of antler points for CUIS bucks ≥ 1.5 yr old yielded $y = -5.682 + 0.163x$ ($r^2=0.66$, $p<0.005$). Fig. 5 depicts the body size-antler development relationship. Those bucks able to obtain better nutrition gain more weight and develop larger antlers. Heredity also influences antler development and body weight (Harmel 1982, McCulloch 1984).

Deer harvest data from 20 CUIS hunt zones (Fig. 6) were compiled into Table 3. Zone 14 provided the largest harvest, with 17 deer killed. No deer were killed in Zones 1, 2, 8, 11, 15, or 16. No zonal trends were observed in size or age of deer. Hunters at Stafford Field enjoyed the best success, with 0.79 deer/hunter. Success rates cannot be reported as a percentage, since some hunters may have killed 2 deer.

The parent-child hunt was the most successful of the 5 hunts, with 24 deer killed by the 29 children, a rate of 0.83 deer/hunter. High success was due to the fact that children are allowed to use high-powered rifles, and may be less selective in their choice of deer. To test the latter hypothesis, we used a chi-square test for goodness-of-fit between the age distributions of deer killed in this hunt and the other hunts combined. The distributions were significantly different ($\chi^2 = 22.18$, $p<0.005$), but the difference was due to the 2.5 and 3.5 yr age classes, which for some reason were under-represented in the parent-child hunt. Twelve deer of each sex were killed, and the average size was 50.3 lb, similar to the overall average. Children may have been slightly

less selective for large antlers, yet killed 2 of the best antlered bucks.

As the 1985-1986 season came to an end, hunters were less selective for large deer. Seven of the 13 fawns and 10 of the 23 deer weighing ≤ 40 lb were killed in the final hunt. Thus the total harvest probably under-estimates production and may over-estimate average body weight. The latter error is inconsequential; weights of hunter-killed deer are appropriate for evaluating trends in herd health. To evaluate production more accurately, cohorts must be followed through several years of harvest (Hayne 1984).

Overall hunt success for 1985-1986 was 0.39 deer/hunter, slightly higher than the rate of 0.37 deer/hunter in 1984-1985, but fewer deer were killed (91 vs. 113). In the 1983-1984 hunts, both hunter success (0.79 deer/hunter) and total harvest (154) were greater. This decline in harvest does not necessarily indicate a reduction in deer abundance. Other factors, e.g. mast availability, weather conditions, and learned hunter-avoidance by deer, also influence harvest (Holsworth 1973, Roseberry and Klimstra 1974). If forage quantity and quality were constant, reduced deer density would result in higher reproduction and larger body weights. In the last 3 CUIS hunting seasons average live weight has declined: from 81.4 lb for bucks and 72.7 lb for does in 1983-1984, to 77.7 lb and 64.0 lb in 1984-1985, to 73.2 lb and 65.7 lb in 1985-1986 (live weight estimated by eviscerated weight plus 35%). The estimated proportion of fawns and yearlings in the harvest has also declined slightly (36.7%, 27.5%, 27.5%). These data suggest that rather than a reduction, there has been an increase in deer population density in relation to habitat carrying capacity.

COMPARISON TO OTHER GEORGIA SEA ISLANDS

Sapelo Island and CUIS have similar deer populations, characterized by high numbers and small body size. Six 3-day hunts, including archery, primitive weapons, and parent-child hunts, are conducted annually on Sapelo. Hunter success from 1981-1985 was 23%-44%, and comprised 57-124 deer (Georgia Game and Fish Division, unpublished data). Average live weights from the 1984 and 1985 harvests were 66 lb for males and 53 lb for females, smaller than CUIS averages. Antler development of bucks ≥ 2.5 yr old was better on Sapelo, with an average of 5.2 antler points vs. 4.2 antler points/buck on CUIS.

On Blackbeard Island, either-sex archery hunts have been held since 1947. Deer are about the same size as on CUIS, although the Blackbeard population may be a genetically smaller race (A.S. Johnson, pers. commun.). A 10-yr (1972-1982) range of average live weights of Blackbeard fawns was 29-40 lb for females and 33-45 lb for males; average live weights of yearling does and

bucks were 51-66 lb and 58-77 lb, respectively. CUIS 1985-1986 estimated live weights of fawns averaged 36 lb for females and 43 lb for males; yearling averages were 57 lb for does and only 54 lb for bucks. These figures are not directly comparable because of the different time frames. We have emphasized them because the importance to future development makes body size in the early age classes a good indicator of herd health.

Antler development, another nutritional index, was better on Blackbeard bucks for the years of available data (A.S. Johnson, unpublished data). In the 1974 and 1975 harvest, Blackbeard bucks ≥ 2.5 yr old had an average of 6.2 antler points. In 1984 the average was 5.6 antler points/buck. The 1974-1984 weighted average for yearlings was 2.2. antler points/buck. In contrast, 1985-1986 CUIS yearlings ($n=3$) had an average of only 1.3 antler points.

Hunter success on Blackbeard Island varies from 10% to nearly 50%. Annual harvest for 20 yr (1962-1981) averaged 27% of the deer population (Johnson et al. 1986). During that period, deer density fluctuated between 1 deer/12 ac and 1 deer/6 ac in response to harvest rate and mast availability. Poor live oak acorn crops improved hunter success and resulted in lower deer numbers. Johnson et al. (1986) found that high hunter success encourages more hunting pressure the next year; although the success rate is then low, the harvest further reduces deer numbers. Fewer hunters and lower harvest in years following low hunter success allow recovery of the deer population, until a poor mast crop and overharvest recommence the cycle. A similar phenomenon may occur on CUIS if harvest reaches comparable levels. CUIS has greater habitat diversity and more species of oak than Blackbeard; therefore the population dynamics of the CUIS deer herd may not be quite as dependent on variable live oak mast production.

CONCLUSION AND MANAGEMENT RECOMMENDATIONS

Unpublished reports to the National Park Service by the Southeastern Cooperative Wildlife Disease Study (1979), the Georgia Game and Fish Division (1979), and Southeastern Wildlife Services, Inc. (1980) concluded that the high density of the CUIS deer herd makes it susceptible to die-offs due to disease, parasitism, and starvation. We believe the population remains at or above the long-term capability of the habitat to support it. The apparent declines in average body size and production and the poor antler quality of bucks in the 1985-1986 harvest evidence a deer herd at subsistence density (Dasmann 1964).

White-tailed deer populations can sustain an annual harvest of 35% (Wilson and McMaster 1974); this rate is approximately maximum sustained yield, which is achieved with a population below the environmental carrying capacity (McCullough 1979, 1984). Lower harvest rates (but

still approaching 25%) are appropriate for deer management at the long-term carrying capacity. In areas with a history of chronic overpopulation and range depletion, first there must be a reduction to well below that level to promote habitat recovery.

Population estimates of the CUIS deer herd in 1979-1980 averaged 2400-4400. Assuming similar current abundance, harvest would have to be increased at least eightfold initially, and maintained at 4-5 times the recent harvest rate in order to optimize carrying capacity. Hence, the significance of CUIS deer hunting has been as a recreational resource, not as a management tool. It is conceivable that the current harvest rate may even exacerbate habitat deterioration by suppressing the deer die-offs that would allow temporary recovery of forage species. If active management of the CUIS deer herd is a desirable goal, we suggest the following to aid in population analysis.

- (1) Biological data should be collected on every hunter-killed deer, including sex, age, eviscerated weight, kill location and date, antler basal diameter or circumference and number of antler points, occurrence of pregnancy, number and sex (if possible) of fetuses, and any obvious signs of disease, injury, or malformation.
- (2) Total number of hunter-days should be recorded, as deer killed per hunter-day is a fairly reliable index of population status. Because of the 1-buck limit, the number and sex of deer killed by each hunter must be known in order to estimate population sex ratio.
- (3) Estimates of crippling mortality and numbers of deer seen by hunters (especially when shots are passed up because deer or antlers are too small) would provide supplemental population information.
- (4) Records of weather conditions during hunts would help explain variations in hunter participation and success.
- (5) Annual spotlight surveys would provide population trend estimates that would be useful for assessing the effects of the previous hunt and setting quotas for the following hunt.
- (6) Quantitative browse and mast surveys should be conducted annually to evaluate habitat conditions and as a correlate of deer production and harvest.

Data collections will not only provide a basis for management decisions, but will fulfill the park's role as an "outdoor laboratory." Should deer population control by sport hunting prove to be impracticable, these data would still be an invaluable contribution to the understanding of deer population dynamics and their interaction with barrier island habitats.

LITERATURE CITED

- Alexander, M.M. 1958. The place of aging in wildlife management. *Amer. Scientist* 46:123-136.
- Coe, R.J., R.L. Downing, and B.S. McGinnes. 1980. Sex and age bias in hunter-killed white-tailed deer. *J. Wildl. Manage.* 44:245-249.
- Couvillion, C.E., V.F. Nettles, C.A. Rawlings, and R.L. Joyner. 1986. Elaeophorosis in white-tailed deer: pathology of the natural disease and its relation to oral food impactions. *J. Wild. Dis.* 22:214-223.
- Dasmann, R.F. 1964. *Wildlife biology*. John Wiley and Sons, New York, NY. 231 pp.
- Downing, R.L. 1980. Vital statistics of animal populations. Pages 247-267 in S.D. Schemnitz, ed. *Wildlife management techniques manual*. 4th ed. The Wildlife Society, Washington, D.C. 686 pp.
- Downing, R.L., E.D. Michael, and R.J. Poux, Jr. 1977. Accuracy of sex and age ration counts of white-tailed deer. *J. Wildl. Manage.* 41:709-714.
- Harmel, D.E. 1982. Effects of genetics on antler quality and body size in white-tailed deer. Pages 339-363 in R.D. Brown, ed. *Antler development in Cervidae*. Caesar Kleberg Wildlife Management Institute, Kingsville, TX.
- Hayne, D.W. 1984. Population dynamics and analysis. Pages 203-210 in L.K. Halls, ed. *White-tailed deer: ecology and management*. Stackpole Books, Harrisburg, PA. 870 pp.
- Holsworth, W.N. 1973. Hunting efficiency and white-tailed deer density. *J. Wildl. Manage.* 43:872-879.
- Johnson, A.S., P.E. Hale, R.L. Marchinton, and J.S. Osborne. 1986. Population dynamics of Blackbeard Island deer. 9th Annual Southeast Deer Study Group Meeting, Gatlinburg, TN. (Abstract.)

- Maguire, H.F., and C.W. Severinghaus. 1954. Wariness as an influence on age composition of white-tailed deer killed by hunters. N. Y. Fish and Game J. 1:98-109.
- Marburger, R.G., J.W. Thomas, and B.D. Loving. 1964. A tale of teeth. Tx. Game and Fish. November: 15-18.
- McClave, J.T., and F.H. Dietrich. 1982. Statistics. 2nd ed. Dellen Publishing, San Francisco, CA. 766 pp.
- McCullough, D.R. 1979. The George Reserve deer herd: population ecology of a K-selected species. Univ. Michigan Press, Ann Arbor. 271 pp.
- McCullough, D.R. 1982. Antler characteristics of George Reserve white-tailed deer. J. Wildl. Manage. 46:821-826.
- McCullough, D.R. 1984. Lessons from the George Reserve, Michigan. Pages 211-242 in L.K. Halls, ed. White-tailed deer: ecology and management. Stackpole Books, Harrisburg, PA. 870 pp.
- Newsome, J.D. 1984. Coastal plain. Pages 367-380 in L.K. Halls, ed. White-tailed deer: ecology and management. Stackpole Books, Harrisburg, PA. 870 pp.
- Roseberry, J.L., and W.D. Klimstra. 1974. Differential vulnerability during a controlled deer harvest. J. Wildl. Manage. 38:499-507.
- Sauer, P.R. 1984. Physical characteristics. Pages 73-89 in L.K. Halls, ed. White-tailed deer: ecology and management. Stackpole Books, Harrisburg, PA. 870 pp.
- Severinghaus, C.A. 1949. Tooth development and wear as criteria of age in white-tailed deer. J. Wildl. Manage. 13:195-216.
- Smith, R.L. 1977. Elements of ecology and field biology. Harper and Row, New York, NY. 497 pp.

Verme, L.J. 1983. Sex ratio variation in *Odocoileus*: a critical review. J. Wildl. Manage. 47:573-582.

Wilson, S.N., and R.R. McMaster. 1974. Ten years of deer management on White River National Wildlife Refuge. Proc. Ann. Conf. Southeast. Game and Fish Comm. 27:143-152.

ACKNOWLEDGEMENTS

This report began as a class project for Dr. R. Larry Marchington's course, Wildlife Management Techniques and Analysis, in the School of Forest Resources, University of Georgia. We are grateful to the class membes for their help in data analysis and to Dr. Marchington for his critical review of the class report.

We thank Ken Morgan, A.S. Johnson, and Bob Warren for their helpful comments. Susan Bratton suggested this write-up and deserves special recognition for seeing it through to completion.

Table 1. Cumberland Island National Seashore Managed Hunts 1985-1986 Summary

Deer Number	Sex	Age	Eviscerated Weight (lb)	Location	Date	Comments *
C.I-1-85	F	.5	24	-	5 Nov 85	
C.I-2-85	M	3.5	44	7	"	spike
C.I-3-85	F	4.5	48	10	"	
C.I-4-85	M	2.5	61	Stafford Field	"	6 point; A
C.I-5-85	F	6.5	56	Bunkley Trail	6 Nov 85	
C.I-6-85	F	5.5	51	Stafford Field	"	
C.I-7-85	F	3.5	50	Stafford Field	"	A
C.I-8-85	F	7.5	59	Stafford Field	"	
C.I-9-85	F	2.5	56	Sea Camp	"	B
C.I-10-85	M	6.5	53	Sea Camp		3 point; B
C.I-11-85	F	3.5	56	Hawkins Creek		
C.I-12-85	M	3.5	50	Stafford Field		3 point
C.I-13-85	F	2.5	42	Stafford Field	19 Nov 85	
C.I-14-85	M	5.5	76	Stafford Field	"	8 point
C.I-15-85	M	2.5	63	Duck House Road	"	5 point
C.I-16-85	M	2.5	50	Duck House Road	"	spike
C.I-17-85	F	5.5	49	Stafford Field	20 Nov 85	
C.I-18-85	F	2.5	56	Stafford Field	"	
C.I-19-85	F	6.5	56	Stafford Field	"	
C.I-20-85	M	3.5	38	Stafford Field	"	spike
C.I-21-85	M	3.5	48	Sea Camp		3 point
C.I-22-85	F	.5	24	Sea Camp		
C.I-23-85	M	2.5	72	26	10 Dec 85	antlers broken off
C.I-24-85	M	4.5	82	25	"	7 point
C.I-24b-85	F	1.5	40	27	"	
C.I-25-85	M	4.5	70	38	"	4 point; A
C.I-26-85	M	2.5	50	7		spike; A
C.I-27-85	F	6.5	51	8		
C.I-28-85	F	1.5	40	41	10 Dec 85	
C.I-29-85	F	1.5	54	-	"	
C.I-30-85	F	.5	32	-	"	
C.I-31-85	F	5.5	65	-	"	

Cumberland Island National Seashore Managed Hunts 1985-1986 Summary

Deer Number	Sex	Age	Eviscerated Weight (lb)	Location	Date	Comments*
C.I-32-85	M	4.5	50	-	"	spike; A
C.I-33-85	F	5.5	53	-	"	
C.I-34-85	M	2.5	60	-	"	spike
C.I-35-85	F	3.5	55	-	"	
C.I-36-85	F	1.5	42	7	11 Dec 85	
C.I-37-85	F	1.5	46	36	"	
C.I-38-85	M	2.5	66	-	"	4 point
C.I-39-85	M	2.5	66	End of Duck House Trail	"	5 point; B
C.I-40-85	M	1.5	-	69	"	spike
C.I-41-85	F	4.5	52	44	"	
C.I-42-85	M	3.5	72	-	12 Dec 85	4 point
C.I-43-85	F	3.5	56	-	"	
C.I-44-85	M	5.5	86	Lake Whitney	"	8 point; A
C.I-45-85	F	6.5	60	Yankee Paradise Tr.	30 Dec 85	B,D
C.I-46-85	F	2.5	46	19	"	1 male fetus
C.I-47-85	F	1.5	36	21	"	
C.I-48-85	M	5.5	62	69	"	5 point
C.I-49-85	M	1.5	37	1	"	buttons; B,E
C.I-50-85	M	.5	32	64	"	button
C.I-51-85	F	1.5	37	22	"	
C.I-52-85	M	4.5	58	4	"	button; C,E
C.I-53-85	F	6.5	56	-	"	
C.I-54-85	F	5.5	58	-	"	
C.I-55-85	F	5.5	50	41	"	
C.I-56-85	F	7.5	54	-	"	
C.I-57-85	M	1.5	42	36	31 Dec 85	spike; D
C.I-58-85	M	.5	36	36	"	button
C.I-59-85	F	4.5	48	41	"	pregnant; A
C.I-60-85	M	3.5	56	9	"	spike; A
C.I-61-85	F	6.5	52	-	"	B,C
C.I-62-85	M	3.5	48	37	"	spike; D
C.I-63-85	M	4.5	64	1	"	6 point

Cumberland Island National Seashore Managed Hunts 1985-1986 Summary

Deer Number	Sex	Age	Eviscerated Weight (lb)	Location	Date	Comments *
C.I-64-85	M	2.5	76	40	"	9 point
C.I-65-85	M	7.5	60	36	"	3 point; A,B
C.I-66-85	F	.5	32	50	"	
C.I-1-86	F	8.5	42	-	1 Jan 86	B
C.I-2-86	M	5.5	65	24	"	8 point
C.I-3-86	F	5.5	62	48	7 Jan 86	
C.I-4-86	M	8.5	74	52	"	
C.I-5-86	F	.5	20	-	"	
C.I-6-86	M	5.5	70	-	"	8 point; B
C.I-7-86	F	5.5	46	38	"	
C.I-8-86	M	.5	30	38	"	
C.I-9-86	M	.5	27	38	"	
C.I-10-86	F	4.5	68	-	"	
C.I-11-86	M	.5	40	-	"	
C.I-12-86	F	7.5	36	-	"	A,D
C.I-13-86	M	8.5	74	-	"	6 point; A
C.I-14-86	F	3.5	50	Sea Camp	8 Jan 86	
C.I-15-86	F	3.5	56	5	"	
C.I-16-86	M	.5	32	South Cut Trail	"	
C.I-17-86	M	.5	30	19	"	
C.I-18-86	F	4.5	42	North Cut	"	E
C.I-19-86	M	1.5	40	-	8 Jan 86	antlers shed
C.I-20-86	M	no age	32	-	"	button
C.I-21-86	M	8.5	54	-		antlers shed
C.I-22-86	-	-	-	-	-	no data
C.I-23-86	M	.5	30	-	9 Jan 86	
C.I-24-86	F	2.5	54	-	"	B
C.I-25-86	M	3.5	54	18	"	spike; A

*Jaw abnormalities:

- A misshapen jaw
- B excessive or abnormal wear on cheek teeth
- C first premolar missing
- D abnormal diastema between cheek teeth
- E retention of deciduous third premolar

Table 2. Average eviscerated weight of cohorts in the 1985-1986 Cumberland Island deer harvest.

Age (yr)	Male		Female	
	Weight (lb) ¹	n	Weight (lb) ¹	n
.5	32.13 ± 3.82	8	26.40 ± 4.80	5
1.5	39.67 ± 2.05	3	42.14 ± 5.72	7
2.5	62.67 ± 8.29	9	50.80 ± 5.74	5
3.5	51.25 ± 9.43	8	53.83 ± 2.73	6
4.5	64.80 ± 12.13	5	51.60 ± 9.84	5
5.5	71.80 ± 8.54	5	54.25 ± 6.28	8
6.5	53.00 ± 0.00	1	55.17 ± 2.97	6
7.5	60.00 ± 0.00	1	49.67 ± 9.88	3
8.5+	67.33 ± 9.43	3	42.00 ± 0.00	1

¹ mean ± standard deviation

Table 3. Age, weight and antler development of Cumberland Island deer by area of harvest, 1985-1986.

<u>Area of harvest</u>	<u>Male</u>			<u>Female</u>	
	<u>Age (yr)</u>	<u>Weight (lb)</u>	<u>Number of antler points</u>	<u>Age (yr)</u>	<u>Weight (lb)</u>
Zone 1		none		none	
Zone 2	5.5 1.5	62 —	5 spike	3.5	56
Zone 3		none		none	
Zone 4	8.5 6.5 .5	74 56 32	-- -- button	none	
Zone 5		none		4.5	42
Zone 6	5.5 .5	86 32	8 --	none	
Zone 7	3.5	44	spike	5.5 .5	62 32
Zone 8		none		none	
Zone 9	2.5	76	9	none	
Zone 10		none		4.5 4.5	52 48
Zone 11		none		none	

Zone 12	3.5	56	spike	none	
	3.5	54	spike		
	2.5	72	--		
Zone 13	4.5	82	7	1.5	40
Zone 14	7.5	60	3	5.5	50
	5.5	65	8	5.5	46
	4.5	70	4	4.5	48
	3.5	48	spike	1.5	46
	2.5	66	5	1.5	40
	2.5	63	5	1.5	37
	2.5	50	spike		
	1.5	42	spike		
	.5	36	button		
	.5	30	--		
	.5	27	--		
Zone 15		none		none	
Zone 16		none		none	
Zone 17	4.5	64	6	2.5	46
	4.5	58	button	.5	42
	2.5	50	spike		
	1.5	37	button		
	.5	30	--		
Zone 18		none		6.5	60
				6.5	51
				3.5	56
Stafford Field	5.5	76	8	7.5	59
	3.5	50	3	6.5	56
	3.5	38	spike	5.5	51
	2.5	61	6	5.5	49
				3.5	50
				2.5	56
				2.5	42
Sea Camp	6.5	53	3	3.5	50
	3.5	48	3	2.5	56
				.5	24

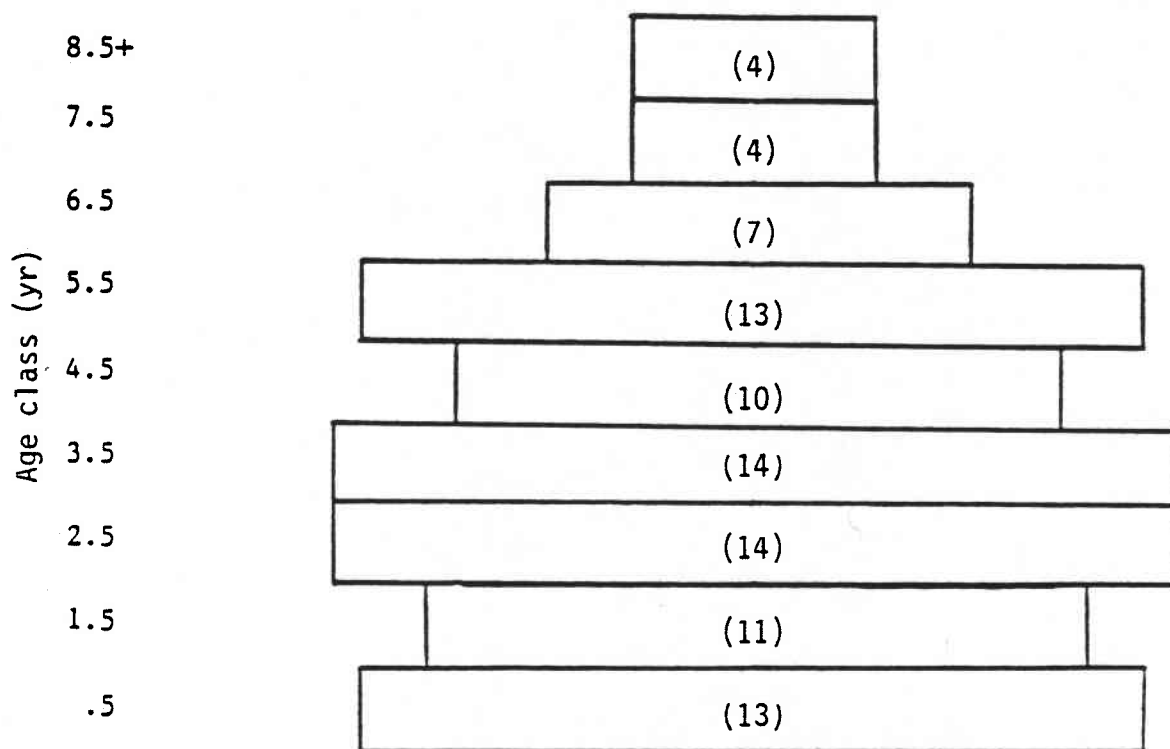


Figure 1. Age composition of the 1985-1986 Cumberland Island deer harvest.

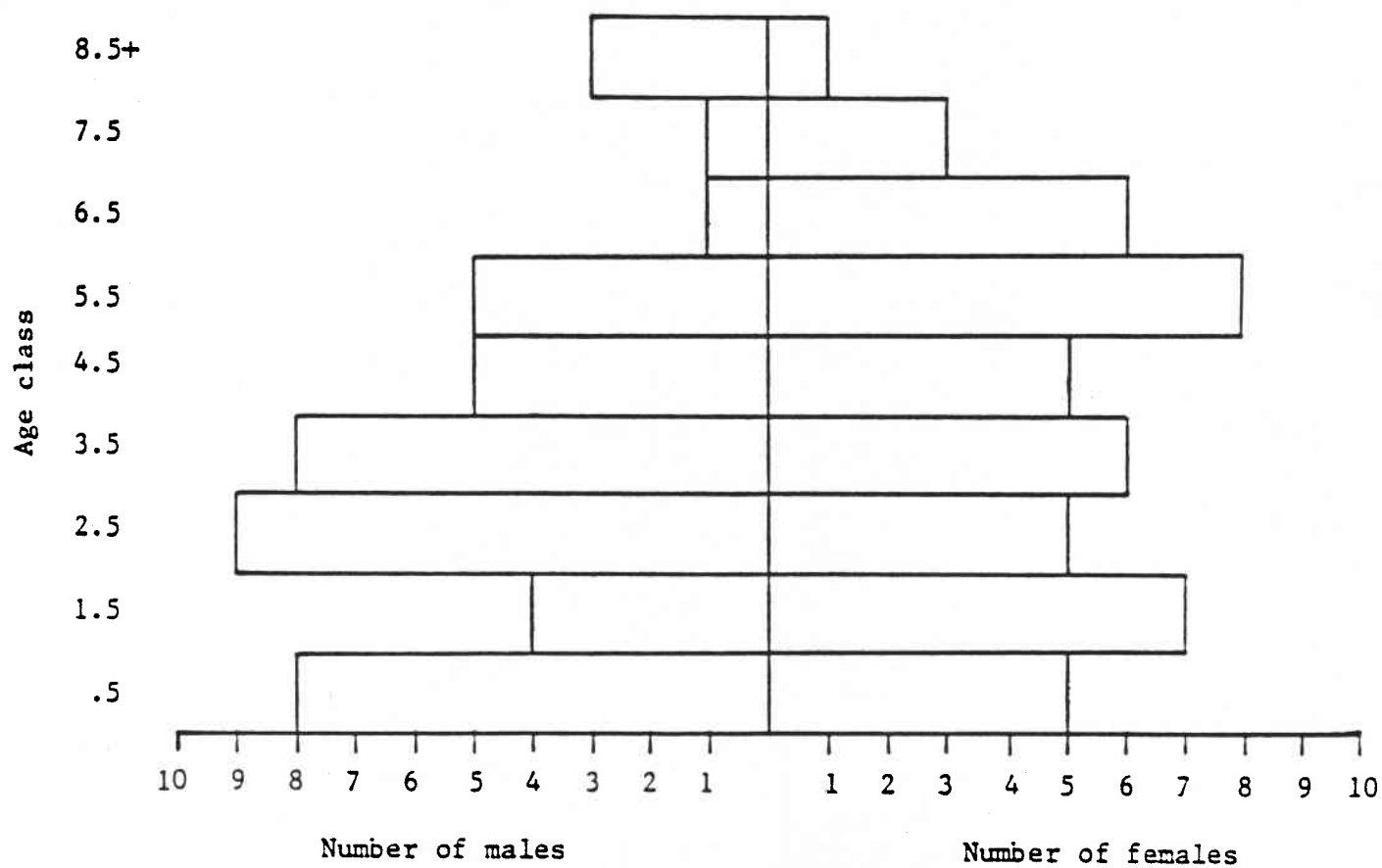


Figure 2. Numbers in each cohort in the 1985-1986 Cumberland Island deer harvest.

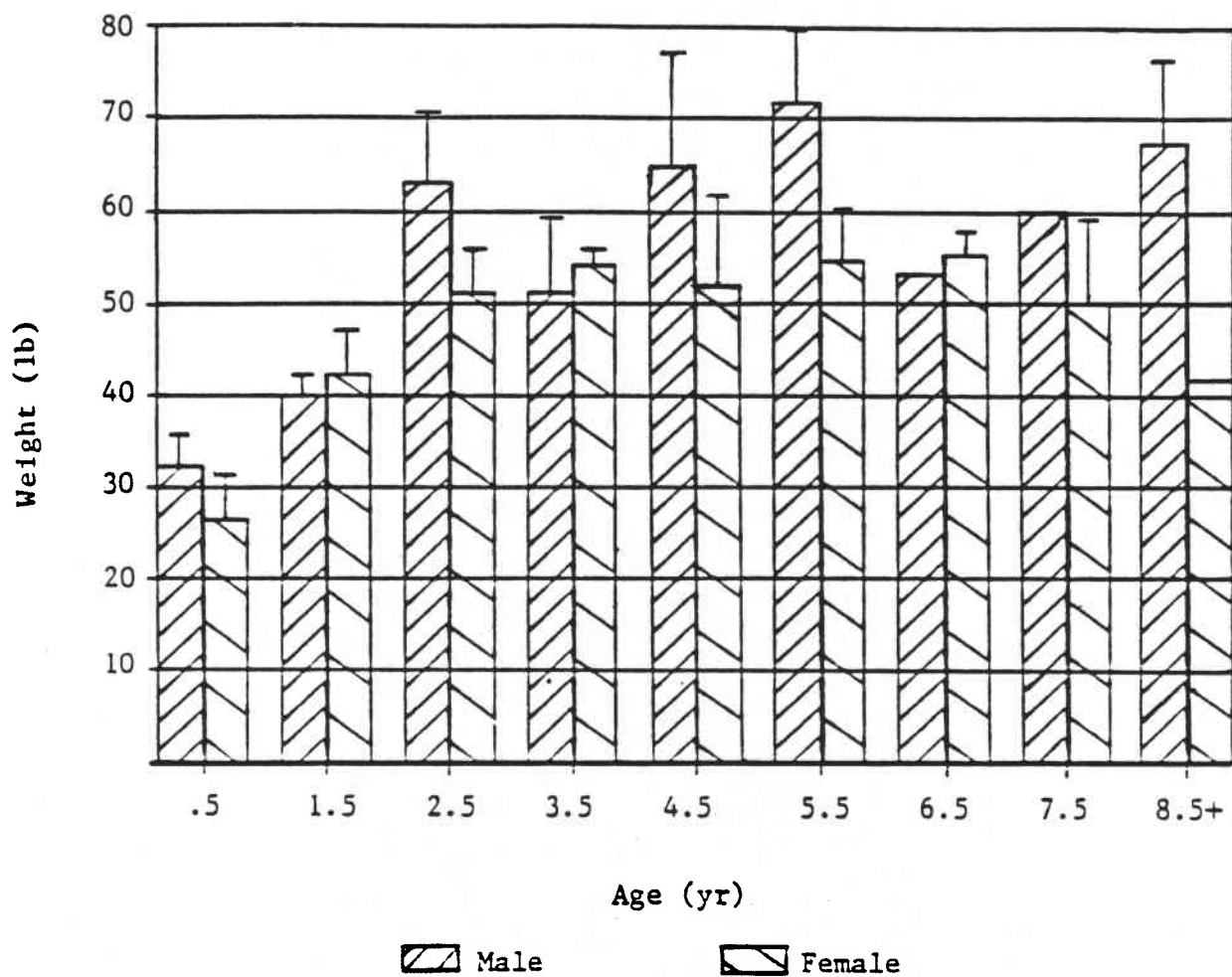


Figure 3. Average eviscerated weight (+1 standard deviation) of cohorts in the 1985-1986 Cumberland Island deer harvest.

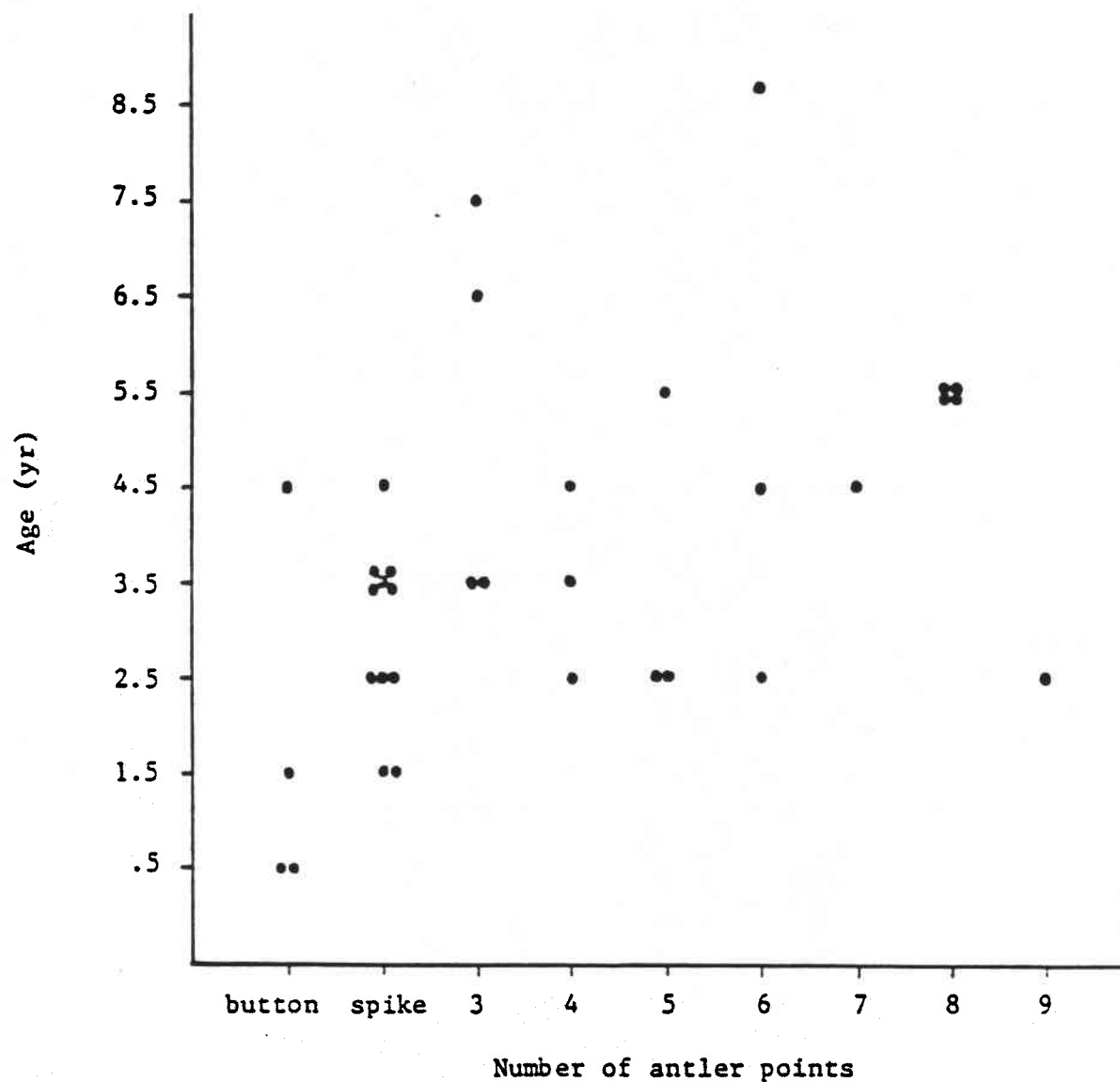


Figure 4. Relationship of antler development and age in Cumberland Island bucks in the 1985-1986 harvest.

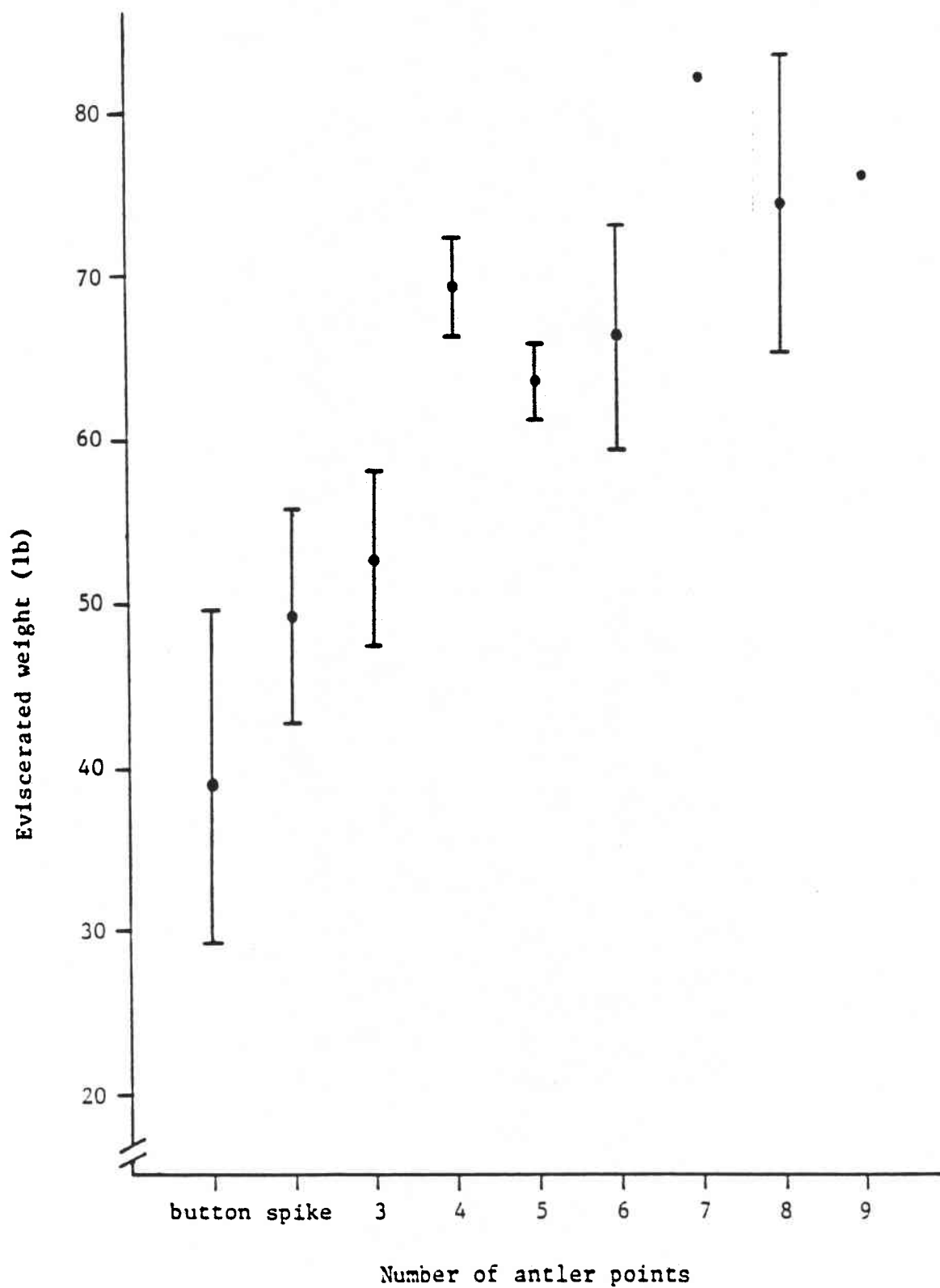


Figure 5. Relationship of antler development and eviscerated weight of bucks in the 1985-1986 Cumberland Island deer harvest.

Figure 6. Cumberland Island managed
hunt zones, 1985-1986.

