



N1615

PROGRESS REPORT SUBMITTED TO THE
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MID-ATLANTIC REGION,
DIVISION OF NATURAL SCIENCES

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TITLE: Calibration of Indices to Sika and White-tailed Deer Abundance on
Assateague Island National Seashore

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SUBMITTED: 7 January 1985

Three large mammalian herbivores, the feral pony (Equus caballus), white-tailed deer (Odocoileus virginianus), and sika deer (Cervus nippon) inhabit Assateague Island National Seashore (AINS). Of this group of herbivores, the white-tailed deer is the only native species. Large mammalian herbivores interact; information about the interaction among feral ponies, sika deer and white-tailed deer is lacking for AINS.

With respect to habitat and vegetation use large mammalian herbivores may interact and exhibit a variety of patterns (National Research Council 1980:104):

1. The different groups might select mutually exclusive habitats, and whether forage preferences were similar or not, would not affect each other's population. No interspecific competition would occur in this situation.
2. The different groups might have overlapping habitat preferences but through behavioral interaction, segregate into discrete portions of the habitat. If competition here is gauged by what a species is capable of in the absence of the other, this pattern could be classified as competition if forage in one (or more) of the habitats become limiting to the species occupying it (them).
3. The different groups might have overlapping habitat preferences and remain sympatric. If they had different forage preferences, they would not compete. If they had overlapping forage requirements, but were not present in sufficient numbers to deplete the forage to limiting amounts they would not compete. But if the forage were reduced to the point of affecting the welfare of one or more groups then competition would occur.

Interspecific competition is judged based on 2 criteria (Milne 1961, Conley 1976):

1. two species compete when they both use some resource that is in short supply; and
2. in using the resource, each species reduces the other's population performance to levels below what these measures would be in the absence of the other species.

Two or more species can use the same resource, but if the joint use does not reduce the resource to the point where each limits the other's demographic performance, there is no competition. The population effect is often difficult to demonstrate. Keiper and Hunter (1982) stated there was apparently little competition for food between deer and ponies at least during the season their study was conducted. Competitive interactions between sika deer and white-tailed deer have yet to be demonstrated. However, because harvest may be indicative of population trends (Caughley 1977) a competitive edge in favor of sika deer may already be present on AINS. The percentage of white-tailed deer represented in the total harvest has dropped approximately 20% since 1978 to a low of only 10.3% in 1983 (Tzilkowski and Brown 1984). This decline in the percentage of white-tailed deer harvested is not proof of competition. Many environmental variables change, the apparent decline may be linked to an environmental variable and not related to competition. To demonstrate competition, one species must be dramatically changed, usually reduced, and the response by another population measured. This experiment is not possible on AINS. Assuming that herbivores compete for food, the effect is presumably on nutrition and ultimately demographic performance. Measuring demographic performance of long-lived herbivores requires a study period of at least several times the mean generation time.

Two general approaches, mark-recapture and removal or change-in-ratio (CIR) methods are used to estimate population size of mobile organisms

(Seber 1973). Mark-recapture procedures are labor-intensive and require that a different system be used to mark and recover the marks to minimize bias. Additionally, to obtain an estimate with an acceptable confidence limit, a relatively large proportion of the population must be marked. For example, for an estimate to be within 95% of a population parameter of 478 animals, 131 animals must be marked. Eberhardt (1982) proposed a method for estimating population size from index data collected before and after removal of a known number of individuals. The bulk of the cost and labor is the removal. If the removal is by sport hunting then this cost is born by the hunter.

From October 1983 to February 1984 two replicated surveys, a spotlight-count and a track-count, were used to index the number of deer on AINS (Tzilkowski and Brown 1984). The 1983 firearms-hunting season was used as the removal period.

Although the number of deer harvested on AINS during the 1983 hunting season was the highest recorded since 1978, the number of sika deer removed apparently had an insignificant impact on the total population size; as the mean number of sightings in both the pre- and post-harvest spotlight sessions were identical. The harvest limit for sika deer had been increased from one to two deer per hunter for the 1984 firearms-hunting season on AINS; if this results in an increased harvest, it should allow the computation of an acceptable CIR estimate.

Paucity of white-tailed deer sightings in both pre- and post-removal sessions along with the small number removed during the ¹⁹⁸³ hunting season were too small to provide a CIR estimate.

The pre-harvest track-count was successfully completed. There was, however, no correlation with the pre-harvest spotlight-count. Accuracy of

the post-harvest track count was hindered by adverse weather conditions to the point where a CIR estimate could not be justifiably computed *with the 1983/84 project data.*

OBJECTIVES:

1. To estimate the number of deer by species, age, and sex.

METHODS:

Population size will be estimated by a combination of CIR and removal method. Prior to the sport hunting season a replicated survey to index the number of deer by species and sex will be conducted. The survey will begin at sunset and the route will be the primary north-south access road. Direction of travel will be randomized with respect to starting location. From a vehicle equipped with 2 spotlights, 2 observers and driver, the species number, sex, and location will be recorded. These data will provide a pre-harvest population index, and an index to species distribution.

Given the single land access route and the existent permit system, an accurate estimate of removal is possible. Each deer harvested could minimally provide information on the species, age, and sex. Age will be estimated by tooth wear and examination of a lower incisor. Radiography and cementum annuli examination will provide an age estimate.

A post-session survey will be made as outlined above in the pre-season survey. Given the data from the pre- and post-season surveys and the hunting removal, a population estimate will be developed as outlined by Eberhardt (1982).

RESULTS AND DISCUSSION:

During the period 5 October to 8 November 1984, 30 spotlight-counts were completed over the standardized route. At least one sika deer was seen each night. The average number of sika deer seen per night was 13.1 deer (SD = 6.32), which was lower than the 1983 preharvest spotlight-count estimate of 16.5 deer per night (SD = 10.99) (Table 1). White-tailed deer were seen on 27 nights. The average number of white-tailed deer seen per night was 2.8 (SD = 2.37) as compared to 4.8 white-tailed deer seen per night (SD = 3.39) in 1983.

Table 1. Weighted count of the number of deer seen, by length of operable route, of each species for 30 preharvest nights from 12 October to 14 November 1983 and from 5 October to 8 November 1984.

Year	Total deer sighted	$\bar{X}$	SD	Range
SIKA				
1983	496	16.5	10.99	2-43
1984	393	13.1	6.32	1-28
WHITE-TAILED DEER				
1983	146	4.8	3.39	0-10
1984	86	2.8	2.37	0-9

During the 1984 hunting season the harvest limit was increased from one sika or one white-tailed deer to two sika deer or one white-tailed deer. As expected, the harvest was greater during the 1984 firearms-season than the 1983 harvest (Table 2). However, there was no difference in the distribution of the harvest between ^{years}~~species~~ (0.879 : 0.895 :: 1983 : 1984) for sika deer and (0.103 : 0.105 :: 1983 : 1984) for white-tailed deer.

Table 2. Summary harvest statistics for the 1983 and 1984 firearms-hunting-season.

Year	Male		Female	
	Adult	Juvenile	Adult	Juvenile
SIKA				
1983	26	4	18	13
1984	42	2	27	14
WHITE-TAILED				
1983	4	0	3	0
1984	4	3	0	3

No difference existed between years in the percentage of the sika harvest that was males (Table 3). The apparent difference between years in the percentage of males in the white-tailed deer harvest was probably a function of the few white-tailed deer that were harvested.

Table 3. Distribution of deer by year, index, sex and species.

Year	Index	Male n(%)	Female n(%)
SIKA			
1983	Spotlight	109(27.9)	281(72.1)
1983	Harvest	30(49.2)	31(50.8)
1984	Spotlight	98(40.6)	143(59.4)
1984	Harvest	44(48.2)	41(51.8)
WHITE-TAILED			
1983	Spotlight	42(45.6)	50(54.4)
1983	Harvest	4(57.1)	3(42.9)
1984	Spotlight	27(45.0)	33(55.0)
1984	Harvest	7(70.0)	3(30.0)

PLANNED ACTIVITIES:

The post-harvest spotlight-count will be completed, harvest and spotlight-count data compiled, analyzed and reported.

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