Martha's Vineyard Deer Survey

Executive Summary

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Background

Two thermal aerial surveys to estimate deer populations on Martha's Vineyard were flown on January 25, 2013 and January 31, 2014. Initial population density estimates for the two surveys were significantly different (*see Table 1.*) despite an almost identical number of deer observations in the imagery. Subsequent analysis found a mathematical error in the 2014 population estimates which explained the discrepancy. However, as part of an effort to produce the highest quality density estimates possible, the researcher teamed with Mass Wildlife Deer Project Leader David Stainbrook to re-examine the spatial distribution of deer observations.

	High Estimate	Low Estimate	Total Observations
2013	54.3	39.7	378
2014	33	23.6	374

Table 1. 2013 and 2014 Martha's Vineyard aerial thermal survey results

Recalculation Methodology

Based upon literature review and the experience of Mass Wildlife several changes were made to the density calculations originally done for these surveys. They include the following:

1. GIS data of deer habitat developed by Mass Wildlife was used to recalculate densities for both surveys.

2. Rather than using canopy cover to model potential under-sampling of deer as done in the original estimates, a change was made to estimate densities at a variety of hypothetical detection rates based on Serber (1982).

The revised calculations were done as: d=n*p/a, where d= density; n= the number of deer observations; p= the detection probability; and a= the area surveyed. *Table 2.* illustrates recalculated density estimates for both surveys at 100%, 80%, 60% and 50% detection rates using exclusively deer identifications and also combined deer and obscured signatures.

Discussion

Looking at recalculated density estimates at the various hypothetical detection levels (*Table 2.)* requires some thought given that there is not an independent data source for estimating the actual detection level for the two surveys. The first data distinction in the table that should be explained is the use of identified deer without the inclusion of unidentified thermal signatures

and the use of combining identified deer with unidentified signatures. Unidentified in the table are thermal signatures thought to represent deer, but which have been obscured in the high-resolution color imagery by vegetation or shadowing. Upon much review, it was determined that their inclusion in the density calculation was warranted, because all collateral image characteristics (shape, size, temperature, etc.) strongly suggested the presence of deer and the absence of reasonable alternative explanations, particularly as to the strong thermal emission.

Since there is no independent data source to characterize the detection rates for the two surveys, we relied on literature reviews and Mass Wildlife biologists' experience to make a judgment. Looking at the estimated densities for the 2013 and 2014 surveys at the 100% detection rate they are 31.5 per mile^2 and 31.2 per mile^2 respectively. All members of the analysis team were unanimous is agreement that it would be highly unlikely, due to the conifer canopy and thick brush, that 100% detection would be possible and thus the estimate would be too low. After a significant review and discussion we suggest that a detection rate of 60%-80% would be reasonable. As such, using the lower detection rate, the density estimates would be 52.5 per mile^2 for 2013 and 51.9 per mile^2 for 2014, which might be a reasonable high density estimate. Using the 80% detection rate would result in 39.4 per mile^2 for 2013 and 39.0 per mile^2 for 2014, which might be a reasonable low density estimate to be used for management planning.

2013-MVY Survey		100% detection no	
Deer	315	unidentified used	26.25
Unidentified	63		
		100% detection all unidentified used	31.5
Habitat Area sq.miles	59	50% detection	63
Survey Area sq.miles		60% detection	52.5
% Habitat Surveyd sq.miles		80% detection	39.375

2014-MVY Survey		100% detection no	27.75
Deer	333	unidentified used	
Unidentified	41		
		100% detection all unidentified used	31.16667
Habitat Area sq.miles	59	50% detection	62.33333
Survey Area sq.miles	12	60% detection	51.94444
% Habitat Surveyd sq.miles	20	80% detection	38.95833

Table 2. Recalculated 2013 and 2014 Martha's Vineyard aerial thermal survey results

Sources

Seber, G. A. F. 1982. The estimation of animal abundance. MacMillan Publishing Co., Inc.: New York. 653 pp.