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BOOTSTRAP INTERVAL ESIMATION OF WILDLIFE POPULATION SIZES FROM MULTIPLE SURVEYS

A research report submitted to the Faculty of science, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Master of Science.

By
Itayi Mutsvairo

Johannesburg, July 2007

DECLARATION

I declare that this research report is my own, unaided work. It is being submitted for the degree of Master of Science in the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

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(Signature of Candidate)

_____ day of _____ 2007

Abstract

The research deals with bootstrap interval estimation of wildlife population sizes from multiple surveys in the Hluhluwe-Umfolosi Park. The jackknife procedure was also used to provide the standard errors for the survey estimates. The main wildlife speciese studied in the research were the White and Black Rhino. The survey estimates for the wildlife species were obtained using line transect sampling and mark-recapture methods respectively. The bootstrap and jackknife procedures were applied separately to each of the datasets. Bootstrap estimates for each of the time point were obtained and the confidence intervals of the bootstrap estimates were constructed using percentile and standard methods. The coverage probability was assessed using the Monte Carlo simulations. Only the nonparametric bootstrap was applied in this research and the results were compared to the jackknife results. The lengths of the confidence intervals were used to assess the confidence intervals with a shorter confidence interval being more exact. The estimates used for both the bootstrap and jackknife methodology were based on a simple state space model. The discrete state space model used was proposed by Fatti et al (2002). State space models provide a natural framework for estimating and predicting animal population abundance given partial or inexact information. The model takes into account the (unknown) birth rate in the population and all known losses (mortalities and relocations) and gains (introductions) in the population between successive surveys as well as the errors in the survey estimates.

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May the LORD bless you all!