

Virunga Mountain Gorilla Population Dynamics: Age- Structured Model

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Abstract

Interest in Virunga Mountain Gorilla Population has significantly increased in the last couple of years. Many censuses have been conducted. These censuses are very expensive and take long time. Some simulation population dynamics have been developed using Vortex population Viability Analysis model. Vortex creates a representation of each animal in its memory and follows the fate of the animal through each year of its lifetime. However, PVA have weaknesses and limitations: That is why for the population dynamics of the Virunga Mountain Gorilla we have endeavoured to develop a new model which can permit to predict the future population size: Age- Structured Model. The model uses Partial Differential Equations with integral boundary conditions. Method of characteristic is used to solve the model. Along the characteristics, the stochastic Age-structured model is developed. Furthermore, we develop the discrete form of the obtained model using Leslie matrix: The population is divided into four disjoint ageclasses: Infant, Juvenile, Sub adult and Adult. For each age-class the parameters of the Leslie matrix are determined. The future population size computed and the limiting behaviour analyzed. The transition matrix obtained has its dominant eigenvalue equal to $\lambda^* = 1.0742$. Since this value is greater than one, the population is growing with an average growth of $\log \lambda^* = \log(1.0742) = 0.031085$, that is 3.1% and at the long time the distribution of the population will remain at the ratios 39.85%, 22.68%, 15.5% and 20.95% respectively for Infant, Juvenile, Sub adult and adult females age-classes. This result can be used to predict the future Gorilla population. The projected growth rate 3.1% is lower than the projected growth rate for the last 10 years is estimated to 3.7% (ICC/UWA/RDB, (2011)). But this growth rate is higher than the longer growth rate since the 1989 census estimated to 2%.

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