

## POISSON PROBABILITY DISTRIBUTION FOR RHINOCEROS CONSERVATION

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### INTRODUCTION

Rhinoceros population in North East India is under threat because of adverse human activities. Their population is on constant decline because of the destruction of their natural habitat and rampant poaching. Deforestation and human intervention also caused a great damage to this animal population.

In this exhibit we have developed a physical and mathematical model to predict probability of finding number of Rhinos in certain square kilometre area in North East India.

### SCIENTIFIC PRINCIPLE INVOLVED

We applied the theory of Poisson distribution to this problem and started to predict the probability of finding number of Rhinos in certain square kilometre area in North East India.

Poisson distribution expresses the probability of a given number of events occurring in a fixed number of time or space. These events need to occur with a known average rate and independently of the time/ space since the last event.

$$P(x) = \frac{\lambda^x \times e^{-\lambda}}{x!}$$

Where

$P(x)$  is the Poisson probability

$\lambda$  is the mean value (here the mean number of Rhinos)

$x$  is the variable (no. of Rhinos) of interest

## MATERIAL REQUIRED

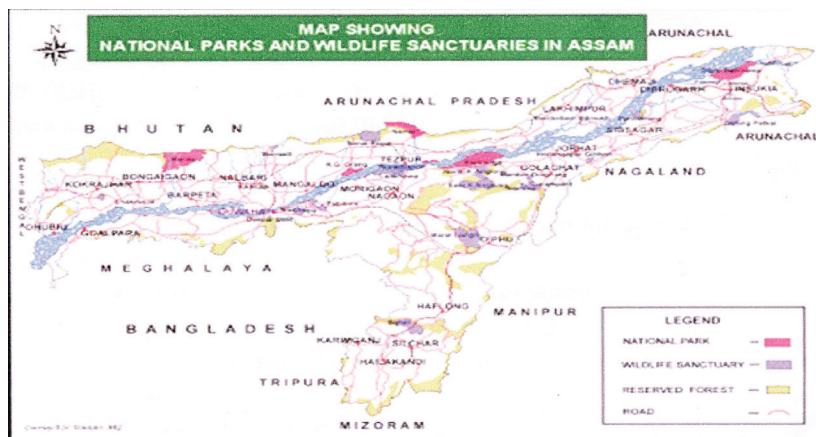
We made this model using old and discarded materials available at home like wooden plank (to make the base of the model), cardboard box (to house a motor which will rotate disc and will have the electrical connections and an electric switch), CD disc (with the Rhino geography mapped and small beads to represent Rhinos), Thermocol pieces (to make a tower for monitoring station), telescopic antenna (to provide a random axial movement) and a glass.

## CONSTRUCTION AND WORKING

The model consists of a wooden base on which two modules are mounted. The first module has a cardboard box on which a motor is placed over which a disc is placed (so that it can be rotated by motor). The second module is placed to the right of the cardboard box which has a thermocol tower with a mounted telescopic antenna for providing a random axial variable.

- i) We modelled the geography of interest on a disc on which we embedded beads to represent Rhinos.
- ii) We randomised geographical space by rotating the disc on circular axis.
- iii) We also introduced another random variable on radial axis.
- iv) The monitoring station shows whether we find a Rhino or not in a given area

The process of modelling the geography on the disc is as follows:-



**Fig. 1: Map showing National Parks and Wildlife Sanctuaries in Assam**

Radius of Circular Disc = 6cm

Area of Circular Disc =  $\pi r^2 = 113.14 \text{ cm}^2$

Area over which Rhinos are spread in Assam = 4365 km<sup>2</sup>

No. of Rhinos in Assam = 3300 (approx)

113:4365 ::  $x$  : 3300

$113/4365 = x/3300$

We get  $x=85$  (which is the number of beads which would represent the Rhinos on our disc).

### **RESULT AND CALCULATIONS**

$\lambda$  = No. of Rhino/Area in sq.m

$\lambda = (3300/4364930000) * 100$  (in metres)

$\lambda = 0.007560259$

Probability of finding a rhino in 100sq. m area

$P = 0.00750331700319649$

We found that the probability of finding the Rhino in random 100 sq. m area was very less and it follows Poisson trials (25 times in 1000 trials) and relates well with what we forecast using Poisson formula (0.00750331700319649).

### **APPLICATIONS**

- i) Educational tool which can be used to gain knowledge can be applied to:
  - Analyse the clusters of Rhino population.
  - Study the movement of Rhino population.
  - Identify areas where urgent action need to be taken to save Rhinos from poachers.
- ii) We approached WWF and offered our support to them on the conservation of Rhinos.
- iii) To spread the awareness of habitat destruction and perils of poaching impacting this beautiful and strong animal
- iv) This mathematical model can be applied to various wildlife conservation efforts.
- v) To study the demography of tribal people and construct population maps.
- vi) Gauge and map habitat destructions.
- vii) We also made a simple android application to spread awareness. The application contains everything we need to know about the Rhinos in Assam from their binomial nomenclature to real time maps. This application also talks about the rate at which our Rhino population is decreasing.
- viii) The cost of the model is less than Rs 500.00.

- ix) Our model is homemade and made from waste material.
- x) The Indian government and WWF can deploy resources on this basis and they can invest in areas where the probability of finding the Rhino is more and invest less in areas where probability of finding Rhino is less. This can save crores of rupees.

#### **REFERENCE**

- i) Statistics for Management, LEVIN Richard, RUBIN, David