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Determination Of Minimum Quadrat Size For The Herbaceous Vegetation: A Case Study Of Durpang Reserve Forest, Arunachal Pradesh, India

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Abstract

For the field vegetation survey, we used the Random sampling method which is an important approach. However, sampling survey in forest areas is difficult because determining an appropriate quadrat size that represents the unevenly distributed vegetation. In this study, we determined the minimum size of the quadrat only for herbaceous vegetation by applyingthe species area curved method which is an important method for the prediction of species richness in terms of habitat area. Using the species area curved method; we simulated random sampling and analyze minimum to maximum diversity. The size of the quadrat in which maximum diversity of species can be recorded is called the minimum size of quadrat for that area. Our result shows that 60×60 sq. cm size are the most representative for sampling survey of herbaceous vegetation in this location.

Keywords: quadrat, herbaceous, sampling, durpang

Introduction

Vegetation in a particular habitat means the different types of species growing in that particular habitat. The process to obtain a well-defined sample is called the sampling technique. The random sampling method is one of the best methods for conducting ecological research; it is widely used in studies of plant diversity, species association analysis, biomass estimation and other areas. Among sampling techniques quadrat method is one of the best ways for vegetation analysis in a particular habitat. A quadrat is a tool used to record the abundance or density of a particular species in a study area. In some instances, it may be possible to simply count the number of organisms of a particular species in an area.

However, in most cases counting all of the organisms would not be practical and other sampling methods are necessary. Quadrats are often square, circular or rectangular areas, of appropriate sizes that are placed at random in the study area. The presence or absence of species, numbers of organisms, or the percentage cover of each species is generally calculated within the quadrat. Quadrats are used to sample plants and may be used to sample some slow moving animals.It is important that quadrats are positioned at random in the study area. This means that every potential point in the study area has an equal chance of being selected for the sample. The size of a quadrat can vary from 0.25 cm x 0.25 cm up to 100 m x 100 m. This will depend on the size of the organisms to be sampled. The minimum size for each quadrat can be determined using the speciesarea-curve method.

Study area

We selected **Durpang Reserve Forest** as our study area, which is situated in Papum pare district of Arunachal Pradesh, India. According to Census 2011 information the location code or village code of Durpang Forest Camp village is 262315. Durpang Forest Camp village is located in Banderdawa Tehsil of Papum Pare district in Arunachal Pradesh, India. It is situated 21km away from sub-district headquarter Banderdewa and 52km away from district headquarter Yupia. Durpang Forest Camp has a total population of 42 people. There are about 8 houses in Durpang Forest Camp village. Banderdawa is the nearest town to Durpang Forest Camp.The study area is our research station and no permission is required to enter the field site to perform a field vegetation survey.

Methodology

To determine the minimum size of the quadrat we used the **species area curve method**. This involves beginning with a small quadrat and counting the number of different species within the quadrat. The size of the quadrat is slowly increased and the count is repeated each time.This method is based on the principle that as the size of the quadrat gradually increases, there is an increase in the number of the species in a quadrat to a certain point from wherethere is no further increase in the number of species of plants. A graph of quadrat size vs. species number is drawn and the point where the curve flattens out indicates the minimum quadrat size for studying vegetation of that particular area. This method is very convenient for vegetation study andanalysis of the plant.

Procedure

In this study, we used 10 × 10 sq. cm as the minimum size of the quadrat and gradually increases and the count was repeated each time. Procedure for determination of minimum size quadrat in our study site as follows-

➢ Lay quadrat and note the number of species in 10×10 sq. cm.

➢ Increase this area to 20×20 sq. cm and note the additional species growing in this area.

➢ Repeat the same procedure for 30 × 30 sq. cm, 40 × 40 sq. cm and so on till 1 × 1 sq. meter areais covered and note the number of additional species every time.

➢ A graph is prepared where number of species on Y-axis and the area of quadrat on the X-axis using this data recorded in the above table.

Results

➢ **Table** showing species richness in each quadrat.

Sl no	Name of the species	Quadrat Size (cm²)									
		10×10	20×20	30×30	40×40	50×50	60×60	70×70	80×80	90×90	100×100
1	Oxanopus	+	+	+	+	+	+	+	+	+	+
2	Cyperus	+	+	+	+	+	+	+	+	+	+
3	Oplismenus	+	+	+	+	+	+	+	+	+	+
4	Cynodon dactylon	+	+	+	+	+	+	+	+	+	+
5	Oldenlandia corymbosa		+	+	+	+	+	+	+	+	+
6	Lucas aspera		+	+	+	+	+	+	+	+	+
7	Evolvolus alsinoides		+	+	+	+	+	+	+	+	+
8	Ageratum conyzoides			+	+	+	+	+	+	+	+
9	Pteris				+	+	+	+	+	+	+
10	Chrysopogon				+	+	+	+	+	+	+

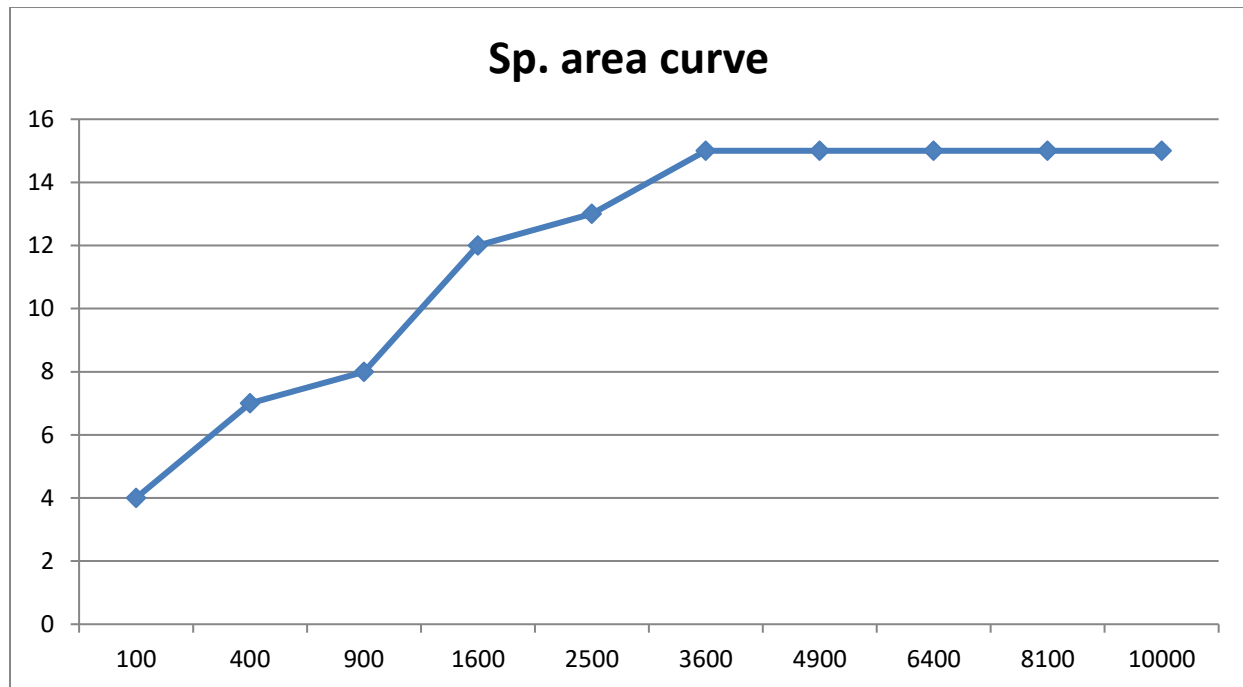|											
	aciculatus										
11	Pogostemon benghalensis				+	+	+	+	+	+	+
12	Phyllanthus urinaria				+	+	+	+	+	+	+
13	Jucus tenuis					+	+	+	+	+	+
14	Digitaria						+	+	+	+	+
15	Mimosa pudica						+	+	+	+	+

Sp. area curve

Figure: Species area curve, x-axis**area**(cm²) and y axis-**no of species**

The point of the graph, at which the curve start flattening or shows only a steady or gradual increase, indicates the minimum size or minimum area of the quadrat suitable for study in that particular location. From the above species-area curve we see that the graph level off after 60× 60 sq. cm, so a maximum of 14 species of plants are found in the area of 60×60 sq. cm. As the area increases, the graph shows no further increase in the number of plant speciesi.e. shows a constant species richness. So, from above

results, shows that **60 × 60 sq. cm** size is the minimum size of quadrat for herbaceous vegetation in **Durpang Reserve Forest** of Arunachal Pradesh, India.

Conclusion

To address the issue of determining minimum quadrat size for herbaceous vegetation in Durpang Reserve Forest, we applied species-area curve method which provides a relationship between the area of habitat and number of species and the best method for field vegetation investigation. This was followed by, analyzing the minimum to a maximum number of herbaceous species by increasing the size of quadrat which shows constant elevation after 60×60 cm², which indicate the minimum size of quadrat for herbaceous vegetation in Durpang Reserve forest. Ecologists have proposed a wide range of factors determining the slope and elevation of the species-area relationship.These factors include the relative balance between immigration and extinction, rate and magnitude of disturbance on small vs. large areas, predator-prey dynamics, and clustering of individuals of the same species as a result of dispersal limitation or habitat heterogeneity.In conservation biology, the species area curve may be used to predict the minimum area that must be preserved to protect the majority of species in a given location.

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