Bialowieza 1997
Expedition Report

Introduction

Bialowieza National Park in north-east Poland, on the border with Belarus, has long been acknowledged as one of the few remaining primeval forests in Europe and is consequently strictly protected. Bialowieza Forest, the larger area surrounding the National Park, does not enjoy the same protection but can still be seen as a unique habitat. Walking through the forest it is possible to see a range of wild mammals, most documented is the European Bison, and many protected plant species. It is therefore a fascinating place to study.

The Forest District of Bialowieza Forest is currently studying its *Pinus* and *Quercus* regeneration. These species are of great economic importance to the forest authorities but are still not being produced in satisfactory numbers, despite some intervention planting and fencing. Our expedition sought to look at the differences in tree regeneration in canopies, and also in gaps of varying sizes. Thus, we hoped to investigate a possible cause of the deficit in *Pinus* and *Quercus* numbers.

The management of the forest had recently moved from clearfelling sizeable areas to small patch and selective felling. However, it is generally accepted that *Pinus* regenerates better in large gaps.

We investigated this possible relationship between gap size and regeneration using the Null Hypothesis:

> There is no difference between tree regeneration in gaps and tree regeneration in canopies.

Method

Field measurements

The sites were chosen in spruce and mixed deciduous woodland. The sites were chosen as gap sites that were, in general, visible from the forest roads. The canopy sites were chosen nearby each gap site. We classified gap and canopy sites as follows:

Gap > 10 m open canopy (in one dimension)
Canopy < 5 m open canopy.

At each site 6 x 6 metre quadrats were set up - one in the gap and one in the canopy nearby. Within each quadrat the following measurements were taken:

- counted number of each species of regenerating tree - in the size classes shown below:
  0 - 10 cm; 11 - 50 cm; 51 - 100 cm; 1 - 2 m; 2 - 5 m; 5 - 10 m
- diameter at breast height (if > 10 cm), height and species were taken of any mature trees standing in the quadrat.
- General canopy height
- Ground flora - percentage cover in two 1m^2 "cirquats"

The length and breadth of the gaps were also measured.

In order to estimate the amount of light penetrating the canopy, photos were taken directly upwards in the centre of each quadrat using a hemispherical camera with a 8mm fish eye lens. This data will be processed and published in a subsequent report.

Data Analysis

The data was analysed using Excel 97 spreadsheets. The following analyses were carried out:

The Shannon Index of Diversity was calculated for the ground flora using the equation:

$$H' = -\Sigma Pi * \ln Pi$$

Pi = proportion of species i
ln = natural log

The regeneration was then regressed against the diversity index.

Regression analyses were also carried out for the percentage cover of *Calamagrostis* sp. and *Pteridium aquilinum* as these were noted as being very dominant in some areas and perhaps swamping regeneration.

ANOVAs were carried out for regeneration of each species in canopies versus gaps for the different size classes. They were also carried out to compare regeneration in canopy versus small gaps versus large gaps. The difference between small and large gaps was defined as:
small gaps <= 393 m^2
large gaps > 393 m^2

This value was chosen as it was the mean gap size.

Results

Table of ANOVA results showing the significant differences in seedling numbers in small, large and canopy sites, in species groups and height classes.

	Height classes				
Species	**0-10 cm**	**11-50 cm**	**51-100 cm**	**1-2 m**	
Acer platanoides	**Ns**	**ns**	**ns**	**-**	
Betula pendula	**-**	******	******	**-**	
Carpinus betulus	**Ns**	*******	*******	*******	
Picea abies	**Ns**	*******	*****	**ns**	
Pinus sylvestris	*****	**ns**	**-**	**-**	
Quercus robur	**Ns**	**ns**	*******	*******	
Populus tremula	**Ns**	**ns**	*****	*****	

'ns' denotes values that were found to be not significant, '-' denote size classes where there was insufficient data to produce a value.

* $P<0.05$; ** $P<0.01$; *** $P<0.005$

It can be seen from the table above that there are clear differences in abundance between gap sizes, species and size classes. Combining this with the mean abundance figures for each species it is possible to observe some significant trends within the species.

Acer platanoides is the only species to show no significant difference in abundance in any gap size. *Betula pendula* are more abundant in big gaps, whilst *Carpinus betulus* is found to be more abundant in small gaps. *Picea abies* was found predominately in small gaps at the 11-50 cm size class, and in big gaps at the 51-100 cm range. The limited number of *Pinus sylvestris* found was mainly in the small size class. *Quercus robur* abundance's were only significantly different in the larger size classes, and were predominantly in the large gaps. *Populus tremula* were also only found in significantly different abundances in the larger size classes but, in contrast to the *Quercus*, were commonest in the smaller gaps.

Discussion

Without a complete analysis of the data, it is difficult to compare our results with those in the literature. However, our results generally agree with other unpublished studies in the area. One scientist working in and around the National Park, Andrzej Bobiec, was attempting to show that sufficient natural regeneration occurs and planting is not necessary. We found plentiful regeneration, and that small gaps in the forest contained *Carpinus*, *Quercus* and *Acer*.

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