Experimental Ecology and Geobotany

A rapid methodology for the survey of Floristic Cartography quadrants in the Po Plain (North-Italy)

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This research was focused to work out and to compare some models of exploration for flora survey on the Po plain, concerning the quadrants of Floristic Cartography. The main aim of the research project was to find a rapid and cheap methodology putting in relation sampling effort with the number of collected species. Besides, we wanted to increase the knowledge of plant distribution in the Lombardy plain.

1 Introduction

Since 1998 the Lombardy Region was involved in an European project of Floristic Cartography with the aim to represent plant distribution on a grid of territorial units and to realize Chorological atlases.

The Lombardy Region also implemented a recent version of a software (CNAT) to store and manage data sets; these data are not only floristic, but regard fauna, fungi, moss, lichen and unviable elements to have a complete view of the land biodiversity.

One system of grid mapping is traditionally used in Europe: this is the System of the Central European Floristic Cartography, CFCE (Ehrendorfer, Hamann). The principal grid unit is named “base area”, which corresponds to a fourth of the IGM cartography sheet (1:50.000). The CFCE grid is based on the European middle UTM-ED50 reference. The base area dimension is 6° of latitude x 10° of longitude (11 x 3 Km, being equivalent to a surface of 143 Km²); it’s univocally identified by two couples of numbers, the first concerning the line and the second concerning the column of the CFCE grid; every base area is divided in four equal parts, each of which is named “quadrant” (3’ x 5’, that is 6 x 5 Km)[1] (Fig.1).

Data are directly collected on field with the support of a “field card” on which all species of the quadrant are listed. In Europe, the first product of the CFCE was the English Floristic Cartography (1962); the second was the Swiss Chorological Atlas [2] and the third was the German Chorological Atlas [3]; the last was the Slovene floristic census [4]. In Italy we remind the Friuli-Venezia Giulia Atlas [5] and the cartography of Trento, Bolzano and the Emilia Romagna [6].

For the Lombardy Region the level of floristic knowledge is described. [7]

The areas with low knowledge are: the Apennine and some parts of the Po Plain, belonging to the provinces of Pavia (Lomellina), Bergamo, Brescia, Lodi, Mantova, Milano.

Until now, botanists have used the same sampling method to survey Floristic Cartography quadrants: they have covered the quadrant many times, in all directions as long as any new species does not appear [8]. Nevertheless this strategy does not always seems good, because it is not possible to check every species in the quadrant and there is a great lost of time and money. Recent researches in the plain show that we can find almost 400 species, while in mountain we can find about 700 [9].

Then, according to the Lombardy Floristic Cartography project, what is the best methodology for flora survey?
2 Specific aims

This work intends to find a rapid and cheap methodology for the flora survey in Po Plain quadrants. In particular aims of this research are to measure how a “minimum area” or a “sample plot” could be representative of all the quadrant surface and to test some exploration models. This research also intends to increase the knowledge of plant distribution in the Lombardy plain.

3 Methods

3.1 Study area

This study focused on some areas of the Po Plain (in the north-west), which show a high homogeneity for the intensive farming. This should allow to cover only few Kilometres of the quadrant to describe a good representative part of the species total.
Four quadrants comparable for habitats and ecological conditions were selected. In each of them we tested all presumed exploration methodologies.

According to the Pareto principle [10], also known as “the 80-20 rule”, that says that for many events the 80% of the effects came from the 20% of the causes, we supposed that the 80% of the quadrant biodiversity could be observed covering the 20% of the quadrant surface.

3.2 Methodologies of exploration

Four models of flora survey were worked out by mean of the ArcView 3.2 support. These models are comparable because similar for some important features (parameters of scale): grain, extent, shape, disposition, and number of plots [11].

The four methodologies are: ecological, random A, random B, transect (Fig. 2, 3, 4, 5). Little and few plots characterise the ecological and the transect models, large and many plots define the random ones.

On field we filled out a complete plant list for each plot to have a good description of the species real presence and to obtain data about diversity, rarity, dominance etc. In this way, the data sets could be also amalgamated in functional groups at the time of analysis [12].

Data set collected during 2007/2008 period were computerized in excel files. The localization on field of each plot took place with the support of GPS mobile system, made available by the Department of Ecology (University of Pavia).
4 Results

In this extended abstract we report some results obtained from a first data elaboration. We have planned further deep tests to put in relation sampling effort with the number of observed species.

As pointed out in literature, the first law of geography [13] says that when some areas are near they are also very similar; following this law the probability to observe more species is higher when little plots are localized far one from another.

We have tried to understand by the cost-benefit analysis of the first data set (Table 1) if many little plots are better or worse than few large plots.

The analysis has shown that covering many little plots allows to collect a high number of species with high costs in term of time and money, while covering few large plots gives low costs in term of time and money, but also a low number of species.

The random A model seems to strike a balance between species number/time-money cost even if the ecological model assures a higher plant number.

Moreover, in our plots the number of new species decreases with the increase of the covered area, according to the concept of the minimal area [14], where the so-called species/area curve expresses the relationship between areas of different size and number of species found in them (Fig. 6).

Finally, during the flora survey of the plot we observed that the sampling time is strictly conditioned by the road accessibility and conditions.
Table 1: First data set of sampling designs: species number and time spent in each quadrant.

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References