

Contribution of the Forest Map of Spain to the chorology of woody plant species

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Abstract

Usually, common species sites are not thoroughly recorded in floristic studies. This kind of studies frequently focuses on rare species chorology. Woody plant surveys for the whole Spanish territory can be found in Ruiz de la Torre's Forest Map of Spain. Five chorological maps based on herbarium and floristic publications data have been compared to those obtained from the Forest Map, using a 10 km UTM grid. After joining the maps, 50 to 95% of UTM squares are exclusive Forest Map contributions. Before adding Forest Map data, known distribution areas were at most 50% of the real area. Therefore, the contribution of the Forest Map to the chorology of woody plant species in Spain can be considered of great magnitude.

Key words: forest mapping, plant distribution maps.

Resumen

Aportación del Mapa Forestal de España al conocimiento de la corología de plantas leñosas

Los estudios florísticos no suelen recopilar exhaustivamente las localidades de las especies más comunes y en general se centran en el estudio detallado de la corología de especies raras. El Mapa Forestal de España de Ruiz de la Torre contiene inventarios de plantas leñosas para todo el territorio nacional. Se han comparado mapas corológicos de cinco especies leñosas basados en herbarios y bibliografía florística con los obtenidos a partir del Mapa Forestal, utilizando como base la malla UTM de 10 km de lado. El Mapa Forestal aporta como novedad entre un 50 y un 95% de los cuadros. Antes de la incorporación de los datos del Mapa Forestal las distribuciones conocidas representaban como máximo el 50% de la real. A la vista de los resultados se puede afirmar que el Mapa Forestal constituye una aportación de gran magnitud al conocimiento de la corología de especies leñosas en España.

Palabras clave: cartografía forestal, mapas de distribución de plantas.

Introduction

Plant distribution is a valuable source of data for biogeography (Dahl, 1998), habitat requirement models (Pearson *et al.*, 2004), conservation of threatened species (Bañares *et al.*, 2004), regions of provenance for plant genetic resources (García del Barrio *et al.*, 2001) and species selection for environmental restoration. Distribution maps of several species have been published in the last two decades, as those in the series of papers starting with Fernández Casas (1985) or Molina (1989). Unfortunately, knowledge on Iberian plant species distribution is far from being complete and further research is needed.

Main data sources for distribution maps, plant checklists and herbaria, usually do not thoroughly record sites for common species. Floristic research work often focuses on rare and endangered species or in recording the maximum species number of the study area, this kind of sampling strategy necessarily reduces attention on common species distribution.

Forest Map of Spain (Ruiz de la Torre, 1990-1999) is a detailed vegetation map (scale 1:200.000) that includes woody plant surveys for each polygon in addition to vegetation type information. Plant surveys are not complete but always include trees and shrubs. Every vegetation polygon in the Forest Map has been visited during field work and therefore species presence data have been thoroughly recorded in the whole country. As a result of this huge field work, the Forest Map includes thousands of spatially referenced species lists.

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In this paper we assess the contribution of the Forest Map of Spain to the knowledge of plant distributions comparing chorological data obtained from the Forest Map to that compiled from floristic publications and herbaria.

Material and Methods

Five tree and shrub species (see Table 1) were selected from the distribution maps published within the Forest Map development period (1990-1999). These maps compile species presence data from herbaria and floristic publications in a 10×10 km UTM grid. Although the selected maps compile sites for the whole Iberian Peninsula and Balearic Islands, Portuguese records were not used in the assessment because forest map data from Portugal were not available. UTM squares were recorded from the text of the papers and in some species there are slight differences with the original published map due to errors on coordinates or omissions of squares.

In order to build species-polygon relations, vegetation polygons in which selected species occur were recorded from polygon description document enclosing each Forest Map sheet. Polygon-square (UTM) relations were obtained by intersecting a 10×10 km UTM grid with the Forest Map. Large polygons (intersecting with more than four squares) were not considered due to the great uncertainty in the position of the species. From these relations species-square tables were built and new distribution maps were drawn.

Contribution of the Forest Map has been assessed in two ways: (1) visually comparing the published distribution map to the map resulting from the addition of Forest Map data and (2) calculating the percentage of squares exclusively reported by each data source.

Table 1. Selected species and the references of the previously published distribution maps

Species	Reference
<i>Arbutus unedo</i> L.	Domínguez and Martínez (1993)
<i>Ilex aquifolium</i> L.	Morales Abad (1992a)
<i>Juniperus thurifera</i> L.	Gómez Manzanque <i>et al.</i> (1993)
<i>Retama sphaerocarpa</i> (L.) Boiss.	Morales Valverde (1995)
<i>Taxus baccata</i> L.	Morales Abad (1992b)

Results

Two figures are presented for each species: previously published distribution map (see Figs. 1, 3, 5, 7 and 9) and new distribution map resulting from the addition of Forest Map data to the previous one (see Figs. 2, 4, 6, 8 and 10).

Percentages shown in Table 2 quantify the contribution of the Forest Map to the chorology of considered species. Contribution varies from near 50% to 95% and known distributions prior to adding Forest Map data were at most 50% of the real one.

Discussion

The main cause of the large difference between previously published and new chorological maps seems



Figure 1. *Arbutus unedo*, previously published distribution map (Domínguez and Martínez, 1993).



Figure 2. *Arbutus unedo*, distribution map resulting from adding Forest Map data to fig. 1.



Figure 3. *Ilex aquifolium*, previously published distribution map (Morales Abad, 1992a).



Figure 4. *Ilex aquifolium*, distribution map resulting from adding Forest Map data to fig. 3.



Figure 5. *Juniperus thurifera*, previously published distribution map (Gómez Manzanque *et al.*, 1993).



Figure 6. *Juniperus thurifera*, distribution map resulting from adding Forest Map data to fig. 5.



Figure 7. *Retama sphaerocarpa*, previously published distribution map (Morales Valverde, 1995).



Figure 8. *Retama sphaerocarpa*, distribution map resulting from adding Forest Map data to fig. 7.



Figure 9. *Taxus baccata*, previously published distribution map (Morales Abad, 1992b).



Figure 10. *Taxus baccata*, distribution map resulting from adding Forest Map data to fig. 9.

Table 2. Contribution of the Forest Map to the chorology of the considered species

Species	Total squares	Squares only reported in previously published map (%)	Squares only reported in the Forest Map (%)	Squares in both data sources (%)
<i>Arbutus unedo</i>	1,570	15.4	55.9	28.7
<i>Ilex aquifolium</i>	793	8.6	73.1	18.3
<i>Juniperus thurifera</i>	605	6.0	51.1	43.0
<i>Retama sphaerocarpa</i>	1,637	1.9	94.6	3.5
<i>Taxus baccata</i>	478	20.7	63.8	15.5

to be related to the fact that common species sites are not thoroughly recorded in most of floristic research works.

In most of the regions, Forest Map data complete known distribution area, filling the gaps between previously recorded scattered squares (i.e. compare distribution area of *Arbutus unedo* in the province of Huelva between Figs. 1 and 2). Even in regions where plant chorology is well known Forest Map contribution may be significant (i.e. compare distribution area of *Ilex aquifolium* in the Basque Country between Figs. 3 and 4).

New *Juniperus thurifera* squares from Forest Map data surround previously known distribution area. Since previous map (Gómez Manzanque *et al.*, 1993) is based on a research work about thuriferous juniper woodlands (Gómez Manzanque, 1990), it may reflect areas where the species become dominant instead of simple presence. This could be the cause of the spatial pattern of the Forest Map contribution for this species and support the idea that Forest Map data not only report about plant communities but also about species presence.

Retama sphaerocarpa is an extreme example of very common species poorly recorded in herbaria and floristic publications. After compiling available data and drawing the distribution map, Morales Valverde (1995) states that the species is much more frequent than the map shows. Forest Map data support this statement increasing known distribution area 18 times (from 88 to 1,637 squares).

Comparing Forest Map data with previously published distribution maps confirms that its contribution to the chorology of Spanish woody plant species is of great magnitude. We therefore recommend using Ruiz de la Torre's Forest Map of Spain as chorological data source for woody plant species in Spain.

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