

Anthos.es: 10 years showing Spanish plant diversity information in the Internet

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Abstract — Anthos is a scientific and technological program that shows Spanish plant biodiversity information in Internet through the open web page www.anthos.es. The program has been developed since 1999 with the support of the *Fundación Biodiversidad* and the *Agencia Estatal Consejo Superior de Investigaciones Científicas – Real Jardín Botánico* and offers 1.3 million plant data with c. 100.000 annual visitors.

Index Terms — Anthos, Spanish plants, biodiversity, internet.



1 INTRODUCTION

Anthos is a scientific and technological program that was developed in accordance with a specific agreement between the *Fundación Biodiversidad* (Biodiversity Foundation, from the Ministry of the Environment) and the *Agencia Estatal Consejo Superior de Investigaciones Científicas* (Spanish National Research Council) – *Real Jardín Botánico* (Royal Botanic Garden, from the Ministry of Science and Innovation) in order to show assorted information about the plant diversity of Spain in the Internet.

The program was initiated in 1999 with a public computer application that has been continually updated up to 1,3 million data concerning plants, using as its main source the Spanish botanical bibliography. In 2005, in accordance with the second agreement for the development of the project, a new computer application was added, developed in a Geographic Information System (GIS), which became accessible to the public in April 2006. A detailed description of the previous Anthos system can be consulted at [1].

The new application integrates and improves the procedures and queries of the previous application, consistently increasing the amount of available data. Furthermore, the new application combines chorological information with other information of a cartographic nature concerning environmental variables, and reference maps. This allows a more accurate location of cited plants, as well as showing in graphic form the different distribution patterns.

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The overall geographical environment chosen for the project is the Iberian Peninsula and the Macaronesian islands (Canaries, Madeira and the Azores) as a representation of each of the biogeographical units present in Spain. In this way, the distribution of a taxon may be studied throughout the entire national territory and surrounding area, fully integrating the taxon in its geographical component.

2 TAXONOMIC INFORMATION

The taxonomic framework for the use and management of the names of plants is still the project *Flora iberica* (www.floraiberica.es), which provides essential knowledge in the areas of taxonomy, chorology, cytology, etc. Anthos follows its criteria faithfully.

Thus, the offered taxonomic treatment is the following:

1. Plants of the Iberian Peninsula and Balearic Islands, within genera which were already published or are in the process of being published in *Flora iberica*. For all other genera, the treatment follows firstly that of Med-Checklist [2] and the rest *Flora Europaea* [3], except in cases where a specific and original treatment is followed.
2. Plants of the Canary Islands, and in general for the entire Macaronesian area, following the taxonomic scheme offered in the *Lista de Especies Silvestres de Canarias* [4].

3 CHOROLOGICAL INFORMATION

The distribution maps of plants have been sketched from the chorological information published in scientific articles and books, along with data from herbarium collections, reviewed by specialists who submit their data.

The initial bibliographic information came from the database of chorological citations which the Royal Botanic Garden (CSIC) began to prepare in 1986. This original information was cleaned up and later greatly extended, thanks to the Anthos project, until reaching its current number of 1.3 million entries.

Data from herbarium collections are received from critical reviews normally carried out by authors of genus syntheses for *Flora iberica*, who submit their data to us. In some particular cases, herbarium data for some plants have been added, in order to complete their distribution. The sum of the plant data from herbaria is close to 36,000 sheets.

Recently, we have also added a great amount of duly contrasted information from other databases. This information is shown as it was provided (with the obligatory adaptation for formats), and the source is cited in each record, so that it can be duly identified. We currently have access to databases as the database of "Plantas vasculares de los Parques Nacionales" (Vascular plants of the Spanish National Parks), from the the *Organismo Autónomo de Parques Nacionales*, (Autonomous Organism of National Parks) of the Ministry of the Environment, or the database of the "Plantas vasculares de la cornisa cantábrica" (Vascular plants of the Cantabrian Cornice), submitted by C. Aedo, G. Moreno Moral and Ó. Sánchez Pedraja, members of the group of experts in

botany for the northern part of the Iberian Peninsula, which brings together the great effort this work group has undertaken in the geographical area comprising the Cantabrian Mountains. This database has provided about 300.000 plant references, noticeably improving the quality of the data offered in the area.

Some of the chorological data of plants collected in the botanical bibliography have shown, over time, to be somewhat unreliable. In these cases, although we are obliged to display them to the public, we have marked them with the label “questionable” so that the user may be aware of the fact that the citation needs verification of some type. This label appears in a distinguishable form both on the distribution maps and on the lists.

4 ASSOCIATED INFORMATION

Besides the distribution maps for the plants, we have incorporated other information which may be of great interest to users, such as: common names, chromosome numbers, synonymy, conservation state, drawings and photographs. The common names were initially taken from the volumes published in *Flora iberica*, to which the information contained in the database “*Nombres vernáculos*” (Common names) has been added, gathered and updated by Dr. Ramón Morales (Real Jardín Botánico, CSIC) and his team. This information has been updated in collaboration with Anthos. The information regarding chromosome numbers comes from a previously published database at the *Flora Iberica* webpage, which was subsequently updated with the most recent bibliography. The information on synonyms of the accepted names comes from the database NOMEN of *Flora Iberica*. For the genera not studied in this project yet, the system of nomenclature employed by Med-Checklist and *Flora Europaea* has been adapted to the structure of Anthos, with the aim of obtaining a homogeneous nomenclature database. The information about the conservation state comes from a newly created database in which we have included the Legal Standards on the protection of plants effective in the Spanish territory, together with information on books and red lists. Further information about plant conservation status can be consulted at www.phyteia.es. The illustrations we offer were submitted from several sources: the black and white plates were provided by *Flora Iberica* and were created by different botanical artists. The coloured plates were submitted from other classical works on the Iberian and Macaronesian flora which, due to their antiquity, are no longer subject to authors’ or editors’ rights. The photographs of the plants were acquired or submitted from diverse artists, whose names appear on the caption of each photo, and which are also responsible for identification of the photographed specimens. In some cases, due to our interest in completing certain collections of images of plants in a geographical or taxonomic area, these photographs were taken within the Anthos project itself, in which case we assume all responsibility for the identification of the plants displayed.

Download Information. Under the epigraph “listings”, Anthos has developed a format for the output of data for each consultation on the distribution of a plant. Thus, the user has access to the information that backs up each of the citations. This relation may be downloaded in different formats (txt, csv and xml), which

allows subsequent editing, using the usual geographical and statistical tools.

Cartographic Information. The Cartographic information comes from free public services or was submitted by colleagues.

Google Maps is loaded with the corresponding licenses, as is Blue Marble, and also the climatic variable layers provided by *Atlas Climático de la Península Ibérica* (Climatic Atlas of the Iberian Peninsula, from UAB).

The *Banco de Datos de la Naturaleza* (Nature Data Bank), of the Ministry of the Environment, provided us with the UTM grid, which we later extended to the whole area, with information corresponding to Spanish National Parks.

The information in the Geological Map was taken from the SEIS.NET program, *Sistema Español de Información de Suelos de España sobre Internet* (Spanish Information System of Spanish Soils on the Internet, IRNA-CSIC).

We obtain WMS remote visualisation of the orthophotos of the Rural Register management tool, known as SIGPAC (System of Identification of Agricultural Plots), for which we have availed ourselves of the generous help of those responsible for the above-mentioned application in TRAGSATEC.

The *Instituto Geográfico Nacional* (Spanish National Geographic Institute) suggested and allowed us the use of the WMS service to load layer information provided within the framework of the *IDEE - Infraestructura de Datos Espaciales de España, Ministerio de Fomento* (Spatial Data Infrastructure of Spain, Ministry of Public Works)

The DEM (Digital Elevation Model) was made up by Geodata S.L. from GTOPO30.

5 USE OF INFORMATION

The information provided in the Anthos Project is distributed on the Internet freely to the broad public for the benefit of whoever may wish to use it; Anthos accepts no responsibility for its reliability, which is the sole responsibility of the authors of the chorological, taxonomic and photographic works.

However, the compilation and management of the above-mentioned information is the work of Anthos, and we should be grateful to be cited as an electronic resource in scientific, technical and professional public outreach works which have availed themselves of the data offered by the program.

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Since 1999, the year in which Anthos, was initiated, a great number of users have generously collaborated with us, informing us of errors or faults detected or offering information of interest. To all of them, as well as to the institutions and the group of consultants and collaborators both within the *Real Jardín Botánico* or external to it, we owe our deepest thanks for the help which, from the outset and up to this day, we have so generously received. We hope to keep counting on the collaboration of any user, as we are very much aware that this is one of the best ways of correcting and updating the extremely complex information in our pages, and that without the assistance of our collaborators the task would be indeed much more difficult.

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