

ORCHIS - Technology in Help of Botanists and Foresters on Both Sides of the Border

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Abstract. This paper presents the technology developed as a part of the project ORCHIS. It aimed to research, record and digitalize data on the species of orchids that live in Strandzha Mountain, which is separated between Bulgaria and Turkey. The collected information is fed to a specialized software installed on mobile devices available to the local foresters and biologists and then presented in a summarized way on a web platform. Both – software and web platform are tools which succeed the easy identification of orchid species as well as base for sustainable research of their population and habitats.

Keywords: Digitalization, Biodiversity, Orchids, Distributed Software System, Biodiversity Software.

1 Introduction

In 2017 the Non-profit Organization for Conservation One Nature – Bulgaria and Demirköy Forestry - Turkey implemented project "ORCHIS - Research, Conservation and Habitats of Orchids in Strandzha", funded under the Programme of the European Union for Cross-Border Cooperation INTERREG-IPA Bulgaria-Turkey 2014-2020 (Ministry of Regional Development and Public Works of Republic of Bulgaria).

The main objective of the project was to improve the capacity for nature conservation, sustainable use and management of common natural resources through cross-border cooperation initiatives. They were focused on the preservation of wild orchids in the protected territory of Strandzha Mountain with the help of an innovative concept - using specialized software to help species identification and assessment of their habitats status as well as early warning of emerging threats.

Strandzha Mountain is a biogeographical crossroad; it is a connection between two continents, two countries, sea and the land, but also geological time periods. Due to its characteristics, it has rich biodiversity and unique florogeographic complex for Europe, which remain poorly studied even today. Among the most interesting species inhabiting the mountain are the orchids. For the biologists and foresters they are important species for the conservation status of the local flora. Their biological and ecological characteristics make them suitable to be used as an indicator for the condition of the habitats where they live. However they are rarely used in the methodologies for monitoring

habitats due to the fact that there are only a few experts who can recognize them on place; specialized literature, such as guides of orchids in Bulgarian / Turkish, is also limited or non-existent.

2 Project Objectivities and Effect

The realization of project ORCHIS (ORCHIS) targeted to overcome this diversion and to use it as a base for investigation of the flora in the cross-border region, using the collected data for the condition of the orchids' habitats. The strong multiply effect and long term opportunities for the continuation of the research had to be guaranteed by the new digitalization technology featuring specialized software, which is easy to update by the users. By creating interactive and constant cooperation between researchers, foresters, tourists etc., the platform had the task to register new species, changes in population, and threats in habitats. The methodology used to organize the system was universal in order to be later used for other species or areas, multiplying the public online resources from inventorying and monitoring of biodiversity in Europe.

Another task was on a later stage to connect the system with the Internet platform NatureIdentify.com (Stewart) of NGO One Nature (NGO One Nature) for online identification of different species upon user request. Due the fact that the project generated long-term investigation opportunity for the involved organizations and experts, it is possible to achieve the 5 years time frame of strategic monitoring according to international standards. 5-year monitoring is required to get the real picture of trends in the populations of wild orchids. In 2015 Bulgaria submitted official reports to the EU on the status of biodiversity and Natura2000 (Programme Nature2000) areas. After 5 years the country will again have to submit information about the current status. With the help of the data generated from the system, the Bulgarian Executive Environmental Agency at Ministry of Environment and Water will be provided a summary report of orchid species in Strandzha to use in their documents.

3 Specialized Software ORCHIS

3.1 Requirements and Outputs

The assignment under the project described the task as development of specialized software for stationary and mobile devices without the need of Internet connectivity, which to assist in determining the species on place and the study of their populations and habitats. The software had to offer interface and data in Bulgarian, Turkish and English, structured in a user-friendly way.

The information for the database had to be taken from the reports of the field surveys and include information for each orchid species with photos, coordinates (location), description, habitats, conservation status, population size, threats. The software then offers option to submit new data in order to create sustainability of the research results and effective monitoring.

The software is distributed only among biologists and foresters that are given special tablets from the project or have been appointed by the two partners to install it on their desktops or laptops. This specification was required due to the classification of the information. As stated above the many orchids are listed as protected species and disclosing their exact location with the general public may endanger their population. The database fields showing the coordinates and nearby villages had to be available only to the software users that were given tablets. The general public can see the locations of the recorded populations of certain orchid species on the website as heatmap (OpenStreetMap).

3.2 Data collection

The data collection was succeeded by team of biologists in Bulgaria and Turkey that conducted field studies in the whole territory of Strandzha. Initially they determined a methodology for checklist from which to be extracted the data for the software database.

Table 1. Checklist sample with required universal fields.

Latin name	Bulgarian name	Turkish name	Description	Conservation	Date	Village	Coordinates	Notes	Number	Observer
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As a result of the comprehensive mapping of the orchid species, size and distribution of their populations in Strandzha was conducted by the experts in Bulgaria and Turkey. 32 species were found, from which 2 species are new to the mountain. Altogether 793 locations (with GPS coordinates) and a total of 1055236 specimens were mapped then the information was fed to the software database.

3.3 Features

Developer log for software ORCHIS (Fig.1) and web platform implementation (Fig. 2):

- Server has been completed to specification, storing all required information and images about each orchid species with the ability to add, remove or change information.
- Unlimited images can be attached to a species which can be displayed on the website and/or synchronized locally to the client software.
- The database stores geo coordinates and tagging ability to orchids.
- API keys can be used via the client software to obtain updates and required information. This includes GPS coordinates, images and all attached information for all of the species. (Fig. 3 and 4.)

- A back-end panel allows easy access to managing species, adding, removing and/or updating information and images.
- The client software has built in data update/synchronization capability to allow caching and storage of all necessary information for the working of the software and project.
- The client software allows each user to submit GPS coordinates track, information, notes and photos of orchids created with the inbuilt camera of the device.
- The submitted information is trackable to which tablet or device it came from by the individual API keys.
- Easy to use touch interface that allows quickly navigating and visually identifying species of orchids.
- The client software is fully usable offline; reports made are stored until internet coverage is available at which time the reports are sent in small bursts to prevent large internet bandwidth consumption.
- Both server and client have 3 languages; Bulgarian, English and Turkish. (See Fig.1)

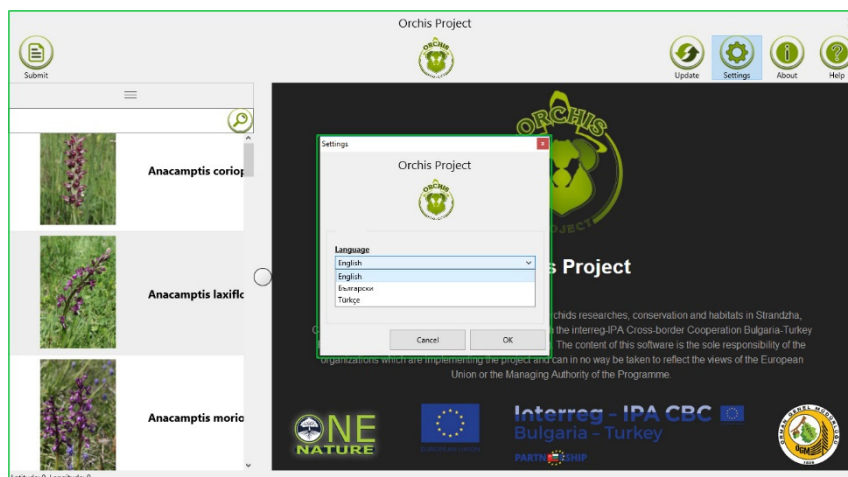


Fig. 1. General view of the client software interface – menu Settings.

- The server software has been developed to function on Unix/Linux platforms, and the client to run on 32-bit/64-bit Windows platforms.
- The project server software is fully integrated with the project website (ORCHIS) for efficient data accessibility between both website and software.

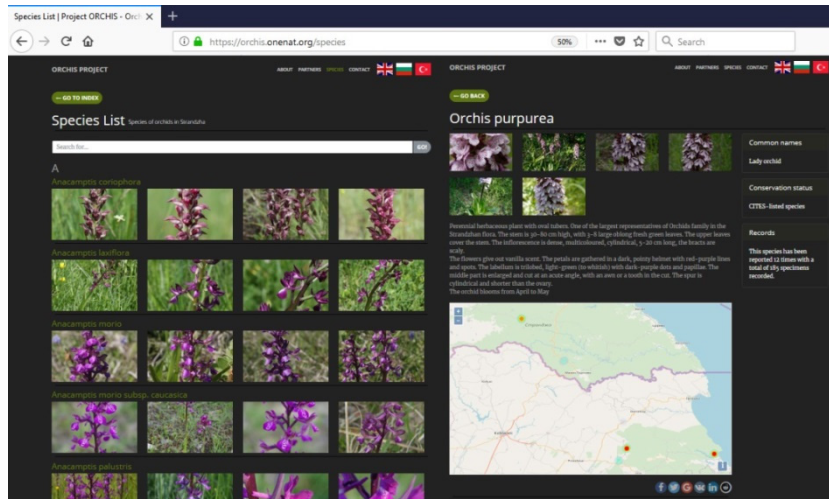


Fig. 2. View of the web platform www.orchis.onenat.org – menu Species and page of a selected species.

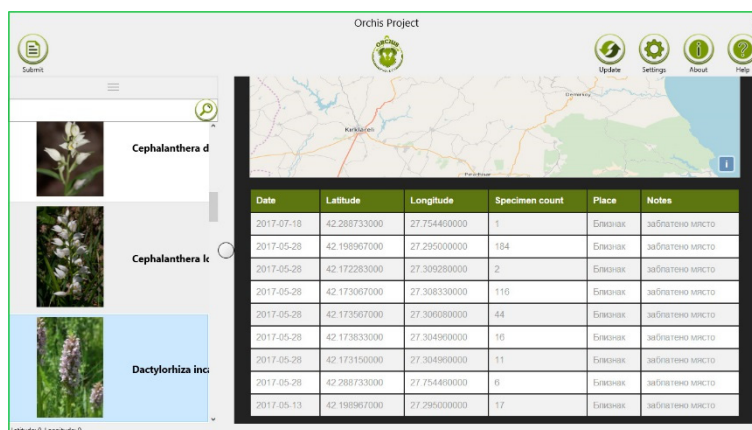
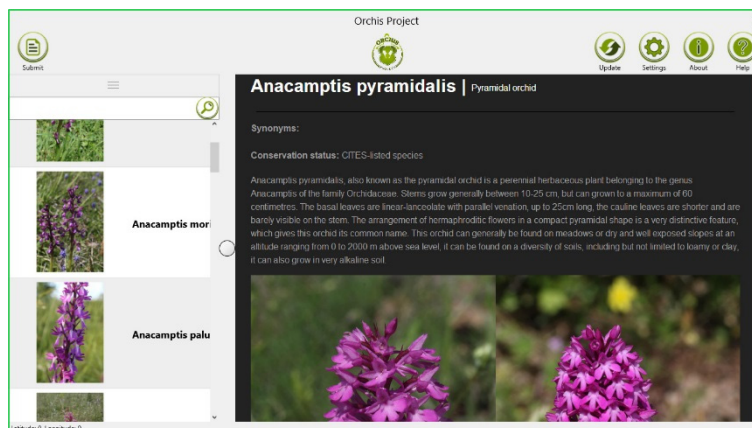


Fig. 3 and Fig. 4. View of the client software inside a species listing.

3.4 Submitting information

Required fields to be filled in the client software for the completion of a sighting by authorized user:

- Species name and date are automatically filled in by the software;
- Latitude and Longitude are automatically filled in by the software, if the GPS device is plugged into the tablet;
- The closest place, the Observer and the Count of specimens are filled in mandatory by the user;

Threats and other remarks is an optional field, but it is very important for the results of the monitoring. Through it, potential threats are submitted to other important data that are then spreading to all other users of the software but are not visible to users with a simple access level on web platform.

The users are encouraged to submit photos supporting the sighting by using the in-built camera in the device. The software allows them to take and upload up to 4 images at once.

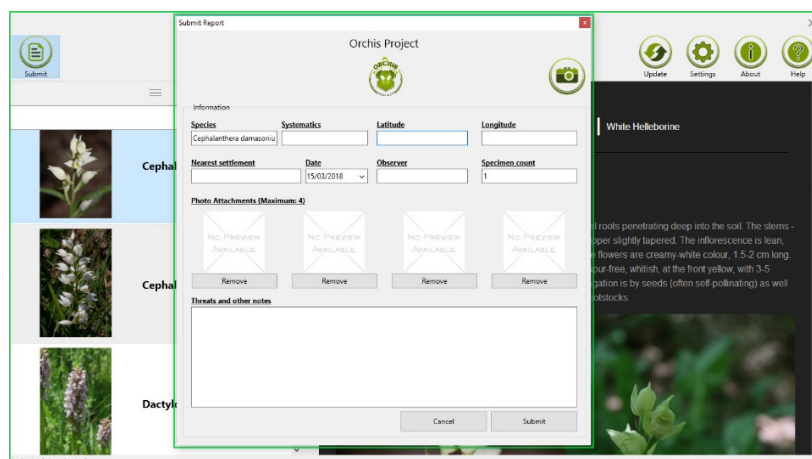


Fig. 5. View of the client software – menu Submit.

After uploading the information is submitted to expert biologists and is evaluated by them. Upon acceptance by them, it spreads to all others holding tablets, then they find the information on their own device when the database updates once it has Internet connectivity.

Full information on habitats, coordinates, number of specimens, closest location is available only to tablet owners and web platform administrators on (ORCHIS) (Fig. 2-4)

4 Training and Data Interpretation

Ensuring the sustainability of the project outcomes, the partners attracted the participation of organizations from both sides of the border such as forestries, NGOs, Nature

Park. Each of them was given for use one of 20 tablets with installed software. Representatives from these organizations were trained to work with the equipment and system as well as how to identify species. This was a critical component for the successful implementation of the software and has a significant impact on the quality of the collected and updated information to achieve effective monitoring. The trainings were conducted once for the Bulgarian participants in Malko Turnovo and once in Igneada for the Turkish respondents.

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