A Hungarian Rotifer database system advantage for Danube research

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1 Introduction

In the river zooplankton rotifers play an important role; however, water currents, turbidity and lack of food provide an unfavorable environment for the potamoplankton. However, side branches, oxbows and near bank areas with low flow provide breeding habitats for plankton. These zones of large rivers show higher rotifer abundance (Donner 1970, 1972; Wallace et al. 2006). Our results from 2008-2009 showed that rotifers make up the highest proportion of zooplankton in the River Danube (70-95 % of the abundance and biomass). We found 92 rotifer taxa in the main branch and 83 taxa in the side branch near Göd (rkm 1669).

The references to rotifer species of the Hungarian Danube Basin are mostly in Hungarian, German or more recently in English. The first paper is from Tóth (1861) about the rotifers of the Hungarian Danube stretch. The collection and systematization of taxonomic data is important for the understanding of ecological functions of species; hence, results of new research must be integrated into previous knowledge. This confirmed our earlier viewpoint that the collection of information in well organized databases serves as an effective tool for easy data access and utilization. We developed a new database system for collecting rotifers data on a national scale, which provides correct information for different water systems (lakes, ponds, rivers, canals etc.). There are many taxon lists available from the internet, which can provide current, accurate and reliable information about species in general (FE 2004, Froese & Pauli - FishBase 2010, GBIF 2010). There are more internet databases with information about Rotatoria, e.g., FADA (2007) or an illustrated online catalogue of the Rotifera in the Academy of Natural Sciences of Philadelphia and the Rotifer Systematic Database; our data base is complementary and specifically focused on Hungary (Rotifer 2003).

2 Methods: Database Management System (DBMS)

Our database contains recordings of rotifer species in the Hungarian fauna based on scientific papers. Numerous tables facilitate easy access to up-to-date information on valid taxon names, synonymous taxon names, paper quotations (name of author(s) and journal, year of publication), date and place of sampling with GPS coordinate or by settlement, habitat type, photos of the animal and habitat maps based on recent data. The objective is to create a well manageable, user-friendly interface, which supports dialogue for querying various details on species and map visualization. The database operating system integrates functions like Google and Yahoo. The Rotifer database is flexible, scalable and the uploading is chronological, beginning with Tóth (1861) to recent days. Database management systems (DBMS) ensure the continuous operations of regular user processes, access to databases in networked, multi-user environments. At the beginning only large IT companies used DBMS software to process enormous amounts of data on high performance computers (e. g. Yahoo!, Cisco, NASA, Lucent Technologies, Motorola, Google, Silicon Graphics, HP, Xerox and Sony Pictures). However, DBMS also became significant in science because of the huge and ever changing

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taxonomy databases (NCBI 2010), the storage of genetic data, their relationships to classification categories, as well as the related multimedia contents (photos, sound and video information, etc).

Searching and filtering on the user interface is designed for simple use (for example only one species occurrence in the country) or for complex queries (specific place, river, or period).

Finally, each settlement data is displayed using the Google Maps API. This is a free solution to show the sampling sites. It is also quite fast, faster than operating the system on an another dedicated ArcGIS Server.

At present, the data uploading is in progress, users can only see the „Under Construction" message. According to the plans in the middle of June the database will work at full functionality. Uploading species photos will be the next step.

The Administrator can give passwords for scientists to upload their own pictures and most recent publications.

Aiming to minimize costs, we developed an open access starting system. The DBMS is MySQL in which metadata, dictionaries, basic data tables and geographic coordinates of sampling sites of the species are stored (Valade & Ballad 2008).

MySQL is an open source-code (GNU) multiuser, multiline, special application of SQL based database management for the server-side. (DuBois 2009) is a widespread database management system; we used LAMP system (Linux–Apache–MySQL–PHP) (Yank 2003). Yii is a speed and component based (object guided) PHP framework for developing web application containing each component required for further development. It supports user management in group style, controlling and screening of data, character sets of foreign languages and it is easy to expand (Winesett 2009).

3 Application and outlook

The basic data table is complete and contains a species list (with synonymous names), names of water bodies, geo-coordinates with settlements, and information on publications (Figure 1). The data entry interface is in Hungarian because most of the references are in Hungarian, but the query interface will be in two languages, English and Hungarian. This application will be useful to give a much easier access to know the Hungarian rotifer fauna for foreigner researchers. Published data that had only been published in Hungarian was made accessible for researchers in other countries. It also gives a complete faunistical notion about the little known Hungarian rotifer fauna. The database will be finished and functional by August 2010.

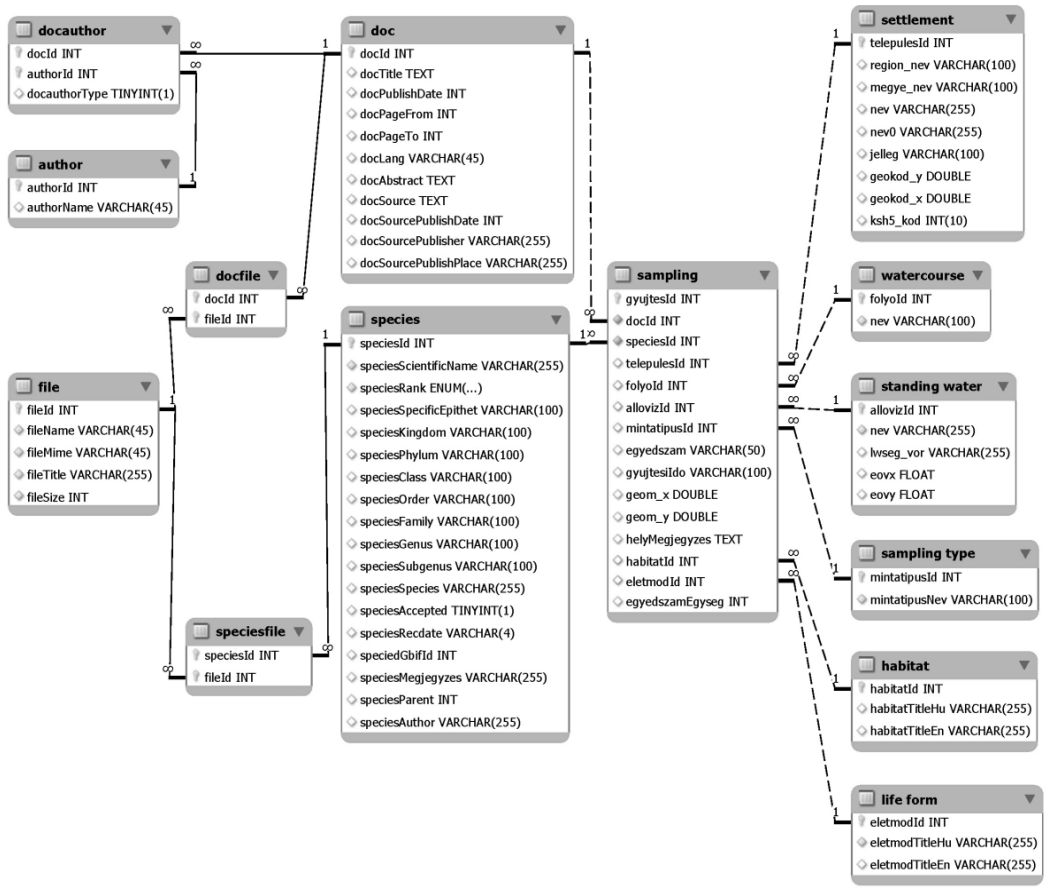

Figure 1. The structure of the data tables in the Hungarian Rotifera Database

4 Conclusions

Presently, the Hungarian Rotifera Database is unique in Europe in the sense that it couples all previously published data on Rotifera with map visualization. With this application, information on the Hungarian Rotatoria fauna will be more accessible and later it can be connected to other databases on the Internet (e.g. FishBase, GBIF). By harmonizing data structure, contents will be comparable with other databases.

After the completion of data upload it will be possible to expand the system to European scale. As species protection measures should ideally operate on larger geographical scales, this expansion will potentially support decision making in transboundary or pan European issues.

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