ILLINOIS NATURAL HISTORY SURVEY

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

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IDNR FSW T 12 P 1

7/27/2007

Joel Cross
Illinois Dept. of Natural Resources
State Wildlife Grants Program
One Natural Resources Way
Springfield, Illinois 62702

Dear Mr. Cross,

This document is a final report on IDNR FSW T 12 P 1, Illinois Statewide Mussel Database: Enhancement and Maintenance, Dr. R. Edward DeWalt and Mr. Kevin S. Cummings of the Illinois Natural History Survey principal investigators.

Introduction

Mussels are highly imperiled across the state, with nearly 20% of some 77 species having been extirpated (Cummings 1991) and are the second-most imperiled aquatic taxon in the state (DeWalt et al. 2005). Much work has been done by Cummings and colleagues, who have collected a large amount of qualitative data for rivers and streams across the state. This information provides important clues to the current and historical extent of mussel species in Illinois. At least 117,327 mollusk (most mussel) specimen records are available in digital form from the Illinois Natural History Survey Mollusk Collection website (http://ellipse.inhs.uiuc.edu:591/INHSCollections/mollsearch.html).

Another group of researchers, mostly associated with the various subunits of the Illinois Department of Natural Resources, have been collecting more standardized mussel data. Robert Szafoni, an IDNR employee, has developed a detailed protocol for collecting mussel data. Not only do he and his colleagues collect the same community composition data collected as Cummings, but they also record demographic data, including sex and reproductive state, and size and age distribution data. These more standardized data allow Szafoni to calculate a number of metrics that capture information about species richness, abundance, reproduction, and pollution tolerance. Together, these metrics are known as the Mussel Classification Index (MC). This number, along with the number of extant mussel species and the presence of species with state imperilment status is used to rate the resource value of streams for supporting a native mussel fauna.

Demographic data collected by IDNR biologist include hundreds of specimens sexed, aged by the number of growth rings, and measured for length. While Szafoni and others hand calculate the MCI value, this is a tedious process, and no analysis is conducted with the highly valuable demographic data. None of these data have been digitized in any substantial way, and there are literally hundreds of site/date events where

1816 South Oak Street, Champaign, Illinois 61820 USA
(217) 333-6880 Fax (217) 333-4949
http://www.inhs.uiuc.edu

these data exist. Having these data digitized is critical to the IDNR harnessing their enormous potential.

The objective of this project was to create a desktop database that IDNR stream biologists could use to capture data about the results of these mussel surveys taking place across the state. Additionally, we would use these data to populate an existing, searchable, interactive web mapping system that would show off the location and species found at each site (http://spatial.inhs.uiuc.edu/maps/working/viewer.htm). Secondary objectives were to program into the database reports for each site, including a "Mussel Indictor Report", an "Element of Occurrence" report, and the ability to create length frequency histograms from the mussel length data.

The Database

This Mussel Data Entry Program has been designed for use by Illinois Department of Natural Resources (IDNR) field biologists to capture data on mussel samples they have taken from Illinois, and adjacent states, rivers and streams. Due to limitations imposed by the lack stable Internet connections at some IDNR satellite facilities, the use of an Internet based solution was ruled out. What this means is that multiple copies of the database will be used across as many computers as needed. This places much pressure on the developers to call all copies of the database back after a data entry session, so that copies can be compiled into one database. We have dealt with the possibility of duplicate record identification numbers by setting them to made at random, using a date/time stamp. The database has been programmed in Microsoft Access (versions 2003), which requires a Windows computer running at least the XP operating system. This application will not work on an Apple computer.

IDNR biologists are generally in the field collecting mussel data until late October. They will then need to enter new data into the database through about mid-December and copy all data to a CD and send it to Dr. R. Edward DeWalt for compilation.

R. Edward DeWalt
Illinois Natural History Survey
1816 S Oak St.
Champaign, IL 61820
217-244-7515
edewalt@inhs.uiuc.edu

Alternatively, those that use RAR or WinZip files may be able to compress the files and email them to Dr. DeWalt. These multiple copies will be compiled into a single file and be quality assured by INHS personnel. Quality assurance will include checking for duplicate records and duplicate stations, errors in spellings, errors in coordinates, etc. These data will be added to a on-line mapping system discussed above.

Many features have been built into the database to speed data entry, improve precision of data, and improve data completeness. A master location file has been included, having been modified from mussel locations in the INHS mussel database. It includes typical geographic information such as counties, states, common locations, and geographic coordinates. All major fields have dropdown lists from which to make choices. Each site is codified with a unique number, so that its identity cannot vary and a specific site can be searched for and associated with mussel data. A master mussel taxonomic names table has been created that provides one spelling for the genus and

species and associated common names, disturbance tolerance, and state and federal imperilment statuses.

A Mussel Survey Habitat Data Sheet provides fields to record information about a site/date event that are specific to that visit. Such information as stream width, depth, qualitative substrate composition, water clarity, and the relative abundance of two invasive mussel species are to be entered here. An exciting feature is an image upload system that will allow photos or scans of field sketches to be associated with a site/date event. These images will be useful in the documenting the condition of the site during a given visit.

A Mussel Community Worksheet allows one to record the number of live, or the presence of dead and relict, species, whether vouchers were kept, and the number of individuals of a species belonging to three growth ring count classes. Species names are entered by dropdown lists. Quality control checks have been programmed that control for errors in the number of individuals being recorded in the ring classes—these must add to the total number of live individuals reported for the species.

A Mussel Demographic Data Sheet allows researchers to record the length of individuals in millimeters. From these data, a length frequency histogram module creates html graphics of the size distribution of the mussels found. These histograms can then be exported to an Excel file where publication quality graphics can be made if desired.

The Freshwater Mussel Resource Value Worksheet automatically calculates a Mussel Classification Index (MCI) using the data found in the Mussel Community Worksheet. This number may be used for classifying the resource value of stream segments that have been sampled. The database has the ability to count the number of live (not dead or relict) and extant (live + dead) species, the number of intolerant species, catch-per-unit effort (# live individuals/man-hours), and the percentage of live species with individuals in the 0–3 growth ring class. These values are directly compared to factor scores, which are summed to build the MCI. A print page of these mussel community indicators has been provided as summary for the site/date sampling event.

Occasionally, a site/date event produces a mussel community worthy of note. If one of these events produces a mussel community with ≥10 extant (live and recently dead) species, an MCI value ≥12, or species with Illinois imperilment status, an Element of Occurrence (EOR) record must be submitted to the Natural Heritage Program.

Illinois Natural Heritage Database Program Manager
Illinois Department of Natural Resources
ORC - Watershed Management Unit
One Natural Resources Way
Springfield IL 62702-1271

An EOR is automatically produced within the Freshwater Mussel Resource Value Worksheet and may be printed.

Deliverables

The IDNR project manager, Mr. Robert Szafoni, is provided with electronic copies of the database (**new_mussel_data_entry**), the Access 2003 development into which researchers will enter their data. Also provided is a Mussel Data Entry Program Manual with complete documentation for how to use this database and a glossary of fields used. A program file, **crystl32.ocx**, is provided that improves the performance of the database, eliminating error messages on startup that may have been experienced by researchers last

year. Two programs called **bar and graph**, are files needed to create the length frequency histograms, a new feature of the database.

Dr. DeWalt will be available this December to accept more data for compilation, this at no extra charge.

Sincerely,

Dr. R. Edward DeWalt

1816 South Oak Street, Champaign, Illinois 61820 USA
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