Incorporating Rare Aquatic Species Occurrence Data into Management

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Michigan Natural Features Inventory
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Inset-right cover photo: Big Water Crayfish (*Cambarus robustus*), a species of special concern. Photo by Peter Badra.

Inset-left cover photo: Snuffbox (*Epioblasma triquetra*), a federally endangered mussel species. Photo by Kurt Stepnitz.

Background cover photo: Norvell Manchester Drain (Washtenaw County), where state threatened slippershell (*Alasmidonta viridis*) are found. Photo by Peter Badra.

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Introduction

Detailed information on occurrences of rare and listed aquatic animal species in Michigan is used for natural resource management decision making at the local, state, and national level. Aquatic ecosystems in Michigan such as Great Lakes tributaries and coastal zones, and inland lakes support rare native mussels (Unionidae), fish, aquatic snails (Gastropoda), and crayfish. Of the 240 species in these taxa native to Michigan, 79 are currently endangered, threatened, or are species of special concern (Table 1). Occurrences of these 79 species are tracked by Michigan Natural Features Inventory (MNFI) in the Natural Heritage Database. This database is utilized by local, state, and federal agencies, the private sector, consultants, academia, and the public as the primary source of occurrence data on Michigan's rare species and natural communities. The Natural Heritage Database is a tool for management, as well as research, providing information on the status and range of rare aquatic species occurring in Michigan.

While MNFI maintains the most comprehensive and up-to-date database of listed species occurrences in Michigan, data gaps limit the incorporation of certain taxa into resource management decisions. The goal of this project was to work toward filling gaps in data for rare aquatic animal taxa in order to better inform decision making processes related to the state's aquatic ecosystems. This report documents the sources used to gather the occurrence information and the resulting element occurrences that were entered.

Methods

MNFI is a member of the natural heritage network, which is comprised of programs from all 50 U.S. states, Canadian provinces, and Latin American countries. Data entry and data management in the Natural Heritage Database is performed with common software (Biotics) across the natural heritage programs. The database is populated with element occurrences (EOs), which are based on occurrence data generated by observations in the field. Data gaps arise when species that were previously not tracked become listed as endangered or threatened, or become species of special concern. For example, two crayfish and four unionid mussel species were recognized as species of special concern within the last few years. Since only state listed or special concern species are tracked in the Natural Heritage Database, entry of occurrence data is not yet up to date for these species. The second type of data gap arises when new information generated from recent, or recently acquired, survey results and museum records produce a backlog of occurrence data that need to be entered into the database. Efforts for this project focused on both types of data gaps.

Occurrence data for native unionid mussels, fish, and crayfish were gathered from museum records, field survey reports from researchers, and published literature. Some occurrence data were already on-hand at MNFI. Data collected for each occurrence was assessed for completeness and accuracy before being entered into the Natural Heritage Database.

Results

A total of 203 new element occurrences were entered into the Natural Heritage Database. An additional 64 existing EOs were updated with information from new data sources (e.g. survey reports or museum records). Tables 2-4 give the number of EOs entered and updated for each species in each taxa group. These new and updated EOs are now part of the Natural Heritage Database.

The two crayfish species recently recognized as species of special concern were judged to be an important gap to fill based on the lack of crayfish occurrence data previously entered into the database, the availability of results from a recent state-wide survey effort (Smith *et al.* 2017), and the increased focus on crayfish by natural resource decision makers since the recent introduction of the invasive red swamp crayfish (*Procambarus clarkii*) to Michigan.

In 2018, standardized mussel survey protocols for Michigan were accepted for cases where a permit is being sought for construction or other projects in rivers where occurrences of rare or listed mussel species are expected to occur. Since then, a number of survey efforts have been completed and results have been made available to MNFI. These survey reports are an important source for occurrence data and were utilized for this project.

From communication with the collection manager of the University of Michigan Museum of Zoology, Mollusk Collection (UMMZ) it was discovered that a large amount of snail (Gastropoda) occurrence data is now available digitally from (UMMZ). Though gastropods remain an information gap, with this data source in place there's now the opportunity to address the data gap in the future by entered these occurrences into the database.

Primary Data Sources

Crayfish:

MSU-Lippson, R.L. "The Distribution of the Crayfishes of Michigan with Aspects of their Life Cycle and Physiology." A dissertation submitted to Michigan State University. 1975.

MSU-Parsons, Gary L. 2019. Excel file containing catalog number. "Crayfish Records at the MSU Arthropod Research Collection."

MSU-Smith, K. R., B. M. Roth, M. L. Jones, D. B., Hayes, S. J. Herbst, and N. Popoff. Changes in the distribution of Michigan crayfishes and the influence of invasive rusty crayfish (Faxonius rusticus) on native crayfish substrate associations. Biological Invasions 21(2): 637-656.

MSU-Smith, Kelley and Brian Roth. 2017. "Robustus immunis." Excel file containing collection collection data for C. robustus and F. immunis.

Fish:

Southwest Michigan Land Conservancy-Fuller, Nate. 2016.

UMMZ-Earl, D. 2017. Spreadsheet of fish museum specimen from University of Michigan.

GVSU-Preville, N. 2018. Grand River river redhorse home ranges, summer 2018.

Mussels:

CMU-Parker, S. 2012. "Effects of a Tar Sands Oil Spill on the Mussel Community in the Kalamazoo River, Michigan." Academic report.

CMU-Woolnough, Excel spreadsheet of 2013 federally endangered mussel surveys.

CMU-S. Barnett, D. Woolnough, A.Gibson, M. Ross, and M. Caldwell. 2019. Jan. 21. Excel spreadsheet with data from 2013 sampling.

CMU-Zanatta, D. 2011. Unpublished data from field survey. GLFWRA-USFWS unionid project.

Consultant-Badgett, Nathan. 2018. 2018 Unionid Surveys at 5 Proposed Dredge Sites, Grand River, Kent County, Michigan. Final Report.

Consultant-Dunn, Heidi. 2016-09-17. Michigan Threatened and endangered species form regarding various mussel species in grand river.

Consultant-Huehner, Martin K. 2014. Report of survey done by Enviroscienses Inc. for native mussel species.

Consultant-JF New and Associates, Inc., Stranded Mussel Survey and Relocation Report

MDEQ-Rathbun, Harrington, Mehne, Survey of Grand River, downstream of the dam in Lyons.

MDNR Permit Report-Rathbun, Joe. 2011. Spreadsheet of 2011 Mussel Survey data: "Permit record-Joe 2011 surveys. xls".

MDNR-Johnson, J. 2014. "L. nasuta info from Jennifer Johnson 2014.docx."

MDNR-Leonardi, photos and specimens

Table 1. Number of aquatic species native to Michigan within four main taxa groups. (Fed E= federally endangered; E= state endangered; T= state threatened; SC= species of special concern)

	# of Native MI Species	Fed E	E	T	SC	Total
Mussels	43	5	8	6	13	32
Fish	128		9	9	8	26
Aquatic Snails	60		4	2	13	19
Crayfish	9				2	2
Total	240	5	21	17	36	79

Table 2. Number of new crayfish element occurrences and updates entered into the Natural Heritage Database. (SC= species of special concern)

Species	Common name	New EOs	EO updates
Cambarus robustus (SC)	Big water crayfish	55	
Faxonius immunis (SC)	Calico crayfish	52	
	Total	107	

Table 3. Number of new fish element occurrences and updates entered into the Natural Heritage Database. (X= state extirpated; E= state endangered; T= state threatened; SC= species of special concern)

Species	Common name	New EOs	EO updates
Chrosomus erythrogaster (E)	Southern redbelly dace		2
Clinostomus elongatus (E)	Redside dace		2
Cottus ricei (SC)	Spoonhead sculpin	11	
Fundulus dispar (SC)	Starhead topminnow	1	
Moxostoma carinatum (T)	River redhorse		3
Moxostoma duquesnei (SC)	Black redhorse	4	
Notropis amblops (X)	Bigeye chub	3	2
Notropis anogenus (E)	Pugnose shiner		3
Notropis dorsalis (SC)	Bigmouth shiner	1	1
Notropis texanus (X)	Weed shiner	7	
Noturus miurus (SC)	Brindled madtom		5
Noturus stigmosus (E)	Northern madtom		4
Number of species = 12	Total	27	22

Table 4. Number of new unionid mussel element occurrences and updates entered into the Natural Heritage Database. (fed E= federally endangered; E= state endangered; T= state threatened; SC= species of special concern)

Species	Common name	New EOs	EO updates
Alasmidonta marginata (SC)	Elktoe	7	8
Alasmidonta viridis (T)	Slippershell	2	2
Cyclonaias tuberculata (T)	Purple wartyback		1
Epioblasma triquetra (fed E)	Snuffbox	2	2
Lasmigona compressa (SC)	Creek heelsplitter	12	1
Lasmigona costata (SC)	Fluted-shell	9	8
Ligumia nasuta (E)	Eastern pondmussel	1	
Ligumia recta (E)	Black sandshell	1	3
Pleurobema sintoxia (SC)	Round pigtoe	10	3
Potamilus alatus (SC)	Pink heelsplitter	2	2
Toxolasma parvum (E)	Lilliput		1
Truncilla truncata (SC)	Deertoe	1	1
Utterbackia imbecillis (SC)	Paper pondshell	7	1
Venustaconcha ellipsiformis (SC)	Ellipse	4	3
Villosa fabalis (fed E)	Rayed bean	1	
Villosa iris (SC)	Rainbow	10	6
Number of species = 16	Total	69	42