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UPDATED GEOGRAPHIC DISTRIBUTIONS OF MICHIGAN HERPETOFAUNA: A SYNTHESIS OF OLD AND NEW SOURCES

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ABSTRACT - Recently a comprehensive overview of reptiles and amphibians in Michigan was published. Unfortunately, the distributions of the species represented were compiled before widespread accessibility to technological tools providing greater access to museum and historical records as well as citizen science efforts. To update the known ranges of Michigan herpetofauna, published literature, museum collections, and photographic vouchers submitted to an online database were examined and 339 new county and island records were added, updating the maps for 48 of Michigan's 55 known species of reptiles and amphibians. I also present the first published list of Michigan amphibians that includes two new plethodontid salamanders, the Northern Dusky Salamander (*Desmognathus fuscus*) and Southern Two-lined Salamander (*Eurycea cirrigera*). This paper serves as an example of the wealth of information available to scientists that may have previously been unobtainable, and can be used for the distribution of herpetofauna elsewhere.

Keywords*: Amphibia, Anura, Caudata, Citizen Science, Grey Literature, Natural History Collections, Range Expansion, Reptilia, Squamata, Testudines*

INTRODUCTION

Many organisms have complex distributions, shaped by geology, climate, and even anthropogenic disturbances (e.g. Dale et al., 2001; Broennimann et al., 2007). Understanding the distribution of species is a focus of ecology, and fundamental to biogeography. The delineation of a species' range is an important resource that can be utilized in ecological and evolutionary studies (Guisan and Thuiller, 2005). For example, if a species has a fragmented distribution, isolated 'populations' may represent unique lineages or Evolutionary Significant Units (Moritz, 1994; 2002). Once a species' distribution is known, further studies can examine why it occurs in particular areas and subsequently predict their occurrence (Gonzalez et al., 2011). Understanding distributions is important in ecological modeling (e.g. Guisan and Thuiller, 2005; Thuiller et al., 2005), and if the boundaries of a species' range used in analyses are not completely known, conservation assessments may be misrepresented (Nelson et al., 1990; Graham et al., 2004). As the effects of climate change become more evident, a more complete knowledge of species distributions can contribute to a more complete understanding of how a changing environment impacts wildlife (Berry et al., 2002).

Northern latitudes have only been inhabitable by reptiles and amphibians since the end of the Pleistocene glaciation, which has presumably resulted in relatively low numbers of northern herpetofauna (e.g. Holman, 2001; 2004; 2012). As global temperatures continue to increase, many ectothermic species continue to disperse, expanding their distributions northwards (e.g. Holman, 2001; 2004; 2012). It is important to document any northward range expansions to monitor this phenomenon. The four major regional landscape ecosystems in the state of Michigan (Holman, 2004; 2012) have been heavily affected by past glaciation events (e.g. Holman, 2001; 2004; 2012), thus making it ideal for the study of changing distributions.

Recently a much-needed overview of Michigan's herpetofauna was published (Holman, 2012). While other publications singled out specific taxa (i.e. snakes, Holman et al. 2006; turtles, Harding and Holman 1997; amphibians, Harding and Holman 1992) or encompassed a larger region that includes Michigan (Harding 1997), Holman (2012) has written the first comprehensive work on Michigan herpetofauna in over 80 years (Ruthven et al., 1928). Holman's book effectively summarizes many aspects of the biology of Michigan's reptiles and amphibians, including a paleontological perspective as well as distribution maps for each species. However, since

Holman's text, more sources of information have become available due to technological advances. Much of the data used for present distribution modeling comes from museums and natural history collections (Ponder et al., 2001; Reutter et al., 2003; Araújo and Guisan, 2006). While there is a wealth of information that can be found in museum collections on species distributions or population trends (Boundy, 2004; 2005), voucher specimens are typically collected by biologists. Over the past decade, technology has afforded greater access to published literature records, and collaborative efforts such as VertNet (http://www.vertnet.org) have made records from museum collections more readily available. As a result, I used many of these technical resources to update the current geographic distributions of Michigan's amphibians and reptiles, ultimately expanding on Holman's recent publication and demonstrating how these sources can be useful in gathering additional information to characterize species distributions.

METHODS

I performed literature searches (Google Scholar, Web of Knowledge) and examined museum records (HerpNet (records are now combined with VertNet), Museum of Cultural and Natural History at Central Michigan University (MCNH), University of Michigan's Museum of Zoology (UMMZ)) for every reptile and amphibian species known to occur in Michigan. I also reviewed maps provided by the Michigan Natural Features Inventory (MNFI). Any questionable specimens (primarily on the basis of range) were verified by collection managers. I further consulted the Michigan Herp Atlas Project (MHA) accessible at (www.miherpatlas.org), where citizens are encouraged to report sightings of reptiles or amphibians in Michigan and can submit photographic vouchers. All photographic vouchers used to fill in distributional gaps were personally verified by JGP. Any photograph that was not sufficient to identify the species and all non-vouchered reports were recorded with an 'unverified' designation. Such records are listed Appendix 4), but not included in distribution maps. Localities were identified to county or island.

I adhere to the taxonomy used by Holman with the following exceptions: 1) I use the genera *Anaxyrus* and *Lithobates* instead of *Bufo* and *Rana* (Crother, 2012); 2) I use *Acris blanchardi* instead of *A. crepitans blanchardi* for the Blanchard's Cricket Frog (Gamble et al., 2008); 3) I use *Pantherophis vulpinus* for all foxsnakes in Michigan (Crother et al., 2011); 4) I omit subspecific names. Ambiguous identifications were not included in the case of Gray and Cope's Gray Treefrogs (*Hyla chrysoscelis* and *H. versicolor*), as these species cannot be differentiated by morphological characters; 5) I do not include a category for hybrid *Ambystoma* salamanders. Holman includes two maps: one for the Blue-spotted Salamander (*A. laterale*) and the other for hybrids plus *A. laterale*. Hybrid *Ambystoma* do not occur across the entire range of *A. laterale*, and many older records fail to distinguish between the two, so I omitted this map.

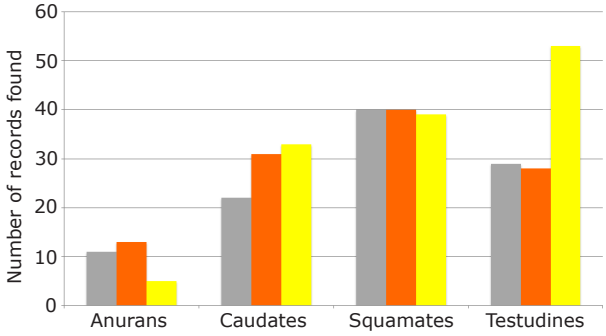

Figure 1. Number of 'new' Michigan herpetofaunal records compiled from literature searches (gray), museum specimens (orange), or photographic vouchers (yellow). Categories have some overlap (see Appendix 1).

RESULTS

A comprehensive review of literature and museum databases yielded 269 unreported county records (Appendix 1). Also compiled are a list of herpetofaunal records on Michigan islands in the Great Lakes (Appendix 2). Among the 269 unreported literature and museum records, 60 are supplemented by recent (2009-present) photographic vouchers from the MHA. In addition, another 70 MHA photographic vouchers represent new county records (Appendix 3), and an additional 74 unconfirmed MHA and other reports are also listed, but not included in the maps (Appendix 4). The combination of these findings altered the distribution maps from Holman 2012 for 48 of Michigan's 55 species of herpetofauna (Appendix 5), including many records from literature, voucher specimens, and citizen science reports (Figure 1).

Included among the updates are two species of plethodontid salamanders, the Northern Dusky Salamander (*Desmognathus fuscus*; MSUM, voucher HE.14494) and the Southern Two-lined Salamander (*Eurycea cirrigera*; UMMZ, voucher UMFS 12185, originally listed as a Northern Two-lined Salamander, *E. bislineata*), that have not been previously included in published contributions of Michigan herpetofauna (Ruthven et al., 1928; Harding and Holman, 1992; Harding, 1997; Holman, 2004; Holman, 2012). These specimens are known only from a single locality and may represent either recent introductions or relict populations. Both species likely represent well established breeding populations (Mifsud, pers. comm.), and should continue to persist in Michigan if anthropogenic disturbance is limited.

DISCUSSION

This contribution improves the understanding of herpetofaunal distributions in Michigan. The updated ranges for all Michigan herpetofauna (Appendix 5) can assist with future biodiversity assessments, ecological modeling, and species-specific studies. The plethora of sources used to compile these data also stands as an example of the amount of previously unavailable data present in museum collections and 'grey' literature. While older records reflect where a species has been found, many lack recent verification. Regardless, over 20% of the literature and museum records included here are supported by MHA photographic vouchers within the past five years. Given the uneven and sporadic sampling represented by these photographic vouchers (e.g. some regions of the Upper Peninsula (UP) and northern Lower Peninsula do not have many records submitted to MHA), I suspect many more historic records are representative of extant populations. Any record whose legitimacy may be questioned and is not backed by a voucher specimen is included in Appendix 4. Even with the addition of recent records, gaps in many species' range maps remain, indicating a need for further survey work. Those who encounter Michigan herpetofauna are encouraged to access The MHA (www.miherpatlas.org) and contribute any sightings, especially through photo documentation.

Similar ventures in other states, provinces or countries that utilize citizen science in this fashion are likewise worthy of support.

This paper should be viewed as a supplement to the range maps presented within Holman (2012), but should not be treated as an absolute list of Michigan herpetofaunal distributions. The data presented serve as an example of the wealth of information that has recently been made available by technological advances in information sharing, and may prove useful in any attempts to catalogue the distributions within a region or to document extensions of known species distributions.

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LITERATURE CITED

Araújo, M. B., and A. Guisan. 2006. Five (or so) challenges for species distribution modelling. Journal of Biogeography 33:1677-1688.

Beauvais, T. F. 2013. *Emydoidea blandingii* (Blanding's Turtle). Herpetological Review 44(4):623.

Berry, P. M., T. E. Dawson, P. A. Harrison, and R. G. Pearson. 2002. Modelling potential impacts of climate change on the bioclimatic envelope of species in Britain and Ireland. Global Ecology and Biogeography 11:453-462.

Blanchard, F. N. 1928. Amphibians and reptiles of the Douglas Lake region in northern Michigan. Copeia 167:42-51.

Blanchard, F. N. 1937. Data on the natural history of the Red-bellied Snake, *Storeria occipito-maculata* (Storer), in northern Michigan. Copeia 1937(3):151-162.

Bogart, J. P., and A. P. Jaslow. 1979. Distribution and call parameters of *Hyla chrysoscelis* and *Hyla versicolor* in Michigan. Life Sciences Contributions of the Royal Ontario Museum, Number 117.

Boundy, J. 2004. Amphibian and reptile distribution records for Louisiana. Herpetological Review 35(2):194-196.

Boundy, J. 2005. Museum collections can assess population trends. *In*: Amphibian Declines: The Conservation Status of United States Species (Ed. Lanoo, M. J.). University of California Press, Berkeley, CA.

Bowen, K. D., and J. C. Gillingham. 2004. Distribution of reptiles and amphibians on the islands of eastern Lake Michigan: summary and analysis. Michigan Academician 36:213-23.

Bowen, K. D., S. D. McMahon, and E. A. Beever. 2007. *Elaphe vulpina* (Western Foxsnake). Herpetological Review 38(4):486.

Broennimann, O., U. A. Treier, H. Müller-Schärer, W. Thuiller, A. T. Peterson, and A. Guisan. 2007. Evidence of climatic niche shift during biological invasion. Ecology Letters 10(8):701-709

Carlson, T. A., and E. J. Szuch. 2005. *Desmognathus fuscus fuscus* (Northern Dusky Salamander). Herpetological Review 36(4):461.

Carlson, T. A., and E. J. Szuch. 2007. Un-weathered (new) artificial cover objects effectively sample plethodontid salamanders in Michigan. Herpetological Review 38(4):412-415.

Casper, G. S., and T. G. Anton. 2008. An amphibian and reptile inventory of Sleeping Bear Dunes National Lakeshore. Natural Resource Technical Report NPS/GLKN/NRTR—2008/147.

Crother, B. I. (ed.). 2012. Scientific and Standard English Names of Amphibians and Reptiles of North America, North of Mexico. Society for the Study of Amphibians and Reptiles, Salt Lake City, UT. Herpetological Circular 37.

Crother, B. I., M. E. White, J. M. Savage, M. E. Eckstut, M. R. Graham, and D. W. Gardner. 2011. Reevaluation of the status of the foxsnakes *Pantherophis gloydi* Conant and *P. vulpinus* Baird and Girard (Lepidosauria). ISRN Zoology doi:10.5402.

Dale, V. H., L. A. Joyce, S. McNulty, R. P. Neilson, M. P. Ayres, M. D. Flannigan, P. J. Hanson, L. C. Irland, A. E. Lugo, C. J. Peterson, D. Simberloff, F. J. Swanson, B. J. Stocks, and B. M. Wotton. 2001. Climate change and forest disturbances. BioScience 51(9):723-734.

Douglas, J. F. 1977. Reptile records new for Grand Traverse County, Michigan. Jack-Pine Warbler 55(3):154-155.

Edgren, R. A. Jr. 1942. Amphibians and reptiles from Van Buren County, Michigan. Copeia 1942(3):180.

Gamble, T., P. B. Berendzen, H. B. Shaffer, D. E. Starkey, and A. M. Simons. 2008. Species limits and phylogeography of North American cricket frogs (*Acris*: Hylidae). Molecular Phylogenetics and Evolution 48(1):112-125.

Gonzalez, A., J. C. Clemente, A. Shade, J. L. Metcalf, S. Song, B. Prithiviraj, B. E. Palmer, and R. Knight. 2011. Our microbial selves: what ecology can teach us. European Molecular Biology Organization Reports 12(8):775-784.

Gibbs, M., F. N. Notestein, and H. L. Clark. 1905. A preliminary list of the Amphibia and Reptilia of Michigan. Seventh Report of the Michigan Academy of Science pgs. 109-110.

Graham, C. H., S. Ferrier, F. Huettman, C. Moritz, and A. T. Peterson. 2004. New developments in museum-based informatics and applications in biodiversity analysis. Trends in Ecology and Evolution 19:497-503.

Guisan, A., and W. Thuiller. 2005. Predicting species distribution: offering more than simple habitat models. Ecology Letters 8:993-1009.

Hallock, L.A. 1991. Habitat utilization, diet and behavior of the eastern massasauga (*Sistrurus catenatus*) in southern Michigan. Master's Thesis, Michigan State University.

Harding, J. H. 1997. Amphibians and Reptiles of the Great Lakes Region. The University of Michigan Press, Ann Arbor, Michigan.

Harding, J. H., and J. A. Holman. 1992. Michigan frogs, toads, and salamanders, a field guide and pocket reference. Michigan State University Cooperative Extension Service Bulletin E-2350.

Harding, J.H., and J.A. Holman. 1997. Michigan turtles and lizards: A field guide and pocket reference. Michigan State University Cooperative Extension Service Bulletin E-2350.

Holman J. A. 2001. Fossil dune and soils near Saginaw Bay, a unique herpetological habitat. Michigan Aca-

demician 33:135-153.
Holman, J. A. 2004. Herpetological assemblages of the Michigan Regional Landscape Ecosystems. Michigan Academician 36:165-190.
Holman, J. A. 2012. The Amphibians and Reptiles of Michigan. Wayne State University Press, Detroit, Michigan.
Holman, J. A., J. H. Harding, M. M. Hensley, and G. R. Dudderar. 2006. Michigan Snakes, a Field Guide and Pocket Reference. Rev. ed. Michigan State University Extension Service Bulletin E-2000.
Kannan, K., L. Tao, E. Sinclair, S. D. Pastva, D. J. Jude and J. P. Giesy. 2005. Perfluorinated compounds in aquatic organisms at various trophic levels in a Great Lakes food chain. Archives of Environmental Contamination and Toxicology 48(4):559-566.
Kozak, K. H., R. A. Blaine, and A. Larson. 2006. Gene lineages and eastern North American palaeodrainage basins: phylogeography and speciation in salamanders of the *Eurycea bislineata* species complex. Molecular Ecology 15:191-207.
Lagler, K. F. 1943. Food habits and economic relations of the turtles of Michigan with special reference to fish management. The American Midland Naturalist 29(2):257-312.
Lehtinen, R. M. 2002. A historical study of the distribution of Blanchard's Cricket Frog (*Acris crepitans blanchardi*) in southeastern Michigan. Herpetological Review 33(3):194-197.
Lehtinen, R. M., G. Fox, K. Pecor, and G. Schneider. 2003. *Hemidactylium scutatum* (Four-toed Salamander). Geographic distribution. Herpetological Review 34(3):256.
Long, C. A., and C. A. Long. 1976. Some amphibians and reptiles collected on islands in Green Bay, Lake Michigan. The Jack-Pine Warbler 54(2):54-58.
Maldonado-Koerdell, M., and I. L. Firschein. 1947. Notes on the ranges of some North American salamanders. Copeia 2:140.
Mifsud, D. A., and S. Zera. 2013. *Hemidactylium scutatum* (Four-toed Salamander). Geographic distribution. Herpetological Review 44(4):619.
Mittleman, M. B. 1966. *Eurycea bislineata*. Catalogue of American Amphibians and Reptiles 45:1-4.
Moritz, C. 1994. Defining 'evolutionary significant units'. Trends in Ecology and Evolution 9(10):373-375.
Moritz, C. 2002. Strategies to protect biological diversity and the evolutionary processes that sustain it. Systematic Biology 51(2):238-254.
Nelson, B. W., C. A. C. Ferreira, M. F. Silva, and M. L. Kawasaki. 1990. Endemism centres, refugia and botanical collection density in Brazilian Amazonia. Nature 345:714-716.
Ponder, W. F., G. A. Carter, P. Flemons, and R. R. Chapman. 2001. Evaluation of museum collection data for use in biodiversity assessment. Conservation Biology 15:648-657.
Potter, D. 1920. Reptiles and amphibians collected in central Michigan in 1919. Copeia 82:39-41.
Reutter, B. A., Helfer, V., Hirzel, A. H., and P. Vogel. 2003. Modelling habitat-suitability on the base of museum collections: an example with three sympatric *Apodemus* species from the Alps. Journal of Biogeography 30:581-590.
Ruthven, A. G., C. Thompson, and H. Thompson. 1912. The herpetology of Michigan. Michigan Geological and Biological Survey 10(3):1-166.
Ruthven, A. G., C. Thompson, and H. Gaige. 1928. The Herpetology of Michigan. University of Michigan Handbook Series No. 3.
Schuett, G. W. 1979. *Clemmys insculpta* (Wood Turtle). Herpetological Review 10(2):59.
Seefelt, N. E., J. C. Gillingham, P. D. Farrell, L. A. Ortmann, D. R. Rasmer, and K.D. Bowen. 2013a. *Chrysemys picta marginata* (Midland Painted Turtle). Herpetological Review 44(2):272.
Seefelt, N. E., J. C. Gillingham, P. D. Farrell, L. A. Ortmann, D. R. Rasmer, and K.D. Bowen. 2013b. *Plethodon cinereus* (Eastern Red-backed Salamander). Herpetological Review 44(2):269-270.
Seefelt, N. E., J. C. Gillingham, P. D. Farrell, L. A. Ortmann, D. R. Rasmer, and K. D. Bowen. 2013c. *Storeria dekayii* (Dekay's Brownsnake). Herpetological Review 44(2):275-276.
Soderberg, N. 2009. Molecular genetics and natural history of the Southern Two-lined Salmander, *Eurycea cirrigera*, in Murphy Lake State Game Area, Tuscola County, Michigan. Master's Thesis, University of Michigan-Flint.
Soderberg, N., T. Yoder, and E. Szuch. 2009. *Eurycea bislineata* (Northern Two-lined Salamander). Herpetological Review 40(1):106.
Syzmanski, J. 1998. Status assessment for Eastern Massasauga (*Sistrurus c. catenatus*). U.S. Fish and Wildlife Service.
Thuiller, W., S. Lavorel, M.B. Araújo, M.T. Sykes and I.C. Prentice. 2005. Climate change threats plant diversity in Europe. Proceedings of the National Academy of Sciences USA 102:8245-8250.
Wooten, D. A. 2003. Comparative ultrastructural carapace morphology in three freshwater turtles. Chelonian Conservation and Biology 4(3):682-684.

Appendix 1. A list of county records for Michigan herpetofauna in addition to the distribution maps in Holman 2012. Records come from published literature, museum vouchers, and the Michigan Natural Features Inventory (MNFI). When multiple specimens were present at museums, the number of records is indicated.

Common Name	Scientific Name	County/Island	Source
Frogs and Toads			
Blanchard's Cricket Frog	*Acris blanchardi*	Genesee	Lehtinen 2002
Blanchard's Cricket Frog	*Acris blanchardi*	Newaygo	KU
Blanchard's Cricket Frog	*Acris blanchardi*	St. Clair	MCNH, MNFI 2011, Lehtinen 2002
Fowler's Toad	*Anaxyrus fowleri*	Emmet	Ruthven et al. 1928
Fowler's Toad	*Anaxyrus fowleri*	Isabella	MCNH
Fowler's Toad	*Anaxyrus fowleri*	Leelanau	Ruthven et al. 1928
Cope's Gray Treefrog	*Hyla chrysoscelis*	Kalkaska	UMMZ, Bogart and Jaslow 1979
Gray Treefrog	*Hyla versicolor*	Branch	USNM
Gray Treefrog	*Hyla versicolor*	Missaukee	MCNH (4), MSUM
Gray Treefrog	*Hyla versicolor*[1]	Cass	MSUM (5)
American Bullfrog	*Lithobates catesbeianus*[1]	St. Clair	Ruthven et al. 1928
Green Frog	*Lithobates clamitans*	Bois Blanc Island	Holman 20123
Green Frog	*Lithobates clamitans*	Drummond Island	Holman 20123
Pickerel Frog	*Lithobates palustris*	Genesee	UMMZ, Ruthven et al. 1928
Pickerel Frog	*Lithobates palustris*	Ogemaw	MCNH
Pickerel Frog	*Lithobates palustris*	Wayne	USNM, Ruthven et al. 1912[4]
Northern Leopard Frog	*Lithobates pipiens*	Bois Blanc Island[5]	UMMZ
Northern Leopard Frog	*Lithobates pipiens*	Drummond Island[5]	MSUM
Wood Frog	*Lithobates sylvaticus*	Kalkaska	Holman 2012[3]
Spring Peeper	*Pseudacris crucifer*	Drummond Island	Holman 2012[3]
Western Chorus Frog	*Pseudacris triseriata*[1]	Branch	USNM
Salamanders			
Blue-spotted Salamander	*Ambystoma laterale*	Arenac	UMMZ (3), Ruthven et al. 1912, 1928
Blue-spotted Salamander	*Ambystoma laterale*	Isabella	MCNH
Blue-spotted Salamander	*Ambystoma laterale*[1]	Oceana	MSUM (2)
Blue-spotted Salamander	*Ambystoma laterale*	Ogemaw	MCNH
Blue-spotted Salamander	*Ambystoma laterale*[1]	Genesee	LSU (3), MCZ
Blue-spotted Salamander	*Ambystoma laterale*[1]	Tuscola	Carlson and Szuch 2007
Blue-spotted Salamander	*Ambystoma laterale*[1]	Van Buren	MVZ (2)
Spotted Salamander	*Ambystoma maculatum*	Barry	MCNH
Spotted Salamander	*Ambystoma maculatum*	Eaton	CAS, MVZ, Gibbs et al. 1905, Ruthven et al. 1912, 1928[4]
Spotted Salamander	*Ambystoma maculatum*	Grand Traverse	MCNH (2)
Spotted Salamander	*Ambystoma maculatum*	Leelanau	MCNH
Spotted Salamander	*Ambystoma maculatum*[1]	Clare	Potter 1920, Ruthven et al. 1928
Spotted Salamander	*Ambystoma maculatum*[1]	Tuscola	MCNH (2), MSUM, Carlson and Szuch 2007
Spotted Salamander	*Ambystoma maculatum*[2]	Kalamazoo	MCNH
Spotted Salamander	*Ambystoma maculatum*[2]	Wexford	MCNH
Eastern Tiger Salamander	*Ambystoma tigrinum*	Isabella	MCNH (2)
Eastern Tiger Salamander	*Ambystoma tigrinum*	Montcalm	MSUM, Gibbs et al. 1905[6], Ruthven et al. 1912, 1928[4]
Eastern Tiger Salamander	*Ambystoma tigrinum*[1]	Lapeer	TCWC, UMMZ
Eastern Tiger Salamander	*Ambystoma tigrinum*[1]	Lenawee	AMNH, MCNH (2), Ruthven et al. 1912, 1928

Appendix 1 (continued). A list of county records for Michigan herpetofauna in addition to the distribution maps in Holman 2012. Records come from published literature, museum vouchers, and the Michigan Natural Features Inventory (MNFI). When multiple specimens were present at museums, the number of records is indicated.

Common Name	Scientific Name	County/Island	Source
Northern Dusky Salamander	*Desmognathus fuscus*[1]	Tuscola	MSUM, Carlson and Szuch 2005, 2007
Southern Two-lined Salamander	*Eurycea cirrigera*	Tuscola	UMMZ, Soderberg 2009, Soderberg et al. 2009
Four-toed Salamander	*Hemidactylium scutatum*	Benzie	Casper and Anton 2008
Four-toed Salamander	*Hemidactylium scutatum*	Cass	MVZ (9), UMMZ (49)
Four-toed Salamander	*Hemidactylium scutatum*	Crawford	MCNH (2)
Four-toed Salamander	*Hemidactylium scutatum*	Gratiot	MCNH
Four-toed Salamander	*Hemidactylium scutatum*	Huron	Mifsud and Zera 2013
Four-toed Salamander	*Hemidactylium scutatum*	Iosco	UMMZ, USNM
Four-toed Salamander	*Hemidactylium scutatum*	Isabella	MCNH (2)
Four-toed Salamander	*Hemidactylium scutatum*	St. Clair	UMMZ, Lehtinen et al. 2003
Four-toed Salamander	*Hemidactylium scutatum*	St. Joseph	MVZ (8)
Four-toed Salamander	*Hemidactylium scutatum*[1]	Tuscola	Carlson and Szuch 2007
Mudpuppy	*Necturus maculosus*	Genesee	MCZ (2), UMMZ, Ruthven et al. 1928
Mudpuppy	*Necturus maculosus*	Gratiot	Ruthven et al. 1912, 1928
Mudpuppy	*Necturus maculosus*	Manistee	ANSP (3)7
Mudpuppy	*Necturus maculosus*	Van Buren	KU, Ruthven et al. 1912, 1928[4]
Mudpuppy	*Necturus maculosus*[1]	St. Clair	UMMZ, Ruthven et al. 1912, 1928[4]
Eastern Newt	*Notophthalamus viridescens*	Montcalm	Ruthven et al. 1928
Eastern Newt	*Notophthalamus viridescens*[1]	Macomb	MCNH
Eastern Newt	*Notophthalamus viridescens*[1]	Wayne	Ruthven et al. 1928
Eastern Red-backed Salamander	*Plethodon cinereus*	Drummond Island	Holman 2012[3]
Eastern Red-backed Salamander	*Plethodon cinereus*	Saginaw	Holman 2012[3]
Eastern Red-backed Salamander	*Plethodon cinereus*[1]	Sanilac	Holman 2012[3]
Eastern Red-backed Salamander	*Plethodon cinereus*[1]	Tuscola	Holman 2012[3]
Lizards			
Five-lined Skink	*Plestiodon fasciatus*	Charlevoix	Ruthven et al. 1928
Five-lined Skink	*Plestiodon fasciatus*	Gratiot	Ruthven et al. 1912, 1928
Five-lined Skink	*Plestiodon fasciatus*[1]	Isabella	MCNH
Five-lined Skink	*Plestiodon fasciatus*	Kent	LACM, Gibbs et al. 1905[6], Ruthven et al. 1912, 1928[4]
Five-lined Skink	*Plestiodon fasciatus*[1]	Lake	UMMZ
Five-lined Skink	*Plestiodon fasciatus*	Lenawee	UMMZ (3), Ruthven et al. 1912, 1928
Five-lined Skink	*Plestiodon fasciatus*[1]	Ottawa	Gibbs et al. 1905, Ruthven et al. 1912, 1928[4]
Five-lined Skink	*Plestiodon fasciatus*	Tuscola	MCNH
Snakes			
North American Racer	*Coluber constrictor*	Bay	MSUM
North American Racer	*Coluber constrictor*	Gratiot	Ruthven et al. 1912, 1928
North American Racer	*Coluber constrictor*	Ionia	MSUM
North American Racer	*Coluber constrictor*[1]	Isabella	MCNH (3)
North American Racer	*Coluber constrictor*[2]	Mecosta	MCNH, UMMZ
North American Racer	*Coluber constrictor*	Saginaw	MCNH, Gibbs et al. 1905[6]
Ring-necked Snake	*Diadophis punctatus*	Eaton	Gibbs et al. 1905[6], Ruthven et al. 1912, 1928

Appendix 1 (continued). A list of county records for Michigan herpetofauna in addition to the distribution maps in Holman 2012. Records come from published literature, museum vouchers, and the Michigan Natural Features Inventory (MNFI). When multiple specimens were present at museums, the number of records is indicated.

Common Name	Scientific Name	County/Island	Source
Ring-necked Snake	*Diadophis punctatus*	Gratiot	Ruthven et al. 1912, 1928
Ring-necked Snake	*Diadophis punctatus*	Livingston	Ruthven et al. 1928
Eastern Hog-nosed Snake	*Heterodon platirhinos*[1]	Benzie	Casper and Anton 2008
Eastern Hog-nosed Snake	*Heterodon platirhinos*	Emmet	MCNH, OMNH
Eastern Hog-nosed Snake	*Heterodon platirhinos*	Gratiot	Ruthven et al. 1912, 1928
Eastern Hog-nosed Snake	*Heterodon platirhinos*	Leelanau	Casper and Anton 2008
Eastern Hog-nosed Snake	*Heterodon platirhinos*[1]	Montmorency	UMMZ, Ruthven et al. 1928
Eastern Hog-nosed Snake	*Heterodon platirhinos*[1]	Ottawa	MCNH
Eastern Hog-nosed Snake	*Heterodon platirhinos*[1]	St. Clair	Ruthven et al. 1912, 1928[4]
Eastern Milksnake	*Lampropeltis triangulum*[2]	Genesee	LACM
Eastern Milksnake	*Lampropeltis triangulum*	Gratiot	USNM (2), Ruthven et al. 1912, 1928
Eastern Milksnake	*Lampropeltis triangulum*[1]	Mecosta	UMMZ
Eastern Milksnake	*Lampropeltis triangulum*	Saginaw	UMMZ
Eastern Milksnake	*Lampropeltis triangulum*	Van Buren	MCZ, Gibbs et al. 1905[6], Ruthven et al. 1912, 1928
Plain-bellied Watersnake	*Nerodia erthyrogaster*	Calhoun	MNFI 1992
Plain-bellied Watersnake	*Nerodia erthyrogaster*	Ingham	USNM
Northern Watersnake	*Nerodia sipedon*	Arenac	UMMZ (15), Ruthven et al. 1928
Northern Watersnake	*Nerodia sipedon*	Genesee	MCZ
Northern Watersnake	*Nerodia sipedon*	Gladwin	Ruthven et al. 1928
Northern Watersnake	*Nerodia sipedon*	Gratiot	Ruthven et al. 1912, 1928
Northern Watersnake	*Nerodia sipedon*[1]	St. Clair	UMMZ
Smooth Greensnake	*Opheodrys vernalis*	Eaton	Gibbs et al. 1905, Ruthven et al. 1928
Smooth Greensnake	*Opheodrys vernalis*	Genesee	MCZ
Smooth Greensnake	*Opheodrys vernalis*	Gratiot	Ruthven et al. 1928
Smooth Greensnake	*Opheodrys vernalis*	Hillsdale	Ruthven et al. 1928
Smooth Greensnake	*Opheodrys vernalis*	Lenawee	UMMZ
Smooth Greensnake	*Opheodrys vernalis*	Mason	Ruthven et al. 1928
Smooth Greensnake	*Opheodrys vernalis*	Osceola	UMMZ
Smooth Greensnake	*Opheodrys vernalis*[8]	Saginaw	MCNH, TCWC
Smooth Greensnake	*Opheodrys vernalis*[8]	Wayne	UCM, USNM, Ruthven et al. 1928[4]
Queen Snake	*Regina septemvittata*	Isabella	MCNH
Queen Snake	*Regina septemvittata*	Shiawassee	UMMZ
Eastern Massasauga	*Sistrurus catenatus*[1]	Benzie	Gibbs et al. 1905[6]
Eastern Massasauga	*Sistrurus catenatus*	Gratiot	Ruthven et al. 1912, 1928, Hallock 1991
Eastern Massasauga	*Sistrurus catenatus*	Midland	MCNH, Szymanski 1998
Eastern Massasauga	*Sistrurus catenatus*	Roscommon	MNFI 1998, Szymanski 1998
Eastern Massasauga	*Sistrurus catenatus*	Wexford	Ruthven et al. 1928
Dekay's Brownsnake	*Storeria dekayi*[1]	Alcona	UMMZ, Ruthven et al. 1928
Dekay's Brownsnake	*Storeria dekayi*	Arenac	MCNH, UMMZ
Dekay's Brownsnake	*Storeria dekayi*	Houghton	BYUH
Dekay's Brownsnake	*Storeria dekayi*	Macomb	UMMZ
Red-bellied Snake	*Storeria occipitomaculata*	Beaver Island	Holman 2012[3]
Red-bellied Snake	*Storeria occipitomaculata*	Bois Blanc Island	Blanchard 1937

Appendix 1 (continued). A list of county records for Michigan herpetofauna in addition to the distribution maps in Holman 2012. Records come from published literature, museum vouchers, and the Michigan Natural Features Inventory (MNFI). When multiple specimens were present at museums, the number of records is indicated.

Common Name	Scientific Name	County/Island	Source
Red-bellied Snake	*Storeria occipitomaculata*	Gratiot	Ruthven et al. 1912, 1928
Red-bellied Snake	*Storeria occipitomaculata*	Huron	UMMZ (3), Ruthven et al. 1912, 1928
Red-bellied Snake	*Storeria occipitomaculata*	Kalamazoo	ANSP, Gibbs et al. 1905[6], Ruthven et al. 1912, 1928[4]
Red-bellied Snake	*Storeria occipitomaculata*	Leelanau	Ruthven et al. 1928
Red-bellied Snake	*Storeria occipitomaculata*[1]	Mecosta	UMMZ
Red-bellied Snake	*Storeria occipitomaculata*	Menominee	MSUM (3), UMMZ
Red-bellied Snake	*Storeria occipitomaculata*	Montcalm	MCNH
Red-bellied Snake	*Storeria occipitomaculata*	Van Buren	MCZ
Red-bellied Snake	*Storeria occipitomaculata*	Wexford	ROM (2)
Butler's Gartersnake	*Thamnophis butleri*	Alcona	UMMZ
Butler's Gartersnake	*Thamnophis butleri*	Isabella	MCNH, MSUM
Eastern Ribbonsnake	*Thamnophis sauritus*	Alcona	Ruthven et al. 1928
Eastern Ribbonsnake	*Thamnophis sauritus*	Arenac	MCNH, UMMZ
Eastern Ribbonsnake	*Thamnophis sauritus*	Monroe	UMMZ
Eastern Ribbonsnake	*Thamnophis sauritus*[1]	Montmorency	UMMZ, Ruthven et al. 1928
Eastern Ribbonsnake	*Thamnophis sauritus*[1]	Ottawa	Gibbs et al. 1905[6], Ruthven et al. 1912, 1928[4]
Eastern Gartersnake	*Thamnophis sirtalis*	Menominee	Holman 2012[3]
Eastern Gartersnake	*Thamnophis sirtalis*[1]	Muskegon	Holman 2012[3]
Eastern Gartersnake	*Thamnophis sirtalis*[1]	Van Buren	Ruthven et al. 19124, Holman 2012[3]
Turtles			
Spiny Softshell	*Apalone spinifera*	Bay	UMMZ, Douglas 1977
Spiny Softshell	*Apalone spinifera*	Iosco	Lagler 1943
Spiny Softshell	*Apalone spinifera*[1]	Isabella	MCNH
Spiny Softshell	*Apalone spinifera*[2]	Kent	Ruthven et al. 1928, Lagler 1943
Spiny Softshell	*Apalone spinifera*	Saginaw	UMMZ
Spiny Softshell	*Apalone spinifera*[1]	St. Clair	YPM
Snapping Turtle	*Chelydra serpentina*[2]	Arenac	UMMZ, Ruthven et al. 1928
Snapping Turtle	*Chelydra serpentina*[1]	Bay	MCNH, UMMZ
Snapping Turtle	*Chelydra serpentina*[1]	Benzie	Lagler 1943, Casper and Anton 2008
Snapping Turtle	*Chelydra serpentina*[1]	Clare	MCNH, Lagler 1943
Snapping Turtle	*Chelydra serpentina*[1]	Emmet	Lagler 1943
Snapping Turtle	*Chelydra serpentina*[1]	Lapeer	UMMZ, Ruthven et al. 1928
Snapping Turtle	*Chelydra serpentina*[1]	Macomb	Kannan et al. 2005
Snapping Turtle	*Chelydra serpentina*[1]	Midland	MCNH, UMMZ, Wooten 2003
Snapping Turtle	*Chelydra serpentina*[1]	Ogemaw	Lagler 1943
Snapping Turtle	*Chelydra serpentina*[1]	Osceola	Lagler 1943
Snapping Turtle	*Chelydra serpentina*	Oscoda	Ruthven et al. 1928
Painted Turtle	*Chrysemys picta*	Bay	UMMZ (2), USNM (3), Ruthven et al. 1928
Painted Turtle	*Chrysemys picta*[1]	Lapeer	MCNH, UMMZ, Ruthven et al. 1928
Painted Turtle	*Chrysemys picta*[1]	Monroe	UMMZ (5), Ruthven et al. 1928
Painted Turtle	*Chrysemys picta*[1]	Sanilac	ROM, UMMZ, USNM
Painted Turtle	*Chrysemys picta*[1]	Tuscola	UMMZ

Appendix 1 (continued). A list of county records for Michigan herpetofauna in addition to the distribution maps in Holman 2012. Records come from published literature, museum vouchers, and the Michigan Natural Features Inventory (MNFI). When multiple specimens were present at museums, the number of records is indicated.

Common Name	Scientific Name	County/Island	Source
Painted Turtle	*Chrysemys picta*[1]	Van Buren	Edgren 1942, Lagler 1943
Spotted Turtle	*Clemmys guttata*	Antrim	CUMV
Spotted Turtle	*Clemmys guttata*	Ionia	UMMZ, Ruthven et al. 1928
Spotted Turtle	*Clemmys guttata*	Manistee	MNFI 2011
Blanding's Turtle	*Emydoidea blandingii*[1]	Benzie	Beauvais 2013
Blanding's Turtle	*Emydoidea blandingii*[9]	Chippewa	MNFI 2002
Blanding's Turtle	*Emydoidea blandingii*	Emmet	MNFI 2000
Blanding's Turtle	*Emydoidea blandingii*[1]	Gratiot	Ruthven et al. 1912, 1928
Blanding's Turtle	*Emydoidea blandingii*[1]	Sanilac	MNFI 2003
Wood Turtle	*Glyptemys insculpta*	Alger	MPM
Wood Turtle	*Glyptemys insculpta*	Ogemaw	MNFI 2000
Northern Map Turtle	*Graptemys geographica*	Bay	MCNH
Northern Map Turtle	*Graptemys geographica*	Benzie	Casper and Anton 2008
Northern Map Turtle	*Graptemys geographica*	Berrien	Ruthven et al. 1912, 1928
Northern Map Turtle	*Graptemys geographica*[1]	Clare	MSUM (2), YPM
Northern Map Turtle	*Graptemys geographica*[1]	Clinton	MSUM (16)
Northern Map Turtle	*Graptemys geographica*	Crawford	UAZ
Northern Map Turtle	*Graptemys geographica*[1]	Isabella	MCNH (17)
Northern Map Turtle	*Graptemys geographica*[1]	Lake	CM (2), Lagler 1943
Northern Map Turtle	*Graptemys geographica*[1]	Lenawee	UMMZ (4)
Northern Map Turtle	*Graptemys geographica*[1]	Oceana	MSUM (2)
Northern Map Turtle	*Graptemys geographica*	Oscoda	MCNH
Eastern Musk Turtle	*Sternotherus odoratus*	Eaton	USNM, Ruthven et al. 1912, 1928[4]
Eastern Musk Turtle	*Sternotherus odoratus*	Isabella	MCNH, Gibbs et al. 1905[6]
Eastern Box Turtle	*Terrapene carolina*	Eaton	MNFI 2008, Ruthven et al. 1912, 1928[4]

[1] These records are confirmed by photographic vouchers in the Michigan Herp Atlas Project (2009-present).
[2] These records are supported by the Michigan Herp Atlas Project (No voucher available, recorded 2004-present).
[3] These records are cited in Holman 2012, but omitted from his maps. To avoid confusion, I include them here. These records are all either island records or widespread species that are "recorded from every county" according to Holman.
[4] This record is listed in Ruthven et al. 1912 and 1928 as an unvouchered 'report,' in contrast to the majority of Ruthven's records that were supported by museum vouchers. Records from this source are only included here if supported by additional records.
[5] Holman 2012 reports that L. pipiens is absent from Bois Blanc and Drummond Islands, citing an erroneous mention in a previous work (Harding and Holman, 1992). These vouchers validate the 1992 text.
[6] Gibbs et al. may be unreliable. In their 1905 paper they include *Plethodon glutinosus*, *Carphophis amoenus*, and *Thamnophis radix*, in their list of Michigan herpetofauna. To my knowledge, none of these three species has ever been collected in Michigan. Several of Gibbs et al.'s reports are supplemented by museum specimens or photographic vouchers (Michigan Herp Atlas), and most fall within the known ranges of these species. It should be noted that Gibbs incorrectly recorded the locality data on other specimens (N. Gilmore, pers. comm.), so it is plausible to consider that some of these are also inaccurate. Records from this source are only included here if supported by additional records.
[7] This record is supplemental by the author's (JGP) personal observations.
[8] These specimens are catalogued under the genus *Liochlorophis* in their respective institutions. The current accepted genus is *Opheodrys* (Crother, 2008).
[9] Holman writes that *E. blandingii* is missing from 'Alger and Luce' Counties in the eastern Upper Peninsula (UP), but in maps lists this species as present in Alger while absent in Chippewa and Mackinac counties in multiple published distributions (Holman, 2004; 2012), therefore I treat Chippewa County as an unreported record.

Museum abbreviations are as follows: American Museum of Natural History (AMNH), The Academy of Natural Sciences (ANSP), Monte L. Bean Museum, Brigham Young University (BYUH), California Academy of Sciences (CAS), Carnegie Museum of Natural History (CM), Central Michigan University Museum of Cultural and Natural History (MCNH), Cornell University Museum of Vertebrates (CUMV), University of Kansas Natural History Museum (KU), Natural History Museum of Los Angeles County (LACM), Louisiana Museum of Natural History, Louisiana Museum of Natural History, Louisiana State University (LSU), Museum of Comparative Zoology, Harvard University (MCZ), Milwaukee Public Museum (MPM), Michigan State University Museum (MSUM), Museum of Vertebrate Zoology, University of California-Berkeley (MVZ), Sam Noble Oklahoma Museum, University of Oklahoma (OMNH), Royal Ontario Museum (ROM), Texas Cooperative Wildlife Collection, Texas A&M University (TCWC), Amphibian and Reptile Collection, University of Arizona (UAZ), University of Michigan Museum of Zoology (UMMZ), Smithsonian National Museum of Natural History (USNM), Peabody Museum, Yale University (YPM). Records from the Michigan Natural Features Inventory (MNFI) are included with the date of most recent record denoted.

Appendix 2. Herpetofaunal records for Michigan Islands not included in the distribution maps presented either in the present work or in Holman (2012). This table is adapted from Holman (2012) who adapted from Bowen and Gillingham (2004). All numbered islands denote new additions to the islands listed in Holman 2012.

Common Name	Species	Island(s)
Blue-spotted Salamander	*Ambystoma laterale*	Garden, High, Trout
Spotted Salamander	*Ambystoma maculatum*	N. Manitou, S. Manitou
Red-backed Salamander	*Plethodon cinereus*	Garden, High, Hog[1], N. Fox, N. Manitou, S. Fox, S. Manitou
Eastern Newt	*Notophthalmus viridescens*	Squaw, St. Martin[2]
Eastern American Toad	*Anaxyrus americanus*	Big Summer[2], Garden, High, Hog, Little Summer[2], N. Fox, N. Manitou, S. Fox, S. Manitou, Squaw, Trout, Whiskey
Gray Treefrog	*Hyla versicolor*	Trout
Spring Peeper	*Pseudacris crucifer*	Garden, Gull, N. Fox, N. Manitou, S. Manitou, Trout
American Bullfrog	*Lithobates catesbeianus*	N. Manitou
Green Frog	*Lithobates clamitans*	Garden, High, N. Manitou
Northern Leopard Frog	*Lithobates pipiens*	Big Summer[2], Garden, S. Manitou
Wood Frog	*Lithobates sylvaticus*	Harbor, N. Manitou, St. Martin[2]
Eastern Milksnake	*Lampropeltis triangulum*	Garden, High, N. Fox, Whiskey
Smooth Greensnake	*Opheodrys vernalis*	S. Fox[3]
Eastern Foxsnake	*Pantherophis vulpinus*	Big Summer[2], Little Summer[2], N. Manitou[4], S. Fox[5], St. Martin[2], Summer[2]
Ring-necked Snake	*Diadophis punctatus*	Big Summer[2], Garden, N. Fox, N. Manitou, S. Fox, S. Manitou, St. Martin2
Northern Watersnake	*Nerodia sipedon*	Garden, High, Hog, N. Fox, Squaw, St. Martin[2], Whiskey
Dekay's Brownsnake	*Storeria dekayi*	Hog6, N. Manitou, S. Fox, S. Manitou
Red-bellied Snake	*Storeria occipitomaculata*	Garden, High, Hog[7], Squaw, Whiskey
Northern Ribbonsnake	*Thamnophis sauritus*	N. Manitou
Eastern Gartersnake	*Thamnophis sirtalis*	Big Summer[2], Garden, High, Little Summer[2], N. Fox, N. Manitou, S. Fox, S. Manitou, Squaw, St. Martin[2], Trout, Whiskey
Eastern Snapping Turtle	*Chelydra serpentina*	Garden, N. Manitou, S. Manitou
Painted Turtle	*Chrysemys picta*	Garden, High, Hog8, N. Manitou, S. Manitou

[1] Seefelt et al. 2013b
[2] Long and Long 1976
[3] Casper and Anton 2008
[4] Bowen et al. 2007
[5] Previously, the South Fox Island specimen was believed to be a cataloguing error (Casper and Anton, 2008; Harding pers. comm.), but more recent records of *P. vulpinus* on Lake Michigan islands (Bowen et al., 2007; MHA) indicate that this specimen may represent an accurate record.
[6] Seefelt et al. 2013c
[7] Blanchard 1937
[8] Seefelt et al. 2013a

Appendix 3. Additional records supplied by the Michigan Herp Atlas, supplemented by verified photographic vouchers. Year of the most recent record is noted.

Common Name	Species	County	Year
Frogs and Toads	Anura		
Fowler's Toad	*Anaxyrus fowleri*	Benzie	2014
Fowler's Toad	*Anaxyrus fowleri*	Mecosta	2014
Salamanders	Caudata		
Blue-spotted Salamander	*Ambystoma laterale*	Macomb	2012
Blue-spotted Salamander	*Ambystoma laterale*	Sanilac	2014
Blue-spotted Salamander	*Ambystoma laterale*	St. Clair	2012
Spotted Salamander	*Ambystoma maculatum*	Huron	2011
Spotted Salamander	*Ambystoma maculatum*	Isabella	2012
Spotted Salamander	*Ambystoma maculatum*	Macomb	2012
Spotted Salamander	*Ambystoma maculatum*	Muskegon	2012
Spotted Salamander	*Ambystoma maculatum*	St. Clair	2013
Marbled Salamander	*Ambystoma opacum*	Monroe	2015
Eastern Tiger Salamander	*Ambystoma tigrinum*	Clinton	2014
Eastern Tiger Salamander	*Ambystoma tigrinum*	Macomb	2014
Eastern Tiger Salamander	*Ambystoma tigrinum*	Mason	2013
Four-toed Salamander	*Hemidactylium scutatum*	Clare	2010
Four-toed Salamander	*Hemidactylium scutatum*	Hillsdale	2012
Four-toed Salamander	*Hemidactylium scutatum*	Lapeer	2011
Four-toed Salamander	*Hemidactylium scutatum*	Wexford	2015
Mudpuppy	*Necturus maculosus*	Mason	2014
Eastern Newt	*Notophthalmus viridescens*	Clare	2010
Snakes	Squamata		
North American Racer	*Coluber constrictor*	Osceola	2015
Eastern Hog-nosed Snake	*Heterodon platirhinos*	Alcona	2014
Eastern Hog-nosed Snake	*Heterodon platirhinos*	Montcalm	2011
Eastern Hog-nosed Snake	*Heterodon platirhinos*	Presque Isle	2004
Eastern Milksnake	*Lampropeltis triangulum*	St. Clair	2014
Smooth Greensnake	*Opheodrys vernalis*	Macomb	2012
Gray Ratsnake	*Pantherophis spiloides*	Clinton	2013
Gray Ratsnake	*Pantherophis spiloides*	Montmorency	2014
Eastern Foxsnake	*Pantherophis vulpinus*	Shiawassee	2013
Dekay's Brownsnake	*Storeria dekayi*	Cass	2014
Dekay's Brownsnake	*Storeria dekayi*	Ionia	2013
Dekay's Brownsnake	*Storeria dekayi*	Oceana	2015
Red-bellied Snake	*Storeria occipitomaculata*	Benzie	2011
Red-bellied Snake	*Storeria occipitomaculata*	Eaton	2014
Red-bellied Snake	*Storeria occipitomaculata*	Jackson	2008
Red-bellied Snake	*Storeria occipitomaculata*	Lake	2012
Red-bellied Snake	*Storeria occipitomaculata*	Manistee	2013
Butler's Gartersnake	*Thamnophis butleri*	Lapeer	2015
Butler's Gartersnake	*Thamnophis butleri*	Tuscola	2011
Eastern Ribbonsnake	*Thamnophis sauritus*	Benzie	2013
Eastern Ribbonsnake	*Thamnophis sauritus*	Calhoun	2013
Eastern Ribbonsnake	*Thamnophis sauritus*	Hillsdale	2013
Turtles	Testudines		
Spiny Softshell	*Apalone spinifera*	Genesee	2013
Spiny Softshell	*Apalone spinifera*	Mason	2008
Spiny Softshell	*Apalone spinifera*	Mecosta	2013
Spiny Softshell	*Apalone spinifera*	Shiawasee	2015
Spiny Softshell	*Apalone spinifera*	Wayne	2007
Snapping Turtle	*Chelydra serpentina*	Gladwin	2013
Painted Turtle	*Chrysemys picta*	Baraga	2012
Painted Turtle	*Chrysemys picta*	Benzie	2011
Painted Turtle	*Chrysemys picta*	Macomb	2012
Painted Turtle	*Chrysemys picta*	Wayne	2014
Painted Turtle	*Clemmys guttata*	Benzie	2012
Wood Turtle	*Glyptemys insculpta*	Antrim	2011

Appendix 3 (continued). Additional records supplied by the Michigan Herp Atlas, supplemented by verified photographic vouchers. Year of the most recent record is noted.

Common Name	Species	County	Year
Northern Map Turtle	*Graptemys geographica*	Gratiot	2014
Northern Map Turtle	*Graptemys geographica*	Manistee	2012
Northern Map Turtle	*Graptemys geographica*	Midland	2013
Northern Map Turtle	*Graptemys geographica*	Saginaw	2011
Northern Map Turtle	*Graptemys geographica*	St. Clair	2013
Northern Map Turtle	*Graptemys geographica*	Osceola	2009
Eastern Musk Turtle	*Stenotherus odoratus*	Lake	2012
Eastern Musk Turtle	*Stenotherus odoratus*	Mason	2013
Eastern Box Turtle	*Terrapene carolina*	Macomb	2011
Eastern Box Turtle	*Terrapene carolina*	Midland	2011
Eastern Box Turtle	*Terrapene carolina*	Wayne	2014
Pond Slider	*Trachemys scripta*	Emmet	2012
Pond Slider	*Trachemys scripta*	Lapeer	2009
Pond Slider	*Trachemys scripta*	Macomb	2013
Pond Slider	*Trachemys scripta*	St. Clair	2012
Pond Slider	*Trachemys scripta*	Wayne	2014

Appendix 4. Additional records whose accuracy has come into question. These include literature and museum specimens that may have incorrect identification or locality data as well as records submitted by the Michigan Herp Atlas (MHA), unverified by photographic vouchers. All abbreviations follow Appendix 1.

Species	County/Island	Source	
Frogs and Toads			
Blanchard's Cricket Frog	*Acris blanchardi*	Leelenau	Holman 2012
Blanchard's Cricket Frog	*Acris blanchardi*	Antrim	Ruthven et al. 1912, 1928[1]
Blanchard's Cricket Frog	*Acris blanchardi*	Cheyboygan[2]	Ruthven et al. 1912, Blanchard 1928
Blanchard's Cricket Frog	*Acris blanchardi*	Mason[3]	MCNH
Blanchard's Cricket Frog	*Acris blanchardi*	Presque Isle[4]	MSUM
Fowler's Toad	*Anaxyrus fowleri*	Beaver Island[5]	MCNH
Cope's Gray Treefrog	*Hyla chrysoscelis*[6]	Alcona	MHA 2011
Cope's Gray Treefrog	*Hyla chrysoscelis*[6]	Oakland	MHA 2012
Cope's Gray Treefrog	*Hyla chrysoscelis*[6]	Ottawa	MHA 2011
Cope's Gray Treefrog	*Hyla chrysoscelis*[6]	Delta	MHA 2013
American Bullfrog	*Lithobates catesbeianus*	Emmet	Ruthven et al. 1928[1]
American Bullfrog	*Lithobates catesbeianus*	Saginaw	MHA 2015
Boreal Chorus Frog	*Pseudacris maculata*[7]	Houghton	MHA 2011
Salamanders			
Blue-spotted Salamander	*Ambystoma laterale*[8]	Gratiot	Ruthven et al. 1912, 1928
Blue-spotted Salamander	*Ambystoma laterale*	Mecosta	MHA 2014
Blue-spotted Salamander	*Ambystoma laterale*	Midland	MHA 2014
Blue-spotted Salamander	*Ambystoma laterale*	Montmorency	MHA 2014
Blue-spotted Salamander	*Ambystoma laterale*[8]	Saginaw	CAS
Spotted Salamander	*Ambystoma maculatum*	Genesee	MHA 2012
Eastern Tiger Salamander	*Ambystoma tigrinum*	Eaton	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Southern Two-lined Salamander	*Eurycea bislineata*	Berrien	Maldonado-Koerdell and Firschein 1947[10]
Four-toed Salamander	*Hemidactylium scutatum*	Mecosta	MHA 2014
Mudpuppy	*Necturus maculosus*	Allegan	Gibbs et al. 19059, Ruthven et al. 1912, 19281
Mudpuppy	*Necturus maculosus*	Ottawa	Ruthven et al. 1912, 19281
Eastern Newt	*Notophthalmus viridescens*	Shiawassee	MHA 2002
Lizards			
Five-lined Skink	*Plestiodon fasciatus*	Barry	Gibbs et al. 19059, Ruthven et al. 1912, 1928[1]
Five-lined Skink	*Plestiodon fasciatus*	Genessee	Ruthven et al. 1912[1]
Five-lined Skink	*Plestiodon fasciatus*	Kalamazoo	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Five-lined Skink	*Plestiodon fasciatus*	Montcalm	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Five-lined Skink	*Plestiodon fasciatus*	St. Joseph	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Five-lined Skink	*Plestiodon fasciatus*	Van Buren	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Snakes			
North American Racer	*Coluber constrictor*	Arenac	Gibbs et al. 1905[9]
North American Racer	*Coluber constrictor*	St. Clair	Gibbs et al. 1905[9]
Ring-necked Snake	*Diadophis punctatus*	Kalamazoo	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Ring-necked Snake	*Diadophis punctatus*	Montcalm	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Ring-necked Snake	*Diadophis punctatus*	Van Buren	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Eastern Milksnake	*Lampropeltis triangulum*	Alger	MHA 2012
Eastern Milksnake	*Lampropeltis triangulum*	Macomb	MHA 2013
Eastern Milksnake	*Lampropeltis triangulum*	Montcalm	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Eastern Milksnake	*Lampropeltis triangulum*	Ottawa	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]

Appendix 4 (continuted). Additional records whose accuracy has come into question. These include literature and museum specimens that may have incorrect identification or locality data as well as records submitted by the Michigan Herp Atlas (MHA), unverified by photographic vouchers. All abbreviations follow Appendix 1.

Species	County/Island	Source	
Smooth Greensnake	*Opheodrys vernalis*	Barry	Gibbs et al. 1905[9], Ruthven et al. 1928[1]
Smooth Greensnake	*Opheodrys vernalis*	Kalamazoo	Gibbs et al. 1905[9], Ruthven et al. 1928[1]
Smooth Greensnake	*Opheodrys vernalis*	Kent	Gibbs et al. 1905[9], Ruthven et al. 1928[1]
Smooth Greensnake	*Opheodrys vernalis*	Montcalm	Gibbs et al. 1905[9], Ruthven et al. 1928[1]
Smooth Greensnake	*Opheodrys vernalis*	Sanilac	MHA 2003
Smooth Greensnake	*Opheodrys vernalis*	Van Buren	Gibbs et al. 1905[9], Ruthven et al. 1928[1]
Gray Ratsnake	*Pantherophis spiloides*	Macomb	MHA 2012
Eastern Foxsnake	*Pantherophis vulpinus*	Leelanau	MSUM11
Queen Snake	*Regina septemvittata*	Crawford	MHA 2011
Queen Snake	*Regina septemvittata*	Eaton	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Queen Snake	*Regina septemvittata*	Montcalm	Gibbs et al. 19059, Ruthven et al. 1912, 1928[1]
Queen Snake	*Regina septemvittata*	Van Buren	Gibbs et al. 19059, Ruthven et al. 1912, 1928[1]
Eastern Massasauga	*Sistrurus catenatus*	Leelanau	MHA 2007
Dekay's Brownsnake	*Storeria dekayi*	Hillsdale	MHA 2012
Red-bellied Snake	*Storeria occipitomaculata*	Barry	MHA 2014
Red-bellied Snake	*Storeria occipitomaculata*[12]	Bois Blanc Island	MHA 2012
Butler's Gartersnake	*Thamnophis butleri*	Berrien	MHA 2013
Butler's Gartersnake	*Thamnophis butleri*	Midland	MHA 2015
Butler's Gartersnake	*Thamnophis butleri*	Ottawa	MHA 2014
Eastern Ribbonsnake	*Thamnophis sauritus*[13]	Chippewa	MHA 2014
Eastern Ribbonsnake	*Thamnophis sauritus*[13]	Ontonagon	MHA 2014
Turtles			
Spiny Softshell	*Apalone spinifera*	Eaton	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Spiny Softshell	*Apalone spinifera*	Macomb	MHA 2013
Spiny Softshell	*Apalone spinifera*	Montcalm	Gibbs et al. 1905[9], Ruthven et al. 1912, 1928[1]
Wood Turtle	*Glyptemys insculpta*[14]	Ingham	MSUM, MNFI 1983
Wood Turtle	*Glyptemys insculpta*[14]	Lapeer	Schuett 1979
Wood Turtle	*Glyptemys insculpta*[14]	Livingston	TCWC, Schuett 1979
Wood Turtle	*Glyptemys insculpta*[14]	Washtenaw	UMMZ
Northern Map Turtle	*Graptemys geographica*	Macomb	MHA 2013
Eastern Musk Turtle	*Stenotherus odoratus*	Mecosta	MHA 2012
Eastern Box Turtle	*Terrapene carolina*[15]	Baraga	MNFI 1977
Eastern Box Turtle	*Terrapene carolina*[16]	Cheboygan	Blanchard 1928, Ruthven et al. 1928[1]
Eastern Box Turtle	*Terrapene carolina*[15]	Houghton	MNFI 1977
Pond Slider	*Trachemys scripta*	Bay	MHA 2013
Pond Slider	*Trachemys scripta*	Jackson	MHA 2014

[1] This record is listed in Ruthven et al. 1912 and 1928 as an unvouchered 'report,' in contrast to the majority of Ruthven's records that were supported by museum vouchers.
[2] This is well north of the previously accepted range for *A. blanchardi* (specimen originally listed as *A. gryllus*), so I report this record cautiously. However, F.N. Blanchard, the namesake of this species was considered an outstanding herpetologist in his day (Holman, 2012), so this may represent a legitimate specimen from a relict population (likely no longer extant).
[3] This individual is outside of the commonly accepted range for *A. blanchardi*, and the specimen was unavailable for confirmation, so I report this record cautiously.
[4] This record is outside of the commonly accepted range for *A. blanchardi*. The specimen has been verified by J. Harding, however it may have been inappropriately catalogued.
[5] This is outside the known range of *A. fowleri*. Unfortunately, the specimen is no longer available for examination. This species is morphologically similar to *A. americanus*, which is well documented from Beaver Island so I report this record cautiously.
[6] These specimens are backed by photographic vouchers, but were not identified by call, and therefore are considered unverified.
[7] This report is possibly a misidentification. There is no known evidence to suggest *P. maculata* is found on the mainland (Harding, pers. comm.).
[8] These records are listed as *A. jeffersonianum*, but *A. jeffersonianum* (Unisexual hybrid complex) and *A. laterale* were considered the same species as recently as the 1970's (Harding, pers. comm.), so these records may represent either one or both species. Unisexual *Ambystoma* are unverified in northern Michigan.

Appendix 4 (continuted). Additional records whose accuracy has come into question. These include literature and museum specimens that may have incorrect identification or locality data as well as records submitted by the Michigan Herp Atlas (MHA), unverified by photographic vouchers. All abbreviations follow Appendix 1.

[9] Gibbs et al. may be unreliable. In their 1905 paper they include *Plethodon glutinosus*, *Carphophis amoenus*, and *Thamnophis radix*, in their list of Michigan herpetofauna. To my knowledge, none of these three species has ever been collected in Michigan. Several of Gibbs et al.'s reports are supplemented by museum specimens or photographic vouchers (Michigan Herp Atlas), and most fall within the known ranges of these species. It should be noted that Gibbs incorrectly recorded the locality data on other specimens (N. Gilmore, pers. comm.), so it is plausible to consider that some of these are also inaccurate misidentified.

[10] This represents a record of '*E. bislineata*' that has been questioned (Mittleman, 1966). Given that both the Tuscola population and populations in Indiana have been identified as *E. cirrigera* (Kozak et al., 2006), I include it here as a potential historical record.

[11] Previously, this specimen was believed to be a cataloguing error (Casper and Anton, 2008; Harding pers. comm.), but more recent records of *P. vulpinus* on Lake Michigan islands (Bowen et al., 2007; MHA) indicate that this specimen may represent an accurate record.

[12] This report is from Stephen Ross, and is not explicitly available through the MHA.

[13] *T. sauritus* has never been confirmed in Michigan's Upper Peninsula (UP). These records are photos without the resolution to unequivocally determine identity beyond the genus level.

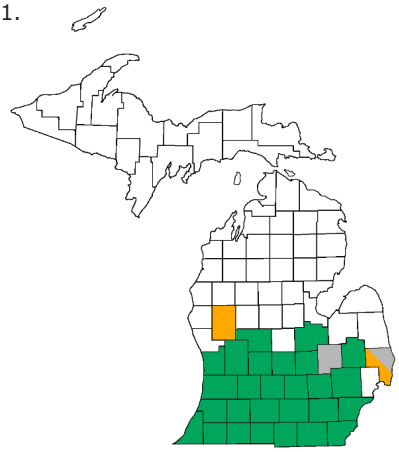
[14] These likely represent introduced specimens (Harding, pers. comm.), and are disjunct from the known range of *G. insculpta*.

[15] These specimens are reported by MNFI and are well out of the known range of *T. carolina*. This species is otherwise absent from the whole of the UP as well as northern Wisconsin (Harding, 1997). These reports are not accompanied by vouchers, so I report these skeptically.

[16] This report by F. N. Blanchard is well north of the known range of *T. carolina*. As stated above, Blanchard is regarded as a prominent expert in Michigan herpetology, but due to the proximity of this record to known *T. carolina* populations I report this record cautiously.

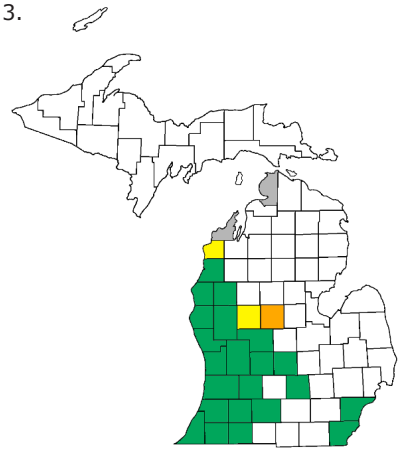
Appendix 5. The geographic distribution for all 55 species of reptiles and amphibians found in the state of Michigan. Localities are represented at the county level, but four main islands are also included (Beaver, Bois Blanc, Drummond, and Isle Royale), following the methods of Holman (2012). Counties recorded by Holman (2012) are in green, museum vouchers (orange), literature reports (gray) and photographic vouchers (yellow) are differentiated in the maps.

1.



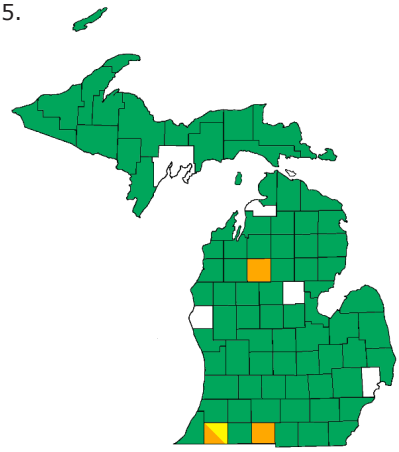
Blanchard's Cricket Frog
(*Acris blanchardi*)
Three new records brings the total number of counties from which *A. blanchardi* has been found in Michigan to 30. This species occurs predominantly in the southern third of Michigan, but may be found in some counties adjacent to its current range where suitable habitat is present.

3.



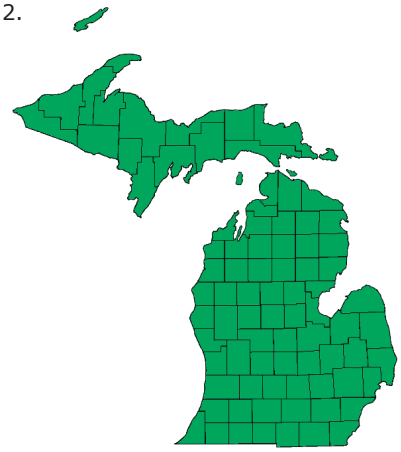
Fowler's Toad
(*Anaxyrus fowleri*)
Five new records brings the total number of counties from which *A. fowleri* has been found in Michigan to 27. This species occurs predominantly in the western half of the Lower Peninsula (LP) of Michigan, but may be found in some counties adjacent to its current range where suitable habitat is present.

5.



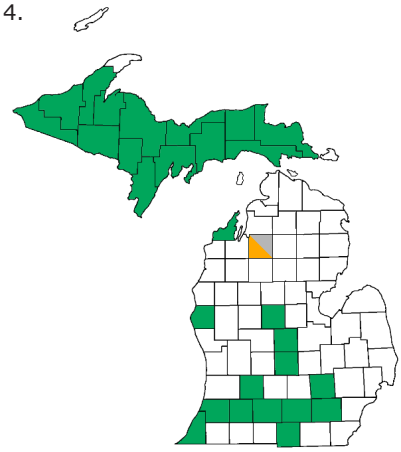
Gray Treefrog
(*Hyla versicolor*)
Three new records (all from museum specimens) brings the total number of counties from which *H. versicolor* has been found in Michigan to 78. This species occurs statewide and is only 'missing' from five counties (Charlevoix, Delta, Gladwin, Macomb, Oceana). It is difficult to identify apart from Cope's Gray Treefrog (*H. chrysoscelis*), but may be present in all five of these counties.

2.



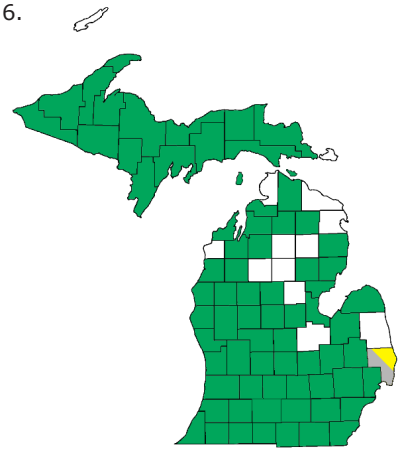
Eastern American Toad
(*Anaxyrus americanus*)
The distribution of *A. americanus* already encompassed all 83 counties and major islands in Michigan. There was no range extension added by this publication.

4.



Cope's Gray Treefrog
(*Hyla chrysocelis*)
One new record brings the total number of counties from which *H. chrysoscelis* has been found in Michigan to 30. This species occurs across most of the Upper Peninsula (UP) and in the southern portion of the LP of Michigan. Since is it difficult to identify apart from the Gray Treefrog (*H. versicolor*), it may occur elsewhere throughout the state.

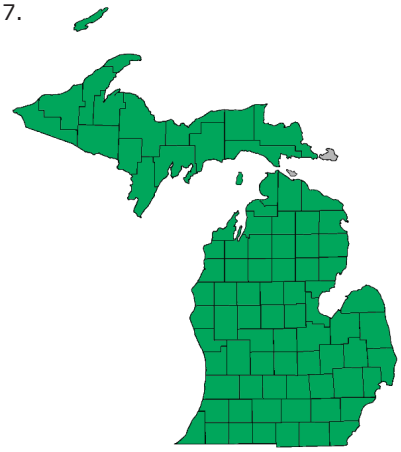
6.



American Bullfrog
(*Lithobates catesbeianus*)
One new record brings the total number of counties from which *L. catesbeianus* has been found in Michigan to 72. This species occurs statewide and is only 'missing' from 11 counties. It is found in counties adjacent to each of these and may be present in all of these counties where suitable habitat exists.

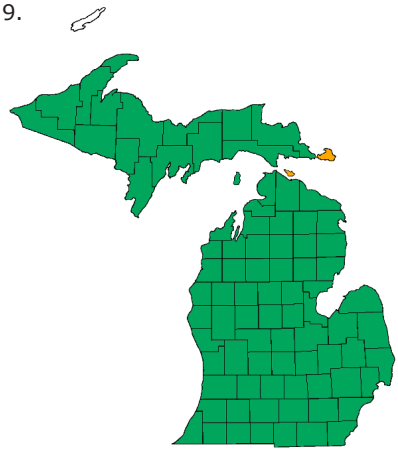
Appendix 5 (continued). The geographic distribution for all 55 species of reptiles and amphibians found in the state of Michigan. Localities are represented at the county level, but four main islands are also included (Beaver, Bois Blanc, Drummond, and Isle Royale), following the methods of Holman (2012). Counties recorded by Holman (2012) are in green, museum vouchers (orange), literature reports (gray) and photographic vouchers (yellow) are differentiated in the maps.

7.



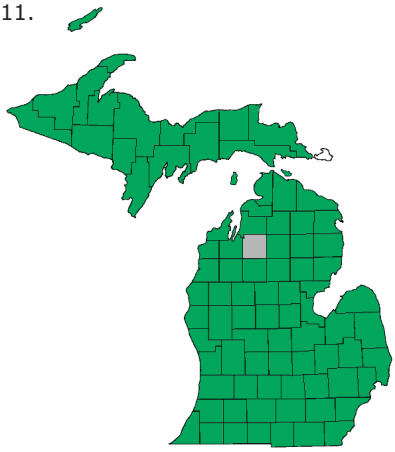
Green Frog
(*Lithobates clamitans*)
The distribution of *L. clamitans* already encompassed all 83 counties in Michigan. However, literature records also place *L. clamitans* on Drummond and Bois Blanc Islands in Lake Huron.

9.



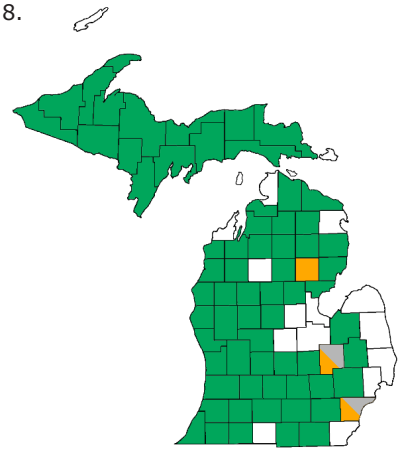
Northern Leopard Frog
(*Lithobates pipiens*)
The distribution of *L. pipiens* already encompassed all 83 counties in Michigan. However, museum specimens also place *L. pipiens* on Drummond and Bois Blanc Islands in Lake Huron. The only major island where *L. pipiens* has not been found is Isle Royale in Lake Superior.

11.



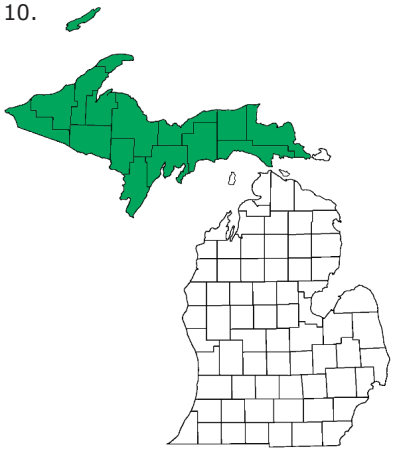
Wood Frog
(*Lithobates sylvaticus*)
With one new record (Kalkaska Co.) *L. sylvaticus* occupies all counties in Michigan. The distribution of *L. sylvaticus* already encompassed 82 counties in Michigan. *Lithobates sylvaticus* also occurs on all major islands except Drummond Island, where it may be found where suitable habitat is present.

8.



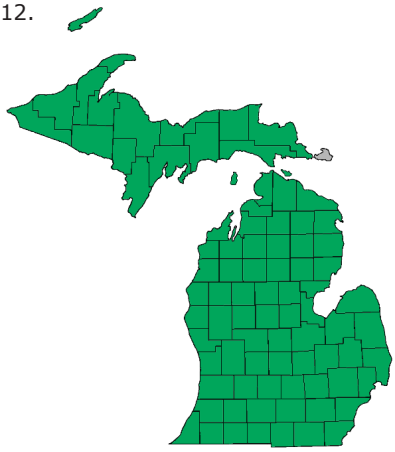
Pickerel Frog
(*Lithobates palustris*)
Three new records brings to the total number of counties from which *L. palustris* has been found in Michigan to 69. This species occurs statewide and is only 'missing' from 14 counties. It is found in counties adjacent to each of these and may be present in all of these counties where suitable habitat exists.

10.



Mink Frog
(*Lithobates septentrionalis*)
The distribution of *L. septentrionalis* already encompassed all 15 counties in Michigan's UP plus Isle Royale. No new records were added by this publication. There is no indication that *L. septentrionalis* may be present in the LP, although it might be found on some Michigan islands (e.g. Drummond Island).

12.



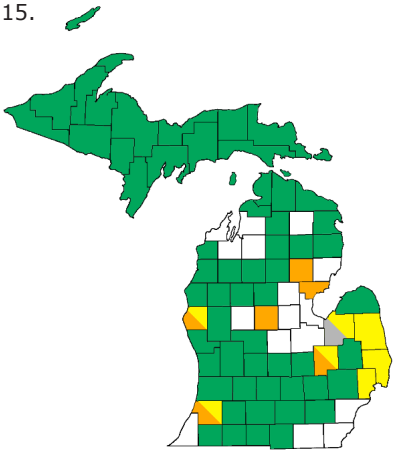
Spring Peeper
(*Pseudacris crucifer*)
The distribution of *P. crucifer* already encompassed all 83 counties in Michigan. However, a literature record also places *P. crucifer* on Drummond Island in Lake Huron. This species is now known from all major Michigan islands.

Appendix 5 (continued). The geographic distribution for all 55 species of reptiles and amphibians found in the state of Michigan. Localities are represented at the county level, but four main islands are also included (Beaver, Bois Blanc, Drummond, and Isle Royale), following the methods of Holman (2012). Counties recorded by Holman (2012) are in green, museum vouchers (orange), literature reports (gray) and photographic vouchers (yellow) are differentiated in the maps.

13.

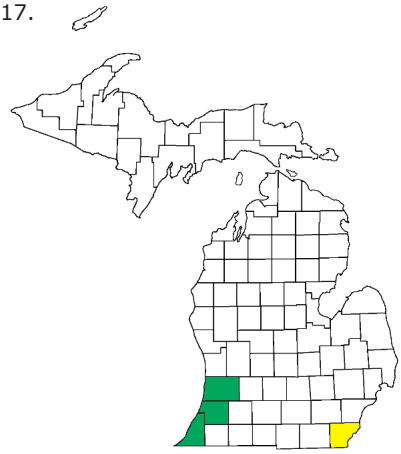
Boreal Chorus Frog
(*Pseudacris maculata*)
This species is only known from Isle Royale in Michigan. An unconfirmed report places *P. maculata* in Houghton County on the mainland UP, but there is no evidence to support that.

15.



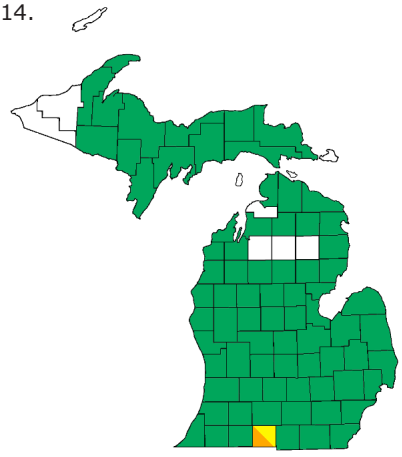
Blue-spotted Salamander
(*Ambystoma laterale*)
Ten new records brings the total number of counties from which *A. laterale* has been found in Michigan to 67. This species occurs statewide and is only 'missing' from 16 counties. It is found in counties adjacent to each of these and may be present in all of these counties where suitable habitat exists.

17.



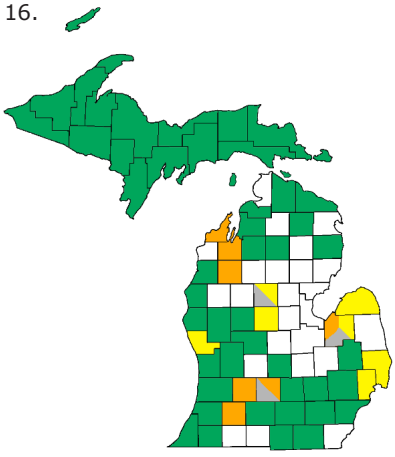
Marbled Salamander
(*Ambystoma opacum*)
This species was only known from three counties in southwest Michigan and had not been recorded in the state since 1989 (Holman 2012). However, a participant of the Michigan Herp Atlas discovered an *A. opacum* in Monroe County in southeastern Michigan in 2015.

14.



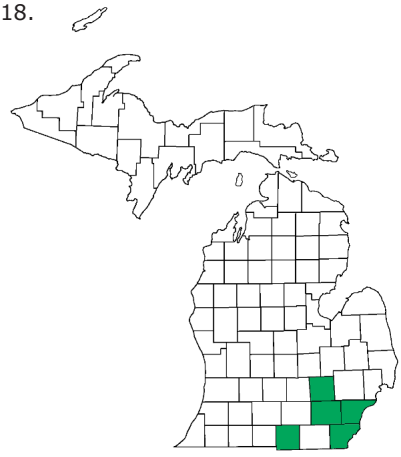
Western Chorus Frog
(*Pseudacris triseriata*)
With one new record (Branch Co.) the distribution of *P. triseriata* encompassed 77 counties in Michigan. This species occurs statewide and is only 'missing' from 6 counties. It is found in counties adjacent to each of these and may be present in all of these counties where suitable habitat exists.

16.



Spotted Salamander
(*Ambystoma maculatum*)
Thirteen new records brings the total number of counties from which *A. maculatum* has been found in Michigan to 59. This species occurs statewide and is only 'missing' from 24 counties. It is found in counties adjacent to most of these and may be present in all of these counties where suitable habitat exists.

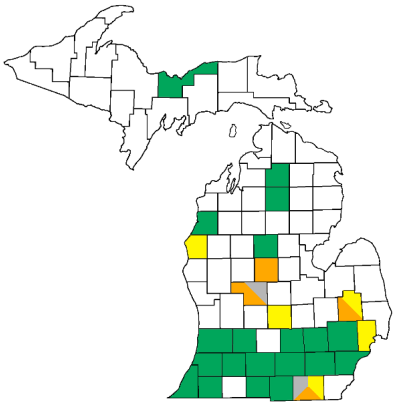
18.



Small-mouthed Salamander
(*Ambystoma texanum*)
This species is only known from five counties in southeast Michigan. This publication does not expand the range of *A. texanum* in Michigan, but it may occur in adjacent counties where suitable habitat is present.

Appendix 5 (continued). The geographic distribution for all 55 species of reptiles and amphibians found in the state of Michigan. Localities are represented at the county level, but four main islands are also included (Beaver, Bois Blanc, Drummond, and Isle Royale), following the methods of Holman (2012). Counties recorded by Holman (2012) are in green, museum vouchers (orange), literature reports (gray) and photographic vouchers (yellow) are differentiated in the maps.

19.

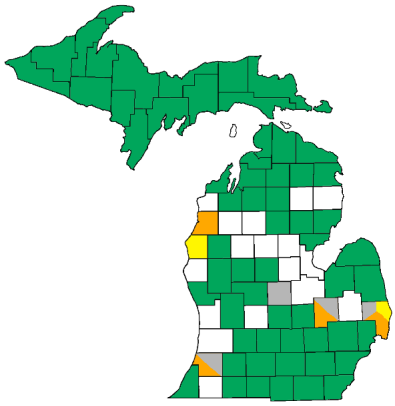


Eastern Tiger Salamander
(*Ambystoma tigrinum*)
Seven new records brings the total number of counties from which *A. tigrinum* has been found in Michigan to 21. This species has been found in one county (Alger) in the UP and occupies a patchy distribution throughout portions of the LP. It may occur in adjacent counties where suitable habitat is present.

21.

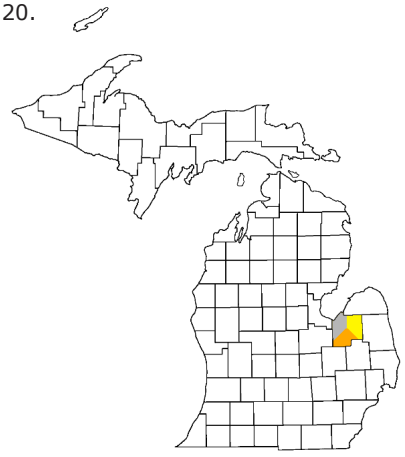
Southern Two-lined Salamander
(*Eurycea cirrigera*)
This species is new to the herpetofauna of Michigan and is known from a single site in one county (Tuscola). It is uncertain whether *E. cirrigera* is introduced or represents a relict population in Michigan, However, there is a sustainable population (Mifsud, pers. comm.). Initially, identified as the Northern Two-lined Salamander, *E. bislineata*, genetic work suggested the population was in fact *E. cirrigera* (Soderberg 2009).

23.



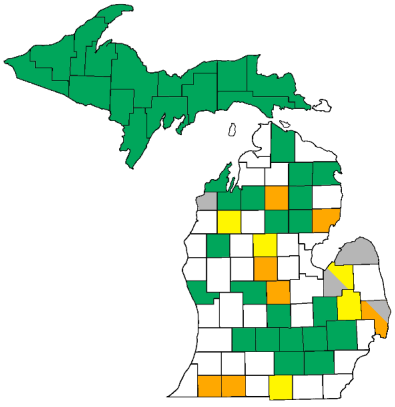
Mudpuppy
(*Necturus maculosus*)
Six new records brings the total number of counties from which *N. maculosus* has been found in Michigan to 66. This species is only 'missing' from 17 counties. It is found in counties adjacent to each of these and may be present in all counties. It is found on some islands in the Great Lakes, but has not been recorded from Beaver or Bois Blanc Islands.

20.



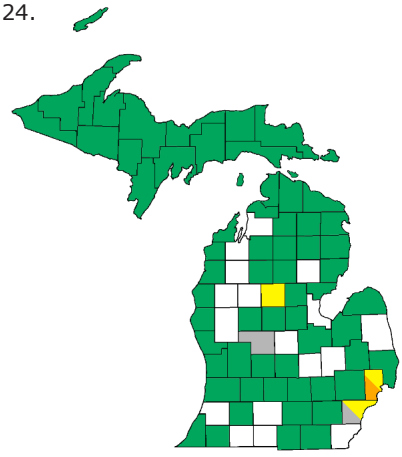
Northern Dusky Salamander
(*Desmognathus fuscus*)
This species is new to the herpetofauna of Michigan and is only known from a single site in one county (Tuscola). While there is some uncertainty as to whether *D. fuscus* is introduced or represents a relict population in Michigan, there appears to a sustainable population (Mifsud, pers. comm.).

22.



Four-toed Salamander
(*Hemidactylium scutatum*)
Fourteen new records brings the total number of counties from which *H. scutatum* has been found in Michigan to 50. This species occupies a patchy distribution statewide and is 'missing' from 33 counties. It is found in counties adjacent to each of these and may be present in all of these counties where suitable habitat exists.

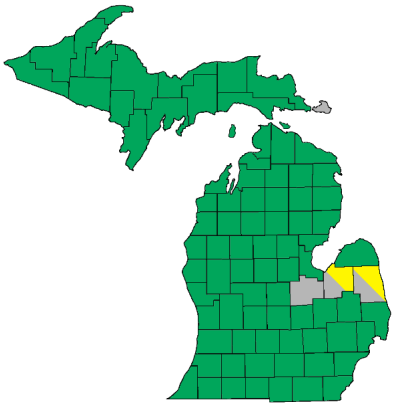
24.



Eastern Newt
(*Notophthalmus viridescens*)
Four new records brings the total number of counties from which *N. viridescens* has been found in Michigan to 66. This species occurs statewide and is only 'missing' from 17 counties. It is found in counties adjacent to each of these and may be present in all of these counties where suitable habitat exists.

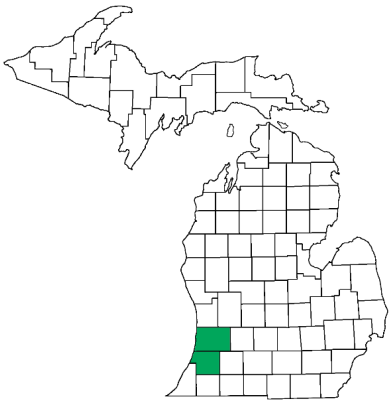
Appendix 5 (continued). The geographic distribution for all 55 species of reptiles and amphibians found in the state of Michigan. Localities are represented at the county level, but four main islands are also included (Beaver, Bois Blanc, Drummond, and Isle Royale), following the methods of Holman (2012). Counties recorded by Holman (2012) are in green, museum vouchers (orange), literature reports (gray) and photographic vouchers (yellow) are differentiated in the maps.

25.



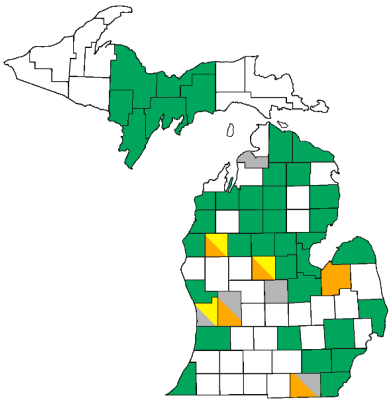
Eastern Red-backed Salamander
(*Plethodon cinereus*)
With three new county records plus Drummond Island (all listed in the text of Holman 2012), *P. cinereus* has been recorded in every county and major island in the state of Michigan.

26.



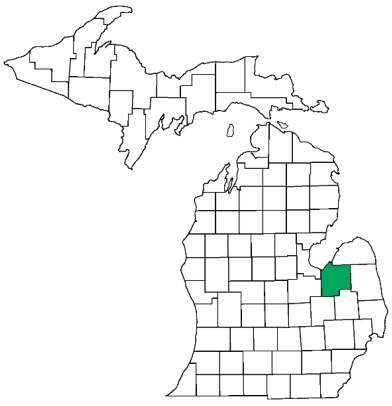
Western Lesser Siren
(*Siren intermedia*)
This species is only known from two counties in southwest Michigan and has not been recorded in the state since 1961 (Holman 2012). This publication does not expand the range of *S. intermedia* in Michigan, and it is unknown if it still occurs in the state.

27.



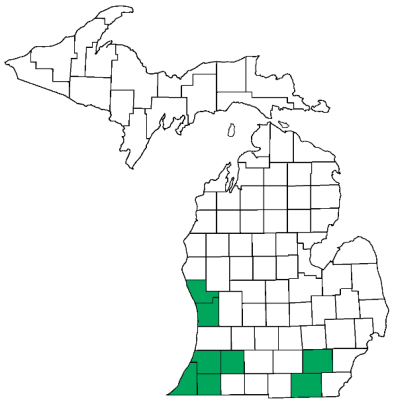
Five-lined Skink
(*Plestiodon fasciatus*)
Eight new records brings the total number of counties from which *P. fasciatus* has been found in Michigan to 44. This species occupies a patchy distribution statewide and is 'missing' from 39 counties. It is found in counties adjacent to most of these and may be present in all of these counties where suitable habitat exists, at least in the LP. In the UP, *P. fasciatus* has only been found in the central counties.

28.



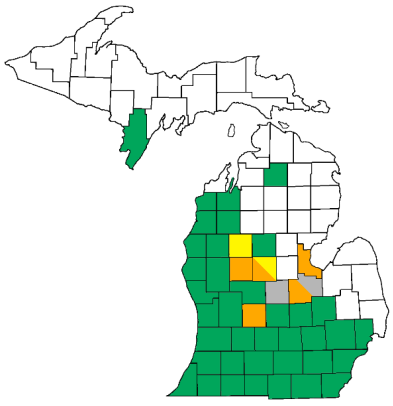
Six-lined Racerunner
(*Aspidoscelis sexlineatus*)
This species only known from a single site in one county (Tuscola). While there is some uncertainty as to whether *A. sexlineatus* is introduced or represents a relict population in Michigan, there appears to a sustainable population. This publication does not expand the range of *A. sexlineatus*.

29.



Kirtland's Snake
(*Clonophis kirtlandi*)
This species is only known from eight counties in southern Michigan. This publication does not expand the range of *C. kirtlandi* in Michigan. It may occur in adjacent counties where suitable habitat is present.

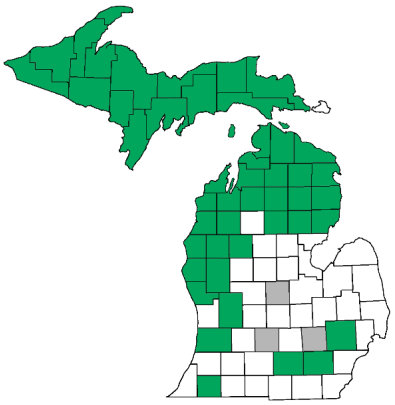
30.



North American Racer
(*Coluber constrictor*)
Seven new records brings the total number of counties from which *C. constrictor* has been found in Michigan to 45. This species is found in one county in the UP (Menominee) and throughout the southern and western portions of the LP. It may occur in adjacent counties where suitable habitat is present.

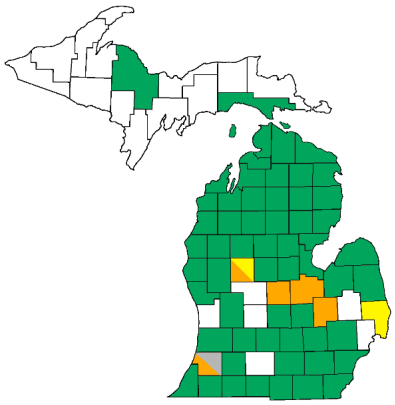
Appendix 5 (continued). The geographic distribution for all 55 species of reptiles and amphibians found in the state of Michigan. Localities are represented at the county level, but four main islands are also included (Beaver, Bois Blanc, Drummond, and Isle Royale), following the methods of Holman (2012). Counties recorded by Holman (2012) are in green, museum vouchers (orange), literature reports (gray) and photographic vouchers (yellow) are differentiated in the maps.

31.



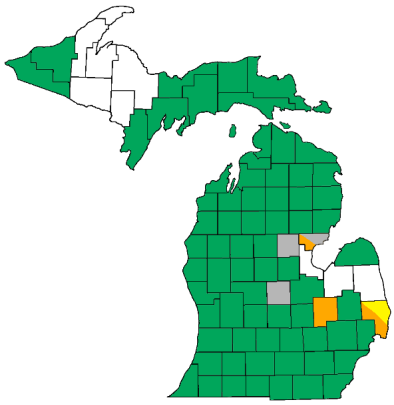
Ring-necked Snake
(*Diadophis punctatus*)
Three new records (all literature) brings to the total number of counties from which *D. punctatus* has been found in Michigan to 48. This species is found throughout the western and northern LP, and UP (Menominee) with a fragmented distribution in the southern LP. It may occur in adjacent counties where suitable habitat is present.

33.



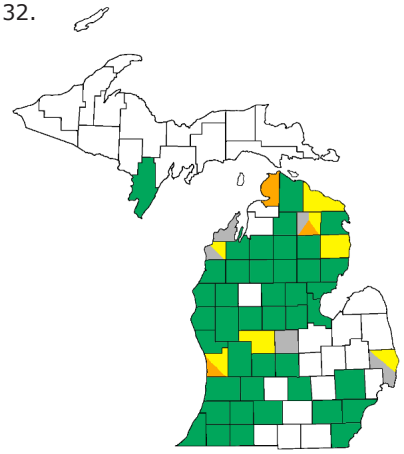
Eastern Milksnake
(*Lampropeltis triangulum*)
Six new records brings the total number of counties from which *L. triangulum* has been found in Michigan to 64. This species is found throughout the LP, and two counties in the UP (Mackinac and Marquette). It is 'missing' from only six counties in the LP, and has been found in counties adjacent to all of these. It may be found throughout the LP where suitable habitat is present.

35.



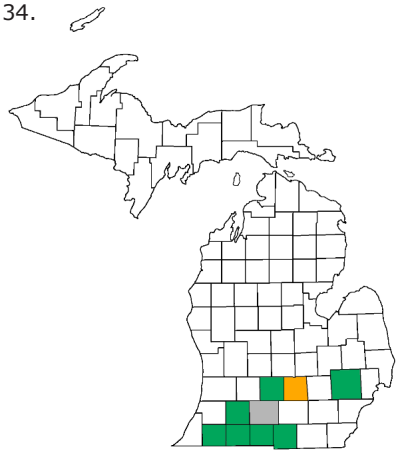
Northern Watersnake
(*Nerodia sipedon*)
Five new records brings the total number of counties from which *N. sipedon* has been found in Michigan to 76. This species is found throughout the LP, only absent from three counties (Bay, Sanilac, Tuscola), and is also found throughout the UP except in a cluster of five counties in the western portion It may occur in adjacent counties where suitable habitat is present.

32.



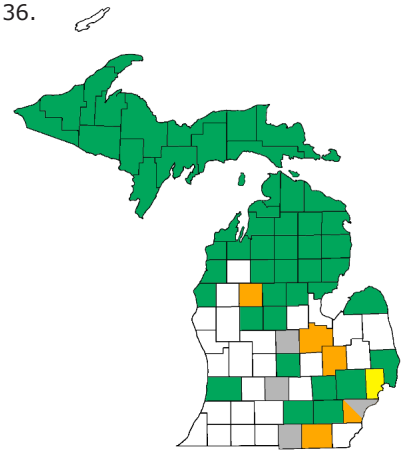
Eastern Hog-nosed Snake
(*Heterodon platirhinos*)
Ten new records brings the total number of counties from which *H. platirhinos* has been found in Michigan to 53. This species occupies a fragmented distribution throughout the LP, and is also found in one county in the UP (Menominee). It may occur in adjacent counties where suitable habitat is present.

34.



Plain-bellied Watersnake
(*Nerodia erythrogaster*)
Two new records brings the total number of counties from which *N. erythrogaster* has been found in Michigan to nine. This species occurs in the southern portion of the LP of Michigan. This species is protected in Michigan and is not common, but may occur in adjacent counties where suitable habitat is present.

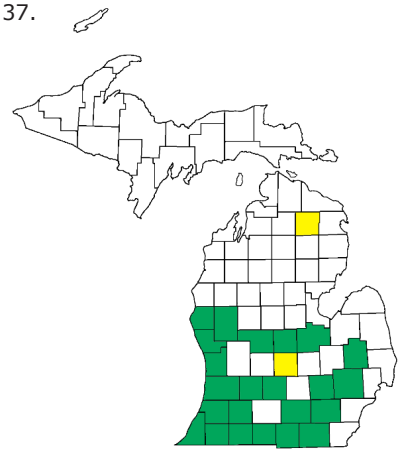
36.



Smooth Greensnake
(*Opheodrys vernalis*)
Nine new records brings the total number of counties from which *O. vernalis* has been found in Michigan to 58. This species is found throughout the UP and northern LP with a scattered distribution in the southern LP. It may occur in adjacent counties where suitable habitat is present.

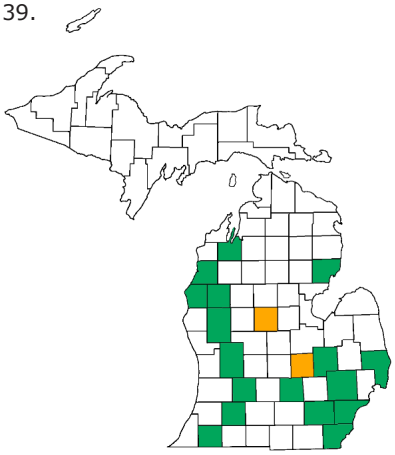
Appendix 5 (continued). The geographic distribution for all 55 species of reptiles and amphibians found in the state of Michigan. Localities are represented at the county level, but four main islands are also included (Beaver, Bois Blanc, Drummond, and Isle Royale), following the methods of Holman (2012). Counties recorded by Holman (2012) are in green, museum vouchers (orange), literature reports (gray) and photographic vouchers (yellow) are differentiated in the maps.

37.



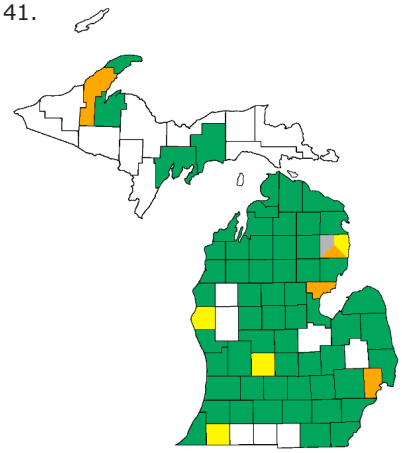
Gray Ratsnake
(*Pantherophis spiloides*)
Two new records (both photo vouchers) brings the total number of counties from which *P. spiloides* has been found in Michigan to 25. This species is found the southern LP, although one new record is in Montmorency County, far north of its known distribution. It may occur in adjacent counties in southern Michigan where suitable habitat is present.

39.



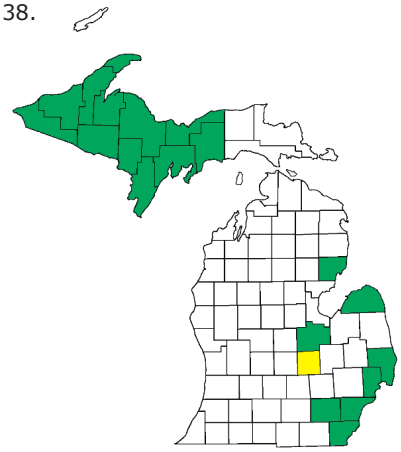
Queen Snake
(*Regina septemvittata*)
Two new records (museum specimens) brings the total number of counties from which *R. septemvittata* has been found in Michigan to 18. This species occupies a fragmented distribution in the LP and may occur in adjacent counties where suitable habitat is present.

41.



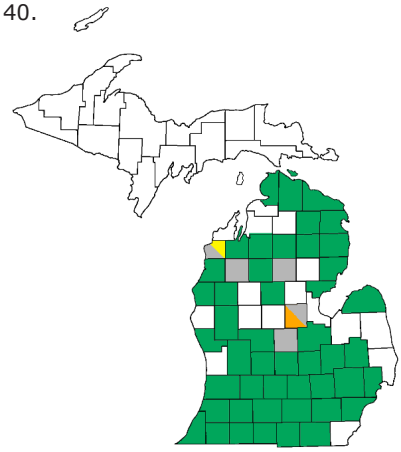
Dekay's Brownsnake
(*Storeria dekayi*)
Seven new records brings the total number of counties from which *S. dekayi* has been found in Michigan to 66. This species occupies a fragmented distribution in the UP and is found in most counties in the LP. *Storeria dekayi* may occur in all counties in the LP where suitable habitat is present.

38.



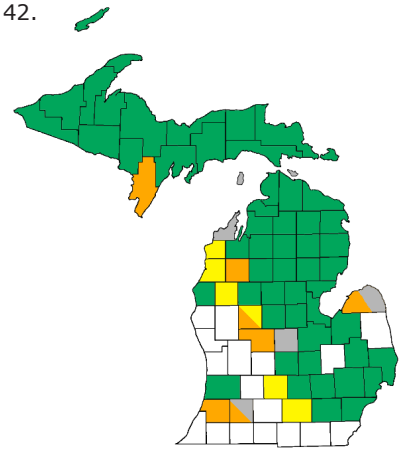
Eastern Foxsnake
(*Pantherophis vulpinus*)
One new record (photo voucher) brings the total number of counties from which *P. vulpinus* has been found in Michigan to 21. This species is found in western/central UP and southeastern LP. It may occur in adjacent counties in southern Michigan where suitable habitat is present. Previously, *P. vulpinus* in Michigan has been considered as two species, but recent work (Crother et al., 2011) suggested that all Michigan foxsnake populations belong to *P. vulpinus*.

40.



Eastern Massasauga
(*Sistrurus catenatus*)
Five new records brings the total number of counties from which *S. catenatus* has been found in Michigan to 53. This species occupies a fragmented distribution in the LP and may occur in adjacent counties where suitable habitat is present. *S. catenatus* is listed as endangered in the State of Michigan. Any observations should be reported to the Michigan Department of Natural Resources.

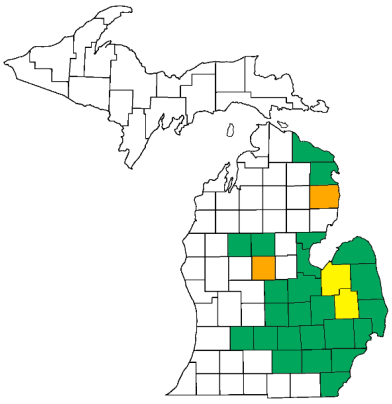
42.



Red-bellied Snake
(*Storeria occipitomaculata*)
Sixteen new records brings the total number of counties from which *S. occipitomaculata* has been found in Michigan to 66 plus all major islands. This species is found throughout the UP and most counties in the LP. *Storeria occipitomaculata* may occur in all counties in the LP where suitable habitat is present, although it is notably absent in the southernmost tier of counties.

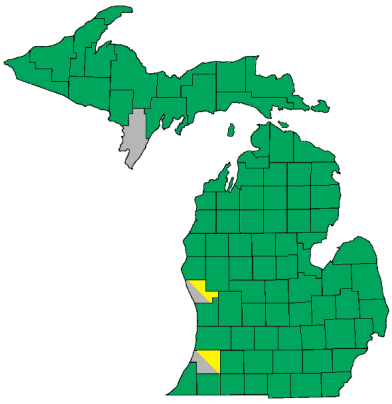
Appendix 5 (continued). The geographic distribution for all 55 species of reptiles and amphibians found in the state of Michigan. Localities are represented at the county level, but four main islands are also included (Beaver, Bois Blanc, Drummond, and Isle Royale), following the methods of Holman (2012). Counties recorded by Holman (2012) are in green, museum vouchers (orange), literature reports (gray) and photographic vouchers (yellow) are differentiated in the maps.

43.



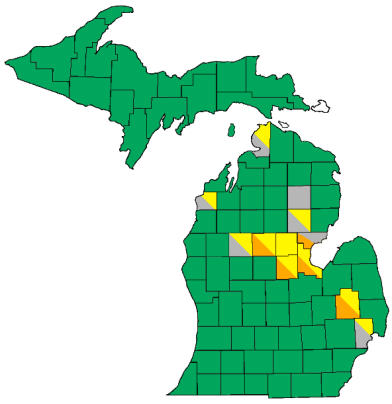
Butler's Gartersnake
(*Thamnophis butleri*)
Four new records brings the total number of counties from which *T. butleri* has been found in Michigan to 28. This species is found only in the eastern and central portions of the LP. *Thamnophis butleri* may occur in adjacent counties where suitable habitat is present.

45.



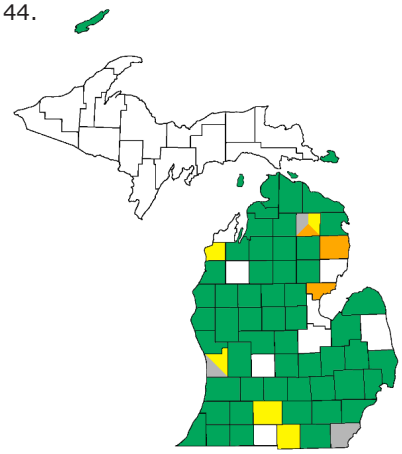
Eastern Gartersnake
(*Thamnophis sirtalis*)
Three new records (from the text of Holman 2012) brings the total number of counties from which *T. sirtalis* has been found in Michigan to 83. The range of this species encompasses every county and major island in Michigan.

47.



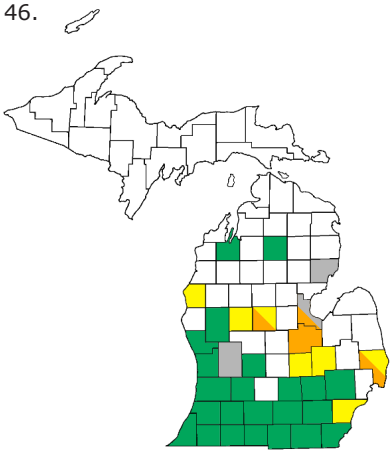
Eastern Snapping Turtle
(*Chelydra serpentina*)
Twelve new records brings the total number of counties from which *C. serpentina* has been found in Michigan to 83 as predicted by Holman (2012). The range of this species encompasses every county and in addition to some islands of the Beaver Archipelago in Lake Michigan.

44.



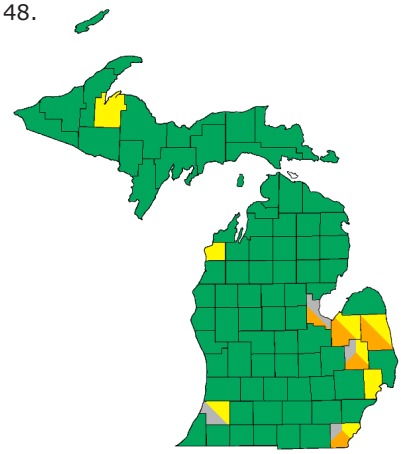
Northern Ribbonsnake
(*Thamnophis sauritus*)
Eight new records brings the total number of counties from which *T. sauritus* has been found in Michigan to 60. This species is found throughout the LP in all but eight counties where it may be found where suitable habitat is present. *Thamnophis sauritus* is also known from all major islands in Michigan, but is unverified from the UP.

46.



Spiny Softshell
(*Apalone spinifera*)
Eleven new records brings the total number of counties from which *A. spinifera* has been found in Michigan to 34. This species is found consistently in the southern LP and occupies a fragmented distribution in the central portion of the state. *Apalone spinifera* may be present in additional counties where suitable habitat is present.

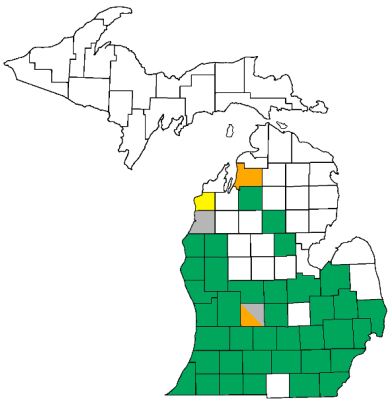
48.



Painted Turtle
(*Chrysemys picta*)
Nine new records brings the total number of counties from which *C. picta* has been found in Michigan to 83 as predicted by Holman (2012). The range of this species encompasses every county and major island in Michigan with the exception of Bois Blanc Island in Lake Huron.

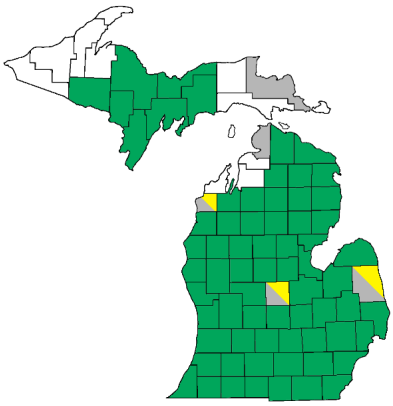
Appendix 5 (continued). The geographic distribution for all 55 species of reptiles and amphibians found in the state of Michigan. Localities are represented at the county level, but four main islands are also included (Beaver, Bois Blanc, Drummond, and Isle Royale), following the methods of Holman (2012). Counties recorded by Holman (2012) are in green, museum vouchers (orange), literature reports (gray) and photographic vouchers (yellow) are differentiated in the maps.

49.



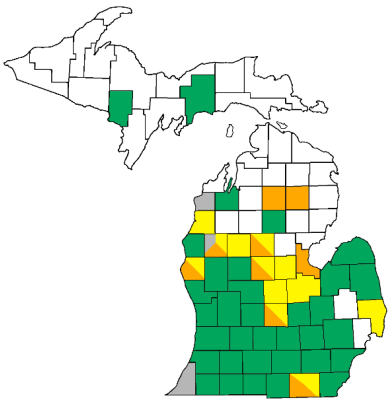
Spotted Turtle
(*Clemmys guttata*)
Four new records brings the total number of counties from which *C. guttata* has been found in Michigan to 42. This species is found consistently in the southern LP and occupies a fragmented distribution in the central portion of the state. *Clemmys guttata* may be present in additional counties where suitable habitat is present, but is protected in the state of Michigan and may prove difficult to find at additional localities.

50.



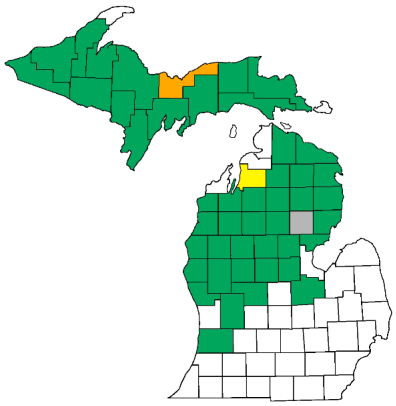
Blanding's Turtle
(*Emydoidea blandingii*)
Five new records brings the total number of counties from which *E. blandingii* has been found in Michigan to 73. This species is found consistently in the LP and central UP. *Emydoidea blandingii* may be present in additional counties where suitable habitat is present, but is protected in the state of Michigan and may prove difficult to find at additional localities.

51.



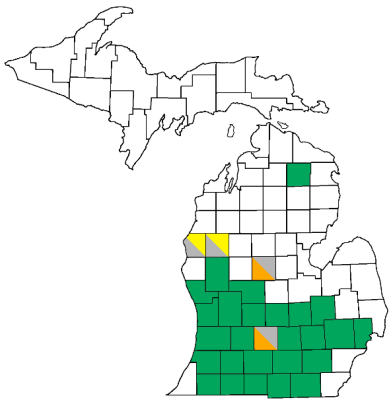
Northern Map Turtle
(*Graptemys geographica*)
Seventeen new records brings the total number of counties from which *G. geographica* has been found in Michigan to 52. The new records move the range in the LP farther north than previously recorded. This species is found consistently in the LP and two counties in central UP. *Graptemys geographica* may be present in additional counties where suitable habitat is present.

52.



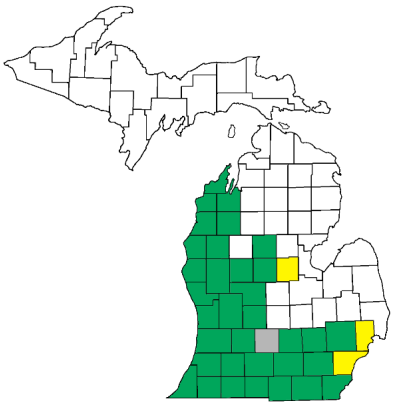
Wood Turtle
(*Glyptemys insculpta*)
Three new records brings the total number of counties from which *G. insculpta* has been found in Michigan to 48. This species is found consistently in the UP and northern LP, but it absent from the southern portions of the state. *G. insculpta* may be present in additional counties where suitable habitat is present, but is protected in the state of Michigan and may prove difficult to find at additional localities.

53.



Eastern Musk Turtle
(*Sternotherus odoratus*)
Four new records brings the total number of counties from which *S. odoratus* has been found in Michigan to 31. This species is found predominantly in the southern LP, but has been recorded in a few northern LP populations and may be present in additional counties where suitable habitat is present.

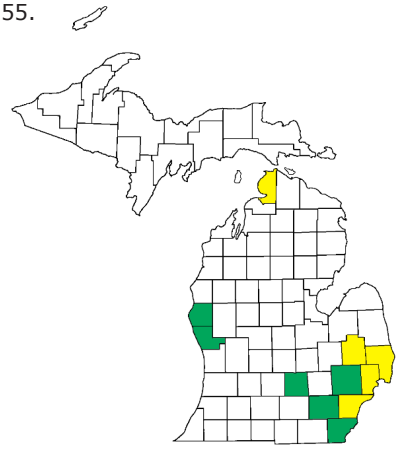
54.



Eastern Box Turtle
(*Terrapene carolina*)
Four new records brings the total number of counties from which *T. carolina* has been found in Michigan to 38. This species is found predominantly in the southern and western counties in the LP. *Terrapene carolina* may be present in additional counties where suitable habitat is present, but is protected in the state of Michigan and may prove difficult to find at additional localities.

Appendix 5 (continued). The geographic distribution for all 55 species of reptiles and amphibians found in the state of Michigan. Localities are represented at the county level, but four main islands are also included (Beaver, Bois Blanc, Drummond, and Isle Royale), following the methods of Holman (2012). Counties recorded by Holman (2012) are in green, museum vouchers (orange), literature reports (gray) and photographic vouchers (yellow) are differentiated in the maps.

55.



Pond Slider
(*Trachemys scripta*)

Five new records (all photo-vouchers) brings the total number of counties from which *T. scripta* has been found in Michigan to 11 BA). This species is found predominantly in the southeastern Michigan, but is nonnative to the state, and may continue to spread northward as it has proved to be a successful invasive species in other areas (Thomas et al. 2010).