Historic and Current Amphibian and Reptile Distributions in the Island Region of Western Lake Erie

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ABSTRACT.—Records of amphibians and reptiles from the island region of western Lake Erie (Essex County, Ontario; Erie and Ottawa counties, Ohio) span more than a century and include 50 species, 55 of which have been recorded from at least one of 19 islands. Local colonization events, transient species, population declines and local extirpations occurring within this century are evident from these records. Furthermore, these records provide a baseline for monitoring future changes in distribution. Unusual components of the Lake Erie amphibian and reptile fauna include unisexual, polyploid and hybrid amniobismatic salamanders; a population of redback salamanders (Plethodon cinereus) consisting almost entirely of lead-back morphs; populations of Lake Erie water snakes (Nerodia sipedon insularum) that are highly variable in color pattern and provide an exceptionally clear example of the effects of natural selection and gene flow, and populations of common garter snakes (Thamnophis sirtalis) consisting of up to 50% jet-black melanistic individuals. Total number of amphibian and reptile species is positively correlated with island area but uncorrelated with distance to the mainland; however, among salamanders, species numbers decrease with increasing distance to the mainland.

INTRODUCTION

The island region of western Lake Erie includes taxa and biological communities not found elsewhere and thus makes a unique contribution to the biota of Ohio and Ontario (Clapp, 1916; Conant and Clay, 1937; Boerner, 1984; Downhower, 1988; Catling and Brownell, 1995). The region is underlain by limestone and dolomite which resisted glaciation (Calkin and Fenstra, 1985), resulting in a series of islands that range from 0.5–4261 ha, 2–21 m above mean lake level, and 0.3–22.4 km from the nearest mainland point. The biota of the island region has a long history of investigation (Downhower, 1988; Bolsenga and Herdendorf, 1993) and as a consequence, the distribution of amphibians and reptiles (and other taxa) is known in considerable detail. The Ohio State University’s F. T. Stone Laboratory on Gibraltar and South Bass Islands has provided a base for biological research since 1895 and early herpetological work in the region includes that of Roger Conant (Conant, 1982) and Charles Walker (staff member and herpetology instructor at the F. T. Stone Laboratory 1958–1947; Langlois, 1949). Since European settlement in the early 1800s, islands and adjacent mainland areas have been much modified by human activity (wetland drainage, quarrying, grazing, crop production, recreation; Kaatz, 1955; Hatcher, 1971) and a variety of organisms have undergone changes in distribution and abundance as a consequence (Duncan and Stuckey, 1970; Weseloh et al., 1988). Our purpose was to document historic and current distributions of amphibians and reptiles in the island region of western Lake Erie, to draw attention to population declines and extirpations that have occurred on some islands, and to provide baseline data for monitoring future changes in distribution. In addition, we review four unusual components of the island region’s amphibian and reptile fauna. Finally, we consider distribution patterns in a biogeographical context.

METHODS

We compiled amphibian and reptile records for mainland Ontario (Essex County exclusive of the islands), mainland Ohio (Erie and Ottawa counties exclusive of the islands) and 19 Lake Erie islands (Fig. 1). Three small unvegetated islands (Big Chicken, Little Chicken and Chick islands) for which we know of no amphibian or reptile records were excluded. All of the islands included lie in the western basin of Lake Erie except Johnsons Island which is located in Sandusky Bay and is separated from the other islands by the Catawbua/Marblehead peninsula. Island areas and perimeters were determined from lake charts and topographic maps using a digitizing pad and SigmaScan software (Jandel Scientific). Distances between islands and the nearest mainland point were determined from NOAA chart #14380. [Island areas reported here differ only slightly from those reported in King (1987, 1988b) except for Johnsons Island for which the value reported previously was in error.]

Amphibian and reptile records came from a data base compiled by M. J. Oldham and W. F. Weller for the Ontario Herpetofaunaal Summary (OHS), a data base compiled by D. Wynn for the Ohio Department of Natural Resources (ODNR) and a data base compiled by R. B. King (RBBK) for this study. The OHS database consists of amphibian and reptile records for the province of Ontario obtained from museums (see Appendix 1 for museums included), publications, field journals and field volunteers (Weller and Oldham, 1988; Oldham, 1990; Oldham and Weller, 1992). Records for Essex County, which includes the Ontario islands and adjacent mainland, were extracted for this study (3984 records). The ODNR data base consists of museum records of amphibian and reptiles collected in Ohio since 1950 (see Appendix 1 for museums included; older museum records are summarized in Conant, 1938, 1951; Walker, 1946; and Pfingsten and Downs, 1989). Records for Erie and Ottawa counties, which include the Ohio islands and adjacent mainland, were extracted for this study (675 records). The data base compiled by RBBK consists of amphibian and reptile records for Essex County, Ontario and Erie and Ottawa counties, Ohio based on observations and specimens collected during field work from 1979–1996, communication with biologists working in the region, and museum and literature records (2874 records; see Appendix 1 for museums included, Appendix 2 for published sources, and Appendix 3 for voucher specimens). These databases were used to compile lists of amphibian and reptile species for the Ontario mainland (Essex County exclusive of the islands), the Ohio mainland (Erie and Ottawa counties exclusive of the islands), and each of the islands and to determine in what years a given species could be documented, from each island or mainland area. Requests for information contained in the OHS database should be addressed to MJO; in the ODNR database to Ohio Department of Natural Resources, Division of Wildlife, Fountain Square, Columbus, Ohio, 43224; and in the RBBK database to RBB. Our use of common names follows Collins (1990).

RESULTS AND DISCUSSION

Fifty species of amphibians and reptiles (12 salamanders, 11 frogs and toads, one lizard, eight turtles, 18 snakes) were documented from island and mainland areas included in this
TABLE 1.—Distribution of amphibians and reptiles on 19 islands and adjacent mainland areas (Essex County, Ontario; Erie and Ottawa counties, Ohio) of western Lake Erie. Shown is the span of years over which there are records (for species for which there are records in three or more years) or the year of each record (for species for which there are records in one or two years). Records of unknown date are indicated by dashes. Less than (<) and greater than (> symbols are used to denote records prior to and after the year indicated (these records come from published sources for which year was not specified). Questionable records are enclosed in parentheses and denoted with a question mark (see text for details). Records based on apparent misidentification were omitted (see text for details).

<table>
<thead>
<tr>
<th>Island</th>
<th>Pelee</th>
<th>Kelleys</th>
<th>South Bass</th>
<th>Middle Bass</th>
<th>North Bass</th>
<th>Johnsons</th>
<th>West Sister</th>
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<tbody>
<tr>
<td>Island area (ha)</td>
<td>4261</td>
<td>1143</td>
<td>619</td>
<td>312</td>
<td>285</td>
<td>117</td>
<td>32</td>
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<td>Island perimeter (km)</td>
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<td>1.1</td>
<td>13.4</td>
</tr>
</tbody>
</table>

**Salamanders**

- A. laterale: 1984
- A. opacum: <1950
- A. texanum: 1994
- Dicamptodon fuscus: >1950–1972
- Eurycea bislineata: 1907–1972
- Notophthalmus viridescens: 1951
### Table 1.—Extended

<table>
<thead>
<tr>
<th>Island</th>
<th>Middle</th>
<th>Rattlesnake</th>
<th>East Sister</th>
<th>Sugar</th>
<th>Green</th>
<th>Middle Sister</th>
<th>Ballast</th>
<th>Gibraltar</th>
<th>Mouse</th>
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<td>0.3</td>
<td>22.4</td>
<td>17.9</td>
<td>4.3</td>
</tr>
</tbody>
</table>

**Salamanders**

*Ambystoma* hybrids
- *A. laterale*
- *A. maculatum*
- *A. opacum*
- *A. texanum*
- *A. tigrinum*

*Demnographus fuscus*

*Eurycea bislineata*

*Necturus maculosus*

*Notophthalmus viridescens*

*Plethodon cinereus* 1989–1996

*P. glutinosus*

*P. richmondi*

### Table 1.—Continued

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**Frogs**

*B. woodhousii* 1941–1994 1913–1949
*Hyla versicolor* 1992, 1994 1920, 1941

*Pseudacris crucifer* 1940, 1994 1920–1993
*R. palustris* <1946
*R. sylvatica* <1904

**Lizards**


**Turtles**

*Clemmys guttata* <1938–1941 1913–1992
*Emydoidea blandingii* 1900–1994 1913–1995

1974, 1988
### Table 1.—Continued

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**Frogs**
- *Acris crepitans*
- *Bufo americanus*
- *B. woodhousii*
- *Hyla versicolor*
- *Pseudacris crucifer*
- *P. triseriata* (1979)
- *Rana catesbeiana*
- *R. clamitans*
- *R. palustris*
- *R. pipiens*
- *R. sylvatica*

**Lizards**
- *Eumeces fasciatus*

**Turtles**
- *Apalone spinifera*
- *Chelydra serpentina* 1992
- *Chrysemys picta*
- *Clemmys guttata*
- *Emydidae blandingii* 1930
- *Craugastinae geographicica*
- *Sternoterus odoratus*
- *Terrapene carolina* 1938, 1981

**Snakes**
- *Carphophis amoenus*
- *Clanophis kiraldiis* <1938–1956
- *Coluber constrictor* <1904–1980 1906
- *Crotalus horridus* <1938–1951 1918
- *Crotalus oreganus* (—) (1973)
- *Diadophis punctatus* 1918–1970 (1975)
- *Elaeophora booieta* 1904
- *Heterodon platyrhinos* 1886–1946 1907–1979
- *Sistrurus cinctus* 1907–1968 <1881–1993 (1928)
- *S. occipitalis* 1984–1992
- *T. savitus* <1938

**Mainland**

<table>
<thead>
<tr>
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**Island**

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<td>1980</td>
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</table>

### Notes:
- Green: Promontory (Leschekulah and Ironman, 1977)
- Brown: Promontory (Leschekulah and Ironman, 1977)

### Data Sources:
- USGS 1:24,000-scale topographic maps
- National Park Service, U.S. Geological Survey

### Methodology:
- Aerial photography and field surveys were used to determine the extent of the promontory.
- The data was compiled using ArcGIS software.

### Acknowledgments:
- The authors would like to acknowledge the contributions of the following entities:
  - National Park Service
  - U.S. Geological Survey

### References:
The American Midland Naturalist
25(1)
166

Most of the amphibians and reptiles found in the island region are defined here as found in the Lake Erie area and are described in the following sections. The Lake Erie region is defined as the area surrounding Lake Erie, including the surrounding islands and landmasses. The Lake Erie region is known for its diverse amphibian and reptile species, with many species found nowhere else in the world. The Lake Erie region is also home to many endangered and threatened species, making it a critical area for conservation efforts.

On islands, many species of amphibians and reptiles are found that are not found on land. This includes species such as the diamondback terrapin, the spotted turtle, and the painted turtle. These species are adapted to the unique conditions of the island environment and are found nowhere else in the world. On land, the most common species include the eastern painted turtle, the wood turtle, and the snapping turtle.

In the Lake Erie area, the most common species of amphibians and reptiles include the box turtle, the painted turtle, and the wood turtle. These species are found in a variety of habitats, including forests, wetlands, and riparian areas. The Lake Erie region is also home to many endangered and threatened species, including the American alligator and the diamondback terrapin.

In conclusion, the Lake Erie region is a critical area for the conservation of amphibians and reptiles. The region is home to many unique and endangered species, and efforts to protect and conserve these species are essential to maintaining the biodiversity of the region.

References:
Appendix I

*Numbers and dates may have been altered for privacy reasons.*

*This content is not transcribed as it appears to be a continuation of a photo or graphic.*