

Notes and Discussion Piece

Status and Distribution of the Least Darter (*Etheostoma microperca* Jordan and Gilbert) in Ohio: A State Listed Species of Concern

ABSTRACT.—Up to date research on the historical and current distribution of the least darter (*Etheostoma microperca*) in Ohio is not available, despite its status as a Species of Concern. Using a dataset of 229 recorded occurrences, we compared 20th and 21st century presence/ absence of least darter in Ohio to detect changes in distribution and evaluate the need for conservation measures. We added 11 recent surveys for streams that lacked 21st century data. Before 2000 the least darter was known from 44 streams in 18 counties across the glaciated portion of Ohio. This decreased to 37 streams in 14 counties in surveys from 2000 to 2013 considering only temporally spaced collections (*e.g.*, at least two collections per location – one from the 20th and one from the 21st century). Two streams added *E. microperca* populations since 2000. However, in spite of continued monitoring, nine streams lost populations including the disappearance from counties in its Northeastern Ohio range. Farm ditches with ample vegetation were common locations where least darters were encountered. Because least darters are associated with vegetated habitat throughout their life history, such ditches may serve as important habitat for this species if plant communities are maintained. *E. microperca* remains vulnerable in Ohio, and we recommend continued monitoring.

INTRODUCTION

The least darter (*Etheostoma microperca* Jordan and Gilbert) is a small North American darter species growing to a mere 4.4 cm in length as adults with a flattened body, rounded snout, and large eyes (Burr and Page, 1979). It is olive brown above and white to yellow on the underside with prominent dark blotches along the sides and a well-defined black line that runs through the snout and eyes. Breeding males have orange anal and pelvic fins. Their diet consists of small crustaceans and other aquatic invertebrates (Burr and Page, 1979). Occurrence and abundance of the least darter declined during the latter half of the 20th century in portions of its native range throughout the Great Lakes region (Johnson and Hatch, 1991) and its conservation status varies greatly by state. It is listed as endangered in Iowa (IAC, 2015), of special concern in Arkansas (AGFC, 2013), and rare or uncommon in Wisconsin (WNHI, 2014). NatureServe (2015) lists the species as extirpated from Kentucky, imperiled in Illinois and Missouri, rare or uncommon in Minnesota and Oklahoma and secure in Michigan and Indiana.

In spite of its conservation status, little ecological research has been published on *E. microperca*. In Ohio published papers on the historical and current distribution of the least darter are scarce notwithstanding its listing as a State Species of Concern. A species of concern is defined as a species or subspecies which might become threatened under continued or increased stress or for which information is insufficient to permit an adequate status evaluation (ODNR, 2012).

Knowing the habitat preferences of *E. microperca* is essential in evaluating its current status in Ohio. Still or slow moving water and dense aquatic vegetation are the two most cited habitat features for least darters (Table 1). In fact *E. microperca* has a strong association with aquatic vegetation throughout its entire life history (Cudmore-Vokey and Minns, 2002) and is thought to have been abundant in prairie type stream habitat before extensive ditching, dredging, and draining of such streams (Trautman, 1981). Sand, silt, organic debris, and gravel substrates are also frequently documented from lakes and streams containing populations of *E. microperca* (*ibid.*). During the breeding season adults are more abundant in calm, heavily weeded shallow waters (Johnson and Hatch, 1991). Males defend small territories of about 30 cm in diameter from other males. Females spawn on aquatic plants or on organic debris and the eggs are not guarded during incubation (Petrevic, 1936).

We recently collected least darters in the Ottawa River (Lucas Co.) on the University of Toledo main campus. This stimulated our review of current and past Ohio distributions. Here, we compare the 20th and early 21st century distributions of the least darter in Ohio using a vouchered dataset from the Ohio State University Fish Division (OSUFD, 2014). Our goal was to document changes in distribution of this species in Ohio and evaluate the need for conservation measures and a management plan.

TABLE 1.—Preferred habitat characteristics of *E. microperca* from published studies

Publication	Year	Location	<i>E. microperca</i> habitat description
Petravicz	1936	Wayne County, Michigan	Slow moving water containing aquatic vegetation and sand or gravel substrate.
Burr and Page	1979	Iroquois County, Illinois	Submerged vegetation and filamentous algae, “quiet” water and overhanging banks, low gradient streams with muck, sand, or gravel substrates.
Scott and Crossman	1979	Ontario, Canada	Quiet, vegetated “pothole” lakes and slow moving streams with dense aquatic vegetation and muddy substrate.
Trautman	1981	Ohio	Lakes and streams containing dense aquatic vegetation and filamentous algae, clear water, low gradient, muck, debris, sand or gravel substrates.
Becker	1983	Wisconsin	Ponds, lakes and streams with clear shallow water, dense vegetation or filamentous algae and substrates of sand, gravel, silt, mud, boulders, or clay.
Johnson and Hatch	1991	Becker County, Minnesota	Dense aquatic vegetation, slow moving water, with silt, sand, and organic substrates.
Cudmore-Vokey and Minns	2002	Lake Ontario	Highly associated with vegetation throughout their entire life history
Hargrave and Johnson	2003	Northwestern Arkansas	Pools or stream margins possessing dense aquatic vegetation and substrates comprised of sand, silt, gravel, or detritus.
Hubbs <i>et al.</i>	2004	Great Lakes Region	Dense aquatic vegetation and quiet waters.
Crail <i>et al.</i>	2011	Fulton and Lucas Counties, Ohio	Agricultural ditches and streams with aquatic vegetation.

METHODS

We used a dataset consisting of 280 recorded least darter vouchers and field collections in Ohio, Michigan, Missouri, and Indiana available from the OSUFD (2014). This dataset contained presence/absence records from the Ohio State University, Ohio Environmental Protection Agency, and the Ohio River Valley Sanitation Commission ranging from 1927 to 2013. It included location (stream, county), collection date, and method (seine and electrofishing). It did not include habitat information or fish abundance per unit area. All non Ohio and nongeoreferenced records were removed for our analysis resulting in 229 remaining records. The complete dataset was divided into two parts; 113 records from 1927 to 1999 (20th century records) and 116 records from 2000 to 2013 (early 21st century records). We focused on temporally spaced collections from each stream (at least one collection from the 20th and one from the 21st century) and recorded changes in presence/absence from these repeated collections. To strengthen the dataset, we made collections in all 11 streams with existing 20th century records but no 21st century survey. This sampling was carried out in December of 2014 and the collections were added to the OSUFD. We assumed this database provided a reasonable reflection of the historical and recent distribution of least darters in Ohio.

RESULTS AND DISCUSSION

20TH CENTURY DISTRIBUTION

Before 2000 the OSUFD revealed least darter presence across western and central Ohio in 44 low gradient streams and sheltered vegetated lakes in 18 counties considering only temporally spaced collections (Table 2). Populations were present in the Auglaize basin, Little Miami River, Scioto River, Deer Creek, as

TABLE 2.—Locations, Ohio counties and least darter presence/absence during 20th and early 21st century field collections (✓=found; ✗=not found, 0=no collection data available)

Location	Ohio county	20th century	Early 21st century
Auglaize River	Allen	+	+
Camp Creek	Allen	-	+
Cranberry Run	Allen	0	+
Riley Creek	Allen	+	+
Blackhoof Creek	Auglaize	0	+
Dry Run	Auglaize	0	+
Huffman Creek	Auglaize	+	+
Virginia Creek	Auglaize	0	+
Wrestle Creek	Auglaize	0	+
Brush Lake	Champaign	+	+
Lake Run	Champaign	0	+
Proctor Run	Champaign	0	+
Spring Fork	Champaign	+	+
Gilroy Ditch	Clark	+	+
Lisbon Fork	Clark	+	+
Little Miami River	Clark	+	+
Bridge Creek	Darke	+	+
Grays Branch	Darke	+	+
Greenville Creek	Darke	+	+
Harris Run	Darke	+	+
Lake Branch Ditch	Darke	+	+
McQuay Ditch	Darke	+	+
Millers Fork	Darke	+	+
Mississinewa River	Darke	+	+
Spring Branch	Darke	+	+
Twin Creek	Darke	+	+
Scioto River	Delaware	+	+
Cold Creek	Erie	+	-
Compton Creek	Fayette	0	+
Maple Grove Creek	Fayette	0	+
Paint Creek	Fayette	+	+
Rattlesnake Creek	Fayette	+	+
Braden Lake	Logan	+	+
Doke Lake	Logan	+	+
Lemen Lake	Logan	+	+
Newell Lake	Logan	+	+
Heldman Ditch	Lucas	-	+
Ten Mile Creek/Ottawa River	Lucas	+	+
Tenmile Creek	Lucas	+	+
Barron Creek	Madison	0	+
Bradford Creek	Madison	+	+
Deer Creek	Madison	+	-
Big/Little Darby creeks	Madison	+	+
Mud Run	Madison	+	+
Phifer Ditch	Madison	0	+
Vallery Ditch	Madison	0	+
William Cathart Ditch	Madison	0	+
Ballinger Run	Miami	+	-
Bennett Ditch	Miami	+	-
Sigmon Ditch	Miami	+	+
Silver Lake	Miami	+	-
Spring Creek	Miami	+	-
Trotters Creek	Miami	0	+
Yellowbud Creek	Pickaway	+	+
Dry Fork	Preble	0	+
Lesley Run	Preble	+	+
Swamp Creek	Preble	+	+
Ninemile Creek	Shelby	+	+
Turkeyfoot Lake	Summit	+	-
Nettle Lake	Williams	+	-
Sycamore Creek	Wyandot	+	-

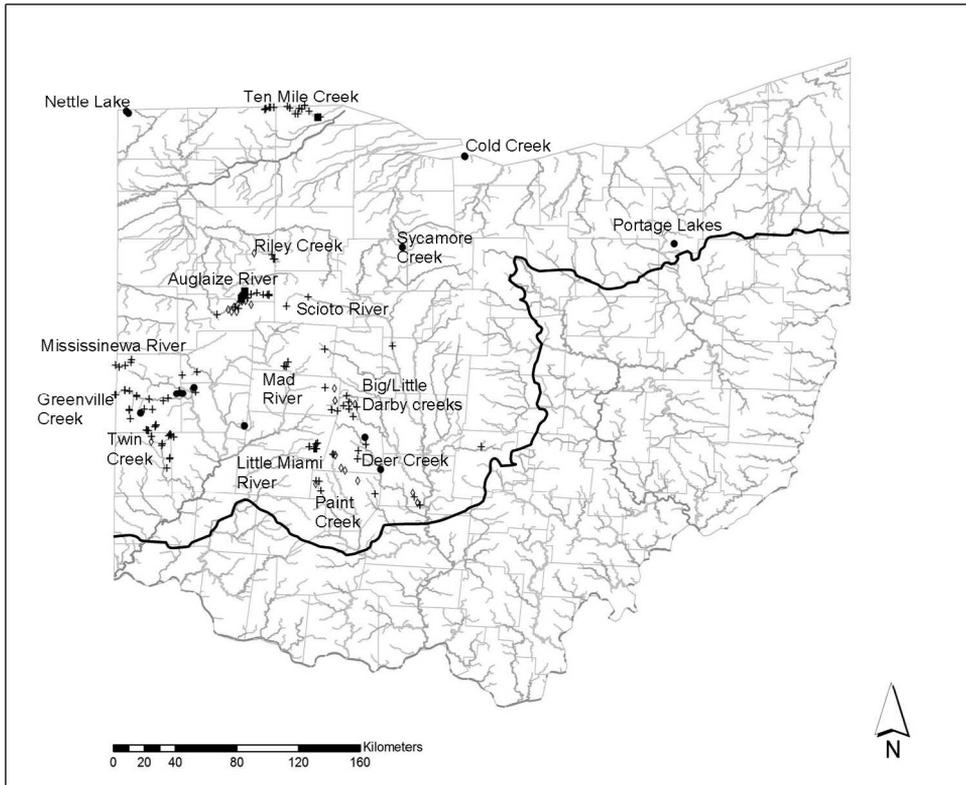


FIG. 1.—Records of least darter (*Etheostoma microperca*) in Ohio from 229 field collections and vouchers from 1927 to 2013 (OSUFD, 2014). Circles identify locations where the least darter was found in the 20th but not the 21st century. Squares represent locations where least darter was found in the 21st but not the 20th century. Plus signs show locations where least darter were collected in both centuries. Diamonds represent locations where least darter was collected in the 21st century but no collection records exist from the 20th century. The black line represents the maximum extent of the Wisconsin ground moraines (Ohio Division of Geological Survey, 2005). Single locations listed in Table 2 may be represented by multiple data points on this map indicating multiple records of least darter from those locations

well as Greenville Creek, Twin Creek and the Mississinewa River near the Indiana border (Fig. 1). We noted collections from kettle lakes including Braden, Doke, and Lemen lakes near Bellefontaine (Ohio) in the Great Miami River watershed, in the Sandusky watershed, as well as in the Portage Lakes in the Tuscarawas watershed South of Akron. These areas are all located within the glaciated regions of Ohio (Fig. 1). Following glacial retreat, these areas contained kettle lakes, prairies, and rivers filled with nutrient rich sediment. Streams in these regions exhibited low flow, abundant aquatic vegetation, and firm substrates dominated by sand, gravel, and some silt (Trautman, 1981). These habitat conditions allowed the least darter to persist, as the densely vegetated, low flow qualities of the prairie habitat appear necessary for its successful reproduction (Petraevicz, 1936; Burr and Page, 1979).

EARLY 21ST CENTURY DISTRIBUTION

Since 2000 *E. microperca* has been documented in 37 low gradient streams and sheltered vegetated lakes in 14 Ohio counties, not considering the 15 new sites without a pre-2000 matching sample (Table 2). Populations remained present in the Auglaize basin, Little Miami River, the Scioto River drainage,

Deer Creek, as well as Greenville Creek, Twin Creek and the Mississinewa River near the Indiana border. The least darter also maintained its presence in the kettle lakes near Bellefontaine (Ohio) in the upper reaches of the Great Miami River watershed (Fig. 1). Some populations in the northern portion of its Ohio range became extirpated (Fig. 1). For example populations in Nettle Creek (Williams Co.), Sycamore and Cold creeks (Greater Sandusky Basin), and in the Portage Lakes region (Summit Co.) are no longer present despite repeated sampling at those locations over the last ten years. These streams were sampled an average of four times since 2000 (OSUFD, 2014). In Cold Creek the disappearance of least darter may be due to predation from various trout species stocked for sport fishing purposes. With some exceptions (*e.g.*, Long Lake), the Portage Lakes exhibit patchy areas of submerged vegetation with a sandy substrate (Zimmerman, field observations), a habitat less suited for *E. microperca* than dense aquatic vegetation and plant debris. Remarkably, the Iowa darter (*Etheostoma exile*), endangered in Ohio and with some overlapping habitat preferences with *E. microperca* (Becker, 1983), persists in several of these lakes (*e.g.*, Turkeyfoot Lake, Mud Lake) and seems to favor this patchy vegetation and sandy substrate (Zimmerman, field observations).

It is unclear why the least darter is no longer present in the Sandusky River basin. We speculate frequent dredging and plant removal from rural streams may contribute to localized extirpation of least darter populations. Agricultural ditches, for example, are rarely managed as fish habitat but reduced frequency of dredging and plant removal, while maintaining their drainage function, may restore habitat qualities necessary to support least darter populations (Smiley *et al.*, 2008; Crail *et al.*, 2011). In a 2008–2011 survey of fish communities in farm streams in the greater Sandusky River basin (Becher and Gottgens, 2012; Selden, 2013), we identified such ditches with a low frequency of dredging (less than once every 5 y) and sufficient plant cover and substrate firmness. Even though several of these sites contained fish assemblages characteristic of wet prairie streams (*sensu* Trautman, 1981), no least darters were encountered among the nearly 40,000 fish that were sampled, identified and returned to these streams during our surveys. On the other hand, our group recorded 1615 least darters, including gravid females, within headwater ditches of the Ten Mile Creek/Ottawa River drainage (Crail *et al.*, 2011). Ditches in that drainage that were characterized by plants colonizing the sides and channel of the stream contained 71% of those least darters (*ibid.*). Downstream from these ditches, we also found *E. microperca* in the Ottawa River on the University of Toledo main campus in 2010 after the last remaining dam was removed from this river in late 2007.

CONCLUSION

Etheostoma microperca remains vulnerable in Ohio. Before 2000 it was recorded in 18 Ohio counties. After 2000, with 15 additional sampling locations in the database, only 14 counties contained least darter populations. Considering only temporally spaced collections, 35 sites had least darters in both the 20th and 21st century collections (no change), in nine locations the species was no longer found in the post 2000 records (decreasing) and in two locations they were found in the 21st but not in the 20th century samples (increasing). Agricultural streams, if comanaged for drainage and biological conservation, may develop habitat characteristics beneficial for sustaining the least darter. Continued removal of dams may also allow for expansion of *E. microperca* range in Ohio. Given its status, we recommend continued monitoring of least darter's distribution and available habitat.

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LITERATURE CITED

- AGFC. 2013. Arkansas endangered, threatened, and species of special concern. Arkansas Game and Fish Commission. www.agfc.com/licenses/Documents/SpecialConcernSpecies.pdf
- BECHER, C. AND J. F. GOTTGENS. 2012. The impact of dredging on heterogeneity and fish communities in agricultural streams of the greater Sandusky River watershed, Ohio. *Proc. 2012 National Conference Undergraduate Research, Ogden, Utah*, 578–583.

- BECKER, G. C. 1983. Fishes of Wisconsin. University of Wisconsin Press, Wisconsin. 1052 p.
- BURR, B. M. AND L. PAGE. 1979. The life history of the Least darter, *Etheostoma microperca*, in the Iroquois river, Illinois. Illinois Institute of Natural Resources Natural History Survey Division. 15 p.
- CRAIL, T. D., J. F. GOTTGENS, AND A. KRAUSE. 2011. Fish community response to evolving channel complexity in an agricultural headwater system. *J. Soil Water Cons.*, **66**:295–302.
- CUDMORE-VOKEY, B. AND C.K. MINNS. 2002. Reproductive ecology and vegetation association databases of Lake Ontario fishes. Fisheries and Oceans Canada, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Burlington ON. Canadian Manuscript Report of Fisheries and Aquatic Sciences No. 2607.
- HARGRAVE, C. W. AND J. JOHNSON. 2003. Status of Arkansas Darter, *Etheostoma cragini*, and Least Darter, *E. microperca*, in Arkansas. *Southw. Nat.*, **48**:89–92.
- HUBBS, C. L., K. F. LAGLER, AND G. R. SMITH. 2004. Fishes of the Great Lakes region revised edition. University of Michigan Press, Michigan. 201 p.
- IAC. 2015. Iowa Administrative Code, Natural Resources Commission 571.77.2. www.legis.iowa.gov/law/administrativeRules/chapters?agency=571&pubDate=05-27-2015
- JOHNSON, J. D. AND J. HATCH. 1991. Life history of the Least Darter, *Etheostoma microperca*, at the northwestern limits of its range. *Am. Midl. Nat.*, **125**:87–103.
- NATURESERVE. 2015. NatureServe Explorer database on species and ecological community data. <http://explorer.natureserve.org> (updated 2015).
- ODNR. 2012. Wildlife that are considered to be endangered, threatened, species of concern, special interest, extirpated, or extinct in Ohio. Ohio Department of Natural Resources, Division of Wildlife. Publication 5356. 10 p.
- OHIO DIVISION OF GEOLOGICAL SURVEY. 2005. Glacial Map of Ohio. Ohio Department of Natural Resources, Division of Geological Survey. 2 p.
- OSUFD. 2014. Ohio State University Division of Fishes. OSU Fish Division Database. 1315 Kinnear Road, Columbus, Ohio. <http://osuc.biosci.ohio-state.edu/Fishes/>.
- PETRAVICZ, J. 1936. The breeding habits of the least darter, *Microperca punctulata* (Putnam). *Copeia*, **1936**:77–82.
- SCOTT, W. B. AND E. CROSSMAN. 1979. Freshwater fishes of Canada. Bryant Press Limited. Stevenson, J. C., D. G. Cook and L. Smith (eds.). Fisheries Research Board of Canada, Ottawa. 966 p.
- SELDEN, J. 2013. The effect of dredging on fish communities in agricultural streams in Crawford, Sandusky and Seneca counties of Ohio. M.S. thesis, Department of Environmental Sciences, University of Toledo, Ohio. 110 p.
- SMILEY, P. C., R. B. GILLESPIE, K. W. KING, AND C. HUANG. 2008. Contribution of habitat and water quality to the integrity of fish communities in agricultural drainage ditches. *J. Soil Water Cons.*, **63**:218A–219A.
- TRAUTMAN, M. B. 1981. The fishes of Ohio. Ohio State University Press, Columbus. 782 p.
- WNHI. 2014. Wisconsin Natural Heritage Inventory. <http://dnr.wi.gov/topic/NHI/WList.html>.
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