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Summary of Previous and New Records of the Arkansas Darter (*Etheostoma cragini*) in Arkansas

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Abstract

The Arkansas Darter, *Etheostoma cragini*, has an extremely limited distribution in Arkansas and is designated as a candidate for listing under the federal Endangered Species Act. It was first documented in the state in 1979 in Wilson Spring near Fayetteville. Between 1979 and 1985 it was collected in 4 additional headwater streams in Benton and Washington counties. A 1997 study documented the persistence of the species in 3 of the 5 historic streams, but 1 stream yielded only a single individual. A 2004-2005 study reassessed the status of the 5 historically known populations and searched broadly for new populations, documenting *E. cragini* at 15 sites, all within a 2-km radius of historic sites. In 2010-2011, more concentrated sampling efforts were made in the sub-basins with prior records of the species. These efforts documented populations at 13 additional sites, greatly improving the resolution of the distribution of this species within Arkansas.

Introduction

The Arkansas Darter, *Etheostoma cragini*, was originally described from a site near Garden City, Kansas (Gilbert 1885). It inhabits small spring-fed tributaries of the Arkansas River basin in Colorado (Beckman 1970), Kansas (Cross and Collins 1995), Oklahoma (Miller and Robison 2004), Missouri (Pflieger 1997), and Arkansas (Robison and Buchanan 1988). It is rare in Arkansas and is of special concern due to its limited habitat in the state (Robison and Buchanan 1988). Past collections have documented this species in 4 areas. We made more concentrated searches in and around these areas, discovering populations in additional streams within the 4 areas and in additional streams nearby.

Methods

ESRI ArcMap™ geographic information system software and ground reconnaissance with local landowners were used to identify spring run habitats within the sub-basins where *E. cragini* had previously been documented. After receiving landowner permission, these habitats were sampled by using 1/3-m, 1/8-inch mesh dip-nets. One hundred eight sites were sampled between November 2009 and March 2011. Sampling by 2 to 4 netters was focused on aquatic vegetation, submerged terrestrial vegetation, undercut banks, and backwater areas with fine substrate deposits, where *E. cragini* individuals are typically encountered based on our past experience. When specimens of *E. cragini* were collected in areas likely to represent new populations, 1 to 3 voucher specimens were preserved in 10% formalin. Vouchers have been or will be deposited in the collections of the University of Arkansas – Fort Smith or Arkansas Game and Fish Commission – Nongame Aquatics Program.

The small watercourses where *E. cragini* occurs are often unnamed and not marked on published maps, making relocation of some historic sites problematic. Geographic positioning system (GPS) devices now provide more accurate location designations. We have included GPS locations in decimal degrees, North American Datum 1927, for all locations where we collected *E. cragini*.

Results

We summarize collections from all major studies of *E. cragini* in Arkansas and several new discoveries to provide a comprehensive look at distribution of the species in the state (Figure 1).

The first known occurrence of *E. cragini* in Arkansas was based on the collection of 5 specimens in 1979 from what is now known as Wilson Spring in northwestern Fayetteville (Harris and Smith 1985).

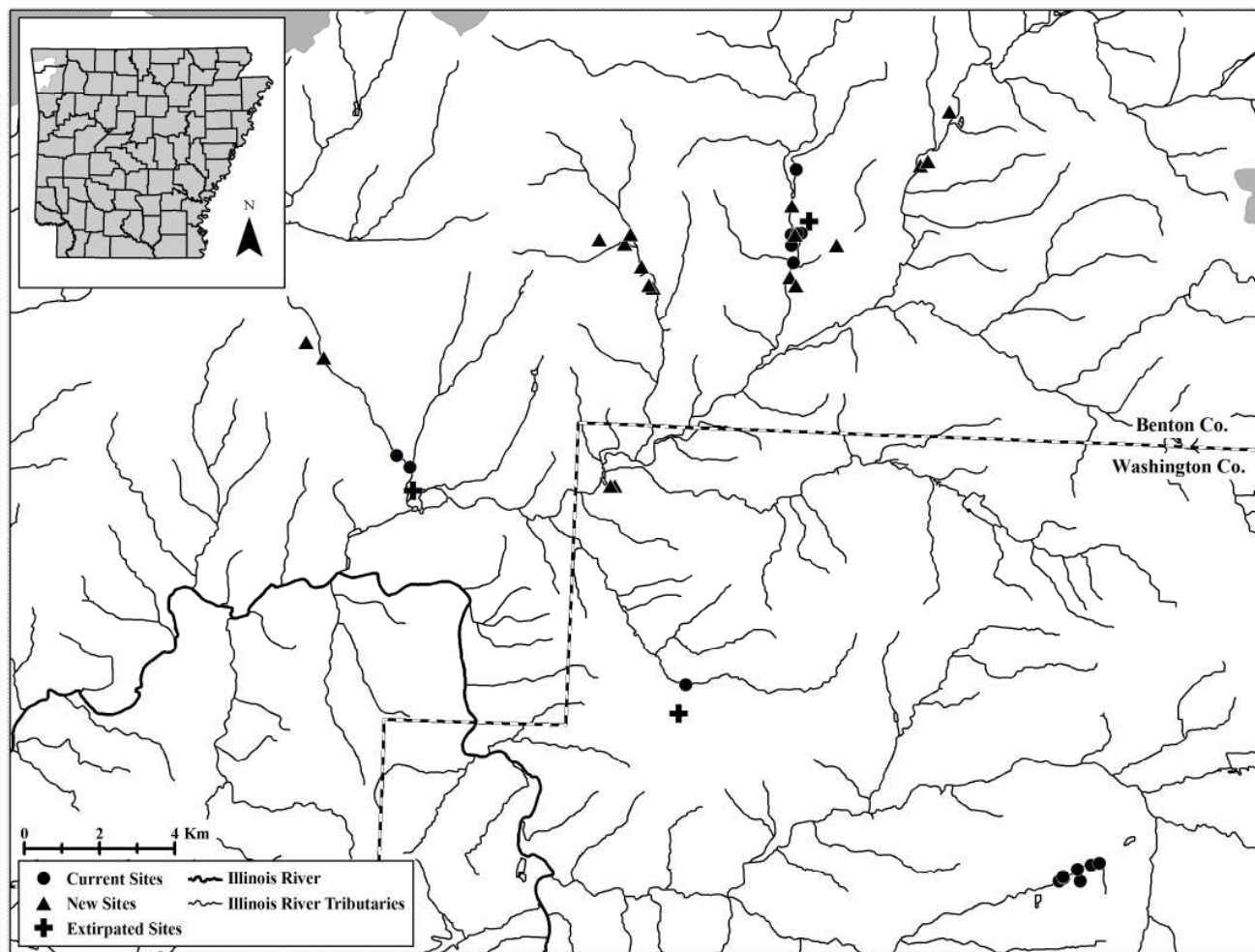
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Figure 1: Map of Benton and Washington counties, Arkansas, depicting all sites where *Etheostoma cragini* has been collected. Current sites were documented prior to this study. Adjacent sites connected by occupied habitat are a single “population.”

Intensive sampling in 1997 for a mark-recapture population estimate (Hargrave 1998, Hargrave and Johnson 2003) captured 207 specimens from this spring. Extensive sampling in 2004 yielded 60 specimens, confirming the species’ presence in Wilson Spring; in Clabber Creek downstream of Wilson Spring to the beginning of a broad, deep, channelized section; in the lower end of a spring run entering from the opposite side of the creek; upstream in the creek at least to the Interstate Highway 530 crossing; and throughout a drainage ditch flowing into the creek upstream of Arkansas Highway 112 (Wagner and Kottmyer 2006).

- Washington County: Unnamed spring run at junction of Arkansas Highway 112 and U.S. Highway 71 bypass in Fayetteville (T17N R30W

sec. 33), 19 March 1979, 5 specimens uncatalogued (Harris and Smith 1985).

- Washington County: Wilson Spring run at junction of Arkansas Highway 112 and U.S. Highway 71 bypass in Fayetteville (T17N R30W sec. 33 NW), 19 October 1997, 207 released alive (Hargrave 1998, Hargrave and Johnson 2003).
- Washington County: Wilson Spring run at junction of Arkansas Highway 112 and U.S. Highway 71 bypass in Fayetteville (T17N R30W sec. 33 NW, 36.10677 N 94.18809 W), 9 April 2004, 6 released alive (Wagner and Kottmyer 2006), 2 November 2009, 5 released alive.
- Washington County: Clabber Creek near junction of Arkansas Highway 112 and U.S. Highway 71 bypass in Fayetteville (T17N R30W sec. 33 NW, 36.10603 N 94.18950 W), 9 April 2004, 18

released alive (Wagner and Kottmyer 2006), 2 November 2009, 9 released alive.

- Washington County: Clabber Creek behind Landers Auto near junction of Arkansas Highway 112 and U.S. Highway 71 bypass in Fayetteville (T17N R30W sec. 28 SE, 36.10997 N 94.17997 W), 9 April 2004, 43 released alive (Wagner and Kottmyer 2006).
- Washington County: unnamed spring tributary of Clabber Creek near junction of Arkansas Highway 112 and U.S. Highway 71 bypass in Fayetteville (T17N R30W sec. 33 NW, 36.10712 N 94.18828 W), 9 April 2004, 1 released alive (Wagner and Kottmyer 2006).
- Washington County: marshy seep tributary of Clabber Creek at Truckers Lane in Fayetteville (T17N R30W sec. 33 N, 36.10891 NE 94.18406 W), 9 April 2004, 1 released alive (Wagner and Kottmyer 2006).
- Washington County: ditch tributary of Clabber Creek at drive-in theater in Fayetteville (T17N R30W sec. 28 SE, 36.11048 N 94.17760 W), 9 April 2004, 5 released alive (Wagner and Kottmyer 2006).

Harris and Smith (1985) reported *E. cragini* from Healing Spring Run and Little Osage Creek based on a 1981 collection at their confluence. Intensive sampling in 1997 for a mark-recapture population estimate (Hargrave 1998, Hargrave and Johnson 2003) yielded 43 specimens from Healing Spring Run. Wagner and Kottmyer (2006) sampled widely in the area, increasing definition of the geographic scope of populations in this area, including population in four additional spring tributaries to Little Osage Creek in the area. Recently, we walked all of Little Osage Creek in this area searching for suitable habitat and collected single *E. cragini* specimens in 2 disjunct patches of vegetated backwater habitat along the main creek. These observations lead us to believe that the mainstem of Little Osage Creek does not provide significant habitat for this species, but rather is occasionally occupied by individuals from the tributary populations straying into patches on suitable backwater habitat.

- Benton County: Healing Spring Run and Little Osage Creek at Arkansas Hwy. 264 crossing (T18N R31W sec. 10), 21 August 1981, 5 specimens (ASUMZ 9340; Harris and Smith 1985).
- Benton County: Healing Spring Run at Arkansas

Hwy. 264 crossing (T18N R31W sec. 10 NW), 5 November 1997, 43 released alive (Hargrave 1998, Hargrave and Johnson 2003).

- Benton County: Healing Spring Run at Arkansas Hwy. 264 crossing (T18N R31W sec. 3 SW, 36.26073 N 94.27032 W), 4 May 2005, 11 released alive (Wagner and Kottmyer 2006), 3 November 2009, 15 released alive, 10 June 2010, 3 released alive.
- Benton County: unnamed spring run tributary to Healing Spring Run (T18N R31W sec. 3 SW, 36.25808 N 94.27301 W), 27 October 2005, presence noted (Wagner and Kottmyer 2006).
- Benton County: unnamed spring-fed ditch above a pond on Mill Dam Road (T18N R31W sec. 3 E, 36.26387 N 94.26602 W), 27 October 2005, 9 released alive (Wagner and Kottmyer 2006). Recent visits indicate this population is extirpated.
- Benton County: unnamed spring run tributary to Little Osage Creek (T19N R31W sec. 34 SW, 36.27636 N 94.27004 W), 5 October 2005, 27 specimens (25 released alive, 2 UAFS-1740; Wagner and Kottmyer 2006), 4 November 2009, 15 released alive.
- Benton County: unnamed spring run #1 tributary to Little Osage Creek (T18N R31W sec. 3 SE, 36.26098 N 94.26819 W), 28 October 2005, presence noted (Wagner and Kottmyer 2006), 3 November 2009, 5 released alive.
- Benton County: unnamed spring run #2 tributary to Little Osage Creek (T18N R31W sec. 3 SW, 36.26092 N 94.26949 W), 28 October 2005, presence noted (Wagner and Kottmyer 2006).
- Benton County: backwater on east bank of Little Osage Creek (T18N R31W sec. 3 NW, 36.26770 N 94.27115 W), 18 November 2010, 1 released alive.
- Benton County: Little Osage Creek across from mouth of Healing Spring Run (T18N R31W sec. 10 NW, 36.25391 N 94.27040 W), 15 November 2005, 1 specimen (UAFS-1690, Wagner and Kottmyer 2006).
- Benton County: unnamed spring run tributary to Little Osage Creek on Colonel Meyers Road (T18N R31W sec. 10 SW, 36.24857 N 94.26967 W), 15 November 2010, 7 specimens (6 released alive, 1 AGFC uncatalogued).
- Benton County: unnamed spring run tributary to Little Osage Creek on Arkansas Highway 264 (T18N R31W sec. 2 SW, 36.25831 N 94.25769 W), 21 October 2010, 30 specimens (29 released alive, 1 AGFC uncatalogued).

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Harris and Smith (1985) reported 2 unnamed spring run tributaries of Osage Creek near the community of Logan as occupied by *E. cragini* based on 1982 collection records. When resurveyed in 1997 (Hargrave 1998, Hargrave and Johnson 2003), one of these was described as Gailey Hollow and yielded 1 specimen. The second was denoted as Lower Palmer Spring and yielded no specimens. In 2005, what was thought to be Lower Palmer Spring and the creek channel in Gailey Hollow were both dry. Wagner and Kottmyer (2006) encountered 42 *E. cragini* throughout 2 spring branches that merge and would flow into Gailey Hollow during wetter conditions. Subsequent visits have found flow and small numbers of *E. cragini* reaching Gailey Hollow on occasion. Our recent surveys documented populations 3.25 km northwest of the previously known population, separated by a losing stream section that apparently has surface flow only during extreme flood conditions.

- Benton County: unnamed spring run tributary to Osage Creek near Logan community (T18N R32W sec. 27), 23 March 1982, 12 specimens (NLU 54208; Harris and Smith 1985)
- Benton County: Gailey Hollow (T18N R32W sec. 27 SW), *unknown date* 1997, 1 released alive (Hargrave 1998, Hargrave and Johnson 2003).
- Benton County: two spring branch tributaries to Gailey Hollow (T18N R32W sec. 27 SW, 36.20622 N 94.38728 W), 7 June 2005, 42 specimens (41 released alive, 1 UAFS-1606; Wagner and Kottmyer 2006).
- Benton County: unnamed spring run tributary to Osage Creek near Logan community (T18N R32W sec. 34), 28 July 1982, 3 specimens (ASUMZ 9396; Harris and Smith 1985).
- Benton County: unnamed spring run tributary to Osage Creek near Logan community (T18N R32W sec. 17 SW, 36.23326 N 94.41459 W), 2 March 2011, 5 specimens (4 released alive, 1 AGFC uncatalogued).
- Benton County: unnamed spring run tributary to Osage Creek near Logan community (T18N R32W sec. 20 NE, 36.22952 N 94.40927 W), 2 March 2011, 6 specimens released alive.

Harris and Smith (1985) reported an unnamed spring run tributary of Wildcat Creek as occupied by *E. cragini* based a 1982 collection. When resurveyed in 1997 (Hargrave 1998, Hargrave and Johnson 2003), the location was described as Huffmaster's Spring, and yielded no specimens. Wagner and Kottmyer (2006)

discovered a small new population nearby, possibly the source of the 1982 specimen. Extensive searches in the area have failed to uncover additional populations.

- Washington County: Spring run tributary to Wildcat Creek northeast of White Oak Church and cemetery (T17N R31W sec. 17), 20 April 1982, 1 specimen (NLU 54206; Harris and Smith 1985).
- Washington County: Spring run tributary to Wildcat Creek northeast of White Oak Church and cemetery (T17N R31W sec. 17 NE, 36.15200 N 94.30072 W), 22 September 2005, 19 specimens (18 released alive, 1 uncatalogued; Wagner and Kottmyer 2006), 8 April 2008, 3 released alive, 16 November 2010, 3 released alive.

The expansion of *E. cragini* records in tributaries of Little Osage Creek prompted a focus of searches in other parts of the Osage Creek watershed. The known distribution of the species is expanded to the northeast by 2 new Benton County records, and a Washington County record was in a direct Osage Creek tributary located centrally between 3 of the previously known areas of record.

- Benton County: unnamed spring run tributary to Osage Creek 1/8 mile north of Evening Star Road (T19N R31W sec. 36 NE, 36.27877 N 94.23096 W), 10 June 2010, 4 specimens released alive; slightly upstream 26 October 2010, 3 released alive.
- Benton County: unnamed spring run tributary to Osage Creek on Shadow Valley Golf Course (T19N R31W sec. 25 SE, 36.29073 N 94.22485 W), 15 November 2010, 25 released alive.
- Washington County: unnamed spring run tributary to Osage Creek 1/4 mile west of Thornsberry Church (T18N R31W sec. 31 NE, 36.19941 N 94.32376 W), 3 December 2010, 26 released alive.

Lick Branch is the next watershed west of Little Osage Creek. It is highly karst influenced, with several losing segments that are dry at normal flow separating resurging segments where we collected *E. cragini* in the upper part of the watershed. We also documented significant populations in several spring tributaries to Lick Branch.

- Benton County: Lick Branch due east of junction of Benton County Road 221 and 216 (T18N R31W sec. 8NW, 36.25101 N 94.31352 W), 14 December 2010, 50 released alive.

- Benton County: unnamed spring run tributary #1 of Lick Branch east of junction of Benton County Road 221 and 216 (T18N R31W sec. 8 SW, 36.24760 N 94.31193 W), 14 December 2010, 30 released alive.
- Benton County: unnamed spring run tributary #2 of Lick Branch east of junction of Benton County Road 221 and 216 (T18N R31W sec. 8 SW, 36.24821 N, 94.31322 W), 14 December 2010, 10 released alive.
- Benton County: unnamed spring run tributary of Lick Branch along Arkansas Highway 264 (T19N R31W sec. 6 SW, 36.25891 N, 94.32812 W), 1 March 2011, 60 released alive.
- Benton County: unnamed run below a pond tributary to Lick Branch (T19N R31W sec. 6 SE, 36.25814 N 94.32078 W), 1 March 2011, 2 released alive.
- Benton County: Lick Branch north of Arkansas Highway 264 (T19N R31W sec. 6 SE, 36.26122 N 94.31868 W), 1 March 2011, 4 released alive.

Conclusion

More concentrated efforts to sample in small spring habitats within the watersheds where *E. cragini* has been observed in the past have led to discovery of several additional local populations in northwestern Arkansas. This has greatly increased the resolution of our understanding of the species geographic distribution within the state. While these efforts have significantly increased the total estimated number of *E. cragini* in the state, the populations are highly isolated. Due to the extent of intervening stream reaches that appear to be unsuitable habitat based on the lack documented *E. cragini* records, there seems to be little opportunity for movement between most populations. This leaves the local populations highly susceptible to extirpation, as has been observed in the case of one population discovered in 2005. In light of this, we consider the species to remain at risk in the state and encourage continued protection and conservation efforts.

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