Journal of the Arkansas Academy of Science

Volume 66 Article 29

2012

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B. K. Wagner
Arkansas Game and Fish Commission, bkwagner@agfc.state.ar.us

M. D. Kottmyer
The Nature Conservancy

M. E. Slay
The Nature Conservancy

Recommended Citation

Wagner, B. K.; Kottmyer, M. D.; and Slay, M. E. (2012) "Summary of Previous and New Records of the Least Darter (Etheostoma microperca) in Arkansas," *Journal of the Arkansas Academy of Science*: Vol. 66 , Article 29.
DOI: https://doi.org/10.54119/jaas.2012.6622
Available at: https://scholarworks.uark.edu/jaas/vol66/iss1/29

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

B.K. Wagner [1], M.D. Kottmyer [2], and M.E. Slay [2]

[1]*Arkansas Game and Fish Commission, 915 E. Sevier Street, Benton, AR 72015*
[2]*The Nature Conservancy, 601 North University Avenue, Little Rock, Arkansas 72205*

[1]Correspondence: bkwagner@agfc.state.ar.us

Abstract

The least darter, *Etheostoma microperca*, has a limited distribution in Arkansas and is designated as a species of greatest conservation need by the Arkansas Game and Fish Commission. The fish was first documented in the state in 1938 in Wildcat Creek west of Springdale with additional discoveries in 1960, 1973, 1981, and 1982. A 1997 study documented the persistence of the species in Healing Spring Run and a spring run tributary of Osage Creek, 2 of the historic streams. Field sampling in 2004-2005 and 2010-2011, provided more concentrated sampling efforts in the basin. This study sought to determine the present status of least darter populations in Arkansas by detecting presence or absence at previously reported locations and locations in the same watersheds having similar habitat. Information on all least darter collections in Arkansas is compiled herein. The species appears to be extirpated from Wildcat Creek, Clear Creek, and Elkhorn Springs. Previously undocumented populations were found in the Clear Creek and Flint Creek watersheds. Least darter has not been collected from Osage Creek since 1973, persists in a spring run tributary to Osage Creek reported first in 1997. The species also persists in Healing Spring Run, and additional populations were found in other nearby tributaries to Little Osage Creek and in vegetated backwaters along the creek itself.

Introduction

The least darter was originally described under the name *Microperca punctulata* (Putnam 1863), but it was subsequently moved to the genus *Etheostoma* and renamed *E. microperca* (Jordan 1888, Collette and Knapp 1966). The species is distributed throughout the Great Lakes region with disjunct populations occurring in the Ozark Highlands and Oklahoma's Blue River drainage (Burr and Page 1979). Throughout its range it is associated with quiet water, soft substrates, and dense aquatic vegetation (Burr and Page 1979, Johnson and Hatch 1991, Lee et al. 1980, Robison and Buchanan 1988). In the southern, Ozarkian portion of its range, the least darter is closely associated with the cold waters of springs (Miller and Robison 2004, Pflieger 1997, Robison and Buchanan 1988, Seilheimer and Fisher 2010). Springs and spring runs differ from other streams in being clear, thermally stable, and having little flow variation (Hubbs 1995), important factors in the persistence of this species on the southern margin of its range (Seilheimer and Fisher 2010).

Although the earliest reports from Arkansas were collections by Gilbert (1889) and Meek (1889) reporting *E. microperca* from "a small creek entering the Poteau River from the north, about 7 miles west of Waldron, Scott County, Arkansas" and "a tributary of the Little Red River at Judsonia, Arkansas" (USNM 42837, nmnh.si.edu), respectively, these collections were later identified as what is now recognized as *Etheostoma proeliare* (Burr 1978). Black and Black (1938) recorded 1 specimen (UMMZ 123168, Fishnet2.net) from a tributary of Bois d'Arc Creek on US Hwy 67, 4 miles W of Hope in the Red River drainage, a collection that Burr (1978) suspected was erroneously labeled or cataloged, as this location is occupied by *E. proeliare*. Buchanan (1973) mapped several collections in the Saline River basin in central Arkansas based on Fruge (1971), but reexamination of these specimens proved them to also be *E. proeliare* (Burr 1978). Confirmed populations of *E. microperca* in Arkansas appear to be limited to the Illinois River watershed located in northwest Arkansas (Burr 1978, Harris and Smith 1985, Hargrave 1998), the earliest of which is another 1938 collection by Black and Black (UMMZ 123459, Fishnet2.net).

The earliest Arkansas records found to be valid upon reexamination by Burr (1978) are from Clear Creek (1960), Wildcat Creek (1938), and Osage Creek (1973). Although the physical habitats for these sites were later described as spring runs (Hargrave 1998,

Hargrave and Johnson 2003), the location information associated with these collections is vague, and the actual sampling points may have been in the tributary main stems at road crossings (Burr 1978). Harris and Smith (1985) found least darters at 2 additional sites (Elkhorn Springs and "Healing Spring Run and Little Osage Creek"), but were unable to document the fish at the 3 previously reported locations. In 1997, these 5 locations, along with 19 other springs, were surveyed again for *E. microperca* with populations observed at 2 locations, Healing Springs and a spring on Osage Creek (Hargrave 1998, Hargrave and Johnson 2003). More recently, Wagner and Kottmyer (2006) confirmed the continued presence of *E. microperca* in the Healing Springs and Little Osage Creek area and collected 2 individuals in a spring run tributary to Clear Creek near Savoy.

Due to its rarity and possible extirpation at some sites, the species is considered threatened in Arkansas (Robison 1974, Robison and Buchanan 1988) and a species of greatest conservation need (Anderson 2006). Based on previous studies, populations of *E. microperca* are consistently observed at Healing Springs and Little Osage Creek, but they are either intermittent or possibly extirpated at other locations.

This study sought to determine the current status of least darter populations in Arkansas by detecting presence or absence at previously reported locations and locations in the same watersheds having similar habitat.

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. microperca* or *E. cragini* had previously been documented. After receiving landowner permission, these habitats were sampled by using 33-cm, 2-mm mesh dip-nets. One hundred eleven sites were sampled between November 2009 and December 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. microperca* individuals are typically encountered based on our past experience. This has proven to be an effective method for detection of *Etheostoma cragini*, another darter that utilizes similar habitats (Groce et al. 2012, Labbe and Fausch 2000, Wagner et al. 2011). Previous collections either did not report methods or employed different methods than this study, so all data are considered as only occurrence records and not indices of population trends.

When specimens of *E. microperca* were collected in areas likely to represent new populations, 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. microperca* 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. microperca.*

We summarized known collections of *E. microperca* in Arkansas and added new locations from this study to provide a comprehensive summary of the distribution of the species in the state (Figure 1). Collections are grouped by sub-watershed, with collection details including location description, date, collectors, number of specimens, and disposition including catalog number, if applicable. Collections thought to be revisits to the same location are listed as bullet points under the initial collection. Collections during this study also include BKW's field collection number.

Results

Lower Wildcat Creek

The first collection of *E. microperca* in Arkansas still thought to be valid was made from Wildcat Creek in 1938. Despite efforts by Harris and Smith (1985), Hargrave (1998), Wagner and Kottmyer (2006), and the current study to sample potential habitats in and around this location, no additional specimens have been collected. It appears that the species is no longer present in the Wildcat Creek watershed.

Collection details

Benton County: Wildcat Creek 12 miles west of Springdale near Washington County line (possibly at old Arkansas Hwy 68 crossing; 36.18767N 94.33631W, T18N R32W sec. 36 SE SE), 1 July 1938, 2 specimens, Black and Black, collectors (UMMZ 123459, Fishnet2.net, Burr 1978, Harris and Smith 1985).

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DOI: https://doi.org/10.54119/jaas.2012.6622

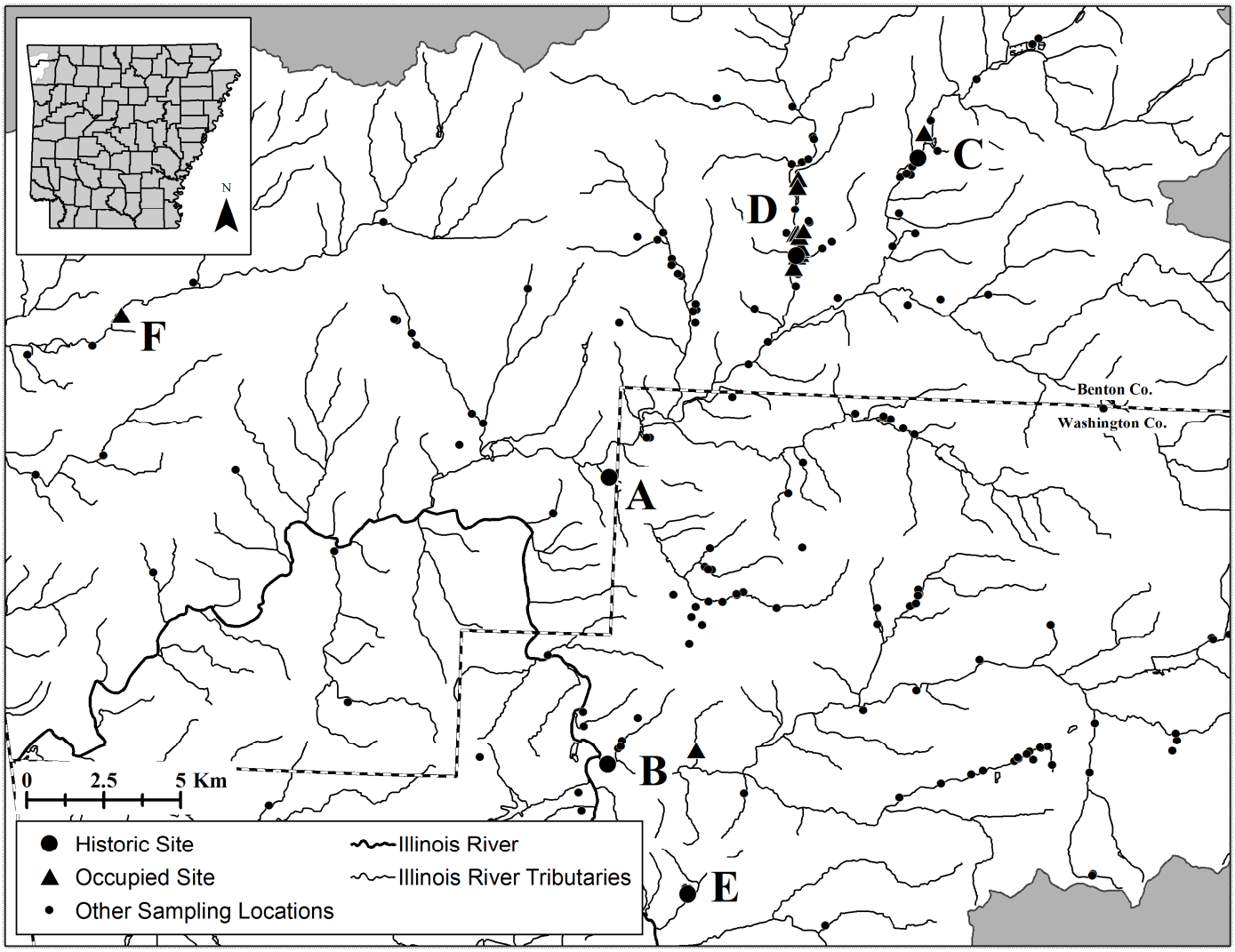

Figure 1: Map of Benton and Washington counties, Arkansas, depicting all sites sampled during this study and highlighting those where *Etheostoma microperca* has been encountered. Focal areas discussed in text are A – Lower Wildcat Creek, B – Clear Creek, C – Osage Creek, D – Little Osage Creek, E – Elkhorn Springs, and F – Flint Creek.

- Harris field notes (*pers. comm*. 2009): Site was revisited as part of a status survey by Harris (*pers. comm*., Harris and Smith 1985), but found no specimens.
- 6 December 2011, BKW2011-049, but did not document any specimens.
- Spring run at Arkansas Hwy 68 crossing (T18N R32W sec. 36 SE). May or may not be the same location. No specimens documented (Hargrave 1998).
- ½ mile west of Harmon (36.15481N 94.28807W), 9 June 2010, BKW2010-024, but did not document any specimens.

Clear Creek

The second collection of *E. microperca* in Arkansas still thought to be valid was made from Clear Creek in 1960. Despite efforts by Harris and Smith (1985), Hargrave (1998), Wagner and Kottmyer (2006), and the current study to sample potential habitats in and around this location, no additional specimens have been collected. However, Wagner and Kottmyer (2006) did collect *E. microperca* from a spring in the watershed, and during this study a sizable population was detected in a downstream pond.

Collection details

Washington County: Clear Creek at Savoy 0.5 miles NE of confluence with Illinois R., 17 April 1960, 1 specimen, R.V. Miller and B.B. Collette, collectors (CU 35568, Fishnet2.net , Burr 1978, Harris and Smith 1985).

- Harris and Smith (1985) revisited area, but did not document any specimens.
- Hargrave (1998) revisited area, but did not document any specimens.
- 5 December 2011, BKW2011-048, but did not document any specimens.

Washington County: Spring run tributary of Clear Creek at Savoy (T17N R31W sec. 32 SE NE; 36.10802N 94.30428W), 22 September 2005, BKW2005-050, 2 specimens (UAFS-2033).

- Washington County: Spring run and pond, 8 June 2010, BKW2010-018, 32 specimens observed.

Osage Creek

The third collection of *E. microperca* in Arkansas still thought to be valid was made from Osage Creek in 1973. Harris and Smith (1985) found no additional specimens in this area, but Hargrave (1998) found an occupied spring run in the area. We also found an occupied spring run in the area during the current study.

Collection details

Benton County: Osage Creek 1.5 miles north of Cave Springs (possibly at Arkansas Hwy 112, T19N R31W sec. 36 NE, 36.28405N 94.22693W), 6 February 1973, 9 specimens (NLU 25892, Burr 1978, Harris and Smith 1985).

- Harris and Smith (1985) revisited the area, but did not document any specimens.

Benton County: Upper portion of spring run tributary to Osage Creek at Arkansas Hwy 112 crossing (T19N R31W sec. 25 SE), 6 November 1997, 49 specimens observed, population estimated at 129 ± 56 (Hargrave 1998, Hargrave and Johnson 2003).

- Lower portion of spring run (T19N R31W sec. 36 NE NE) also sampled during Hargrave (1998) study, no specimens observed.
- Spring at Shadow Valley Golf Course (probably same spring, T19N R31W sec. 25 SE, 36.29073N 94.22485W), 15 November 2010, BKW2010-084, 15 specimens observed.

Little Osage Creek/Healing Springs

Harris and Smith (1985) reported the discovery of *E. microperca* in the Little Osage Creek watershed in 1981. The Healing Spring Run consistently holds the largest population in Arkansas. Several additional populations were discovered in the watershed by Wagner and Kottmyer (2006). During the current study we documented small populations in several vegetated backwaters along the main stem of Little Osage Creek.

Collection details

Benton County: Healing Spring Run and Little Osage Creek at Arkansas Hwy 264 crossing (T18N R31W sec. 10, 36.25391N 94.27040W), 21 August 1981, 1 specimen (ASUMZ 9343; Harris and Smith 1985).

- Harris and Smith 1985; >1,000 individuals estimated.
- Little Osage Creek at Arkansas Hwy 264, 15 August 1996, 2 specimens (UAFS-1488), collected by T Buchanan.
- 5 October 2005, BKW2005-056, 5 specimens (3 released, 2 UAFS-2034)
- 10 June 2010, BKW2010-029, 29 specimens observed.

Benton County: Healing Spring Run on llama ranch above Arkansas Hwy 264, 15 May 1996, 10 specimens (UAFS-1485), collected by T Buchanan.

- Healing Spring Run (T18N R31W sec. 10 NW), 5 November 1997, 285 specimens observed, population estimated at 1,341 ± 349 (Hargrave 1998, Hargrave and Johnson 2003).
- Benton County: Healing Spring Run (T18N R31W sec. 3 SW, 36.26073N 94.27032W), 4 May 2005, BKW2005-014, 49 specimens observed.
- Walked entire run delineating occupied area, 27 October 2005, BKW2005-072, presence/ absence survey with no count of specimens recorded.

https://scholarworks.uark.edu/jaas/vol66/iss1/29
DOI: https://doi.org/10.54119/jaas.2012.6622

Benton County: unnamed spring run tributary to Little Osage Creek (T19N R31W sec. 34 SW, 36.27636N 94.27004W), 5 October 2005, BKW2005-059, 26 specimens (23 released, 3 UAFS-1895).

- Downstream portion (36.27452N 94.27039W), 18 November 2010, BKW2010-060, 23 specimens observed, noted that small impoundment had been constructed on upper portion.

Benton County: unnamed spring-fed ditch above a pond on Mill Dam Road (T18N R31W sec. 3 E, 36.26387N 94.26602W), 27 October 2005, BKW2005-070, 20 specimens observed (16 released, 4 AGFC uncataloged).

- Revisited (this study), but did not document any specimens. Appears to be extirpated.

Benton County: unnamed spring run #1 tributary to Little Osage Creek (T18N R31W sec. 3 SE, 36.26098N 94.26819W), 28 October 2005, BKW2005-073, presence observed.

Benton County: Little Osage Creek

- Little Osage Creek (T18N R31W sec. 3 S, 36.25965N 94.26945W), 16 November 2005, BKW2005-081, 35 specimens observed (30 released, 5 UAFS-2035).
- Little Osage Creek backwater (T18N R31W sec. 3 S, 36.26073N 94.27013W), 18 November 2010, BKW2010-062, 7 specimens observed.
- Little Osage Creek backwater downstream of Arkansas Hwy 264 (T18N R31W sec. 10 SE NW, 36.25053N 94.27139W), 19 November 2010, BKW2010-063, 2 specimens observed.
- Little Osage Creek backwater upstream of Arkansas Hwy 264 (T18N R31W sec. 10 NW NE, 36.25469N 94.26910W), 14 December 2010, BKW2010-077, 20 specimens observed.
- Little Osage Creek (T18N R31W sec. 10 NW NE, 36.25589N 94.26874W), 14 December 2010, BKW2010-078, 2 specimens observed.
- Little Osage Creek backwater N of Arkansas Hwy 264 (T18N R31W sec. 10 NW NE, 36.25649N 94.26892W), 14 December 2010, BKW2010-079, 50 specimens observed.
- Little Osage Creek backwater (T18N R31W sec. 3 SW SE, 36.25967N 94.26946W), 14 December 2010, BKW2010-080, 6 specimens observed.

Elkhorn Springs

Etheostoma microperca was collected from Elkhorn Springs in 1982 (Harris and Smith 1985). Despite efforts by Hargrave (1998), Wagner and Kottmyer (2006), and the current study to sample potential habitats in and around this location, no additional specimens have been collected. It appears that the species is no longer present in Elkhorn Springs.

Collection details

Washington County: Elkhorn Spring run southwest of Arkansas Hwy 16 near Highland Church (T16N T31W sec. 18), 13 July 1982, 4 specimens (NLU 54207; Harris and Smith 1985).

- Hargrave (1998) revisited, but did not document any specimens.
- Elkhorn Springs (36.06606N 94.30614W), 6 December 2005, BKW2005-088, no specimens observed.
- Sampled this study – 3.9 miles northwest of Farmington (36.06754N 94.30756W), 9 June 2010, BKW2010-021, but did not document any specimens.

Flint Creek

During this study we found a previously unknown population of *E. microperca* in a spring tributary of Flint Creek in extreme western Benton County. This provides the westernmost record of the species in Arkansas.

Collection details

Benton County: Spring run on Dawn Hill Golf Course (T18N R33W sec. 17 SE, 36.23374N 94.51447W), 30 June 2011, BKW2011-018, 10 specimens (9 released, 1 AGFC uncataloged).

Discussion

We identified the current Arkansas distribution of *E. microperca* to be confined to localized pockets within the Illinois River basin. Substantial collection

efforts in and around documented collection locations on Wildcat Creek, Clear Creek, and Elkhorn Springs failed to locate any specimens, leading to the conclusion that the species has been extirpated from these locales. In the case of the Clear Creek sub-basin, this study identified a previously unknown population in an upper tributary, but it is isolated from Clear Creek by an impoundment. The species has not been collected from Osage Creek since 1973, but it was confirmed in a spring run tributary first reported in 1997. A population in Healing Spring Run was also confirmed, and previously unreported populations were found in other nearby tributaries to Little Osage Creek and in vegetated backwaters along the creek itself. An additional undocumented population was found in the Flint Creek watershed.

Several Arkansas historic populations have been extirpated, and 2 previously undocumented populations were discovered. Populations appear to be isolated in pockets of unique habitat, either as individual locations or small clusters of populations. Echelle et al. (2010) observed no haplotype sharing among southwestern populations of *E. microperca* and surmised a long history of isolation, which is consistent with the distribution observed in Arkansas. The population discovered in the Flint Creek watershed may be linked to populations in northeast Oklahoma, but no current information is available on the status of these populations. The populations in the Clear Creek and Flint Creek watersheds are both small and isolated, making them particularly susceptible to "blinking out" (Echelle et al. 2010).

The bulk of the populations in Arkansas occur in the watershed of Osage Creek and predominantly in its tributary watershed, Little Osage Creek. Least Darters in this area are more common and have a higher potential to move between spring runs. The species will occupy vegetated backwater spring seeps alongside larger streams (Pflieger 1997), but in Arkansas we have only documented this in Little Osage Creek.

This study has increased the resolution of our understanding of the species' geographic distribution within the state. While these efforts have increased the number of *E. microperca* localities in the state, the populations are mostly isolated. This leaves the local populations highly susceptible to extirpation, as has been observed in the case of 1 population discovered in 2005. In light of this, we consider the species correctly designated as a species of greatest conservation need in the state (Anderson 2006) and encourage continued protection and conservation efforts.

Acknowledgements

Field assistance was provided by J. Stroman of the Arkansas Game and Fish Commission, D. Millican of The Nature Conservancy, J. Baker of Saint Louis University, and J. Throneberry of the Arkansas Natural Heritage Commission. Identification verification, specimen cataloging, and additional collection records were provided by T. Buchanan of the University of Arkansas – Fort Smith. Portions of the fish specimen data used in this study was obtained from the University of Michigan Museum of Zoology and Cornell University Museum of Vertebrates (Accessed through the Fishnet2 Portal, www.fishnet2.net 2011-11-02) and the National Museum of Natural History, Smithsonian Institution, 10th and Constitution Ave. NW, Washington, DC 20560-0193, www.nmnh.si.edu 2012-07-12. Funding for this project was provided by the Arkansas Game and Fish Commission and the U.S. Fish and Wildlife Service through an Arkansas State Wildlife Grant and through a private grant to The Nature Conservancy by the Wal-Mart Stormwater Compliance Team.

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