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## An Annotated Checklist of the Crayfishes (Decapoda: Cambaridae) of Arkansas

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## **Cover Page Footnote**

Our deepest thanks go to HWR's numerous former SAU students who traveled with him in search of crayfishes on many fieldtrips throughout Arkansas from 1971 to 2008. Personnel especially integral to this study were C. Brummett, N. Covington, D. Koym, and J. Rader, and HWR's children, L. and P. Robison. CTM wishes to acknowledge the help of his sons, J. T., III and N.H. McAllister in collecting crayfish over the years. We also thank C. Lukhaup and C.A. Taylor, and especially G.A. Schuster, for the allowing us to use their photographs of crayfish. The Arkansas Game and Fish Commission provided scientific collecting permits to HWR and CTM.

# An Annotated Checklist of the Crayfishes (Decapoda: Cambaridae) of Arkansas

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Running Title: Crayfishes of Arkansas

## Abstract

Prior to the present study, 56 species with 3 additional subspecies for a total of 59 different taxa of crayfishes were recognized from Arkansas. We add a single species (Carmel Crayfish, *Fallicambarus schusteri*) to that list, subtract a documented synonym (*Procambarus ferrugineus* = *Procambarus liberorum*), update the classification to better reflect recent phylogenetic insights, and provide an updated annotated checklist of the 59 crayfish taxa of presently known from the state. There are 8 endemic species in Arkansas, including the Bayou Bodcau Crayfish (*Bouchardina robisoni*), Boston Mountains Crayfish (*Cambarus causeyi*), Hell Creek Cave Crayfish (*C. zophonastes*), Jefferson County Crayfish (*Creaserinus gilpini*), Ouachita Burrowing Crayfish (*Fallicambarus harpi*), Slenderwrist Burrowing Crayfish (*F. petilicarpus*), Saline Burrowing Crayfish (*F. strawni*), and Redspotted Stream Crayfish (*Faxonius acares*). There are also 2 federally endangered species, the Benton County Cave Crayfish (*Cambarus aculabrum*) and the Hell Creek Cave Crayfish (*C. zophonastes*) that inhabit Arkansas karst habitat. We expect that additional species will be included in the list with further DNA analyses.

## Introduction

Crayfishes are a taxonomically diverse group of decapod crustaceans with over 669 species worldwide and 2 centers of diversity, one in the southeastern Appalachian Mountains of the southeastern United States (Northern Hemisphere center) and one in southeast Australia (Southern Hemisphere center) (Crandall and Buhay 2008; Crandall 2016; Crandall and De Grave 2017). Crayfishes are a monophyletic group of arthropods that is a sister group to the clawed lobsters (Nephropoidea Dana, 1852) (Crandall et al. 2000; Bracken-Grissom et al. 2014).

In Arkansas, crayfishes can serve as keystone species and are an integral component of the state's aquatic ecosystems. Fishes, particularly sunfishes and basses (family Centrarchidae) may consume up to two-thirds of the annual production of crayfishes in many streams (Taylor et al. 1996). Crayfishes contribute to the maintenance of food webs by processing vegetation and leaf litter (Huryn and Wallace 1987; Griffith et al. 1994), which increases the availability of nutrients and organic matter to other aquatic and terrestrial organisms.

Crayfishes are members of the Phylum Arthropoda, or joint-legged animals, which includes 97 to 99% of all the animals on Earth. They are classified as crustaceans because of the 2 pair of antennae they possess and the fact they breathe by gills. Individuals are protected by a heavily armored exoskeleton and have 5 pairs of walking legs, the first of which function as enlarged pincers (chelipeds).

Prior to this study, Arkansas had been known to support 59 crayfish taxa (Bouchard and Robison 1980; Taylor et al. 1996), all belonging to the family Cambaridae, and grouped into 7 genera. Our current study also recognizes 59 taxa representing 8 genera based on: (1) 45+ years of fieldwork in Arkansas by one of us (HWR) from 1971 to 2017, (2) a careful search of the pertinent literature, and (3) a search of museums that house Arkansas crayfish specimens. The purpose of this study is: (1) to provide a checklist of all crayfish species/subspecies presently known to occur in Arkansas with an updated phylogenetically-based taxonomy, (2) include a brief account of the habitat of each state crayfish, and (3) establish the state distributions for all known Arkansas crayfishes. We desire to provide this annotated checklist so that aquatic biologists, naturalists, interested laymen, government scientists, and resource managers involved in environmental work in the state would have a useful document to consult in the interim while HWR and KAC prepare a field guide to the crayfishes of Arkansas,

currently in progress.

## Materials and Methods

Fieldwork was carried out during a 45+ yr period from 1971 to July 2017 in all seasons, but particularly in the spring, summer, and fall when collecting is best for crayfishes. Over 1,000 personal collections of crayfishes in Arkansas have been made by HWR, plus numerous collections in the state made by CTM, KAC, and the late HH Hobbs, Jr. (1914–1994), the latter who first guided HWR into the study of Arkansas crayfishes. In addition, collections of Arkansas crayfish housed at Southern Arkansas University (SAU), the Smithsonian National Museum of Natural History (USNM 2016), and the Illinois Natural History Survey (INHS 2016) were also examined.

The 59 taxa listed herein are known to inhabit Arkansas and grouped together in the family Cambaridae using the updated classification scheme of Crandall and De Grave (2017) which better reflects evolutionary associations of crayfish species. The Appendix serves as a convenient checklist of the crayfishes of Arkansas for biologists, naturalists, and resource managers.

Distribution is usually expressed in terms of sections of the state (e.g., northern, southwestern, and central). In some instances, distribution is stated in terms of specific drainage basins such as the Ouachita River system (Fig. 1). If the species is known from only one or 2 streams or counties, the names of the stream and county are given. Statements regarding distributional range within the state are, for the most part, based on collections made by HWR during his longtime statewide collecting effort. Williams (1954), Reimer (1963), Bouchard and Robison (1980), Hobbs and Robison (1985, 1989), and additional published literature records for Arkansas were also examined. Those records and others are housed in the Arkansas Crayfish Database (ACD) held by the Arkansas Game and Fish Commission. Conservation status of Arkansas crayfishes is taken from Taylor et al. (2007) of which HWR was a member of the original AFS Committee and supplied data for the determination of Arkansas crayfishes used in the publication, as well as IUCN (2016) Red List status where KAC participated in Red List assessments (Richman et al. 2015). In addition to those species documented to occur within the political boundaries of Arkansas, we also provide a list of problematic species that have been formerly listed from Arkansas and/or may occur within state borders.

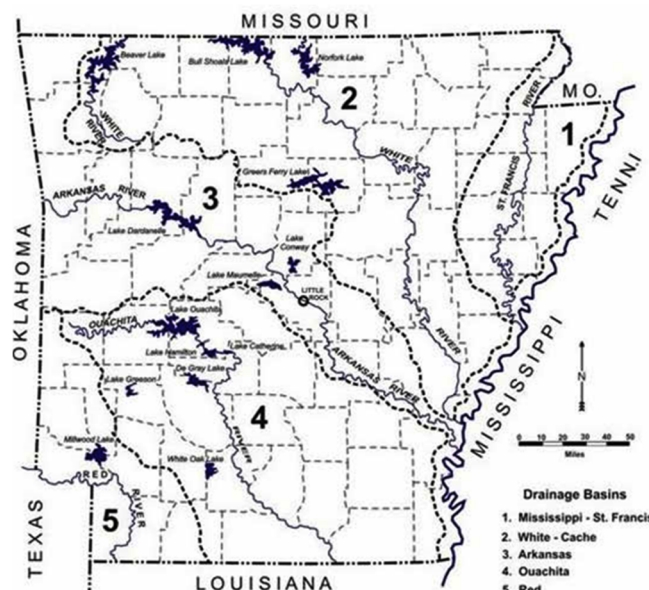


Figure 1. Five major drainage basins of Arkansas. From: [http://www.geology.ar.gov/water/surface\\_water.htm](http://www.geology.ar.gov/water/surface_water.htm).

## Results and Discussion

Fifty-nine crayfish taxa are known to occur in Arkansas. The following is an annotated list of those species, as well as information on their geographic distribution in the state, ecology, and natural history.

### Basic Life History Cycle

Although highly variable, most crayfishes in Arkansas mate between September and March. Form I males (reproductively active with well-defined terminal elements of the first pleopods) seek out receptive females and mating is accomplished. Sperm are carried by the female until oviposition (egg-laying) which may be in March, April and May, although some species begin as early as December or January (Page 1985). Following oviposition, the eggs are attached to the abdomen of the females and they are said to be ovigerous or "in berry." Females carry the eggs for 2 to 20 weeks depending on the water temperature (Page 1985). After hatching, young move quickly through a series of molts until sexual maturity is reached by late summer or early fall.

### Taxonomic Considerations

The taxonomy of North American crayfishes is based on numerous morphological characteristics (Hobbs 1972a), the secondary sexual characters being

## Crayfishes of Arkansas

of primary importance, such as the annulus ventralis, copulatory hooks, bosses on the coxae of some periopods (=walking legs), and first pleopods (Bouchard and Robison 1980). The single most important character in identifying most species of and practically all of the genera of North American crayfishes is the morphology of the male first pleopods. In addition, another important feature for identification, particularly those in the genus *Cambarus*, is the chelae. The taxonomy of freshwater crayfishes was recently updated based on the last 20 years of phylogenetic studies that have called into question family, subfamily, genus, and subgenus affiliations for various taxa (Crandall and De Grave 2017). We have followed their updated classification, which reflects the evolutionary history of the crayfishes.

In crayfishes of the family Cambaridae, adult males exhibit 2 morphological forms during the year, molting into these conditions with only the first form (form I) males capable of breeding, the second form, or form II male being sexually nonfunctional (Bouchard and Robison 1980). The first pleopod, or gonopod as it is known, of the form I male with its delicate, finely sculptured elements, at least one of which consists of amber, corneous material, is easily distinguished from the form II gonopod which has elements usually reduced in length and/or more inflated and without a corneous deposit (Hobbs 1972a). Also reduced in size are the remaining secondary sexual characters such as the chelae.

### ***Ecological Categories***

Arkansas crayfishes occupy 4 main habitat types: (1) primary burrowers (those crayfish who spend their entire life cycles in burrows), (2) stream-dwellers, (3) pond/lake/large river dwellers including secondary burrowers (who do require connectivity of burrows with freshwater), and (4) stygobitic species (obligate cave-dwellers) (Crandall and Buhay 2008).

### ***Brief Historical Review***

The earliest publication dealing with Arkansas crayfishes was Hermann Hagen's (1870) monograph on North American crayfishes which listed *Cambarus obesus* Hagen (= *C. diogenes*) from Arkansas. For the next 70 to 80 years, from 1870 until the late 1940s and 1950s, few additional references to Arkansas crayfishes appeared in the scientific literature. The cornerstone of any serious study of Arkansas crayfishes is A.B. Williams' (1954) study of crayfishes of the Ozark and

Ouachita Mountain uplands of Arkansas and Missouri. He discussed in detail the various forms he collected in these regions and provided numerous new collecting sites. Unfortunately, it is now badly outdated and the taxonomy has changed. Rollin Reimer's M.S. thesis (1963) at the University of Arkansas provided an unpublished survey of the crayfishes of Arkansas which greatly assisted the identification and study of those in the state. He made 289 collections containing 7,300 specimens representing 33 species in 4 genera and also included the first state checklist and brought the number of species known in 1963 from Arkansas to 37. Fitzpatrick (1978) described the primary burrower, *Procambarus liberorum*, from near Fayetteville, Arkansas, a species that Reimer (1969) almost certainly had listed in his doctoral dissertation. Later, Bouchard and Robison (1980) summarized the available information on the crayfishes of Arkansas and provided the first published inventory of the state crayfishes listing 51 taxa (47 species and 4 subspecies). In his doctoral work on crayfishes, Crandall (1993) studied the molecular systematics and evolutionary biology of the crayfish subgenus *Procericambarus* which included numerous Ozarkian species from Arkansas resulting in the first DNA sequence based phylogeny of freshwater crayfish (Crandall and Fitzpatrick 1996). In adjacent Missouri, Pflieger's (1996) book on the *Crayfishes of Missouri* provided fine pen and ink line drawings and color photographs of the 35 crayfish species living there, a number of which also occurred in Arkansas, thus identification of Arkansas taxa was made easier using his photos and line drawings.

In a series of papers on Arkansas crayfishes, Hobbs and Robison (1982, 1985, 1988, 1989) described several new species of *Procambarus* and *Fallicambarus* from Arkansas, as well as summarized data on the subgenus *Girardiella* of *Procambarus* and *Fallicambarus* of the state. More recently, study of the Arkansas crayfish fauna has accelerated during the past 2 decades as studies by Robison and Leeds (1996), Robison (1997, 2001), Dukat and Magoulick (1999), Flinders and Magoulick (2003, 2007), Robison and Crump (2004), Robison and Wagner (2005), Graening et al. (2006a, 2006b, 2006c, 2006d), Robison and McAllister (2006, 2008, 2010, 2014), Rabalais and Magoulick (2006), Westhoff et al. (2006), Magoulick and DiStefano (2007), Larson and Magoulick, (2008, 2011), Robison et al. (2009, 2014, 2017), McAllister and Robison (2010, 2012), Tumilson and Robison (2010), Wagner et al. (2010a, 2010b), McAllister et al. (2011), Ainscough et al. (2013), Taylor and Robison (2016), and Tumilson et al. (2017) all have examined aspects of the Arkansas

crayfish fauna, provided distributional data on state species, and/or described new species occurring in the state.

Conservation of North American crayfishes was aided by the original publication of Taylor et al. (1996) and followed a decade later by Taylor et al. (2007) which provided the current status for all North American crayfishes including those inhabiting Arkansas. Additionally, Richman et al. (2015) provided a global assessment of conservation status of the freshwater crayfishes using international criteria and include assessments of all the Arkansas crayfish.

### Annotated Checklist of Arkansas Crayfishes

Worldwide, there are currently over 669 described species of freshwater crayfishes with an average of 5 to 10 species still being described each year (Crandall and Buhay 2008; Crandall and De Grave 2017). Over 404 (60%) of these are found in the United States and Canada (Taylor et al, 1996). In Arkansas, we have documented 56 species of crayfishes with 3 subspecies represented, thus a total of 59 crayfish taxa inhabiting the state. Of the 59 crayfish taxa listed herein, all but 3 (*Cambarus aculabrum*, *Cambarus setosus*, and *Faxonius cyanodigitus*) have been personally collected in Arkansas by HWR (KAC has collected the *Cambarus* species). All crayfish occurring in Arkansas currently belong to the family Cambaridae.

Within Arkansas, the genus *Faxonius* slightly dominates the crayfish fauna with 18 species and 3 subspecies, while the genus *Procambarus* is represented by 16 species, followed by *Fallicambarus* and *Cambarus* with 7 species each, *Creaserinus* with 3 species, *Cambarellus* and *Faxonella* with 2 species each, and the monotypic genus *Bouchardina* with a single species. In addition, we have discovered several undescribed species of crayfishes in the state (e.g., Crandall et al. 2009); however, formal descriptions of these new species have not yet been completed.

**PHYLUM ARTHROPODA VON SIEBOLD 1848**  
**SUBPHYLUM CRUSTACEA BRÜNNICH 1772**  
**CLASS MALACOSTRACA LATREILLE 1802**  
**ORDER DECAPODA LATREILLE 1802**  
**FAMILY CAMBARIDAE HOBBS 1942**  
**GENUS BOUCHARDINA HOBBS 1977**  
***Bouchardina robisoni* Hobbs 1977 - Bayou Bodcau Crayfish**

*Bouchardina robisoni* (Fig. 2) inhabits lentic and sluggish lotic habitats, especially the backwaters of Bayou Bodcau (=Bodcau) (Red River drainage) and



Figure 2. Bayou Bodcau Crayfish, *Bouchardina robisoni*.

lower Bayou Dorcheat in Columbia, Hempstead, Howard, Lafayette, and Nevada counties of southwest Arkansas (Robison and McAllister 2010). This species has been collected in shallow and small intermittent streams with a sandy substrate and aquatic vegetation such as water primrose (*Ludwigia*), bladderwort (*Utricularia*), and submerged grasses (Robison and McAllister 2010). It is an Arkansas endemic (Robison and Allen 1995). IUCN Red List Status: Data Deficient.

### GENUS CAMBARELLUS ORTMANN 1905

#### ***Cambarellus (Pandicambarus) puer* Hobbs 1945 - Swamp Dwarf Crayfish**

This tiny crayfish is found in well vegetated swamps, ditches, lakes, ponds, sloughs, and sluggish streams with muddy substrate (Hobbs 1989). Although it is rarely collected in the Coastal Plain of Arkansas, elsewhere in its range, this crayfish is a widespread, generalist species, which is believed to be abundant and has no known threats. Tumilson et al. (2017) recently documented the first report of an ovigerous female in Arkansas as well as new collections from Calhoun, Cleveland, Columbia, Greene, Howard, Jackson, Lafayette, Monroe, Union, and White counties. IUCN Red List Status: Least Concern.

#### ***Cambarellus (Pandicambarus) shufeldtii* (Faxon 1884) - Cajun Dwarf Crayfish**

This dwarf crayfish (Fig. 3) occupies ditches, sloughs, oxbow lakes, swamps, and sluggish streams (Hobbs 1989). It has been known to burrow when water levels are low. In Arkansas, it has been taken only from the Coastal Plain. The first report of ovigerous females in the state was documented by Tumilson et al. (2017) as well as new collections from Columbia, Jackson, Lafayette, Lawrence, White, and Woodruff counties. IUCN Red List Status: Least Concern.

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Figure 3. Cajun Dwarf Crayfish, *Cambarellus shufeldtii*.

### GENUS *CAMBARUS* ERICHSON 1846

#### *Cambarus aculabrum* Hobbs and Brown 1987 - Benton County Cave Crayfish

Known only from 4 caves (Bear Hollow, Elm Springs, Logan, and Old Pendergrass) in and around Benton and Washington counties, this federally endangered cave troglobitic crayfish lives in subterranean streams (Hobbs and Brown 1987; Graening et al. 2006d). The type locality, Logan Cave (Benton County), part of the federally-protected Logan Cave National Wildlife Refuge, is a dendritic stream channel cave located in the Mississippian cherty-limestone, Boone Formation of the Springfield Plateau (Hobbs and Brown 1987). Since 2004, extensive survey efforts nearby have revealed no other specimens. The primary reason for federal listing of the species and still remains a serious threat is habitat degradation from groundwater pollution (Graening et al. 2006d). It is listed as critically imperiled (S1) in Arkansas according to NatureServe (2015). IUCN Red List Status: Critically Endangered.

#### *Cambarus causeyi* Reimer 1966 - Boston Mountains Crayfish

This primary burrowing crayfish inhabits complex burrows near spring and run-off areas in upland environs (Robison and Leeds 1996). It is an Arkansas endemic known from the Arkansas River drainage in Franklin, Johnson, Madison, Newton, Pope, Searcy, and Stone counties (Robison and Allen 1995; Robison and Leeds 1996). This species is also known from springs in the Boston Mountains and from 8 watersheds (Upper White, Buffalo, Mulberry, and Upper Mulberry rivers, Spadra, Little Piney, and Big Piney creeks, and the Middle Fork of Illinois Bayou). It may also be present in 10 more watersheds in the Ozark National Forest

(Robison and Leeds 1996). IUCN Red List Status: Least Concern.

#### *Cambarus diogenes* Girard 1852 - Devil Crayfish

Originally considered a subspecies, this primary burrower (Fig. 4) lives in large burrows with tall mud chimneys near ponds, streams, or ditches on the more northerly portion of the Coastal Plain. It can be excavated almost anywhere where the water table is near the surface (Pflieger 1996). This is a broadly distributed species (across the eastern US) and may be a species complex and, therefore, is currently under investigation to define species limits through its range. Tumblison et al. (2017) reported the first specimens from Lawrence County. IUCN Red List Status: Least Concern.



Figure 4. Devil crayfish, *Cambarus diogenes*.

#### *Cambarus hubbsi* Creaser 1931 – Hubbs' Crayfish

An uncommon stream crayfish in Arkansas, *C. hubbsi* has been found in riffles and runs of streams, burrows, and caves (Hobbs 1989). It occurs in northeastern Arkansas in the Eleven Point, Spring, Strawberry, and St. Francis river drainages and portions of the White River drainage (Flinders and Magoulick 2007). IUCN Red List Status: Least Concern.

#### *Cambarus ludovicianus* Faxon 1884 - Painted Devil Crayfish

This is a rather striking dark blue primary burrower that inhabits large burrows in lotic habitats on the Coastal Plain of southern and southwestern Arkansas. Young *C. ludovicianus* have been found in Nix Creek, Texarkana, Miller County (McAllister *unpubl.*). The

painted devil crayfish has been reported as one of the most secretive crayfishes in the Mississippi River drainage as it only leaves its burrows at night or during rainy conditions (Reimer and Clark 1974). Tumilson et al. (2017) documented the first report of an ovigerous *C. ludovicianus* from the state as well as new collections from Columbia and Lafayette counties. IUCN Red List Status: Least Concern.

#### ***Cambarus setosus* Faxon and Garman in Garman, 1889 - Bristly Cave Crayfish**

Graening et al. (2006a) added *C. setosus* to the state list rather recently. This troglobitic species is known in Arkansas from only 2 widely separated caves in Benton and Independence counties, respectively, in northern Arkansas. However, it is also known from at least 40 sites in Missouri (Pflieger 1996), many with declining populations, all restricted to cave environments and most are not adequately protected. The population in Benton County may be at risk because the habitat is located in a watershed that contains several municipal sewage treatment outfalls and numerous confined animal feeding operations (Graening et al., 2006a). It is listed as S1 (critically imperiled) in Arkansas (NatureServe 2015). IUCN Red List Status: Near Threatened.

#### ***Cambarus zophonastes* Hobbs and Bedinger 1964 - Hell Creek Cave Crayfish**

Hobbs and Bedinger (1964) originally described this cave crayfish from Hell Creek Cave, Stone County. An Arkansas endemic (Robison and Allen 1995), it was later discovered in a second Stone County locality, Nesbitt Spring Cave (Graening et al. 2006b, 2006c). In its cave environment, *C. zophonastes* has been observed on the sides of steep rock sides and on the mud bottom of the cave stream (Hobbs and Bedinger 1964, HWR *pers. observ.*). This species was designated as federally endangered in the U.S. in 1987 and listed as S1 (critically imperiled) in Arkansas by NatureServe (2015). It is threatened by a variety of negative factors including: groundwater pollution, a variety of human disturbance, and a reduction in nutrient availability. IUCN Red List Status: Critically Endangered.

#### **GENUS *CREASERINUS* HOBBS 1973**

#### ***Creaserinus caesius* (Hobbs 1975) - Timberlands Burrowing Crayfish**

*Creaserinus caesius* is a widespread primary burrower found in the basins of the Ouachita River and Bayou Dorcheat in southern Arkansas (Robison and Allen 1995). It inhabits roadside ditches with a high

water table, and clay-gravel substrates. IUCN Red List Status: Least Concern.

#### ***Creaserinus fodiens* (Cottle 1863) - Digger Crayfish**

This crayfish is a wide-ranging variable form (Fig. 5) that occupies lentic and lotic habitats as well as semi-terrestrial burrows in fine clay soils on the Coastal Plain. It can be found in a range of habitats such as wetlands (marshes and swamps), roadside ditches, creek banks and among rooted semi-aquatic plants and grasses (Hamr 2005; Taylor et al. 2005) but does not tolerate fast-flowing streams (Bouchard 1974). Tumilson and Robison (2010) reported new county records for *C. fodiens* in Chicot, Clark, and Ouachita counties. Due to the variability and broad distribution of these species, it is thought to be a species complex and is currently under investigation. IUCN Red List Status: Least Concern.

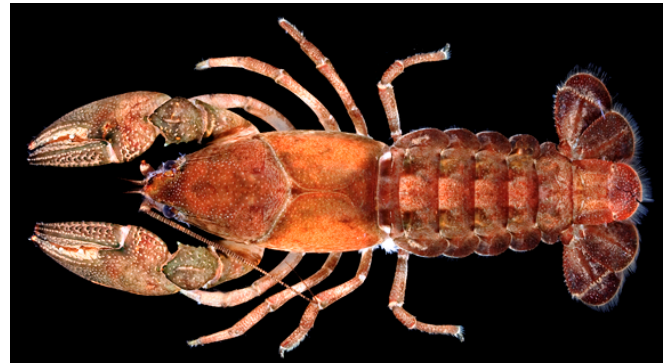


Figure 5. Digger Crayfish, *Creaserinus fodiens*.

#### ***Creaserinus gilpini* (Hobbs and Robison 1989) - Jefferson County Crayfish**

This crayfish is another primary burrower and has been taken only from complex burrows consisting of branching galleries, several of which, except in dry seasons, reach the surface, some of their openings marked by rather crudely constructed turrets (Hobbs and Robison 1989). Thus far, this state endemic has been collected only in Cleveland and Jefferson counties of southcentral Arkansas (Robison and Wagner 2005). IUCN Red List Status: Near Threatened.

#### **GENUS *FALLICAMBARUS* HOBBS 1969**

#### ***Fallicambarus dissitus* (Penn 1955) - Pine Hills Digger**

In Arkansas, this primary burrower is known only from burrows in the Red and Ouachita River watersheds in Columbia and Union counties. This species is found in complex burrows, approximately 61 cm (2 ft) deep, in roadside ditches consisting of sandy clay substrate



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(Hobbs and Robison 1989). IUCN Red List Status: Data Deficient.

### ***Fallicambarus harpi* Hobbs and Robison 1985 - Ouachita Burrowing Crayfish**

*Fallicambarus harpi* is a primary burrower in ditches, lawns, fields, and pastures. Robison and Crump (2004) investigated the distribution, natural history aspects, and its status and found the height of burrowing activity to occur in April when individuals dig burrows ranging from 45 to 85 cm deep and chimneys up to 20 cm in height. Soils tend to consist of sandy clay with organic material with grasses and sedges abundant (Hobbs and Robison 1985). Hundreds of these burrows can occupy a single pasture at a given time. Currently, this crayfish is known only from the Ouachita River basin in Garland, Hot Spring, Montgomery, and Pike counties and, as such, is an Arkansas endemic (Robison and Crump 2004; Robison et al. 2008). IUCN Red List Status: Near Threatened.

### ***Fallicambarus jeanae* Hobbs 1973 - Daisy Burrowing Crayfish**

This bluish-colored primary burrower is found throughout the Ouachita River basin in Clark, Hot Spring, Montgomery, and Pike counties. It is specifically found in roadside ditches and low-lying seepage areas with sandy to clay soils. IUCN Red List Status: Vulnerable.

### ***Fallicambarus petilicarpus* Hobbs and Robison 1989 - Slenderwrist Burrowing Crayfish**

Originally described by Hobbs and Robison (1989) from a single locality in western Union County, Arkansas, this primary burrower and Arkansas endemic has subsequently been collected in adjacent Columbia County in the extreme southern part of the state. This species is presently known from only 18 specimens, from 2 collections at the type locality, and an unknown number of specimens at a second locality in Columbia County (Robison 2001; Tumilson and Robison 2010). Tumilson and Robison (2010) reported that specimens were dug from complex burrows ranging from 20 to 48 cm (8 to 19 in.) in roadside ditches or seepage areas with rushes (*Juncus* sp.) common. IUCN Red List Status: Endangered.

### ***Fallicambarus schusteri* Taylor and Robison 2016 – Carmel Crayfish**

The Carmel Crayfish (Fig. 6) is the most recently described crayfish in Arkansas. Taylor and Robison (2016) described *F. schusteri* from the flatlands draining

south into the Red River from Idabel in southeastern McCurtain County, Oklahoma, to Ashdown in southcentral Little River County, Arkansas. The species occurs in roadside ditches that seasonally flood and have silt and silt-loam dominated soils. A single collection of this primary burrower is known from Arkansas at a roadside ditch ca. 0.8 km SW of Ashdown (33.86523°N, 94.1368°W) taken on 23 April 2015 and deposited in the INHS. IUCN Red List Status: Data Deficient.



Figure 6. Carmel Crayfish, *Fallicambarus schusteri*.

### ***Fallicambarus strawni* (Reimer 1966) - Saline Burrowing Crayfish**

This crayfish is an Arkansas endemic and primary burrower and has been found in the marshy areas drained by the Saline River (Red River drainage) in Howard, Pike, and Sevier counties. Its preferred substrate is sandy-clay; nearby streams are clear, fast-running, and shallow with rocky substrate. IUCN Red List Status: Least Concern.

### ***Fallicambarus tenuis* (Hobbs 1950) - Ouachita Mountain Crayfish**

*Fallicambarus tenuis* inhabits burrows and freshwater springs, or can be found under rocks in small first and second order clear cool permanent streams in the Ouachita Mountains. Robison et al. (2009) also reported it from the Arkansas and Red River basins in western Arkansas. IUCN Red List Status: Data Deficient.

### **GENUS FAXONELLA CREASER 1933**

### ***Faxonella blairi* Hayes and Reimer 1977 - Blair's Fencing Crayfish**

Prior to the report by Robison et al. (2014), this

small crayfish was thought to be rare in Arkansas. Their study documented 87 collections of over 900 specimens from lentic habitats such as roadside ditches in southwestern Arkansas in the Little and Red River basins of Columbia, Howard, Little River, Miller and Sevier counties. In addition, phylogenetic analyses clearly showed that *F. blairi* and *F. clypeata* form reciprocally monophyletic groups and are genetically differentiated from one another and from species in other genera (Robison et al. 2014). IUCN Red List Status: Least Concern.

#### ***Faxonella clypeata* (Hay 1899) - Ditch Fencing Crayfish**

A Coastal Plain inhabitant in Arkansas, *F. clypeata* (Fig. 7) occurs in sluggish streams, lentic habitats, and occasionally burrows as a tertiary burrower (Hobbs 1989). Tumblison and Robison (2010) collected specimens of *F. clypeata* using aquatic dip nets from lentic bodies of water with substrates of decaying leaves. Robison and McAllister (2014) documented *F. clypeata* from 1,198 specimens collected from 34 of 75 (45%) counties in the state. IUCN Red List Status: Least Concern.



Figure 7. Ditch Fencing Crayfish, *Faxonella clypeata*.

#### **GENUS FAXONIUS ORTMANN 1905**

#### ***Faxonius acares* (Fitzpatrick 1965) - Redspotted Stream Crayfish**

This stream crayfish inhabits rapidly flowing water associated with shoals and spring outflows also being favored (McAllister and Robison 2010). Its range includes tributaries of the Ouachita River system in Clark, Garland, Hot Spring, Montgomery, Perry, Pike, Polk, and Saline counties (McAllister and Robison

2010). This is a true Arkansas endemic (Robison et al. 2008). IUCN Red List Status: Least Concern.

#### ***Faxonius cyanodigitus* (Johnson 2010) - Red River Painted Crayfish**

Only one collection of this recently described crayfish from Texas and Arkansas has been documented from the state. The single Arkansas record (Johnson 2010) of this species is a Form I male collected on 13 October 2007 from the Red River at St. Hwy. 59, Little River County (33.55113°N 94.04125°W). IUCN Red List Status: Data Deficient.

#### ***Faxonius difficilis* (Faxon 1898) - Painted Crayfish**

This poorly known crayfish is known in Arkansas only from rocky streams in Washington County. This species inhabits a wide variety of stream types from small to moderate streams with clear water and white sand bottoms, to large streams with mud bottoms and very silty water. This taxonomic group is badly in need of study in Arkansas and adjacent Oklahoma. IUCN Red List Status: Least Concern.

#### ***Faxonius eupunctus* (Williams 1952) - Coldwater Crayfish**

This is a rarely encountered crayfish in the Eleven Point and Spring River systems and the Strawberry River drainage, near Evening Shade in northern Arkansas. Hobbs (1989) reported the habitat of *F. eupunctus* as clear, cold, rapid streams with coarse gravel substrates. It is often found in deeper pools from 2.5 to 3 m under large pieces of cobble. It appears to have been displaced from a portion of its range by the recently introduced crayfish, *F. neglectus* (Larson and Magoulick 2008). IUCN Red List Status: Vulnerable.

#### ***Faxonius lancifer* (Hagen 1870) - Shrimp Crayfish**

This crayfish (Fig. 8) inhabits sluggish streams and lentic habitats in 19 counties of the Coastal Plain in Arkansas. Robison et al. (2017) recently provided a summary of biological information on *F. lancifer* in the state. IUCN Red List Status: Least Concern.

#### ***Faxonius leptogonopodus* (Hobbs 1948) - Little River Creek Crayfish**

Another small stream inhabitant, *F. leptogonopodus* lives in small, clear, rocky streams in the Little River system (Red River Drive) in the Ouachita Mountains of southwestern Arkansas. This species is found in fast flowing water and is also a tertiary burrower (Williams 1954). IUCN Red List Status: Least Concern.

## Crayfishes of Arkansas

Figure 8. Shrimp Crayfish, *Faxonius lancifer*.***Faxonius longidigitus* (Faxon 1898) - Longpincered Crayfish**

The largest crayfish in Arkansas with its distinctive long, slender pinchers occupies rocky tributaries with permanent flow (and silt-free substrates) of the White and Little Red River systems in northern Arkansas. It can be found living in deeper pools beneath and beside large slab boulders. Pflieger (1996) reported a total length of 25.4 cm (10 in) for this crayfish in Table Rock Lake in Missouri. IUCN Red List Status: Least Concern.

***Faxonius macrus* (Williams 1952) - Neosho Midget Crayfish**

This diminutive stream crayfish inhabits fast-flowing clear streams with gravel and rock substrates and shallow burrows in the upper Arkansas River system in northwest Arkansas. It is also often found in shallow burrows or beneath rocks or boulders (Pflieger 1996). IUCN Red List Status: Least Concern.

***Faxonius marchandi* (Hobbs 1948) - Mammoth Spring Crayfish**

In Arkansas, this uncommon stream crayfish occupies clear streams with riffles and runs, with gravel or rubble substrate of the Spring River drainage in Fulton, Lawrence, Randolph, and Sharp counties. It is also found in high numbers in pools and spring-fed streams (Dukat and Magoulick 1999). In other parts of its range, *F. marchandi* is found in higher numbers in non-permanent freshwater habitats than it is in those which are permanent (Flinders and Magoulick 2003). This species is currently under threat by an invading *F. neglectus chaenodactylus* and ecological impacts on their native range as detailed by DiStefano et al. (2017). The species is currently under consideration for federal

endangered species status and would benefit from research to examine gene flow, phylogeographic patterns, and population structure (DiStefano et al. 2017). IUCN Red List Status: Near Threatened.

***Faxonius meeki brevis* (Williams 1952) - Meek's Short Painted Crayfish**

Another rocky stream inhabitant, this form is only found in tributaries of the Arkansas River in extreme northwest Arkansas. This species is found under rocks and is usually associated with rapids. This species is additionally found under debris or in burrows under rocks (Williams 1954). IUCN Red List Status: Least Concern.

***Faxonius meeki meeki* (Faxon 1898) - Meek's Crayfish**

*Faxonius meeki meeki* is a very common stream crayfish of the Arkansas and White River systems north of 35th parallel in the state (Hobbs 1989). It occupies riffles as well as pool regions where it tends to be found under shelter such as rocks and/or large submerged logs. IUCN Red List Status: Least Concern.

***Faxonius menae* Creaser 1933 - Mena Crayfish**

Robison et al. (2009) described the habitat of *F. menae* as shallow pool margins and shallow runs of clear streams (stream order 1 to 3) under rocks and rubble. In Arkansas, this crayfish is found only in the Ouachita Mountains physiographic province in tributaries of the upper Ouachita River in Hot Spring, Montgomery, and Polk counties (Robison et al. 2009). IUCN Red List Status: Least Concern.

***Faxonius nana* (Williams 1952) - Midget Crayfish**

A small crayfish, *F. nana* inhabits rocky streams of northwestern Arkansas (Benton and Washington counties) in the Neosho River basin. In addition, *F. nana* has been reported in the Illinois River (Bergey et al. 2005), and into the White River drainage (Prairie Creek) of Arkansas (C. Taylor, *pers. comm.*). It is found in clear, flowing permanent streams with substrates consisting of limestone gravel and cobbles (Williams 1952). This species' habitat is under constant threat from agriculture, road construction and urbanization, causing sedimentation and water pollution, in addition to construction of dams. IUCN Red List Status: Least Concern.

***Faxonius neglectus chaenodactylus* (Williams 1952) - Gap Ringed Crayfish**

This form of *F. neglectus* is an uncommon and

poorly-known crayfish (Wagner et al. 2010b). It inhabits streams of the North Fork of the White River and Sylamore Creek in Stone County, and has also been reported from the Spring River basin but is suspected to be an introduction (Rabalais and Magoulick 2006) and potentially invading (DiStefano et al. 2017). IUCN Red List Status: Least Concern.

#### ***Faxonius neglectus neglectus* (Faxon 1885) - Ringed Crayfish**

This invasive crayfish is found in clear, rocky, permanently-flowing streams of the White River (except North Fork) and the Arkansas River system in Arkansas. It can be found in riffles and shallow pools with current. This species is a generalist (Pflieger 1996). IUCN Red List Status: Least Concern.

#### ***Faxonius ozarkae* (Williams 1952) - Ozark Crayfish**

This stream form can be found in the White and Black river systems in northern Arkansas. It occurs in burrows beneath rocks and boulders in silt-free substrates in streams and can also be found in pools and riffles. In addition, *F. ozarkae* is able to survive in dry stream beds in moist burrows (Williams 1954; Pflieger 1996; Flinders and Magoulick 2007). IUCN Red List Status: Least Concern.

#### ***Faxonius palmeri longimanus* (Faxon 1898) - Western Painted Crayfish**

This crayfish is a common and widespread subspecies of streams of the Arkansas River and Red River drainages and upper Ouachita River system from southwestern Arkansas to the mid-central part of the state where it intergrades with the nominate form, *F. p. palmeri*. Its habitat is described as flowing stream reaches with rocky substrate but the species is also found in intermittent pools (Metcalf and Distler 1963). Interestingly, this is the most abundant crayfish inhabiting streams of the Ouachita National Forest of Arkansas. IUCN Red List Status: Least Concern.

#### ***Faxonius palmeri palmeri* (Faxon 1884) - Gray - Speckled Painted Crayfish**

In Arkansas, the nominate form is a stream crayfish occupying northeastern and northcentral Arkansas where it intergrades with *F. p. longimanus* throughout central Arkansas. This subspecies is strictly confined to flowing waters in ditches and streams (Pflieger 1996). Intergrades of *F. palmeri* × *longimanus* were reported from Jackson and Lawrence counties, Arkansas, by Tumilson et al. (2017). IUCN Red List Status: Least Concern.

#### ***Faxonius punctimanus* Creaser 1933 - Spothanded Crayfish**

Recently, McAllister and Robison (2012) reviewed the distribution, life history and conservation status of *F. punctimanus* in northern Arkansas. In southern Missouri, Pflieger (1996) reported this species was abundant in protected areas along the shore where there was cover in the form of vegetation, detritus, or large rocks. McAllister and Robison (2012) documented this crayfish was always found in clear, gravel-bottomed pool areas and only occasionally in swift riffles. It was most often hiding beside rocks and debris or under rocks in the pool regions of the stream, but patrolled pool bottoms regularly. They reported *F. punctimanus* from the White River system in Baxter, Clay, Fulton, Independence, Izard, Lawrence, Marion, Randolph, Searcy, Sharp, and Stone counties. IUCN Red List Status: Least Concern.

#### ***Faxonius virilis* (Hagen 1870) - Virile Crayfish**

This wide-ranging lentic and lotic species is sporadically observed in Arkansas. This crayfish is commonly found on rocky substrates; however, in slower rivers, it is found on a variety of material such as mud, silt, and sand. Occasionally, *F. virilis* constructs burrows in river banks, which have been found to occur at up to 10 m deep (Taylor and Schuster 2004). It is a variable species in need of taxonomic study across its range as there are probably several species masquerading as *F. virilis* currently across the United States. IUCN Red List Status: Least Concern.

#### ***Faxonius williamsi* (Fitzpatrick 1966) - Williams' Crayfish**

*Faxonius williamsi* is a tertiary burrower occupying cavities excavated under rocks seated in gravel in upland streams (Pflieger 1996). Fitzpatrick (1966) found it in pool regions, but was replaced by *F. m. meeki* in riffles. Our research has shown this species to be a pool inhabitant living in burrows or excavations under rocks in upland clear streams. Robison (1997) also found it living at the base of a waterfall in a shallow pool with rubble and cobble substrate in Washita Creek, Franklin County (Arkansas River drainage). The distribution of *F. williamsi* in Arkansas is the headwaters of the White River in Benton, Boone, Carroll, Madison, and Washington counties and in the Arkansas River drainage in Franklin and Johnson counties. Robison (1997) initially reported *F. williamsi* in the Arkansas River Drainage tributary of Walnut Creek in Johnson County, but was not cited by Wagner et al. (2010a). Taylor et al. (2007) provided a status of

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“currently stable” for *F. williamsi* based on long-term research on Arkansas crayfishes by Robison (1997) and Westhoff et al. (2006). IUCN Red List Status: Least Concern.

### GENUS *PROCAMBARUS* ORTMANN 1905

#### *Procambarus acutus* (Girard 1852) - White River Crayfish

*Procambarus acutus* (Fig. 9) occupies permanent sluggish to moderately flowing streams and other lentic habitats (Hobbs 1989) where it is commonly collected on the Coastal Plain. In Missouri, 70% of occurrences of *P. acutus* were from standing-water habitats, with the remainder from ditches and small to medium-sized streams (Pflieger 1996). It is known to burrow to avoid drying conditions and spends the winter months in burrows. This crayfish is used in both aquaculture and for fishing bait. IUCN Red List Status: Least Concern.



Figure 9. White River Crayfish, *Procambarus acutus*.

#### *Procambarus clarkii* (Girard 1852) - Red Swamp Crayfish

This tertiary burrower occupies lentic and lotic habitats but can be found in burrows (Hobbs 1989) on the Mississippi Alluvial Plain in eastern Arkansas. This crayfish is commonly raised by commercial crayfish producers in the eastern portion of the state for human consumption and has become a serious introduced agricultural pest (Huner 1977). IUCN Red List Status: Least Concern.

#### *Procambarus curdi* Reimer 1975 - Red River Burrowing Crayfish.

This species is a primary burrower and an inhabitant of lentic and sluggish lotic habitats in the Red River basin of southwestern Arkansas in Little River, Howard, and Miller counties, and adjacent southeastern Oklahoma (McAllister et al. 2011b). It burrows in sandy soil but can inhabit much harsher environments (Hobbs

1989). IUCN Red List Status: Least Concern.

#### *Procambarus dupratzi* Penn 1953 - Southwestern Creek Crayfish

A stream form, *P. dupratzi* occupies the Red River system of southern Arkansas. Walls and Black (2008) suggested that records of *P. dupratzi* from Arkansas and Oklahoma refer to an undescribed species. Molecular analysis will be necessary to confirm this report. IUCN Red List Status: Least Concern.

#### *Procambarus elegans* Hobbs 1969 - Elegant Creek Crayfish

This larger member of the distinctive *Pennides* group can be occasionally encountered in permanent streams of the lower Ouachita River system in southern Arkansas. It is found in streams with brown water that flows from sluggish to moderately swift through multiple channels in an eroded clay substrate (Hobbs 1969). IUCN Red List Status: Data Deficient.

#### *Procambarus geminus* Hobbs 1975 - Twin Crayfish

Hobbs (1975) described this inhabitant and close relative of *P. acutus* from lentic and lotic habitats of the Red River basin in Columbia, Lafayette, and Miller counties. It occurs in muddy sloughs, ditches, and muddy streams (Walls 2009). Tumilson et al. (2017) documented an ovigerous *P. geminus* from the state as well as new collections from Columbia and Lafayette counties. The type locality is located near Taylor, Columbia County (Hobbs 1975). IUCN Red List Status: Least Concern.

#### *Procambarus liberorum* Fitzpatrick 1978 - Osage Burrowing Crayfish

This primary burrower appears to have originated in the White River headwaters of the Ozark Mountains, migrated southward through the Arkansas River drainage onto the north flank of the Ouachita Mountains, then proceeded eastward through the Arkansas River Valley as far east as Lonoke County in the Gulf Coastal Plain province (Crandall et al. 2009). The overall range of *P. liberorum* in Arkansas includes 18 counties, namely Benton, Conway, Crawford, Faulkner, Franklin, Johnson, Logan, Lonoke, Madison, Montgomery, Perry, Polk, Pope, Pulaski, Scott, Sebastian, Washington, and Yell (McAllister et al. 2011b). IUCN Red List Status: Least Concern.

#### *Procambarus natchitochae* Penn 1953 - Red River Creek Crayfish

This crayfish is a creek and stream inhabitant of

tributaries of the Red River drainage in southwestern Arkansas. It inhabits clear to slightly cloudy waters with a moderate current and sandy and rocky substrate, as well as pools and roadside ditches (Hobbs 1989). McAllister (*unpubl.*) has found *P. natchitochae* to be very common in similar waters at Nix Creek in Texarkana, Miller County. IUCN Red List Status: Least Concern.

***Procambarus ouachitae* Penn 1956 - Ouachita River Crayfish**

This crayfish is found in 11 counties of the Ouachita and Arkansas River systems, and is a stream form commonly encountered in southcentral and western Arkansas. Tumilson and Robison (2010) added a new county record for *P. ouachitae* in Bradley County. We (CTM and HWR) have found this crayfish inhabiting a spring site (Abernathy Spring) in Polk County (Ouachita drainage). IUCN Red List Status: Least Concern.

***Procambarus parasimulans* Hobbs and Robison 1982 - Bismarck Crayfish**

Another Arkansas endemic, *P. parasimulans* inhabits burrows in lentic and sluggish lotic situations (Hobbs and Robison 1982). This secondary burrower has been documented by HWR in collections from the Arkansas, Ouachita, and Red River basins in southwestern Arkansas in Clark, Grant, Hot Spring, Nevada, Ouachita, Pike and Sevier counties (Hobbs and Robison 1988). IUCN Red List Status: Least Concern.

***Procambarus regalis* Hobbs and Robison 1988 - Regal Burrowing Crayfish**

This is a state endemic primary burrower found in the southwestern corner of Arkansas in the Red River drainage of Howard, Nevada, and Sevier counties (Hobbs and Robison 1988). This species is found in simple burrows and temporary pools (Hobbs and Robison 1988). IUCN Red List Status: Data Deficient.

***Procambarus reimeri* Hobbs 1979 - Irons Fork Burrowing Crayfish**

This state endemic inhabits burrows and temporary pools in the upper Ouachita River basin (Upper Irons Fork) in Polk County in westcentral Arkansas (Robison and Allen 1995). It is known from only 6 localities (Hobbs and Robison 1988). IUCN Red List Status: Least Concern.

***Procambarus simulans* (Faxon 1884) - Southern Plains Crayfish**

A secondary burrower, *P. simulans* is rarely

collected in Arkansas. It has been found in lentic and lotic habitats and burrows in the southwestern part of the state in Sevier County (Hobbs and Robison 1988). IUCN Red List Status: Least Concern.

***Procambarus tulaneii* Penn 1953 - Giant Bearded Crayfish**

This more widespread secondary burrower has been captured in lentic and lotic habitats and burrows in the Arkansas, Ouachita, and Red River basins in Ashley, Columbia, Drew, Hot Spring, Lafayette, Montgomery, Nevada, Ouachita, and Union counties of the state (Hobbs and Robison 1988). Additional collection/new county records for *P. tulaneii* were provided by Tumilson and Robison (2010) in Bradley, Clark, and Union counties. Mature specimens live in simple burrows often capped with large chimneys 30 cm (12 in) high (Walls 2009). IUCN Red List Status: Least Concern.

***Procambarus viaeviridis* (Faxon 1914) - Vernal Crayfish**

*Procambarus viaeviridis* is taken from sluggish streams and lentic situations on the Mississippi Alluvial Plain of eastern Arkansas. The type locality is the St. Francis River, Clay County (Faxon 1914). IUCN Red List Status: Least Concern.

***Procambarus vioscai vioscai* Penn 1946 - Percy's Creek Crayfish**

In Arkansas, this stream crayfish inhabits tributaries of the Red River system in the southern part of the state. This species can be found in waters with sandy silt or gravel substrates. IUCN Red List Status: Least Concern.

***Problematic Species in Arkansas***

Several species have earlier been erroneously included in the Arkansas crayfish fauna. The Golden Crayfish (*Faxonius luteus*) has been formerly included as occurring in Arkansas based on records from Carroll (White River, Eureka Springs) and Lawrence (Black River, Black Rock) counties; however, Williams (1954) doubted the validity of the White River locality since he was not able to find *F. luteus* in that area. An established population of this species at the Black Rock locality also seems to be questionable, since *F. luteus* is an upland species, and Black Rock lies at the western edge of the Gulf Coastal Plain. Because this location is also considerably downstream from any known population, it seems unlikely that even waifs would occur there (Bouchard and Robison 1980). Thus, we doubt the

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presence of this species in Arkansas based solely on these questionable records and have omitted it from our state checklist.

Another species in question is the Water Nymph Crayfish (*Faxonius nais*). Previously, Williams (1954) identified populations in his study as *Orconectes nais*; however, most of these are referable to *F. virilis* (Bouchard and Robison 1980). Williams did not collect live, adult, or reproductive male specimens of *F. nais* with their distinctive color pattern common to members of the Palmeri Group. The different color patterns of *F. nais* and *F. virilis* certainly would have alerted him that the 2 were morphologically very similar, but separate species were present. Until a confirmed population of *F. nais* is found in Arkansas, it is not currently included as part of the Arkansas crayfish fauna. More complete DNA studies of specimens may reveal more regarding this species in the future.

Previously, the Western Plains Crayfish (*Faxonius causeyi*) had been recorded from Arkansas by Reimer (1966). He considered *F. causeyi* to be distinct from its closest ally, *F. virilis*, although he noted that it may only be a subspecies of *F. virilis*. Hobbs (1972b) later regarded *F. causeyi* as a synonym of *F. virilis*. Hobbs (1974) included *F. causeyi* in his checklist, again questioning its taxonomic validity, but retaining the name until a thorough study of it and *F. virilis* is undertaken. We follow Hobbs (1972b) in regarding *F. causeyi* as a synonym of *F. virilis*, but as noted under the *F. virilis* record and by Hobbs, this species complex needs a thorough study.

Walls (2009) suggested that the Marsh Crayfish (*Procambarus hinei*) is likely to be found in southern Arkansas since it occurs in Ouachita Parish, Louisiana, just below the Arkansas border. However, to date, none have been collected in Arkansas.

The Caddo Chimney Crayfish (*Procambarus machardy*) is another possible addition to future lists. Walls (2009) reported that it was possible that specimens of this species from both Arkansas and Texas may be misidentifications of either *P. curdi* or *P. parasimulans*. However, additional studies will be necessary to confirm this suggestion.

One possible introduction into the state is the Southern White River Crayfish (*Procambarus zonangulus*). Walls (2009) reported that its natural distribution may have been modified by movement for economic purposes because many commercial ponds in central Louisiana (as well as Arkansas and Mississippi) are stocked with a mixture of wild *P. clarkii* and *P. zonangulus* from southern Louisiana. So, the range possibly extends up the Red and Ouachita as well as

Mississippi rivers into Arkansas and Oklahoma.

The most recent crayfish to be added erroneously is the former Lonoke Crayfish, *P. ferrugenus* (Hobbs and Robison 1988) which was later determined to be a synonym of *P. liberorum* by Crandall et al. (2009) and thus, was deleted from the state checklist. While we have herein deleted those species not considered a part of the state crayfish fauna, there are crayfish species which will ultimately be added to our state biodiversity. In our studies of state crayfishes, 3 undescribed crayfish species of the genus *Procambarus* have been discovered using genetic analyses from molecular work (Crandall et al. 2009). Formal descriptions of these undescribed forms are currently being prepared. Collecting continues in Arkansas and undiscovered cryptic species may still yet occur in the state.

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**APPENDIX.** Checklist of the crayfishes of Arkansas.**FAMILY CAMBARIDAE HOBBS 1942****GENUS BOUCHARDINA HOBBS 1977**

*Bouchardina robisoni* Hobbs 1977 - Bayou Bodcau Crayfish

**GENUS CAMBARELLUS ORTMANN 1905**

*Cambarellus puer* Hobbs 1945 - Swamp Dwarf Crayfish

*C. shufeldtii* (Faxon 1884) - Cajun Dwarf Crayfish

**GENUS CAMBARUS ERICHSON 1846**

*Cambarus aculabrum* Hobbs and Brown 1987 - Benton County Cave Crayfish

*C. causeyi* Reimer 1966 - Boston Mountains Crayfish

*C. diogenes* Girard 1852 - Devil Crawfish

*C. hubbsi* Creaser 1931 - Hubbs' Crayfish

*C. ludovicianus* Faxon 1884 - Painted Devil Crayfish

*C. setosus* Faxon and Garman in Garman 1889 - Bristly Cave Crayfish

*C. zophonastes* Hobbs and Bedinger 1964 - Hell Creek Cave Crayfish

**GENUS CREASERINUS HOBBS 1973**

*Creaserinus caesius* (Hobbs 1975) - Timberlands Burrowing Crayfish

*C. fodiens* (Cottle 1863) - Digger Crayfish

*C. gilpini* (Hobbs and Robison 1989) - Jefferson County Crayfish

**GENUS FALLICAMBARUS HOBBS 1969**

*Fallicambarus dissitus* (Penn 1955) - Pine Hills Digger

*F. harpi* Hobbs and Robison 1985 - Ouachita Burrowing Crayfish

*F. jeanae* Hobbs 1973 - Daisy Burrowing Crayfish Burrowing Crayfish

*F. petilicarpus* Hobbs and Robison 1989 - Slenderwrist Burrowing Crayfish

*F. schusteri* Taylor and Robison 2016 - Carmel Burrowing Crayfish

*F. strawni* (Reimer 1966) - Saline Burrowing Crayfish

*F. tenuis* (Hobbs 1950) - Ouachita Mountain Crayfish

**GENUS FAXONELLA CREASER 1933**

*Faxonella blairi* Hayes and Reimer 1977 - Blair's Fencing Crayfish

*F. clypeata* (Hay 1899) - Ditch Fencing Crayfish

**GENUS FAXONIUS ORTMANN 1905**

*Faxonius acares* (Fitzpatrick 1965) - Redspotted Stream Crayfish

*F. cyanodigitus* (Johnson 2010) - Red River Painted Crayfish

*F. difficilis* (Faxon 1898) - Painted Crayfish

*F. eupunctus* (Williams 1952) - Coldwater Crayfish

*F. lancifer* (Hagen 1870) - Shrimp Crayfish

*F. leptogonopodus* (Hobbs 1948) - Little River Creek Crayfish

*F. longidigitus* (Faxon 1898) - Longpincered Crayfish

*F. macrus* (Williams 1952) - Neosho Midget Crayfish

*F. marchandi* (Hobbs 1948) - Mammoth Spring Crayfish

*F. meeki brevis* (Williams 1952) - Meek's Short Painted Crayfish

*F. meeki meeki* (Faxon 1898) - Meek's Crayfish

*F. menae* Creaser 1933 - Mena Crayfish

*F. nana* (Williams 1952) - Midget Crayfish

*F. neglectus chaenodactylus* (Williams 1952) - Gap Ringed Crayfish

*F. n. neglectus* (Faxon 1885) - Ringed Crayfish

*F. ozarkae* (Williams 1952) - Ozark Crayfish

*F. palmeri longimanus* (Faxon 1898) - Western Painted Crayfish

*F. p. palmeri* (Faxon 1884) - Gray-Speckled Painted Crayfish

*F. punctimanus* Creaser 1933 - Spothanded Crayfish

*F. virilis* (Hagen 1870) - Virile Crayfish

*F. williamsi* (Fitzpatrick 1966) - Williams' Crayfish

**GENUS PROCAMBARUS ORTMANN 1905**

*Procambarus acutus* (Girard 1852) - White River Crayfish

*P. clarkii* (Girard 1852) - Red Swamp Crayfish

*P. curdi* Reimer 1975 - Red River Burrowing Crayfish

*P. dupratzi* Penn 1953 - Southwestern Creek Crayfish

*P. elegans* Hobbs 1969 - Elegant Creek Crayfish

*P. geminus* Hobbs 1975 - Twin Crayfish

*P. liberorum* Fitzpatrick 1978 - Osage Burrowing Crayfish

*P. natchitochae* Penn 1953 - Red River Crayfish

*P. ouachitae* Penn 1956 - Ouachita River Crayfish

*P. parasimulans* Hobbs and Robison 1982 - Bismarck Crayfish

*P. regalis* Hobbs and Robison 1988 - Regal Burrowing Crayfish

*P. reimeri* Hobbs 1979 - Irons Fork Burrowing Crayfish

*P. simulans* (Faxon 1884) - Southern Plains Crayfish

*P. tulaneii* Penn 1953 - Giant Bearded Crayfish

*P. viaeviridis* (Faxon 1914) - Vernal Crayfish

*P. vioscai vioscai* Penn 1946 - Percy's Creek Crayfish