

FINAL REPORT

**STATUS AND GENETICS OF THREE OUACHITA CRAYFISHES
OF THE GENUS *PROCAMBARUS***

by

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Introduction

Three species of the crayfish genus *Procambarus* inhabit the Ouachita Mountains of Arkansas, namely, *Procambarus reimeri*, *Procambarus tenuis*, and the more wide-ranging species, *Procambarus liberorum*. Two of these crayfishes (*Procambarus reimeri* and *Procambarus liberorum*) are Arkansas endemics (Robison and Allen, 1995). Unfortunately, little is known of the genetics, distributional ranges of each of these species, conservation status of each, and/or their precise systematic relationships. In an effort to correct some of these problems, this study was undertaken to specifically look at these three species.

Objectives

The intention of this present study was to accurately portray the current conservation status, distribution, and genetics of three Ouachita Mountains crayfishes of the genus *Procambarus*.

Specific objectives of the study were:

1. To establish a baseline distribution and status of three crayfishes: *Procambarus tenuis*, *Procambarus reimeri*, and *Procambarus liberorum*;
2. To employ genetic analyses to clarify the taxonomic status of these three crayfish species of the genus *Procambarus* relative to other *Procambarus* species in the area; and
3. To document the diversity and distribution of the crayfish fauna in areas of the Ouachita Mountains, Arkansas.

Methods and Materials

Field work was conducted from March, 2005 through the spring and into July, 2005. The

majority of collections were made during March, April, May and continued into early June, 2005 when wet conditions were optimal. Two of the three species (*Procambarus liberorum* and *Procambarus reimeri*) are primary burrowers, i.e. they burrow all year long in one place and rarely exit, thus to collect specimens it is necessary to physically dig them out once the burrow is discovered. While the digging of burrows can be quite laborious, it generally remains the most reliable method known to collect primary burrowing crayfishes. The third species, *Procambarus tenuis*, frequents small streams and rivulets and can be collected by turning rocks and catching them by hand or with a small dip net.

Other methods supplemented digging of burrows and hand picking including baited strings and crayfish traps; however, both excavation and hand collecting proved to be superior methods of collecting specimens.

Specimens used for describing the geographic range of each species were initially preserved in 95% isopropyl alcohol and later transferred to the Brigham Young University Monte L. Bean Life Science Museum's crustacean collection after identification to species.

Collection efforts were centered in the Ouachita Mountains and in the Ozark Mountains where *Procambarus liberorum*, the most wide-ranging of the three species was known to occur. Collections were made in 10 counties throughout the Ouachita Mountains and 11 counties in the Ozark Mountains. A total of 63 collections were made from the 21 counties to determine the geographic ranges of the three *Procambarus* species in Arkansas.

In addition to field collections in 2005 by the two Co-Investigators, museum collections housed at the Smithsonian Institution and Southern Arkansas University were examined for specimens of any of the three target species. All previous literature dealing with the three *Procambarus* species in Arkansas was also consulted.

For genetic analyses, gill tissue was dissected from crayfish specimens and preserved in 95% EtOH for DNA extraction. DNA was extracted using standard protocols and a ~500 base pair highly variable segment of the 16S gene of the mitochondrial genome was PCR amplified

using the methods and primers described in Crandall and Fitzpatrick (1996). Sequences were obtained from all populations collected of all three target species plus many of the associated species and taxonomic relatives for phylogenetic comparison. Sequences were aligned using the software Clustal X and phylogenetic analyses were performed in PAUP*. A neighbor-joining tree using the GTR+G model of evolution was estimated from the complete data set and node confidence was assessed using the bootstrap procedure.

Results and Discussion

Procambarus tenuis

Originally, the crayfish, *Procambarus tenuis*, was described from 19 specimens collected on 3 June 1934 by Charles E. Burt from two collections in the headwaters of the Little River system in LeFlore County, Oklahoma. The specimens were deposited in the collection of the United States National Museum and later recognized as a new species by Horton H. Hobbs, Jr. in 1950.

Distributional Range

Previously, the distributional range of *Procambarus tenuis* was known only from two collections, one from LeFlore County, Oklahoma and the other from Polk County, Arkansas. The type-locality is: Oklahoma: LeFlore County: A spring at the base of mountains (tributary to Little River system) six miles east of Page and just west of the Oklahoma State Line. June 3 1934. Charles E. Burt. 19 specimens (3 male form I; 6 male form II, 4 females, 2 male immatures, 4 female immatures). The second locality is Arkansas: Polk Co.: Six miles northwest of Rich Mountain, just east of state line (tributary of Little River system). 3 June 1934. Charles E. Burt. 7 specimens (1 male form II, 3 females; 2 male immatures, 1 female immature).

Searches of the 10 counties throughout the Ouachita Mountains revealed the presence of

four new populations of this crayfish. New populations discovered during this study are as follows: **OKLAHOMA: LeFlore County:** (1) Billy Creek Recreation Area in a spring outflow, west of Big Cedar, OK; (2) Pipe spring approximately five miles north of Big Cedar, OK.; (3) Little Powell Creek approximately 5 miles west of the OK/AR state line on St. Hwy. 1.

ARKANSAS: Polk Co.: (4) Unnamed tributary of Cedar Creek approximately 10 miles north of Acorn, AR; (5) Spring behind the Wonder House on top of Rich Mountain in Queen Wilhelmina State Park; (6) Rivulet at junction of St. Hwy. 172 and St. Hwy. 88 on Rich Mountain in Queen Wilhelmina State Park.

In summary, the distributional range for *Procambarus tenuis* after this study is six localities in two counties, one county in Oklahoma (LeFlore County) and one county in Arkansas (Polk County) (Table 1). Four new populations were discovered in LeFlore County, Oklahoma and Polk County, Arkansas. At each of these locations, *Procambarus tenuis* was found to be a highly localized and a locally uncommon crayfish.

Crayfish Associates

During the collection portion of this study six additional species of crayfishes were collected while searching for *Procambarus tenuis*, namely, *Fallicambarus strawni*, *Orconectes leptogonopodus*, *Orconectes menae*, *Orconectes acares*, *Orconectes saxatilis*, and *Procambarus liberorum*.

Conservation Status

Taylor et al. (1996) published a paper entitled "Conservation Status of crayfishes of the United States and Canada" which provides the most current conservation estimate dealing with crayfishes. In that paper they found 19.2 percent of the crayfish fauna in the United States and Canada endangered, while 13.3 percent was threatened and 14.8 percent considered as special concern. While 52.0 percent or 176 of the 338 native crayfishes were considered "stable," 48.0 percent or 162 species were in need of some conservation status.

In their report, Taylor et al. (1996) listed *Procambarus tenuis* as "Special Concern" based on

the best information available at the time. In this survey *P. tenuis* remains an uncommonly collected species. Using the more globally accepted criteria of the International Conservation Union (IUCN 2001), we recommend this species be listed in the IUCN Red List as “Vulnerable” based on criteria B2a,biii with respect to our data. On the basis of these new data, it is the further recommendation of the two Co-Investigators that *Procambarus tenuis* should be continued in a status of "Special Concern" for the state of Arkansas where it can be monitored in future years to determine if the population increases or declines.

Genetic Analyses

Our molecular genetic study resulted in an alignment of 387 sequenced samples by 528 characters. From these data a phylogeny was estimated (see Appendix 1) showing the evolutionary relationships among the various samples and bootstrap nodal support for those clades of particular interest relative to the three target species. Appendix 2 provides sample name and collection information for all the samples used in this study. The samples of *Procambarus tenuis* form a monophyletic clade with high (100%) bootstrap support for that monophyly supporting its designation as a unique taxon. Furthermore, the phylogeny reveals a close evolutionary relationship among this species and other *Procambarus* species from Texas (*P. curdi*, *P. nigrocinctus*, *P. simulans*), Florida (*P. youngi*), and other Arkansas species (*P. reimeri*, *P. liberorum*). The genetic data suggest that *P. tenuis* has extremely low genetic variability as well. This genetic variability should also be monitored with future studies to be sure it does not decrease and thereby increase the probability of extinction of this species (Spielman et al. 2004).

Procambarus reimeri

Hobbs (1979) described *Procambarus reimeri* collected from burrows in a roadside ditch on an unnumbered road to Irons Fork River about five miles northeast of Mena, Polk County, Arkansas in the spring of 1973. Irons Fork is a south-flowing tributary of the Ouachita River,

entering the mainstem channel northeast of Mena, Arkansas. This crayfish is an Arkansas endemic (Robison and Allen, 1995) known only from Polk County, Arkansas.

Distributional Range

Hobbs (1979) initially found *Procambarus reimeri* in several locations near Mena, Polk County, Arkansas in 1973. The locations previously known for *Procambarus reimeri* are: **Polk Co.:** (1) **Type-Locality:** Burrows in roadside ditch about five miles northeast of Mena, AR on unnumbered road to Irons Fork River, G. B. Hobbs, J. E. Pugh, and H. H. Hobbs, Jr. 18 April 1973; (2) Roadside ditch about 7 miles northeast of Mena, AR. G. B., J. E. Pugh, and H. H. Hobbs, Jr. 18 April 1973; (3) Roadside ditch adjacent to Ouachita River, 3.4 miles east of junction of U.S. Hwy. 71 on St. Hwy. 88. G. B. Hobbs, J. E. Pugh, and H. H. Hobbs, Jr. 18 April 1973; (4) Roadside ditch on Posey Hollow Road 4.5 miles north of Acorn, AR and 1.4 miles east of U.S. Hwy. 71. G. B. Hobbs, J. E. Pugh, and H. H. Hobbs, Jr. 20 April 1973; (5) Flooded tributary to Irons Fork on Posey Hollow Road about 1 mile east of U. S. Hwy. 71. G. B. Hobbs, J. E. Pugh, and H. H. Hobbs, Jr. 20 April 1973; (6) Pool in roadside ditch 3.1 miles southeast of St. Hwy. 375. G. B. Hobbs, J. E. Pugh, and H. H. Hobbs, Jr. 20 April 1973.

Searches of the 10 counties throughout the Ouachita Mountains revealed the presence of only two new populations of this crayfish, both in Polk County. The two new populations are as follows: **Polk County** : (1) Wet area approximately 200 yards from Irons Fork Lake, about eight miles northeast of Mena, AR., and (2) Roadside ditch at edge of U.S. Hwy. 71, approximately five miles north of Mena, AR.

In summary, *Procambarus reimeri* after this study is known from only eight localities in one county, Polk County, Arkansas (Table 2). Two new populations were discovered in Polk County during this study, but these are well within the known range of *P. reimeri*, however, at each of these locations, *Procambarus reimeri* was found to be a highly localized and locally uncommon crayfish.

Biological Aspects:

First form males of *Procambarus reimeri* were first collected on 24 March 2004. Hobbs (1979) collected first form males on 18 April 1973 and 20 April 1973.

No ovigerous females nor females carrying young were found; however, seven tiny juveniles were collected on 23 April 2004. The largest specimen is a female having a carapace length of 41.5 (postorbital carapace length 36.0) mm. The largest and smallest first form males have lengths of 39.4 (33.9) mm and 31.6 (26.6) mm.

Burrows of *Procambarus reimeri* are comparatively simple structures, one-half to one meter in depth constructed in a sandy clay soil.

Three additional species of crayfishes were collected while searching for *Procambarus reimeri* including, *Fallicambarus strawni*, *Orconectes leptogonopodus*, and *Orconectes menae*.

Conservation Status

Taylor et al. (1996) published a paper entitled "Conservation Status of crayfishes of the United States and Canada" which provides the most current conservation estimate dealing with crayfishes. They found 19.2 percent of the crayfish fauna in the United States and Canada endangered, while 13.3 percent was threatened and 14.8 percent considered as special concern. Sadly, only 52.0 percent or 176 of the 338 native crayfishes were considered "stable," while 48.0 percent or 162 species were in need of some conservation status.

In their report, Taylor et al. (1996) listed *Procambarus reimeri* as "endangered" based on the best information available at the time. In our survey it is apparent that *Procambarus reimeri* is indeed an uncommon member of the Ouachita Mountain crayfish fauna and confined to Polk County, Arkansas in the area of the Iron's Fork of the Ouachita River. This southward flowing tributary of the Ouachita River has been impounded to form a small lake, Irons Fork Lake, northeast of Mena, Arkansas. Recently, the city of Mena is considering expansion of Irons Fork Lake thereby decreasing the habitable area of *Procambarus reimeri* (Richard Standage, U. S. Forest Service, pers. comm.). The IUCN has previously listed *P. reimeri* as Vulnerable based on

criteria B1+2ciii and D1. Based on our results, this is still an appropriate categorization for this species. On the basis of this additional information and our collecting effort, it is our recommendation that *Procambarus reimeri* continue to be considered as an "endangered" Arkansas endemic and that monitoring of this crayfish species be continued.

Genetic Analyses

Our molecular genetic study resulted in an alignment of 387 sequenced samples by 528 characters. From these data a phylogeny was estimated (see Appendix 1) showing the evolutionary relationships among the various samples and bootstrap nodal support for those clades of particular interest relative to the three target species. Appendix 2 provides sample name and collection information for all the samples used in this study. The samples of *Procambarus reimeri* form a monophyletic clade with high (98%) bootstrap support for that monophyly supporting its designation as a unique taxon. Furthermore, the phylogeny reveals a close evolutionary relationship among this species and other *Procambarus* species from Texas (*P. curdi*, *P. nigrocinctus*, *P. simulans*), Florida (*P. youngi*), and other Arkansas species (*P. tenuis*, *P. liberorum*). The genetic data suggest that *P. reimeri* also has extremely low genetic variability. This genetic variability should also be monitored with future studies to be sure it does not decrease and thereby increase the probability of extinction of this species (Spielman et al. 2004).

Procambarus liberorum

Fitzpatrick (1978) described *Procambarus liberorum* from a specimen dragged up by a cat in Fayetteville, Arkansas, thus the type-locality is a home address in Fayetteville, Washington County, Arkansas.

Recently, Robison and Crandall (2005) concluded that the rare species, *Procambarus ferrugineus* which was described by Hobbs and Robison (1988), was actually *P. liberorum*.

Distributional Range

Procambarus liberorum is an inhabitant of the Arkansas River basin, occurring from Benton and Washington counties in northwestern Arkansas to Pope and Yell counties in Arkansas (Hobbs and Robison, 1988). Presently, this crayfish is considered a state endemic (Robison and Allen, 1995).

Searches throughout the northern Ouachita Mountains, Arkansas Valley, and the southern Ozark Mountains revealed the presence of thirteen new populations of this crayfish (Table 3). New populations discovered during this study are as follows: **Crawford County:** (1) Natural pond, swampy area. Lat: 35.69403 Long: 93.99400. HWR et al. 9 specimens (8 females; 1 form II male); **Faulkner County:** (2) South of ballfields on Museum Road in Conway, AR (Sec. 5, T5N, R13W). Lat-Long 35:10054-92.41853 NAD27. Brian Wagner. 5 specimens; (3) Vilonia High School south of St. Hwy. 107 and U.S. Hwy. 64 (Sec. 8, T5N, R11W). Lat-Long: 35.08455-92.19810NAD27. Brian Wagner. 5 specimens. **Franklin County:** (4) Roadside ditch along St. Hwy. 23 north of Clarksville, AR. HWR, Gene Leeds, Louie Leeds, Rhea Rylee, Keith Crandall, Jen Buyah, Savel, James, and Joe Kremers; (5) Roadside ditch, 8 miles west of Cass, AR on FSR 1003 (White Mtn. Road) (just east of Gray's Spring. Lat: 35.66762 Long: 93.89267. Elevation: 1700 ft. HWR, et al. 7 specimens (4 form II males; 3 females); (6) Intersection of White Rock Mtn Road (FSR 1003) and Mineral Hill Road. Lat. 35.67610 Long: 93.92035 Elevation : 1400 ft. HWR, et al. 8 specimens (6 form II males; 2 females; 2 juv.); (7) Roadside seepage, ½ mile south of White Rock Mountain Lat: 35.68327 Long: 93.96545 Elevation: 1600 ft. HWR, et al. 15 specimens (1 form II male freshly molted; 14 juv.); (8) Roadside seepage on FSR 1003; "Reimer site"; ½ mile directly south of White Rock Mountain.

Lat: 35.68686 Long: 93.96696 Elevation: 1600 ft. HWR, et al. 11 specimens (2 large females; 9 juveniles); **Johnson County:** (9) Roadside ditch along St. Hwy. 23 (Sec. 33, T14S, R25W). HWR, et al. (10) Residence of Gene Leeds, ca. 3 miles east of Lamar, AR. Gene Leeds. **Scott County:** (11) Waldron High School, Waldron AR. Ron Goddard and Classes. 14 specimens. **Washington County:** (12) Roadside ditch, 10 miles southeast of Fayetteville on St. Hwy. 16. H. W. Robison. 1 specimen. (13) By old drive-in in Fayetteville (Sec. 33, T17N, R30W). Lat-Long: 36.11048-94.17760NAD27. Brian Wagner. 4 specimens.

In summary, the distributional range for *Procambarus liberorum* after this study is 12 counties, namely, Benton, Crawford, Faulkner, Franklin, Johnson, Logan, Lonoke, Pope, Sebastian, Scott, Washington, and Yell counties. A total of thirteen new populations was discovered in Crawford, Faulkner, Franklin, Johnson, Scott, and Yell counties (Table 3). This wide-ranging state endemic crayfish occurs in a broad belt from northern Arkansas in the Ozark Mountains south to the northern portion of the Ouachita Mountains, and then extends east onto the Delta to Lonoke County, Arkansas. At each of these locations, except Lonoke County, *Procambarus liberorum* was usually found to be a locally abundant crayfish.

Crayfish Associates

During the collection portion of this study eight additional species of crayfishes were collected while searching for *Procambarus liberorum* namely, *Fallicambarus fodeins*,, *Cambarus causeyi*, *Cambarus ludovicianus*, *Orconectes acares*, *Orconectes menae*, *Orconectes meeki meeki*, *Orconectes williamsi*, and *Procambarus acutus*.

Conservation Status

In a paper entitled "Conservation Status of Crayfishes of the United States and Canada,"

Taylor et al. (1996) published a paper that provides the most current conservation estimate dealing with crayfishes. In that paper they found 19.2 percent of the crayfish fauna in the United States and Canada endangered, while 13.3 percent was threatened and 14.8 percent considered as special concern. Fifty-two percent or 176 of the 338 native crayfishes were considered "stable" while 48.0 percent or 162 species were in need of some conservation status.

Procambarus liberorum was listed by Taylor et al. (1996) as "Currently Stable" because of the large number of localities known for the Arkansas endemic published by Hobbs and Robison (1988). After extensive collecting in western and central Arkansas, we agree that *Procambarus liberorum* should be considered as "Currently Stable" due to its widespread distribution and general abundance throughout its range in Arkansas. Under the IUCN criteria, this species should be listed as "Least Concern".

Genetic Analyses

Our molecular genetic study resulted in an alignment of 387 sequenced samples by 528 characters. From these data a phylogeny was estimated (see Appendix 1) showing the evolutionary relationships among the various samples and bootstrap nodal support for those clades of particular interest relative to the three target species. Appendix 2 provides sample name and collection information for all the samples used in this study. The samples of *Procambarus liberorum* form a monophyletic clade with a moderately high (72%) bootstrap support for that monophyly supporting its designation as a unique taxon (inclusive of samples from the United States National Museum of Natural History (labeled USNMXX) of *P. ferrugineus*). These samples from the USNM clustered throughout the clade of *P. liberorum* and provided samples from additional counties not collected in this current study. Furthermore, the phylogeny reveals a close evolutionary relationship among this species and other *Procambarus* species from Texas (*P. curdi*, *P. nigrocinctus*, *P. simulans*), Florida (*P. youngi*), and other Arkansas species (*P. reimeri*, *P. tenuis*). The genetic data suggest that *P. liberorum* has

reasonable levels of genetic variability without significant population substructuring. With the extensive sampling we have from this particular species, we plan on writing a single manuscript of the phylogeographic diversity of this species across the state of Arkansas.

Additional Phylogenetic Inferences

In addition to the molecular genetic verification of the species status of the three targeted *Procambarus* species, our extensive sampling also provided support for perhaps two undescribed species of *Procambarus* and two undescribed species of *Fallicambarus*. The first potentially new species (labeled *Procambarus sp. nov. 1?*) are all from Hempstead Co., Arkansas but from two different localities. The bootstrap value (not shown) for this clade is weak and additional samples are needed to confirm or refute the existence of a new species. The second potentially new species, on the other hand, does form a robust clade with a 99% bootstrap support. These samples are from both Hempstead and Lafayette counties, Arkansas, suggesting another relatively narrow endemic undescribed species exists that is in need of conservation concern. Future work should be performed to detail the distribution of this new taxon and provide a formal description of it.

In addition to these potentially two new species of *Procambarus*, we also identified two potentially new species of *Fallicambarus*. The first (*Fallicambarus sp. nov. 1*), is from Nevada Co. Arkansas and appears to be a sister species to *Fallicambarus jeanae*. This potentially new taxon is supported as a monophyletic group with 100% bootstrap support. The second was collected from Bastrop Parish, Louisiana and appears to be a sister taxon to *Fallicambarus caesius*. This clade of *Fallicambarus* is also strongly supported with 100% bootstrap support. Both taxa will need additional sampling to adequately identify the species ranges for appropriate species descriptions.

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Table 1. All Known Collections of *Procambarus tenuis* in Arkansas and Oklahoma.

1. **TYPE LOCALITY:** OK: LeFlore Co.: A spring at base of mountains (tributary to Little River system) six miles east of Page and just west of the Oklahoma State Line. June 3 1934. Charles E. Burt. 19 specimens (3 male form I; 6 male form II, 4 females, 2 male immatures, 4 female immatures)
2. AR: Polk Co.: Six miles northwest of Rich Mountain, just east of state line (tributary of Little River system). 3 June 1934. Charles E. Burt. 7 specimens (1 male form II, 3 females; 2 male immatures, 1 female immature).
3. AR: Polk Co.: Unnamed tributary to Cedar Creek along U.S. Hwy. 71 (Sec. 9, R30W, T1S), ca. 10 miles north of Mena, AR. 1 July 2005. H. W. Robison. 5 specimens (1 male form II; 4 juveniles)
4. OK: LeFlore Co.: Little Powell Creek (tributary of Kiamichi River) at St. Hwy. 1 approximately 5 miles west of OK/AR state line. 23 May 2005. H. W. Robison. 2 specimens.
5. AR: Polk Co.: Queen Wilhelmina State Park, behind Wonder House off St. Hwy. 88? on Rich Mountain. 4 June 2005. Henry W. Robison. 1 specimen (1 immature).
6. AR: Polk Co.: Small rivulet at junction of St. Hwy. 172 and St. Hwy. 88 on Rich Mountain. 5 March 2005 Henry W. Robison. 2 specimens (2 females immatures).
7. OK: LeFlore Co.: Billy Creek Recreation Area in spring outflow. 17 June 2005. Henry W. Robison. 2 specimens.
8. OK: LeFlore Co.: Pipe spring north of Big Cedar. 17 June 2005. Henry W. Robison. 4 specimens.
9. OK: LeFlore Co.: Little Powell (tributary of Kiamichi River) at St. Hwy. 1 ca. 3 miles west of Ok/AR state line. H. W. Robison, K. E. Crandall, and B. Wagner. 3 specimens

Table 2. All Known Collections of *Procambarus reimeri* in Arkansas.

- TYPE LOCALITY:** AR: Polk Co.: Roadside ditch about five miles northeast of Mena, AR on unnumbered road to Irons Fork River.). 18 April 1973. G. B. Hobbs, J. E. Pugh, and H. H. Hobbs, Jr. 116 specimens (3 form I males; 4 male form II; 10 females, 51 juvenile males; 48 juvenile males).
2. AR: Polk Co.: Roadside ditch about 7 miles NE of Mena on unnumbered road to Irons Fork River. 18 April 1973. G. B. Hobbs, J. E. Pugh, and H. H. Hobbs, Jr. 5 specimens (4 juveniles males; 1 juvenile female).
 3. AR: Polk Co.: Roadside ditch adjacent to Ouachita River, 3.4 miles east of junction of U.S. Hwy. 71 on St. Hwy. 88. 20 April 1973. 49 specimens (2 male form I; 2 male form II; 2 females; 20 juvenile males; 23 juvenile females).
 4. AR: Polk Co.: Roadside pool on Posey Hollow Road 4.5 miles north of Acorn, AR and 1.4 miles east of U.S. Hwy. 71. 20 April 1993. G. B. Hobbs, J. E. Pugh, and H. H. Hobbs, Jr.. 2 specimens (2 juvenile males).
 5. AR: Polk Co.: Flooded tributary to Irons Fork River on Posey Hollow Road about 1 mile east of U.S. Hwy. 71. 20 April 1973. G. B. Hobbs, J. E. Pugh, and H. H. Hobbs, Jr. 1 specimen (1 juvenile female).
 6. AR: Polk Co.: Pool in roadside ditch 3.1 miles southeast of St. Hwy. 5 on St. Hwy. 375. 20 April 1973. G. B. Hobbs, J. E. Pugh, and H. H. Hobbs, Jr. 56 specimens (2 male form II; 7 females; 24 juvenile males; 23 juvenile females).
 7. AR: Polk Co.: Roadside ditch on Posey Hollow Road 5.2 miles north of Acorn, AR and 2.1 miles east of U.S. Hwy. 71. 23 April 2004. H. W. Robison, K. A. Crandall, B. Wagner, J. Buhay. 7 specimens.
 8. AR: Polk Co.: Roadside ditch on Posey Hollow Road ¼ mile north of Irons Fork Lake ca. 7 miles north of Acorn, AR and 3 miles east of U.S. Hwy. 71. 23 April 2004. H. W. Robison, K. A. Crandall, B. Wagner, J. Buhay. 5 specimens.
 9. AR: Polk Co.: Roadside ditch on Posey Hollow Road 5.2 miles north of Acorn, AR and 2.1 miles east of U.S. Hwy. 71. 23 April 2005. H. W. Robison. 3 specimens.
 10. AR: Polk Co.: Roadside ditch on U.S. Hwy. 71 ca. 3 miles north of Acorn, AR. 3 May 2005. H. W. Robison. 2 specimens.

Table 3. All Known Collections of *Procambarus liberorum* in Arkansas.

1. **TYPE LOCALITY:** AR: Washington Co.: Fayetteville, AR
2. Franklin Co.: Roadside ditch, 8 miles west of Cass, AR on FSR 1003 (White Mtn. Road) (just east of Gray's Spring. Lat: 35.66762 Long: 93.89267. Elevation: 1700 ft.
May 20, 2005. HWR, Gene Leeds, Louie Leeds, Rhea Rylee, Keith Crandall, Jen Buyah, Savel, James, and Joe Kremers. 7 (4 form II males; 3 females)
3. Franklin Co.: Intersection of White Rock Mtn Road (FSR 1003) and Mineral Hill Road.
Lat. 35.67610 Long: 93.92035 Elevation : 1400 ft. 20 May 2005. HWR, et al.
8 specimens (6 form II males; 2 females; 2 juv.)
4. Franklin Co.: Roadside seepage, ½ mile south of White Rock Mountain
Lat: 35.68327 Long: 93.96545 Elevation: 1600 ft. 20 May 2005. HWR et al.
15 specimens (1form II male freshly molted; 14 juv.)
5. Franklin Co.: Roadside seepage on FSR 1003; "Reimer site"; ½ mile directly south of White Rock Mountain. Lat: 35.68686 Long: 93.96696 Elevation: 1600 ft. 20 May 2005. HWR et al. 11 specimens (2 large females; 9 juveniles)
6. Crawford Co.: Natural pond, swampy area.
Lat: 35.69403 Long: 93.99400 20 May 2005. HWR et al. 9 specimens (8 females; 1 form II male).
7. Scott Co.: Waldron High School, Waldron AR. Keith Goddard and Classes. 14 specimens.
8. Johnson Co.: Residence of Gene Leeds ca. 3 miles east of Lamar, AR. Gene Leeds. 3 specimens.
9. Washington Co.: Roadside ditch approximately 10 miles southeast of Fayetteville along St. Hwy. 16. 15 March 2005. H. W. Robison. 1 specimen.
10. Washington Co.: By old drive-in in Fayetteville (Sec. 33,T17N, R30W).
Lat-long: 36.11048-94.17760NAD27. 9 April 2004. Brian Wagner. 4 specimens.
11. Faulkner Co.: South of ballfields on Museum Road in Conway (Sec. 5, T5N, R13W).
Lat-Long: 35.10054-92.41853 NAD27. 13 March 2004. Brian Wagner. 5 specimens.
12. Faulkner Co.: Vilonia High School south of Hwy. 107 and US 64 (Sec. 8, T5N, R11W).
Lat-Long: 35.08455-92.19810 NAD27. 30 March 2005. Brian Wagner. 5 specimens.

Table 4. Some Additional Crayfish Collections made in 2005 Study.

Franklin Co.: Roadside ditch, 8 miles west of Cass, AR on FSR 1003 (White Mtn. Road) (just east of Gray's Spring. Lat: 35.66762 Long: 93.89267. Elevation: 1700 ft.

May 20, 2005. HWR, Gene Leeds, Louie Leeds, Rhea Rylee, Keith Crandall, Jen Buyah, Savel Daniels, James Finlay, and Joe Kremers.

Procambarus liberorum – 7 (4 form II males; 3 females)

Franklin Co.: Intersection of White Rock Mtn Road (FSR 1003) and Mineral Hill Road.

Lat. 35.67610 Long: 93.92035 Elevation : 1400 ft. 20 May 2005. HWR, et al.

Procambarus liberorum – 8 specimens (6 form II males; 2 females; 2 juv.)

Franklin Co.: Roadside seepage, ½ mile south of White Rock Mountain

Lat: 35.68327 Long: 93.96545 Elevation: 1600 ft. 20 May 2005. HWR et al.

Procambarus liberorum – 15 specimens (1form II male freshly molted; 14 juv.)

Franklin Co.: Roadside seepage on FSR 1003; “Reimer site”; ½ mile directly south of White

Rock Mountain. Lat: 35.68686 Long: 93.96696 Elevation: 1600 ft. 20 May 2005. HWR et al.

Procambarus liberorum – 11 (2 large females; 9 juveniles)

Crawford Co.: Natural pond, swampy area.

Lat: 35.69403 Long: 93.99400 20 May 2005. HWR et al.

Procambarus liberorum – 9 (8 females; 1 form II male)

Crawford Co.: Hurricane Creek

Lat: 35.70551 Long: 94.02766 20 May 2005. HWR et al.

Orconectes meeki meeki – 19 (5 form I males, 11 females, 3 form II males)

Johnson Co.: West Fork of Washita Creek

Lat: 35.64466 Long: 93.59547 21 May 2005. HWR. Gene Leeds, Louie Leeds, Keith

Crandall, Jen Buyah, Savel Daniels, James Finlay, and Joe Kremers.

Orconectes meeki meeki – 10 (8 form II males, 2 females)

Crawford Co.: Spring which enters Washita East Fork at old house place.
Lat: 35.64545 Long: 93.59341 21 May 2005. HWR et al.

Orocnectes meeki meeki – 1 female

Crawford Co.: Roadside spring pipe along St. Hwy. 103? North of Clarksville, AR
Lat: 35.65456 Long: 93.59431 21 May 2005. HWR et al.

Orconectes williamsi – I female

Crawford Co.: School Pond Spring, north of Oark, AR.
Lat: 35.71966 Long: 93.54984 21 May 2005. HWR et al.

Cambarus causeyi – 1 female from 5 foot deep hole.

Crawford Co.: Tate Spring
Lat: 35.73474 Long: 93.55157 21 May 2005. HWR et al.

Cambarus causeyi – 1 female

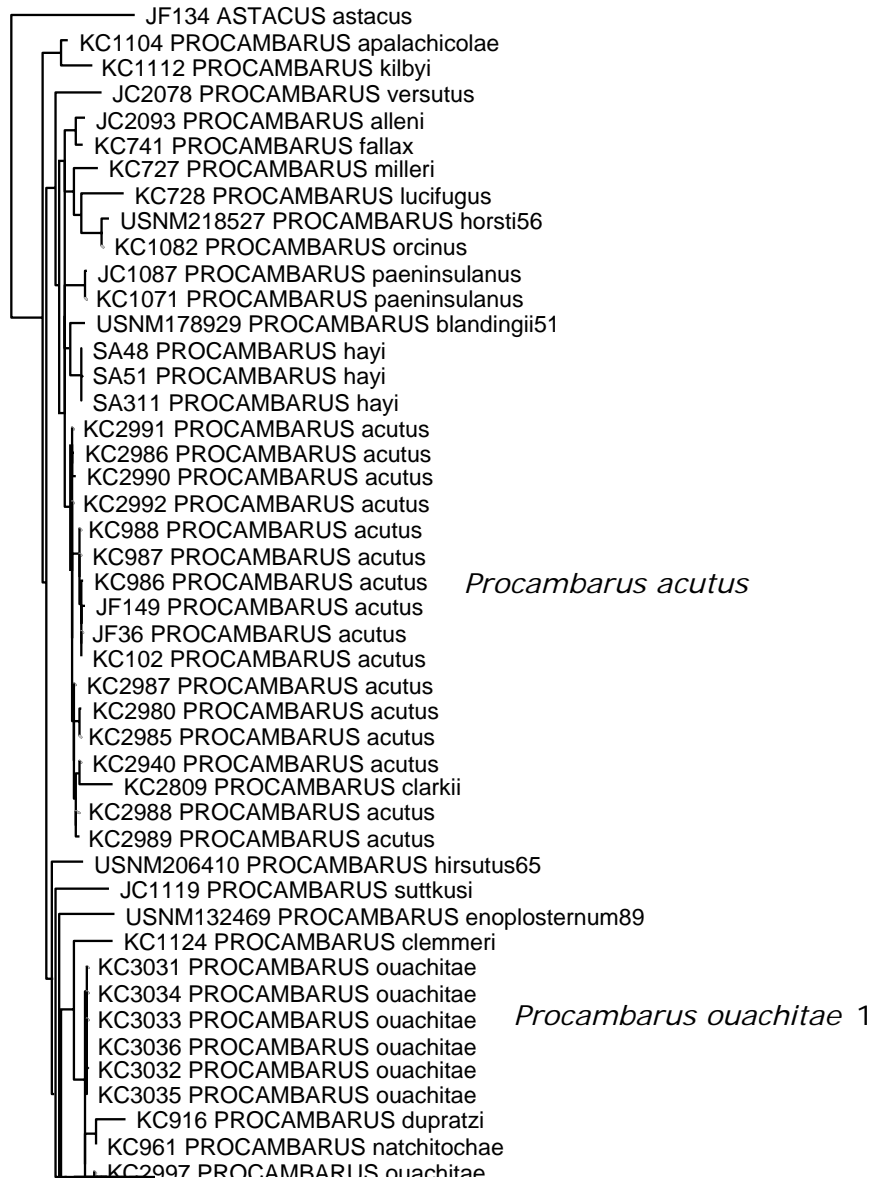
Crawford Co.: Little Piney Creek
Lat: 35.68544 Long: 93.40950 21 May 2005. HWR et al.

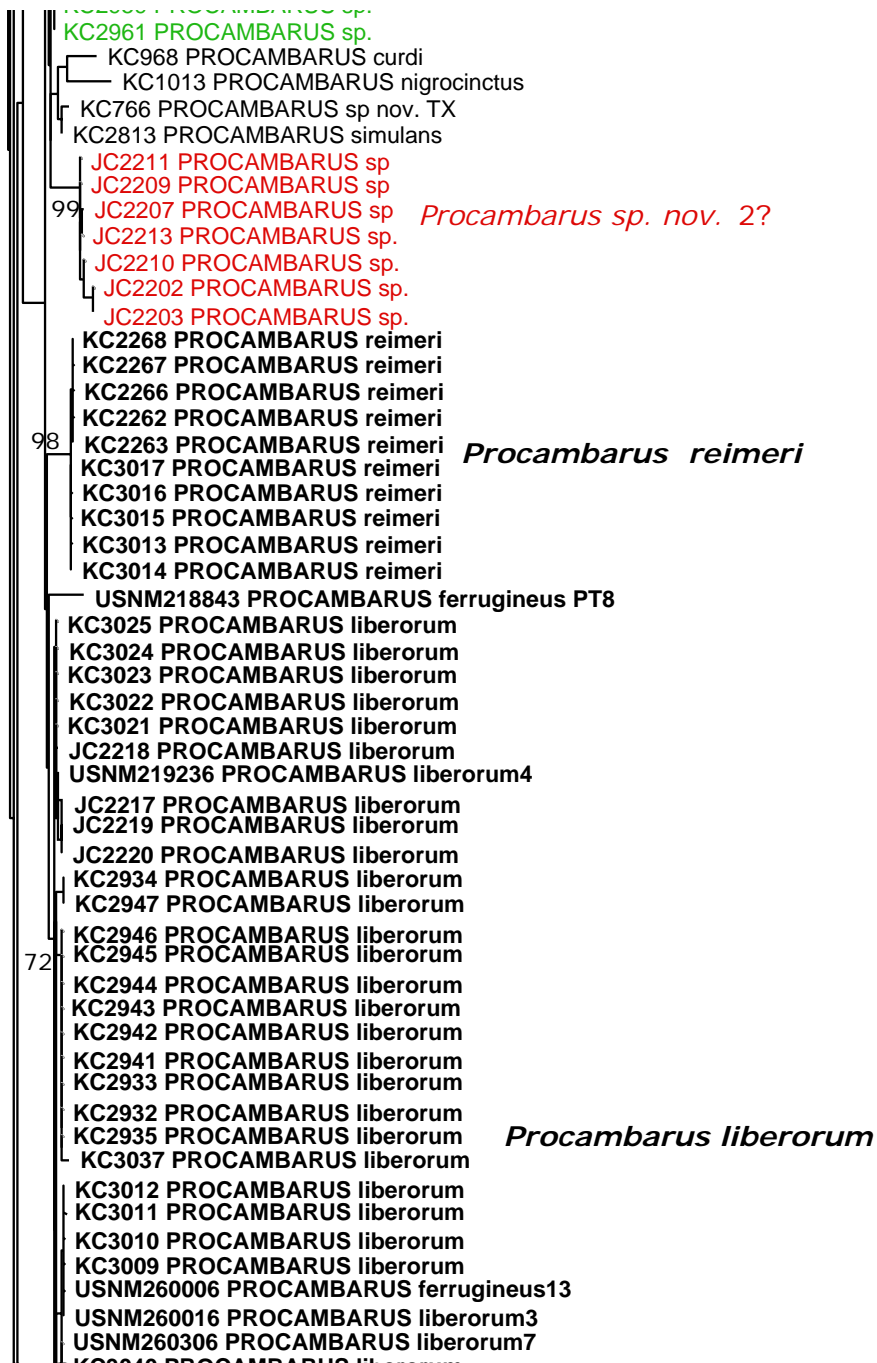
Orconectes meeki meeki – 13 (1 form I male; 9 form II males; 3 females)

Polk Co.: Unnamed tributary to Cedar Creek along U.S. Hwy. 71 (Sec. 9, R30W, T1S), ca. 10 miles north of Mena, AR. 1 July 2005. H. W. Robison.

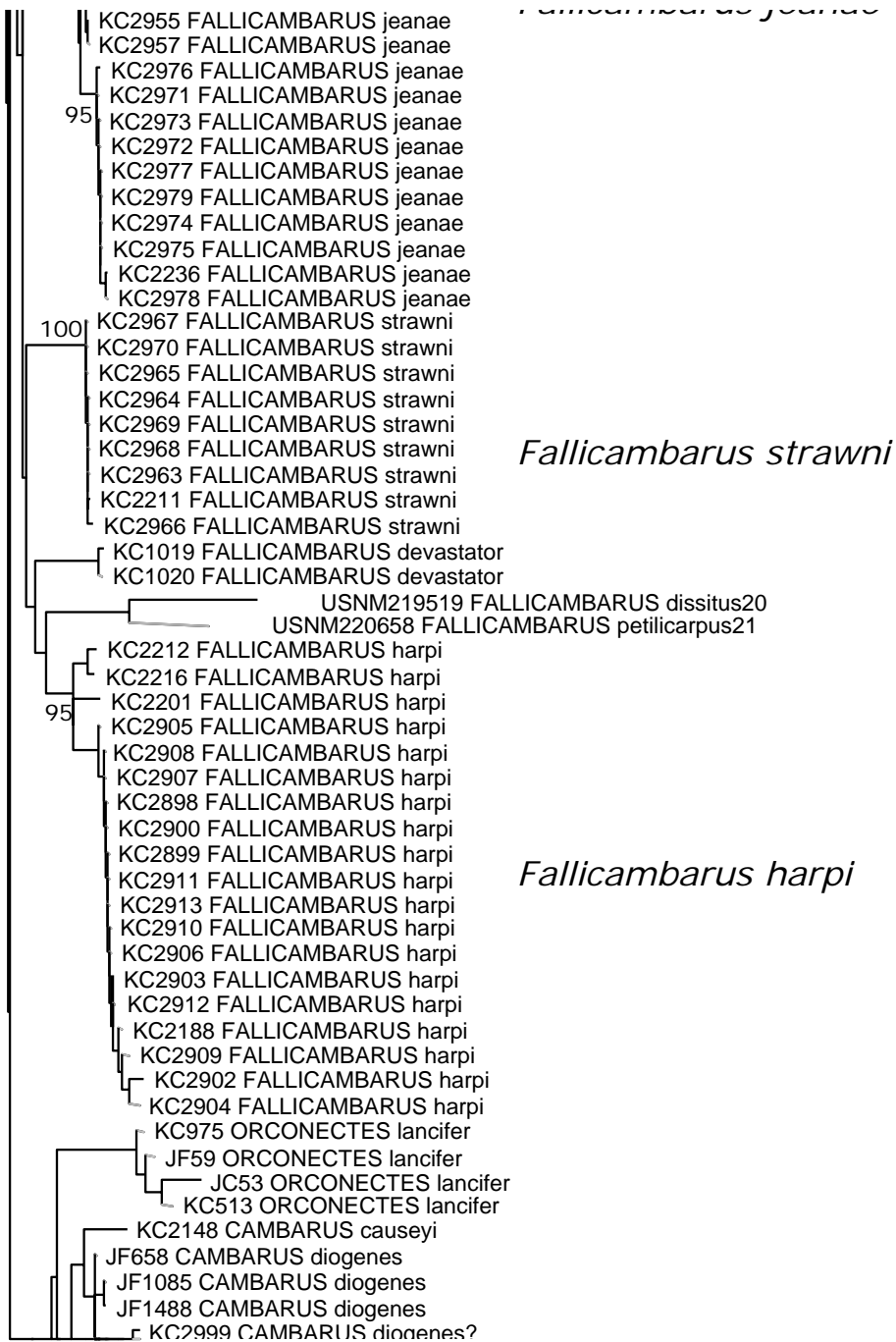
Procambarus tenuis – 5 (1 male form II; 4 juveniles)

Estimated Phylogeny of Arkansas Crayfishes with an emphasis on the targeted *Procambarus* species

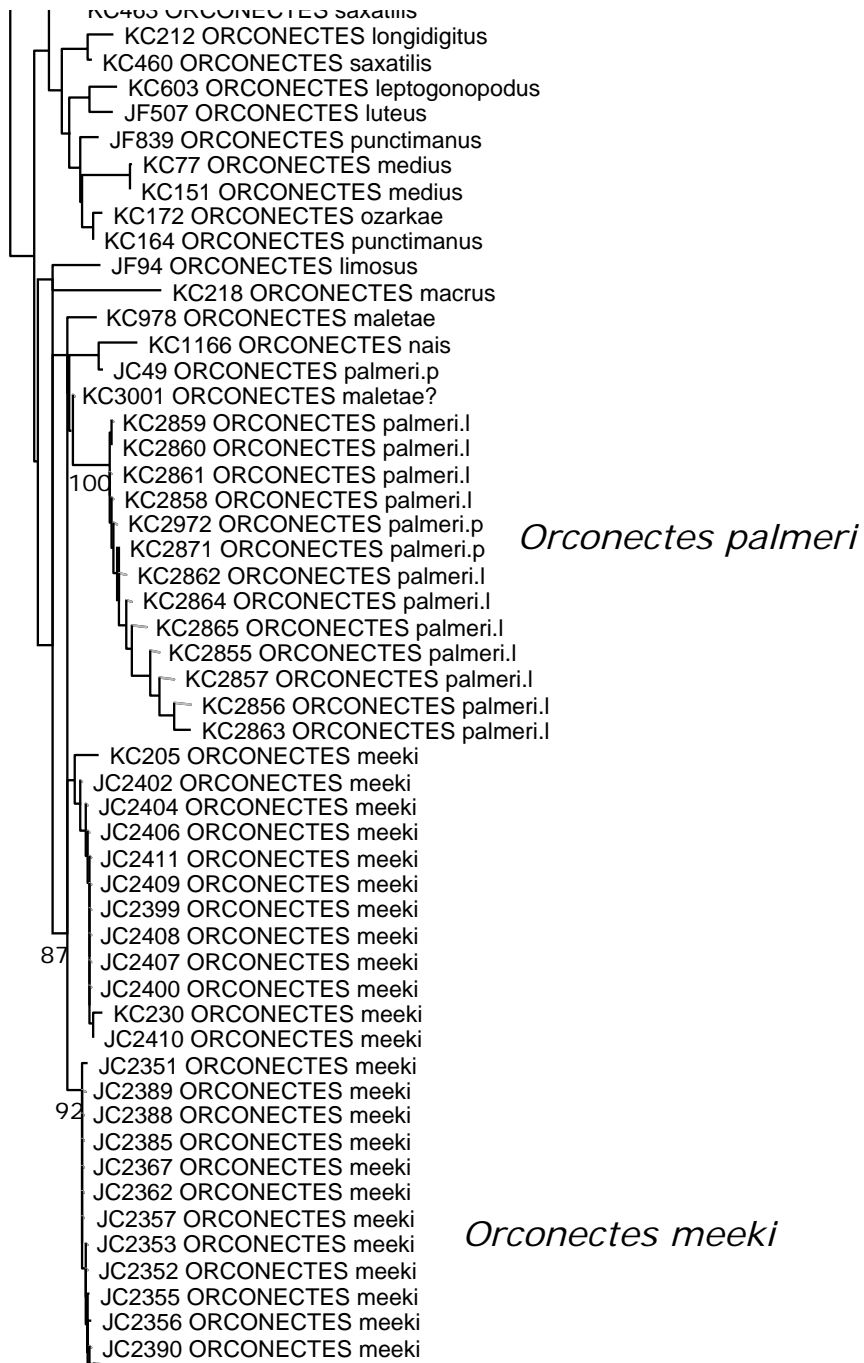












JC#	BYUC#	GENUS	SPECIES	16S	Haplo#	CO1	12S	SEX	FORM	STATE	COUNTY	DRAII RIVER	LOCALITY	JC	SITI	COLLEC'
JC2172	04-98	Cambarus	causeyi	BUHAY				male	1	AR	Johnson		Footprint Spring	308	Hrobison,	
JC2173	04-98	Cambarus	causeyi	BUHAY				female	0	AR	Johnson		Footprint Spring	308	Hrobison,	
JC2174	04-98	Cambarus	causeyi	BUHAY				juv	0	AR	Johnson		Footprint Spring	308	Hrobison,	
JC2175		Procambarus						male	1	AR	Hempstead		Grandview Prairie		Hrobison	
JC2176		Procambarus						female	1	AR	Hempstead		Grandview Prairie		Hrobison	
JC2177		Procambarus						male	2	AR	Hempstead		Grandview Prairie		Hrobison	
JC2178		Fallicambarus	fodiens					male	2	AR	Columbia		2 miles W of Waldo		Hrobison	
JC2179		Fallicambarus	fodiens					male	2	AR	Columbia		2 miles W of Waldo		Hrobison	
JC2180		Fallicambarus	fodiens					male	2	AR	Columbia		2 miles W of Waldo		Hrobison	
JC2182		Cambarus	ludovicianus							AR	Hempstead		5 miles E of Blevins (Henry's Site 6)		Hrobison	
JC2183		Fallicambarus	caesius					female		AR	Hempstead		5 miles E of Blevins (Henry's Site 6)		Hrobison	
JC2184		Fallicambarus	fodiens					female		AR	Hempstead		5 miles E of Blevins (Henry's Site 6)		Hrobison	
JC2185		Procambarus	sp					male	2	AR	Hempstead		5 miles E of Blevins (Henry's Site 6)		Hrobison	
JC2186		Procambarus	sp	BUHAY				female		AR	Hempstead		5 miles E of Blevins (Henry's Site 6)		Hrobison	
JC2187		Procambarus	sp					juvenile		AR	Hempstead		5 miles E of Blevins (Henry's Site 6)		Hrobison	
JC2188		Fallicambarus	fodiens					male	2	AR	Hempstead		Blevins (Henry's Site 7)		Hrobison	
JC2189		Fallicambarus	caesius	BUHAY				male	2	AR	Hempstead		Blevins (Henry's Site 7)		Hrobison	
JC2190		Fallicambarus	caesius					juvenile		AR	Hempstead		Blevins (Henry's Site 7)		Hrobison	
JC2191		Fallicambarus	caesius					juvenile		AR	Hempstead		Blevins (Henry's Site 7)		Hrobison	
JC2192		Fallicambarus	caesius					juvenile		AR	Hempstead		Blevins (Henry's Site 7)		Hrobison	
JC2193		Fallicambarus	caesius					juvenile		AR	Hempstead		Blevins (Henry's Site 7)		Hrobison	
JC2194		Fallicambarus	caesius					juvenile		AR	Hempstead		Blevins (Henry's Site 7)		Hrobison	
JC2195		Fallicambarus	caesius					juvenile		AR	Hempstead		Blevins (Henry's Site 7)		Hrobison	
JC2196		Fallicambarus	caesius					juvenile		AR	Hempstead		Blevins (Henry's Site 7)		Hrobison	
JC2197		Fallicambarus	caesius	BUHAY				female		AR	Hempstead		Blevins (Henry's Site 7)		Hrobison	
JC2198		Fallicambarus	caesius	BUHAY				female	0	AR	Hempstead		5 mi E of Patmos		Hrobison	
JC2199		Fallicambarus	caesius	BUHAY				male	2	AR	Hempstead		5 mi E of Patmos		Hrobison	
JC2200		Cambarus	ludovicianus					female	0	AR	Hempstead		5 mi E of Patmos		Hrobison	
JC2201		Fallicambarus	caesius	BUHAY				female	0	AR	Hempstead		5 mi E of Patmos		Hrobison	
JC2202		Procambarus		BUHAY				male	2	AR	Hempstead		5 mi E of Patmos		Hrobison	
JC2203		Procambarus		BUHAY				male	2	AR	Hempstead		5 mi E of Patmos		Hrobison	
JC2204		Fallicambarus	caesius					juv	0	AR	Hempstead		5 mi E of Patmos		Hrobison	
JC2205		Procambarus						female	0	AR	Lafayette		4 mi N of Lewisville		Hrobison	
JC2206		Procambarus						male	2	AR	Lafayette		4 mi N of Lewisville		Hrobison	
JC2207		Procambarus		BUHAY				female	0	AR	Lafayette		4 mi N of Lewisville		Hrobison	
JC2208		Procambarus						female	0	AR	Lafayette		4 mi N of Lewisville		Hrobison	
JC2209		Procambarus		BUHAY				female	0	AR	Lafayette		4 mi N of Lewisville		Hrobison	
JC2210		Procambarus		BUHAY				male	2	AR	Lafayette		4 mi N of Lewisville		Hrobison	
JC2211		Procambarus		BUHAY				female	0	AR	Lafayette		4 mi N of Lewisville		Hrobison	
JC2212		Procambarus						male	2	AR	Lafayette		4 mi N of Lewisville		Hrobison	
JC2213		Procambarus		BUHAY				female	0	AR	Lafayette		4 mi N of Lewisville		Hrobison	
JC2214	TISSUE	Cambarus	zophonastes							AR	Stone		Hell Creek Cave		Bwagner	
JC2215	TISSUE	Cambarus	zophonastes							AR	Stone		Hell Creek Cave		Bwagner	
JC2216	TISSUE	Cambarus								AR			Nesbitt Cave		Bwagner	
JC2217	TISSUE	Procambarus	liberorum	BUHAY				female	0	AR	Faulkner		Vilonia High School, south of Hwy 107		Bwagner	
JC2218	TISSUE	Procambarus	liberorum	BUHAY				male	2	AR	Faulkner		Vilonia High School, south of Hwy 107		Bwagner	
JC2219	TISSUE	Procambarus	liberorum	BUHAY				male	2	AR	Faulkner		Vilonia High School, south of Hwy 107		Bwagner	
JC2220	TISSUE	Procambarus	liberorum	BUHAY				male	2	AR	Faulkner		Vilonia High School, south of Hwy 107		Bwagner	
JC2221		Fallicambarus	gilpini					female	0	AR	Jefferson		0.5 mi N of Type locale, 10.5 miles S c		Hrobison	
JC2222		Fallicambarus	gilpini					male	2	AR	Jefferson		0.5 mi N of Type locale, 10.5 miles S c		Hrobison	
JC2223		Fallicambarus	gilpini					male	2	AR	Jefferson		0.5 mi N of Type locale, 10.5 miles S c		Hrobison	
JC2224		Fallicambarus	gilpini					female	0	AR	Jefferson		0.5 mi N of Type locale, 10.5 miles S c		Hrobison	
JC2225		Fallicambarus	gilpini					juv	0	AR	Jefferson		0.5 mi N of Type locale, 10.5 miles S c		Hrobison	
JC2226		Fallicambarus	gilpini					female	0	AR	Jefferson		0.5 mi N of Type locale, 10.5 miles S c		Hrobison	
JC2300		Procambarus	liberorum					male	2	AR	Franklin		West of Bee Rock, on FS1003, 8 mi S		Robison,	
JC2301		Procambarus	liberorum					male	2	AR	Franklin		West of Bee Rock, on FS1003, 8 mi S		Robison,	
JC2302		Procambarus	liberorum					female	0	AR	Franklin		West of Bee Rock, on FS1003, 8 mi S		Robison,	
JC2303		Procambarus	liberorum					female	0	AR	Franklin		West of Bee Rock, on FS1003, 8 mi S		Robison,	
JC2304		Procambarus	liberorum	BUHAY				female	0	AR	Franklin		West of Bee Rock, on FS1003, 8 mi S		Robison,	
JC2305		Procambarus	liberorum	BUHAY				male	2	AR	Franklin		West of Bee Rock, on FS1003, 8 mi S		Robison,	
JC2306		Procambarus	liberorum					male	2	AR	Franklin		West of Bee Rock, on FS1003, 8 mi S		Robison,	
JC2307		Procambarus	liberorum					male	2	AR	Crawford		Corner of White Rock Mtn and Mineral		Robison,	
JC2308		Procambarus	liberorum					female	0	AR	Crawford		Corner of White Rock Mtn and Mineral		Robison,	
JC2309		Procambarus	liberorum					female	0	AR	Crawford		Corner of White Rock Mtn and Mineral		Robison,	
JC2310		Procambarus	liberorum	BUHAY				male	2	AR	Crawford		Corner of White Rock Mtn and Mineral		Robison,	
JC2311		Procambarus	liberorum					male	2	AR	Crawford		Corner of White Rock Mtn and Mineral		Robison,	
JC2312		Procambarus	liberorum					male	2	AR	Crawford		Corner of White Rock Mtn and Mineral		Robison,	

JC2313	Procambarus	liberorum		male	2 AR	Crawford	Corner of White Rock Mtn and Mineral Robison,
JC2314	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Corner of White Rock Mtn and Mineral Robison,
JC2315	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Corner of White Rock Mtn and Mineral Robison,
JC2316	Procambarus	liberorum	BUHAY	male	2 AR	Crawford	Corner of White Rock Mtn and Mineral Robison,
JC2317	Procambarus	liberorum		juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2318	Procambarus	liberorum		male	2 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2319	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2320	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2321	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2322	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2323	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2324	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2325	Procambarus	liberorum		juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2326	Procambarus	liberorum		juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2327	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2328	Procambarus	liberorum		juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2329	Procambarus	liberorum		juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2330	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Roadside, 1/2 mile S of White Rock Robison,
JC2331	Procambarus	liberorum		female	0 AR	Crawford	Reimer site, White Rock Mountain Robison,
JC2332	Procambarus	liberorum		female	0 AR	Crawford	Reimer site, White Rock Mountain Robison,
JC2333	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Reimer site, White Rock Mountain Robison,
JC2334	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Reimer site, White Rock Mountain Robison,
JC2335	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Reimer site, White Rock Mountain Robison,
JC2336	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Reimer site, White Rock Mountain Robison,
JC2337	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Reimer site, White Rock Mountain Robison,
JC2338	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Reimer site, White Rock Mountain Robison,
JC2339	Procambarus	liberorum		juv	0 AR	Crawford	Reimer site, White Rock Mountain Robison,
JC2340	Procambarus	liberorum	BUHAY	juv	0 AR	Crawford	Reimer site, White Rock Mountain Robison,
JC2341	Procambarus	liberorum		juv	0 AR	Crawford	Reimer site, White Rock Mountain Robison,
JC2342	Procambarus	liberorum		male	2 AR	Crawford	Natural Pond, Swamp Robison,
JC2343	Procambarus	liberorum		female	0 AR	Crawford	Natural Pond, Swamp Robison,
JC2344	Procambarus	liberorum	BUHAY	female	0 AR	Crawford	Natural Pond, Swamp Robison,
JC2345	Procambarus	liberorum	BUHAY	female	0 AR	Crawford	Natural Pond, Swamp Robison,
JC2346	Procambarus	liberorum		female	0 AR	Crawford	Natural Pond, Swamp Robison,
JC2347	Procambarus	liberorum		female	0 AR	Crawford	Natural Pond, Swamp Robison,
JC2348	Procambarus	liberorum	BUHAY	female	0 AR	Crawford	Natural Pond, Swamp Robison,
JC2349	Procambarus	liberorum		female	0 AR	Crawford	Natural Pond, Swamp Robison,
JC2350	Procambarus	liberorum		female	0 AR	Crawford	Natural Pond, Swamp Robison,
JC2351	Orconectes	meeki	BUHAY	male	1 AR	Crawford	Hurricane Creek Robison,
JC2352	Orconectes	meeki	BUHAY	male	1 AR	Crawford	Hurricane Creek Robison,
JC2353	Orconectes	meeki	BUHAY	female	0 AR	Crawford	Hurricane Creek Robison,
JC2354	Orconectes	meeki		female	0 AR	Crawford	Hurricane Creek Robison,
JC2355	Orconectes	meeki	BUHAY	male	1 AR	Crawford	Hurricane Creek Robison,
JC2356	Orconectes	meeki	BUHAY	male	1 AR	Crawford	Hurricane Creek Robison,
JC2357	Orconectes	meeki	BUHAY	female	0 AR	Crawford	Hurricane Creek Robison,
JC2358	Orconectes	meeki	BUHAY	male	2 AR	Crawford	Hurricane Creek Robison,
JC2359	Orconectes	meeki	BUHAY	female	0 AR	Crawford	Hurricane Creek Robison,
JC2360	Orconectes	meeki	BUHAY	female	0 AR	Crawford	Hurricane Creek Robison,
JC2361	Orconectes	meeki	BUHAY	female	0 AR	Crawford	Hurricane Creek Robison,
JC2362	Orconectes	meeki	BUHAY	male	1 AR	Crawford	Hurricane Creek Robison,
JC2363	Orconectes	meeki	BUHAY	female	0 AR	Crawford	Hurricane Creek Robison,
JC2364	Orconectes	meeki	BUHAY	female	0 AR	Crawford	Hurricane Creek Robison,
JC2365	Orconectes	meeki		female	0 AR	Crawford	Hurricane Creek Robison,
JC2366	Orconectes	meeki		male	2 AR	Crawford	Hurricane Creek Robison,
JC2367	Orconectes	meeki	BUHAY	female	0 AR	Crawford	Hurricane Creek Robison,
JC2368	Orconectes	meeki		female	0 AR	Crawford	Hurricane Creek Robison,
JC2369	Orconectes	meeki		male	2 AR	Crawford	Hurricane Creek Robison,
JC2370	Cambarus	ludovicianus	BUHAY	female	0 AR	Hempstead	5 mi E of Patmos on St Hwy 355 Robison,
JC2371	Fallicambarus	caesius	BUHAY	female	0 AR	Hempstead	5 mi E of Patmos on St Hwy 355 Robison,
JC2372	Fallicambarus	caesius	BUHAY	juv	0 AR	Hempstead	5 mi E of Patmos on St Hwy 355 Robison,
JC2373	Fallicambarus	caesius	BUHAY	juv	0 AR	Hempstead	5 mi E of Patmos on St Hwy 355 Robison,
JC2374	Fallicambarus	fodiens	BUHAY	male	2 AR	Columbia	2 mi W of Waldo Robison,
JC2375	Cambarus	ludovicianus	BUHAY	female	0 AR	Hempstead	5 mi E of Blevins Robison,
JC2376	Fallicambarus	caesius		female	0 AR	Hempstead	Blevins Robison,
JC2377				male	2 AR	Hempstead	Blevins Robison,
JC2378	Cambarus	diogenes		female	0 AR	Nevada	CR 176 Daniel All
JC2379	Fallicambarus	jeanae?		female	0 AR	Nevada	CR 176 Daniel All
JC2380	Fallicambarus	sp.	BUHAY	female	0 AR	Nevada	CR 176 Daniel All

JC2381	Fallicambarus	sp.	BUHAY	female	0 AR	Nevada	CR 176	Daniel All
JC2382	Fallicambarus	sp.	BUHAY	female	0 AR	Nevada	CR 176	Daniel All
JC2383	Fallicambarus	sp.	BUHAY	female	0 AR	Nevada	CR 176	Daniel All
JC2384	Fallicambarus	sp.	BUHAY	female	0 AR	Nevada	CR 176	Daniel All
JC2385	Orconectes	meeki	BUHAY	male	2 AR	Johnson	West Fork of Washita Creek	Robison,
JC2386	Orconectes	meeki	BUHAY	male	2 AR	Johnson	West Fork of Washita Creek	Robison,
JC2387	Orconectes	meeki		female	0 AR	Johnson	West Fork of Washita Creek	Robison,
JC2388	Orconectes	meeki	BUHAY	male	2 AR	Johnson	West Fork of Washita Creek	Robison,
JC2389	Orconectes	meeki	BUHAY	female	0 AR	Johnson	West Fork of Washita Creek	Robison,
JC2390	Orconectes	meeki	BUHAY	male	2 AR	Johnson	West Fork of Washita Creek	Robison,
JC2391	Orconectes	meeki	BUHAY	male	2 AR	Johnson	West Fork of Washita Creek	Robison,
JC2392	Orconectes	meeki		male	2 AR	Johnson	West Fork of Washita Creek	Robison,
JC2393	Orconectes	meeki		male	2 AR	Johnson	West Fork of Washita Creek	Robison,
JC2394	Orconectes	meeki		male	2 AR	Johnson	West Fork of Washita Creek	Robison,
JC2395	Orconectes	meeki		female	0 AR	Johnson	Shack, Washita East	Robison,
JC2396	Orconectes	williamsi		female	0 AR	Johnson	Roadside spring pipe	Robison,
JC2397	Cambarus	causeyi	BUHAY	female	0 AR	Johnson	School pond spring, North of Oark	Robison,
JC2398	Cambarus	causeyi		female	0 AR	Johnson	Tate spring	Robison,
JC2399	Orconectes	meeki	BUHAY	male	2 AR	Johnson	Little Piney Creek	Robison,
JC2400	Orconectes	meeki	BUHAY	male	2 AR	Johnson	Little Piney Creek	Robison,
JC2401	Orconectes	meeki		male	1 AR	Johnson	Little Piney Creek	Robison,
JC2402	Orconectes	meeki	BUHAY	male	2 AR	Johnson	Little Piney Creek	Robison,
JC2403	Orconectes	meeki		male	2 AR	Johnson	Little Piney Creek	Robison,
JC2404	Orconectes	meeki	BUHAY	male	2 AR	Johnson	Little Piney Creek	Robison,
JC2405	Orconectes	meeki		female	0 AR	Johnson	Little Piney Creek	Robison,
JC2406	Orconectes	meeki	BUHAY	male	2 AR	Johnson	Little Piney Creek	Robison,
JC2407	Orconectes	meeki	BUHAY	male	2 AR	Johnson	Little Piney Creek	Robison,
JC2408	Orconectes	meeki	BUHAY	female	0 AR	Johnson	Little Piney Creek	Robison,
JC2409	Orconectes	meeki	BUHAY	male	2 AR	Johnson	Little Piney Creek	Robison,
JC2410	Orconectes	meeki	BUHAY	male	2 AR	Johnson	Little Piney Creek	Robison,
JC2411	Orconectes	meeki	BUHAY	female	0 AR	Johnson	Little Piney Creek	Robison,
KC 2847	Fallicambarus	jeanae	TIM		AR	Pike	Salem	
KC 2848	Fallicambarus	jeanae	TIM		AR	Pike	Salem	Robison,
KC 2849	Orconectes	saxatilis			OK	Le Flore	Little Powell	Robison,
KC 2850	Orconectes	saxatilis			OK	Le Flore	Little Powell	Robison,
KC 2851	Orconectes	saxatilis			OK	Le Flore	Little Powell	Robison,
KC 2852	Procamburus	tenuis	TIM		OK	Le Flore	Little Powell	Robison,
KC 2853	Procamburus	tenuis	TIM		OK	Le Flore	Little Powell	Robison,
KC 2854	Procamburus	tenuis	TIM		OK	Le Flore	Little Powell	Robison,
KC 2855	Orconectes	palmeri longimanus	TIM		OK	Le Flore	Little Powell	Robison,
KC 2856	Orconectes	palmeri longimanus	TIM		OK	Le Flore	Little Powell	Robison,
KC 2857	Orconectes	palmeri longimanus	TIM		OK	Le Flore	Little Powell	Robison,
KC 2858	Orconectes	palmeri longimanus	TIM		OK	Le Flore	Little Powell	Robison,
KC 2859	Orconectes	palmeri longimanus	TIM		OK	Le Flore	Little Powell	Robison,
KC 2860	Orconectes	palmeri longimanus	TIM		OK	Le Flore	Little Powell	Robison,
KC 2861	Orconectes	palmeri longimanus	TIM		OK	Le Flore	Little Powell	Robison,
KC 2862	Orconectes	palmeri longimanus	TIM		OK	Le Flore	Little Powell	Robison,
KC 2863	Orconectes	palmeri longimanus	TIM		OK	Le Flore	Little Powell	Robison,
KC 2864	Orconectes	palmeri longimanus	TIM		OK	Le Flore	Little Powell	Robison,
KC 2865	Orconectes	palmeri longimanus	TIM		OK	Le Flore	Little Powell	Robison,
KC 2866	Procamburus	tenuis			OK	Le Flore	Little Powell	Robison,
KC 2867	Procamburus	tenuis	TIM		OK	Le Flore	Little Powell	Robison,
KC 2868	Orconectes	saxatilis			OK	Le Flore	Little Powell	Robison,
KC 2869	Orconectes	saxatilis	TIM		OK	Le Flore	Little Powell	Robison,
KC 2870	Orconectes	saxatilis	TIM		OK	Le Flore	Little Powell	Robison,
KC 2871	Orconectes	palmeri palmeri	TIM		AR	Polk	Ouachita River	Robison,
KC 2872	Orconectes	palmeri palmeri	TIM		AR	Polk	Ouachita River	Robison,
KC 2873	Orconectes	acares	TIM		AR	Polk	Ouachita River	Robison,
KC 2874	Orconectes	acares	TIM		AR	Polk	Ouachita River	Robison,
KC 2875	Orconectes	acares	TIM		AR	Polk	Ouachita River	Robison,
KC 2876	Orconectes	acares	TIM		AR	Polk	Ouachita River	Robison,
KC 2877	Orconectes	acares	TIM		AR	Polk	Ouachita River	Robison,
KC 2878	Orconectes	acares	TIM		AR	Polk	Ouachita River	Robison,
KC 2879	Orconectes	acares	TIM		AR	Polk	Ouachita River	Robison,
KC 2880	Orconectes	acares	TIM		AR	Polk	Ouachita River	Robison,
KC 2881	Orconectes	acares	TIM		AR	Polk	Ouachita River	Robison,
KC 2882	Orconectes	acares			AR	Polk	Ouachita River	Robison,
KC 2883	Orconectes	acares			AR	Polk	Ouachita River	Robison,

KC 2884	Orconectes	acares		AR	Polk	Ouachita River	Robison,
KC 2885	Orconectes	acares	TIM	AR	Polk	Ouachita River	Robison,
KC 2886	Orconectes	acares		AR	Polk	Ouachita River	Robison,
KC 2887	Orconectes	acares	TIM	AR	Polk	Ouachita River	Robison,
KC 2888	Orconectes	menae	TIM	AR	Polk	Ouachita River	Robison,
KC 2889	Orconectes	menae	TIM	AR	Polk	Ouachita River	Robison,
KC 2890	Orconectes	menae		AR	Polk	Ouachita River	Robison,
KC 2891	Orconectes	menae	TIM	AR	Polk	Ouachita River	Robison,
KC 2892	Orconectes	menae		AR	Polk	Ouachita River	Robison,
KC 2893	Orconectes	menae	TIM	AR	Polk	Ouachita River	Robison,
KC 2894	Orconectes	menae	TIM	AR	Polk	Ouachita River	Robison,
KC 2895	Orconectes	menae	TIM	AR	Polk	Ouachita River	Robison,
KC 2896	Orconectes	menae	TIM	AR	Polk	Ouachita River	Robison,
KC 2897	Orconectes	menae	TIM	AR	Polk	Ouachita River	Robison,
KC 2898	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2899	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2900	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2901	Fallicambarus	harpi		AR	Pike	Glenwood Hotel	Robison,
KC 2902	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2903	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2904	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2905	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2906	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2907	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2908	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2909	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2910	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2911	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2912	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2913	Fallicambarus	harpi	TIM	AR	Pike	Glenwood Hotel	Robison,
KC 2914	Fallicambarus	jeanae	TIM	AR	Pike	Salem	Robison,
KC 2915	Fallicambarus	jeanae	TIM	AR	Pike	Salem	Robison,
KC 2916	Fallicambarus	jeanae		AR	Pike	Salem	Robison,
KC 2917	Fallicambarus	jeanae	TIM	AR	Pike	Salem	Robison,
KC 2918	Fallicambarus	jeanae	TIM	AR	Pike	Salem	Robison,
KC 2919	Fallicambarus	jeanae	TIM	AR	Pike	Salem	Robison,
KC 2920	Fallicambarus	jeanae		AR	Pike	Salem	Robison,
KC 2921	Procambarus	liberorum	TIM	AR	Scott	Waldron	Robison,
KC 2922	Procambarus	liberorum	TIM	AR	Scott	Waldron	Robison,
KC 2923	Procambarus	liberorum	TIM	AR	Scott	Waldron	Robison,
KC 2924	Procambarus	liberorum	TIM	AR	Scott	Waldron	Robison,
KC 2925	Fallicambarus	fodiens		AR	Jefferson	11 miles south of Pine Bluff	
KC 2926	Cambarus	ludovicianus	TIM	AR	Lonoke	Carlisle (recycling center)	
KC 2927	Cambarus	ludovicianus	TIM	AR	Lonoke	Farm Bureau	
KC 2928	Fallicambarus	fodiens		AR	Lonoke	Church Cemetery (1 mile west of 236-13)	
KC 2929	Fallicambarus	sp.	TIM	LA	Bastrop	Moorehouse Parish	
KC 2930	Fallicambarus	sp.	TIM	LA	Bastrop	Moorehouse Parish	
KC 2931	Fallicambarus	sp.	TIM	LA	Bastrop	Moorehouse Parish	
KC 2932	Procambarus	liberorum	TIM	AR	Franklin	Cherokee Prairie Natural Area	
KC 2933	Procambarus	liberorum	TIM	AR	Franklin	Cherokee Prairie Natural Area	
KC 2934	Procambarus	liberorum	TIM	AR	Franklin	Cherokee Prairie Natural Area	
KC 2935	Procambarus	liberorum	TIM	AR	Franklin	Cherokee Prairie Natural Area	
KC 2936	Cambarus	ludovicianus	TIM	AR	Franklin	Downs Prairie	
KC 2937	Cambarus	ludovicianus		AR	Franklin	Downs Prairie	
KC 2938	Cambarus	ludovicianus	TIM	AR	Franklin	Downs Prairie	
KC 2939	Cambarus	ludovicianus		AR	Franklin	Downs Prairie	
KC 2940	Procambarus	acutus	TIM	AR	Franklin	Downs Prairie	
KC 2941	Procambarus	liberorum	TIM	AR	Franklin	Flanagan Prairie	
KC 2942	Procambarus	liberorum	TIM	AR	Franklin	Flanagan Prairie	
KC 2943	Procambarus	liberorum	TIM	AR	Franklin	Flanagan Prairie	
KC 2944	Procambarus	liberorum	TIM	AR	Franklin	Flanagan Prairie	
KC 2945	Procambarus	liberorum	TIM	AR	Franklin	Flanagan Prairie	
KC 2946	Procambarus	liberorum	TIM	AR	Franklin	Flanagan Prairie	
KC 2947	Procambarus	liberorum	TIM	AR	Franklin	Flanagan Prairie	
KC 2948	Procambarus	liberorum	TIM	AR	Washington	Fayetteville	
KC 2949	Procambarus	liberorum	TIM	AR	Washington	Fayetteville	
KC 2950	Procambarus	liberorum	TIM	AR	Washington	Fayetteville	
KC 2951	Fallicambarus	jeanae	TIM	AR	Pike	Highway 70 about 0.6 miles west of Self Cr. Brid	

KC 2952	Fallicambarus	jeanae	TIM	AR	Pike	Highway 70 about 0.6 miles west of Self Cr. Brid
KC 2953	Fallicambarus	jeanae	TIM	AR	Pike	Highway 70 about 0.6 miles west of Self Cr. Brid
KC 2954	Fallicambarus	jeanae	TIM	AR	Pike	Highway 70 about 0.6 miles west of Self Cr. Brid
KC 2955	Fallicambarus	jeanae	TIM	AR	Hot Springs	Fillpoke Residence
KC 2956	Fallicambarus	jeanae	TIM	AR	Hot Springs	Fillpoke Residence
KC 2957	Fallicambarus	jeanae	TIM	AR	Hot Springs	Fillpoke Residence
KC 2958	Fallicambarus	jeanae	TIM	AR	Hot Springs	Fillpoke Residence
KC 2959	Procambarus	sp.	TIM	AR	Hempstead	Grandview Prairie
KC 2960	Procambarus	sp.	TIM	AR	Hempstead	Grandview Prairie
KC 2961	Procambarus	sp.	TIM	AR	Hempstead	Grandview Prairie
KC 2962	Procambarus	sp.	TIM	AR	Hempstead	Grandview Prairie
KC 2963	Fallicambarus	strawni	TIM	AR	Howard	Umpire Baseball Field
KC 2964	Fallicambarus	strawni	TIM	AR	Howard	Umpire Baseball Field
KC 2965	Fallicambarus	strawni	TIM	AR	Howard	Umpire Baseball Field
KC 2966	Fallicambarus	strawni	TIM	AR	Howard	Umpire Baseball Field
KC 2967	Fallicambarus	strawni	TIM	AR	Howard	Umpire Baseball Field
KC 2968	Fallicambarus	strawni	TIM	AR	Howard	Umpire Baseball Field
KC 2969	Fallicambarus	strawni	TIM	AR	Howard	Umpire Baseball Field
KC 2970	Fallicambarus	strawni	TIM	AR	Howard	Umpire Baseball Field
KC 2971	Fallicambarus	jeanae	TIM	AR	Pike	Bear Creek Rd. near Daisy
KC 2972	Fallicambarus	jeanae	TIM	AR	Pike	Bear Creek Rd. near Daisy
KC 2973	Fallicambarus	jeanae	TIM	AR	Pike	Bear Creek Rd. near Daisy
KC 2974	Fallicambarus	jeanae	TIM	AR	Pike	Bear Creek Rd. near Daisy
KC 2975	Fallicambarus	jeanae	TIM	AR	Pike	Bear Creek Rd. near Daisy
KC 2976	Fallicambarus	jeanae	TIM	AR	Pike	Bear Creek Rd. near Daisy
KC 2977	Fallicambarus	jeanae	TIM	AR	Pike	Bear Creek Rd. near Daisy
KC 2978	Fallicambarus	jeanae	TIM	AR	Pike	Bear Creek Rd. near Daisy
KC 2979	Fallicambarus	jeanae	TIM	AR	Pike	Bear Creek Rd. near Daisy
KC 2980	Procambarus	acutus	TIM	AR	Pike	Bear Creek Rd. near Daisy
KC 2981	Cambarus	ludovicianus	TIM	AR	Lonoke	Roadside ditch2 miles south of Lonoke
KC 2982	Cambarus	ludovicianus	TIM	AR	Lonoke	Roadside ditch2 miles south of Lonoke
KC 2983	Cambarus	ludovicianus	TIM	AR	Lonoke	Roadside ditch2 miles south of Lonoke
KC 2984	Cambarus	ludovicianus	TIM	AR	Lonoke	Roadside ditch2 miles south of Lonoke
KC 2985	Procambarus	acutus	TIM	AR	Pulaski	Fourchee Creek
KC 2986	Procambarus	acutus	TIM	AR	Pulaski	Fourchee Creek
KC 2987	Procambarus	acutus	TIM	AR	Pulaski	Fourchee Creek
KC 2988	Procambarus	acutus	TIM	AR	Pulaski	Fourchee Creek
KC 2989	Procambarus	acutus	TIM	AR	Pulaski	Fourchee Creek
KC 2990	Procambarus	acutus	TIM	AR	Pulaski	Fourchee Creek
KC 2991	Procambarus	acutus	TIM	AR	Pulaski	Fourchee Creek
KC 2992	Procambarus	acutus	TIM	AR	Pulaski	Fourchee Creek
KC 2993	Procambarus	ouachitae	TIM	AR	Pulaski	Fourchee Creek
KC 2994	Procambarus	ouachitae	TIM	AR	Pulaski	Fourchee Creek
KC 2995	Procambarus	ouachitae	TIM	AR	Pulaski	Fourchee Creek
KC 2996	Procambarus	ouachitae	TIM	AR	Pulaski	Fourchee Creek
KC 2997	Procambarus	ouachitae	TIM	AR	Pulaski	Fourchee Creek
KC 2998	Procambarus	ouachitae	TIM	AR	Pulaski	Fourchee Creek
KC 2999	Cambarus	diogenes?	TIM	AR	Pulaski	Fourchee Creek
KC 3000	Cambarus	diogenes?	TIM	AR	Pulaski	Fourchee Creek
KC 3001	Orconectes	maletae?	TIM	AR	Pulaski	Fourchee Creek
KC 3002	Procambarus	liberorum	TIM	AR	Perry	Hollis (roadside)
KC 3003	Procambarus	liberorum	TIM	AR	Perry	Hollis (roadside)
KC 3004	Procambarus	liberorum	TIM	AR	Perry	Hollis (roadside)
KC 3005	Procambarus	liberorum	TIM	AR	Perry	Hollis (roadside)
KC 3006	Procambarus	liberorum	TIM	AR	Perry	Hollis (roadside)
KC 3007	Procambarus	liberorum	TIM	AR	Perry	Hollis (roadside)
KC 3008	Procambarus	liberorum	TIM	AR	Perry	Hollis (roadside)
KC 3009	Procambarus	liberorum	TIM	AR	Perry	Roadside ditch up Petit Jean on Rte 2
KC 3010	Procambarus	liberorum	TIM	AR	Perry	Roadside ditch up Petit Jean on Rte 2
KC 3011	Procambarus	liberorum	TIM	AR	Perry	Roadside ditch up Petit Jean on Rte 2
KC 3012	Procambarus	liberorum	TIM	AR	Perry	Roadside ditch up Petit Jean on Rte 2
KC 3013	Procambarus	reimeri	TIM	AR	Polk	Irons Fork Road
KC 3014	Procambarus	reimeri	TIM	AR	Polk	Irons Fork Road
KC 3015	Procambarus	reimeri	TIM	AR	Polk	Irons Fork Road
KC 3016	Procambarus	reimeri	TIM	AR	Polk	Irons Fork Road
KC 3017	Procambarus	reimeri	TIM	AR	Polk	Irons Fork Road
KC 3021	Procambarus	liberorum	TIM	AR	Pulaski	Fourchee Creek
KC 3022	Procambarus	liberorum	TIM	AR	Pulaski	Fourchee Creek

KC 3023		Procambarus	liberorum	TIM	AR	Pulaski	Fourchee Creek	Robison,
KC 3024		Procambarus	liberorum	TIM	AR	Pulaski	Fourchee Creek	Robison,
KC 3025		Procambarus	liberorum	TIM	AR	Pulaski	Fourchee Creek	Robison,
KC 3031	04-99	Procambarus	ouachitae	TIM	AR	Sevier	trib to Clear Creek at Hwy	Robison
KC 3032	04-99	Procambarus	ouachitae	TIM	AR	Sevier	trib to Clear Creek at Hwy 24, 1 mi NE	Robison
KC 3033	04-99	Procambarus	ouachitae	TIM	AR	Sevier	trib to Clear Creek at Hwy 24, 1 mi NE	Robison
KC 3034	04-99	Procambarus	ouachitae	TIM	AR	Sevier	trib to Clear Creek at Hwy 24, 1 mi NE	Robison
KC 3035	04-99	Procambarus	ouachitae	TIM	AR	Sevier	trib to Clear Creek at Hwy 24, 1 mi NE	Robison
KC 3036	04-99	Procambarus	ouachitae	TIM	AR	Sevier	trib to Clear Creek at Hwy 24, 1 mi NE	Robison
KC 3037	04-100	Procambarus	liberorum	TIM	AR	Johnson	Lamar (sec 16, T9N, R22W)	
KC 3038	04-100	Procambarus	liberorum	TIM	AR	Johnson	Lamar (sec 16, T9N, R22W)	
KC 3039	04-100	Procambarus	liberorum	TIM	AR	Johnson	Lamar (sec 16, T9N, R22W)	
KC 3040	04-100	Procambarus	liberorum	TIM	AR	Johnson	Lamar (sec 16, T9N, R22W)	
KC 3041	04-100	Procambarus	liberorum	TIM	AR	Johnson	Lamar (sec 16, T9N, R22W)	
KC 3042	04-100	Procambarus	liberorum	TIM	AR	Johnson	Lamar (sec 16, T9N, R22W)	
KC 3043	04-100	Procambarus	liberorum	TIM	AR	Johnson	Lamar (sec 16, T9N, R22W)	
USNM218843_PT		Procambarus	ferrugineus	BUHAY	AR	Lonoke	9.6 Km (6 Mile S Of US Highway 70 O Gilpin & I	
USNM219236		Procambarus	liberorum	BUHAY	AR	Pope	2 Mile E Of Scottsville, On State Highw	Robison
USNM260016		Procambarus	liberorum	BUHAY	AR	Perry	Roadside Seepage On State Highway	Robison
USNM260006		Procambarus	ferrugineus	BUHAY	AR	Conway	Roadside Ditch, 1.0 Mile S Of junction	Robison
USNM260306		Procambarus	liberorum	BUHAY	AR	Johnson	Forest Service Parking Lot (Sec. 22, T	Robison
USNM260022		Procambarus	ferrugineus	BUHAY	AR	Perry	Roadside Seepage On State Highway	Robison
USNM260008		Procambarus	ferrugineus	BUHAY	AR	Perry	Roadside Seepage On State Highway	Robison
USNM260303		Procambarus	liberorum	BUHAY	1 AR	Madison	Roadside Seepage Along State Highw	Robison

