

STATE WILDLIFE GRANT PROJECT - FINAL REPORT

Project T20 – 7

**STATUS, DISTRIBUTION AND GENETICS OF FOUR SOUTHWESTERN ARKANSAS
BURROWING CRAYFISH**

By

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Introduction

The West Gulf Coastal Plain of Southwest Arkansas is home to a great diversity of burrowing crayfishes. Recent studies have improved our knowledge of many of the crayfish species in the Ouachita Mountains, but our knowledge remains poor with regard to species specifically inhabiting the West Gulf Coastal Plain portion of the state. Two state endemic species which occur there, namely *Procambarus regalis* and *Fallicambarus petilicarpus* (Robison and Allen, 1995) are of particular interest as is *Faxonella blairi*, an uncommon crayfish species of this geographic area.

Procambarus regalis was considered to be of “Special Concern” by Taylor et al. (1996) and ranked G2G3S2S3 by The Nature Conservancy. *Fallicambarus petilicarpus* was considered to be endangered by Taylor et al. (1996) and ranked G1S1 by The Nature Conservancy. Previous to this study it was only known from its type locality. There is currently insufficient information available to plan for the conservation of either of these species or to determine the relative importance of their protection. *Faxonella blairi* is one of the most poorly known crayfishes in Arkansas. This rare crayfish has been found only in southwest Arkansas and southeast Oklahoma (Hayes and Reimer, 1977; Hobbs, 1989). The ecological and genetic relationships between *Faxonella blairi*, *Faxonella clypeata*, and species of the genus *Cambarellus* are not known. The species (*Faxonella blairi*) is recorded from southwest Arkansas, based on a single documented collection held in the U. S. National Museum (Smithsonian). Taylor et al. (1996) consider it to be stable and The Nature Conservancy ranks it as G2S1. There is presently not enough information available to plan for the conservation of this species or determine relative

importance of its protection. In addition to data on these three species, the genetic analysis of *Bouchardina robisoni* is included in this final report as addendum to a report by Robison (2006) on the distribution and conservation status of *B. robisoni*.

Objectives

The intention of this present study was to accurately portray the current conservation status, distribution, and genetics of four southwestern Arkansas crayfishes, namely *Procambarus regalis*, *Fallicambarus petilicarpus*, *Bouchardina robisoni*, and *Faxonella blairi*. Specific objectives of the study were:

1. To establish a baseline distribution and conservation status of three crayfishes: *Procambarus regalis*, *Fallicambarus petilicarpus*, and *Faxonella blairi*;
2. To employ genetic analyses to clarify the taxonomic status of these three crayfish species, plus *Bouchardina robisoni*, relative to other species in their respective genera; and
3. To document the diversity and distribution of the burrowing crayfish fauna in areas of the West Gulf Coastal Plain of Arkansas.

Methods and Materials

Field work was conducted from March, 2006 through the spring and into May, 2007. The majority of collections were made during March, April, May and continued into mid-May, 2007 when wet conditions were optimal. Two of the three species (*Procambarus regalis* and *Fallicambarus petilicarpus*) 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 remove them 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 other species, *Faxonella blairi*, frequents backwater areas of small streams and roadside ditches and can be collected by catching it by hand or with a aquatic dip nets.

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 southwestern Arkansas where the three species are known to occur. Collections were made in 10 counties throughout the West Gulf Coastal Plain namely, Columbia, Union, Hempstead, Howard, Lafayette, Little River, Miller, Nevada, Ouachita, and Sevier counties. A total of 73 collections were made from the 10 counties to determine the geographic ranges of the three crayfish species in Arkansas.

In addition to field collections in 2006 -2007 by the two Co-Investigators, collections housed at Southern Arkansas University were examined for specimens of any of the three target species as was the on line computerized database of crayfishes at the Smithsonian Institution. All previous literature dealing with the three crayfish 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 regalis

Originally, the crayfish, *Procambarus regalis*, was described by Hobbs and Robison (1988) from eight collections from Howard, Nevada, and Sevier counties. The specimens were deposited in the collection of the United States National Museum. Robison and Allen (1995) noted this crayfish was an Arkansas endemic species.

Distribution

Previously, the distribution of *Procambarus regalis* was known only from eight localities from Howard, Nevada, and Sevier counties, Arkansas. The type-locality is: Arkansas: **Nevada County**: (1) DeAnn Cemetery about one mile west of the junction of St. Hwys. 19 and 24 on St. Hwy. 24 at the western edge of the city limits of Prescott, Arkansas. 16 March 1982. Elaine Laird. Seven other localities are known: (2) **Howard Co.**: Mineral Springs, 2 form 1 males. May 1986. Kyle Erwin and Jason Erwin. (3) 2 miles south of Mineral Springs, 1 male form II, Linda Tate. 1985. (4) 1.4 miles south of St. Hwy. 27 on St. Hwy. 317. 1 juvenile male. 2 May 1986. Henry W. Robison. (5) Sevier Co.: (5) Roadside wet area 5.1 miles east of Oklahoma state line on U.S. Hwy. 70. 21 April 1973. J. Pugh, G. B. Hobbs, and H. H. Hobbs, Jr. 2 juvenile males, 5 juvenile females. (6) field 1.5 miles north of Paraloma (Sec. 8, T11S, R28W). 1 female. 1 April 1987. Eddie Daniels and H. W. Robison. (7) Seepage area 1.6 miles southwest of the junction of St. Hwy. 27 and 234. 1 male form II, 3 females, 2 juvenile males, and 1 juvenile female. 20 April 1987. G. B. Hobbs and H. H. Hobbs, Jr. (8) Roadside ditch 0.4 miles east of the Oklahoma state line. 1 form I male, 1 form II male, 2 females, 10 juvenile males, 12 juvenile

females. 21 April 1973. J. E. Pugh, G. B. Hobbs, and H. H. Hobbs.

Searches of the 10 counties throughout the West Gulf Coastal Plain revealed the presence of nine new populations of this crayfish all in Sevier County and Howard County, Arkansas. New populations discovered during this study are as follows: **Sevier Co.:** Roadside wet area 5.1 miles east of Oklahoma state line on U.S. Hwy. 70. 16 March 2007. H. W. Robison. **Sevier Co.:** Roadside ditch on St. Hwy. 317, 3 miles southeast of the junction of St. Hwy. 317 and US Hwy. 71 (Sec. 6, T10S, R29W). 20 April 2007. Henry W. Robison. **Sevier Co.:** Roadside ditch on St. Hwy. 317, 2.5 miles southeast of the junction of St. Hwy. 317 and US Hwy. 71 (Sec. 31, T9S, R29W). 20 April 2007. Henry W. Robison. **Sevier Co.:** Roadside ditch on U.S. Hwy. 70, 7 miles west of DeQueen, AR (Sec. 19, T8S, R32W). 31 March 2007. Henry W. Robison. **Sevier Co.:** Roadside ditch on U.S. Hwy. 70, 5 miles west of DeQueen, AR. (Sec. 21, T8S, R32W). 27 April 2007. Henry W. Robison. **Sevier Co.:** Roadside ditch on U.S. Hwy. 70, 3.1 miles west of DeQueen, AR. (Sec. 26, T8S, R32W). 24 March 2007. Henry W. Robison. **Sevier Co.:** Roadside ditch on U.S. Hwy. 70, 4 miles west of DeQueen, AR. (Sec. 27, T8S, R32W). 21 April 2007. Henry W. Robison. **Howard Co.:** Seepage area, 1.5 miles west of Mineral Springs, AR on St. Hwy. 27 (Sec. 23, T10S, R29W). 30 May 2006. Henry W. Robison **Howard Co.:** Roadside ditch 2 miles north of Tollette, AR on St. Hwy. 355 (Sec. 28, T10S, R29W). 15 April 2006. Henry W. Robison.

In summary, the distribution for *Procambarus regalis* after this study is 17 localities in three counties (Howard, Nevada, and Sevier counties) in Arkansas (Table 1). Nine new populations were discovered in Sevier and Howard counties, Arkansas. At each of these nine

new locations, *Procambarus regalis* was found to be a highly localized and a locally uncommon crayfish.

Habitat

Procambarus regalis is a primary burrower, i.e. it burrows all year long in one place and rarely exits except during the breeding season when males search for females. This species was never collected in static open water in fields or in ditches with standing water, but rather always only from burrows. Burrow tended to be simple in construction and depths of capture ranged from 1-2.5 feet. Soils where burrows were found tended to be of a sandy clay without standing water. Roadside ditches, because of their propensity to hold water seasonally, are a favorite habitat type for this species.

Crayfish Associates

During the collection portion of this study four additional species of crayfishes were collected while searching for *Procambarus regalis*, namely, *Cambarus ludovicianus*, *Fallicambarus fodiens*, *Faxonella blairi*, and *Procambarus acutus*.

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 assessment 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.

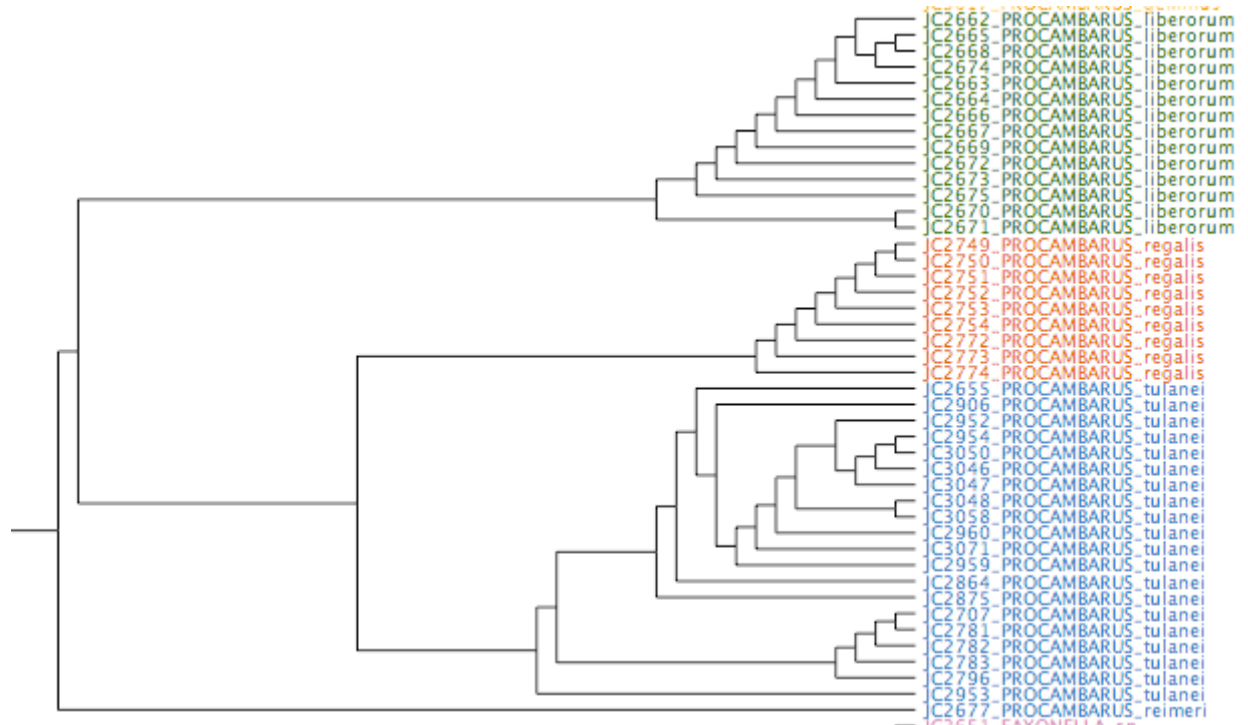
In their report, Taylor et al. (1996) listed *Procambarus regalis* as "Special Concern" based on the best information available at the time. In the present survey *P. regalis* remained an

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 regalis* 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

The genetic samples of *Procambarus regalis* all clustered together and showed similar within species genetic diversity as *Procambarus liberorum* (Figure 1 [subclade], Appendix 1 [total phylogeny]). *P. regalis* samples formed a single monophyletic clade, sister to *Procambarus tulanei*. The (*P. regalis*, *P. tulanei*) clade was then sister to *P. liberorum*, and that clade sister to a single representative of *P. remeri*. The (*P. remeri*, (*P. liberorum*, (*P. regalis*, *P. tulanei*)) clade was then sister to *Procambarus geminus*. *P. geminus* showed substantial genetic structure within the clade suggestive of cryptic species within this clade. The genetic results clearly support *P. regalis* as a distinct species with ample genetic diversity within the species. Because of the relatively small sample sizes from this reclusive species, it is difficult to assess population structure within this species. 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). Likewise, further within species sampling should be undertaken to determine the extent of population substructuring within the species. Finally, further studies should further examine the genetic structure of *P. geminus* and explore the potential for cryptic species within this lineage.

Figure 1. Subclade showing the monophyly of *Procambarus regalis* relative to other selected *Procambarus* species.



Fallicambarus petilicarpus

Hobbs and Robison (1989) described *Fallicambarus petilicarpus* from specimens captured in burrows in a roadside seepage in Union County, southwestern Arkansas first collected in the spring of 1982. This crayfish is an Arkansas endemic (Robison and Allen, 1995) known only from Union County, Arkansas.

Distribution

Hobbs and Robison (1989) initially found *Fallicambarus petilicarpus* in a single location near the Columbia – Union County line in Union County, Arkansas. The type locality for *Fallicambarus petilicarpus* is: **Union Co.:** (1) **Type-Locality:** Roadside seepage 0.2 mile east of the Columbia County line on St. Hwy. 57, Union County, Arkansas (Sec. 21, T16S, R18W). Henry W. Robison. April 30, 1982.

Searches of the 10 counties throughout the West Gulf Coastal Plain revealed the presence of only a single new population of this crayfish in Union County (Table 2). The new population is as follows: **Union County :** (1) Wet area along U.S. Hwy. 82 in Marysville, Arkansas.

An intriguing discovery was made in eastern Union County east of El Dorado along U.S. Hwy. 82 (See Table 2). The specimens appear to be *Fallicambarus petilicarpus*, but they differ genetically (Jen Buhay, pers. comm.). To be totally certain about its identification to the specific level will require a trip to the Smithsonian Institution collection to compare the DNA of the type series of *Fallicambarus petilicarpus* with the specimens collected during this study.

In summary, *Fallicambarus petilicarpus* after this study is known from only two localities in one county, Union County, Arkansas. One new population was discovered in Union County during this study, plus another possible locality in eastern Union County, east of El Dorado, AR; however, at each of these locations, *Fallicambarus petilicarpus* was found to be a highly localized and locally uncommon crayfish.

Habitat

Fallicambarus petilicarpus is a primary burrower and remains in the burrow all year long except for short forays out to search for females to reproduce in the breeding season. It has not been collected in standing water. Burrows of *Fallicambarus petilicarpus* are relatively shallow and complex structures which are constructed in sandy loam soil and topped by chimneys from

8-10 cm tall. Burrows are normally from one to 1.5 feet deep and often penetrate tangled dense root mats of grasses growing in and on the banks of the roadside ditches they inhabit.

Biological Aspects

First form males of *Fallicambarus petilicarpus* have been collected in March and April (Hobbs and Robison 1989). No ovigerous females nor females carrying young have been found to date. 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, respectively.

Crayfish Associates

Four additional species of crayfishes were collected while searching for *Fallicambarus petilicarpus* including, *Cambarus ludovicianus*, *Procambarus acutus*, *Procambarus tulaneii*, and *Faxonella clypeata*.

Conservation Status

In their report, Taylor et al. (1996) listed *Fallicambarus petilicarpus* as "endangered" based on the best information available at the time. In our survey it is apparent that *Fallicambarus petilicarpus* is indeed a rare member of the West Gulf Coastal Plain crayfish fauna and confined to Union County, Arkansas. The IUCN has previously listed *F. petilicarpus* 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 *Fallicambarus petilicarpus* continue to be considered as an "endangered" Arkansas endemic and that monitoring of this crayfish species be continued.

Genetic Analyses

The samples of *Fallicambarus petilicarpus* not only form a monophyletic clade (Figure 2), but this clade is exceptionally distinct from any other clades, including other members of the genus *Fallicambarus* (Appendix 1 – total phylogeny). Indeed, the amount of genetic diversity separating this species from others is equivalent to the separation of other genera of freshwater crayfish. Within this clade, there is substantial genetic structuring. We obtained a single sample of *Fallicambarus dissitus* from Columbia County which clusters within the *Fallicambarus petilicarpus* clade. This begs the question of the distinctiveness of *F. dissitus*. However, the amount of genetic diversity between this species and the containing clade of *F. petilicarpus* is consistent with other crayfish species differences. But this would mean that there are five distinct species in this particular subclade. Clearly, further sampling is warranted of *Fallicambarus dissitus* to get a reasonable handle on the relative amounts of genetic diversity within versus among these species. Note also that samples from what was thought to be an undescribed species of *Procambarus* from Little River County with noted blue legs, clusters as a basal sister taxon to the *Fallicambarus petilicarpus* clade. Thus, there appears to be at least two very distinct species here and probably more and this clade as a whole is exceptionally distinct (genetically) relative to other crayfish genera. Further sampling is warranted for the “blue legs” species from Little River County, *Fallicambarus dissitus* to examine its distinctiveness relative to *F. petilicarpus*, and of *F. petilicarpus* itself to discern whether the substantial genetic structure within the species is due to sampling artifact or simply because the species is highly fragmented in its distribution.

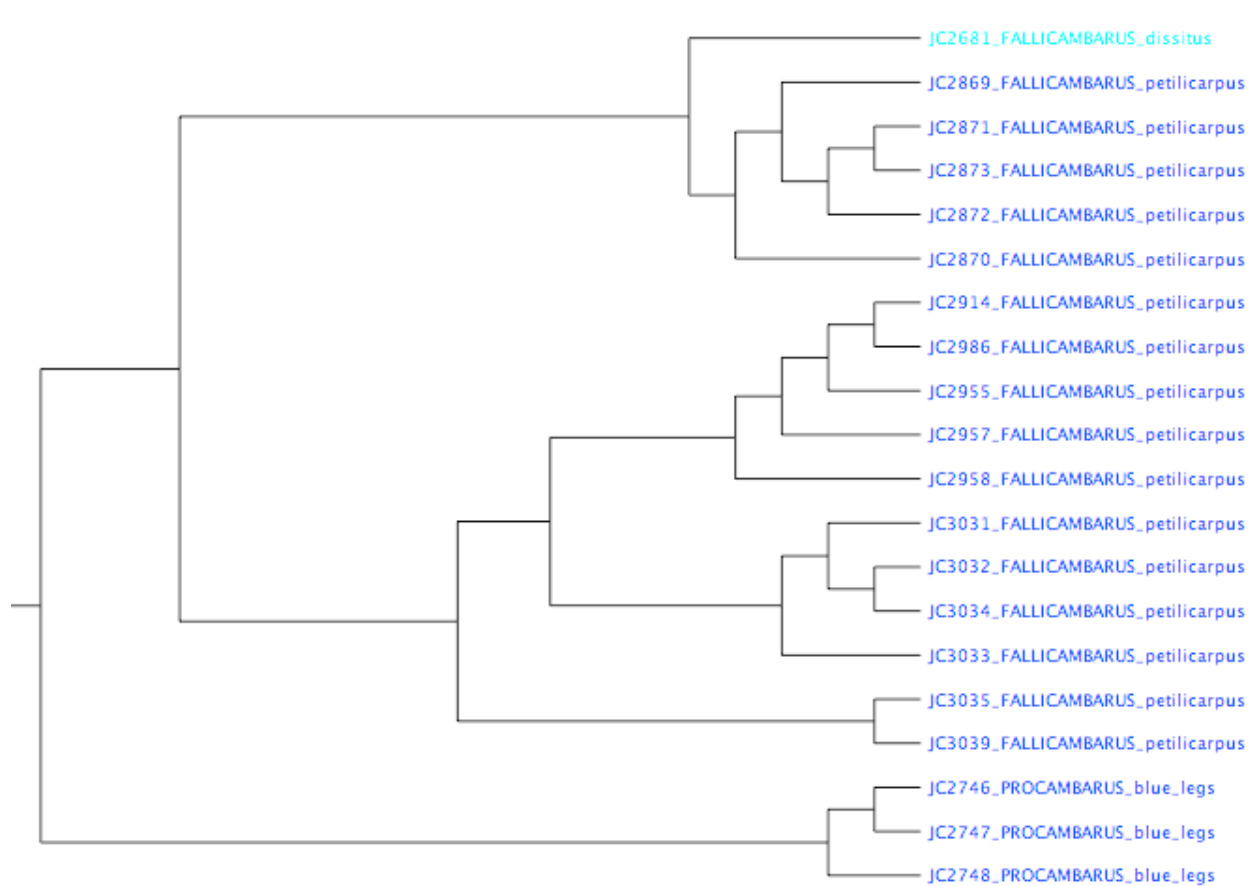


Figure 2. Subclade of *Fallicambarus petilicarpus* with a single sample of *F. dissitus* and an undescribed species from Little River County. This clade is significantly phylogenetically distinct from all other clades in the overall phylogeny (see Appendix 1).

Faxonella blairi

Hayes and Reimer (1977) described *Faxonella blairi* from the Little River drainage of southeastern Oklahoma and southwestern Arkansas. The type locality is a woodland swamp 100 yards west of U.S. Hwy. 259 on north side of the Little River, seven miles south of Broken Bow, McCurtain County, Oklahoma. Little has been published since concerning this tiny crayfish and thus it appeared when this study was initiated that this crayfish was quite rare in Arkansas. In

order to make sure workers are aware of the differences between *Faxonella blairi* and the more common crayfish relative, *Faxonella clypeata*, the diagnosis from the original description is provided below of *Faxonella blairi*.

Diagnosis

Hayes and Reimer (1977) described the distinguishing characters of *Faxonella blairi* which included the annulus ventralis of the *F. blairi* female which is firmly embedded in the sternum, much more than in other species of *Faxonella* and the sinus simpler in sculpture. In these features, *F. blairi* is more similar to *F. creaseri* than to either *F. clypeata* or *F. beyeri*. The females of *F. blairi* can easily be distinguished from other species of *Faxonella* by the prominent caudal lip of the annulus ventralis.

Male *F. blairi* can be distinguished from all other *Faxonella* species by the more straight central projection of *F. blairi* which reaches to the coxae of the first pereopod. In *F. creaseri*, the central projection reaches basically to the same level, but the distal half of the ramus is bent more mesially. In *F. clypeata*, the mesial process is much shorter and more crowded.

Distribution

Faxonella blairi is an inhabitant of southwestern Arkansas and southeastern Oklahoma. Our study indicates that this crayfish is far more widespread and much more common than formerly believed. Searches throughout southwestern Arkansas revealed the presence of 36 new populations of this crayfish. New populations discovered during this study are as follows:
AR: **Sevier Co.:** Roadside wet area 5.1 miles east of Oklahoma state line on U.S. Hwy. 70. 28 April 2006. H. W. Robison, K. Crandall, B. Wagner, J. Buhay, and M. Kottmyer. Sevier Co.:

Roadside ditch on St. Hwy. 317, 3 miles southeast of the junction of St. Hwy. 317 and US Hwy. 71 (Sec. 6, T10S, R29W). 11 March 2006. Henry W. Robison. Sevier Co.: Roadside ditch on St. Hwy. 317, 2.5 miles southeast of the junction of St. Hwy. 317 and US Hwy. 71 (Sec. 31, T9S, R29W). 19 April 2007. Henry W. Robison. Sevier Co.: Roadside ditch on U.S. Hwy. 70, 7 miles west of DeQueen, AR (Sec. 19, T8S, R32W). 19 April 2007. Henry W. Robison. Sevier Co.: Roadside ditch on U.S. Hwy. 70, 5.2 miles west of DeQueen, AR. (Sec. 21, T8S, R32W). 15 March 2007. Henry W. Robison. Sevier Co.: Roadside ditch on U.S. Hwy. 70, 4 miles west of DeQueen, AR. (Sec. 27, T8S, R32W). 2 May 2006. Henry W. Robison. Sevier Co.: Roadside ditch on U.S. Hwy. 70, 3.1 miles west of DeQueen, AR. (Sec. 26, T8S, R32W). 4 May 2006. Henry W. Robison. Sevier Co.: Clear Creek at St. Hwy. 24, 1 mile east of jct. of St. Hwy. 24 and St. Hwy. 41 (Sec. 30, T9S, R31W). 15 June 2006. Henry W. Robison. Sevier Co.: Roadside ditch on St. Hwy. 41, 1.1 mile south of Horatio, AR. (Sec. 2, T10S, R32W). 18 June 2006. Henry W. Robison. Little River Co.: Roadside ditch south of Horatio, AR 33.88128 -94.41887 NAD27. 28 April 2006. H. W. Robison, K. Crandall, B. Wagner, J. Buhay, and M. Kottmyer. **Little River Co.:** Roadside ditch on St. Hwy. 41, 4 miles south of Horatio, AR. (Sec. 16, T10S, R32W). 21 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 234, 2 miles east of Winthrop, AR. (Sec. 17, T11S, R31W). 21 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 32, 7 miles west of Ashdown, AR. (Sec. 1, T13S, R31W). 21 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 32, 5.2 miles west of Ashdown, AR. (Sec. 5, T13S, R30W). 22 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 41, 6.3 miles south of Horatio, AR. (Sec. 28, T10S, R32W). 24 March 2006. Henry W. Robison. Little

River Co.: Roadside ditch on St. Hwy. 41, 2 miles south of Cross Roads, AR. (Sec. 14, T11S, R32W). 24 March 2006. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 41, 3 miles south of Cross Roads, AR. (Sec. 22, T11S, R32W). 24 March 2006. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 234, 1 mile west of Winthrop, AR. (Sec. 2, T11S, R31W). 24 March 2006. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 234, 3.5 miles east of Winthrop, AR. (Sec. 22, T11S, R31W). 20 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 234, 1.5 miles west of Alleene, AR. (Sec. 27, T11S, R31W). 20 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 234, 1 mile west of Alleene, AR. (Sec. 26, T11S, R31W). 20 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 234, 4 miles west of Wilton, AR. (Sec. 4, T12S, R32W). 20 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 41, 2 miles north of Foreman, AR. (Sec. 3, T12S, R32W). 20 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 41, 4 miles south of Cross Roads, AR. (Sec. 27, T11S, R32W). 21 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 41, 1 mile north of Foreman, AR. (Sec. 11, T12S, R32W). 21 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 32 at Wallace, AR. (Sec. 36, T12S, R31W). 21 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 32, 4 miles east of Foreman, AR. (Sec. 6, T13S, R31W). 21 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 32, 7.5 miles east of Foreman, AR. (Sec. 2, T13S, R31W). 21 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 41, 7.2 miles south of Horatio, AR. (Sec. 30, T10S, R32W). 21 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 41, 1 mile south of Cross Roads, AR. (Sec. 11,

T11S, R32W). 21 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 32, 2 miles west of Ashdown, AR. (Sec. 3, T13S, R30W). 27 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 32, 1.1 miles west of Ashdown, AR. (Sec. 1, T13S, R30W). 27 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on co. road, 4 miles south of Ashdown, AR. (Sec. 19, T13S, R29W). 27 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on U.S. Hwy. 71, 1.5 miles south of Ashdown, AR. (Sec. 9, T13S, R29W). 27 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 32, 5 miles east of Foreman, AR. (Sec. 5, T13S, R31W). 28 April 2007. Henry W. Robison. Little River Co.: Roadside ditch on St. Hwy. 32, 6 miles east of Foreman, AR. (Sec. 4, T13S, R31W). 28 April 2007. Henry W. Robison.

In summary, the distributional range for *Faxonella blairi* after this study is only two counties in Arkansas, namely, Little River and Sevier counties. Thirty-six new populations were discovered in Little River and Sevier counties (Table 3). At each of these locations, *Faxonella blairi* was found to be a locally abundant crayfish.

Habitat

Hayes and Reimer (1977) described the habitat of this species as turbid, shaded, static water areas with an average of 12 inches in depth. This species is not found in running water. It is a secondary burrower and will burrow when waters levels recede.

Crayfish Associates

During the collection portion of this study six additional species of crayfishes were collected

while searching for *Faxonella blairi* namely, *Fallicambarus fodiens*, *Cambarus ludovicianus*, *Procambarus geminus*, *Procambarus regalis*, *Procambarus curdi*, and an undescribed *Procambarus* (*Girardiella*) species we called the “Green legs form” because of its beautiful green appendages.

Conservation Status

Faxonella blairi was listed by Taylor et al. (1996) as “Currently Stable.” After extensive collecting in southwestern Arkansas, we agree that *Faxonella blairi* should be considered as “Currently Stable” due to its more widespread distribution than previously believed and general abundance throughout its range in southwestern Arkansas. Under the IUCN criteria, this species should be listed as “Least Concern”.

Genetic Analyses

The samples of *Faxonella blairi* form a monophyletic group that has a sister relationship to *Faxonella clypeata* (Appendix 1). Within *Faxonella blairi* there is considerable genetic variation with three distinct lineages with the two main lineages corresponding mostly, but not 100%, with the two sampling localities (Figure 3). The third distinct lineage is from a single juvenile sampled at the same Little River County location as the other, but has considerable genetic distance from the other samples. In our sampling for *F. blairi*, we sampled *F. clypeata* extensively. Samples we thought might have been *F. blairi* from other locations and counties, turned out to be genetically more closely related to *F. clypeata*. However, the genetic diversity contained within the *F. clypeata* clade is equivalent to other genera with many species. Thus,

these preliminary data suggest that *F. clypeata* might be a large and genetically diverse species complex that is in dire need of further study. As for *F. blairi*, the genetic results suggest that the species is geographically localized to just two counties, but has extensive genetic variation within the species.

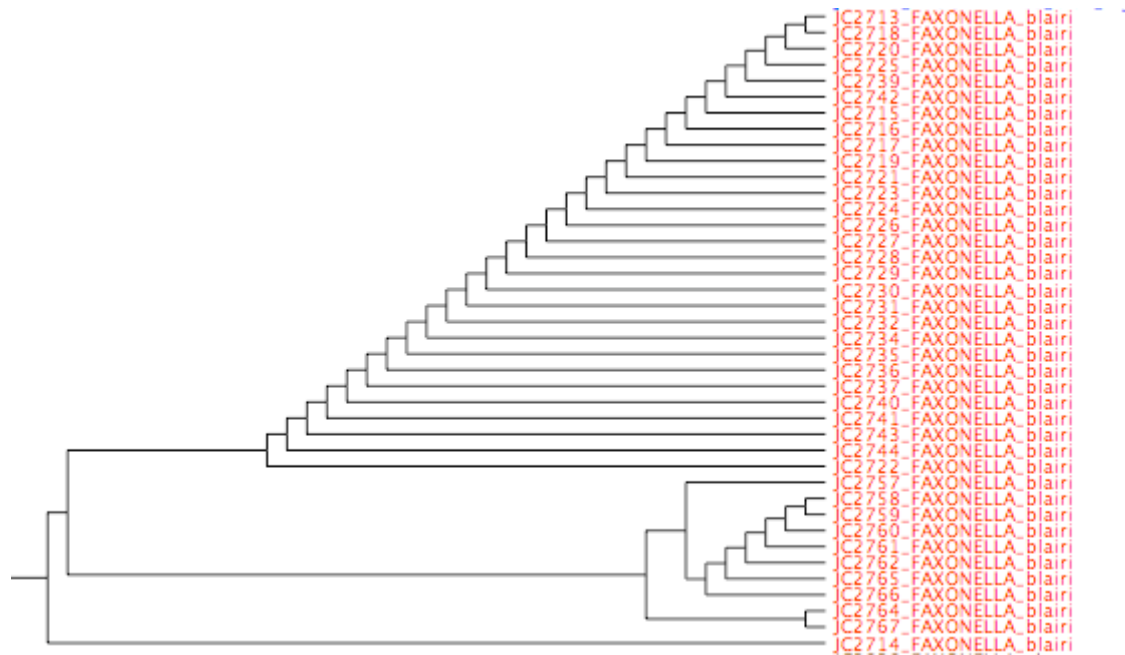


Figure 3. Phylogeny of *Faxonella blairi* showing samples from this species form a monophyletic group sister to *Faxonella clypeata* with extensive, but relatively unstructured, genetic variation within species.

ADDENDUM TO REPORT – Genetic status of *B. robisoni*

Bouchardina robisoni

The crayfish *Bouchardina robisoni* was originally described in 1977 by the late Dr. Horton H. Hobbs, Jr., of the Smithsonian Institution (Hobbs, 1977) from specimens collected in Lafayette County, Arkansas by Dr. Henry W. Robison. This crayfish species has proven to be an Arkansas state endemic (Bouchard and Robison, 1981; Robison and Allen, 1995), occurring

nowhere else in the world, and few collections have been made of this species since 1977. The only known published photograph of *B. robisoni* remains that published in Lukhaup (2003) taken by Dr. Hobbs in 1977.

Distribution

Hobbs (1976) described the type locality of *Bouchardina robisoni* as backwaters of Bayou Bodcaw (=Bodcau) in Lafayette County, Arkansas about 3.5 miles north of Lewisville, Arkansas. This stream is alternatively spelled “Bodcaw” and “Bodcau.” In the original description (Hobbs, 1976), it was labeled “Bayou Bodcaw.” Recently, Robison (2006) surveyed this species in southwestern Arkansas and this information is reported elsewhere.

Genetic Analysis

We sampled *Bouchardina robisoni* from two locations with extensive sampling at each location (as this species is locally abundant when found). These samples showed an extraordinary amount of genetic diversity with absolutely no genetic structure (see Appendix 1). We’ve never seen such genetic variation with such a lack of genetic structure in a crayfish species before. More extensive phylogenetic analyses are required to verify that this is a real biological phenomenon and not an artifact of spurious data. A potential biological explanation is one of a parthenogenetic lineage, which is not unknown in freshwater crayfish (Scholtz et al. 2003).

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Table 1. All Known Collections of *Procambarus regalis* in Arkansas.

1. **TYPE LOCALITY:** AR: **Nevada County:** DeAnn Cemetery about one mile west of the junction of St. Hwys. 19 and 24 on St. Hwy. 24 at the western edge of the city limits of Prescott, Arkansas. 16 March 1982.
2. **Howard Co.:** Mineral Springs, 2 form 1 males. May 1986. Kyle Erwin and Jason Erwin.
3. **Howard Co.:** 2 miles south of Mineral Springs, 1 male form II, Linda Tate. 1985.
4. **Howard Co.:** 1.4 miles south of St. Hwy. 27 on St. Hwy. 317. 1 juvenile male. 2 May 1986. Henry W. Robison.
5. **Sevier Co.:** Roadside wet area 5.1 miles east of Oklahoma state line on U.S. Hwy. 70. 21 April 1973. J. Pugh, G. B. Hobbs, and H. H. Hobbs, Jr. 2 juvenile males, 5 juvenile females.
6. **Sevier Co.:** A field 1.5 miles north of Paraloma (Sec. 8, T11S, R28W). 1 female. 1 April 1987. Eddie Daniels and H. W. Robison.
7. **Sevier Co.:** Seepage area 1.6 miles southwest of the junction of St. Hwy. 27 and 234. 1 male form II, 3 females, 2 juvenile males, and 1 juvenile female. 20 April 1987. G. B. Hobbs and H. H. Hobbs, Jr.
8. **Sevier Co.:** Roadside ditch 0.4 miles east of the Oklahoma state line. 1 form I male, 1 form II male, 2 females, 10 juvenile males, 12 juvenile females. 21 April 1973. J. E. Pugh, G. B. Hobbs, and H. H. Hobbs.
9. **Sevier Co.:** Sevier Co.: Roadside wet area 5.1 miles east of Oklahoma state line on U.S.

- Hwy. 70. 16 March 2007. H. W. Robison. (2 specimens)
10. **Sevier Co.:** Roadside ditch on St. Hwy. 317, 3 miles southeast of the junction of St. Hwy. 317 and US Hwy. 71 (Sec. 6, T10S, R29W). 20 April 2007. Henry W. Robison. (1 specimen)
 11. **Sevier Co.:** Roadside ditch on St. Hwy. 317, 2.5 miles southeast of the junction of St. Hwy. 317 and US Hwy. 71 (Sec. 31, T9S, R29W). 20 April 2007. Henry W. Robison. (2 specimens)
 12. **Sevier Co.:** Roadside ditch on U.S. Hwy. 70, 7 miles west of DeQueen, AR (Sec. 19, T8S, R32W). 31 March 2007. Henry W. Robison. (1 specimen)
 13. **Sevier Co.:** Roadside ditch on U.S. Hwy. 70, 5 miles west of DeQueen, AR. (Sec. 21, T8S, R32W). 27 April 2007. Henry W. Robison. (3 specimens)
 14. **Sevier Co.:** Roadside ditch on U.S. Hwy. 70, 3.1 miles west of DeQueen, AR. (Sec. 26, T8S, R32W). 24 March 2007. Henry W. Robison. (1 specimen)
 15. **Sevier Co.:** Roadside ditch on U.S. Hwy. 70, 4 miles west of DeQueen, AR. (Sec. 27, T8S, R32W). 21 April 2007. Henry W. Robison. (2 specimens)
 16. **Howard Co.:** Seepage area, 1.5 miles west of Mineral Springs, AR on St. Hwy. 27 (Sec. 23, T10S, R29W). 30 May 2006. Henry W. Robison (1 specimen)
 17. **Howard Co.:** Roadside ditch 2 miles north of Tollette, AR on St. Hwy. 355 (Sec. 28, T10S, R29W). 15 April 2006. Henry W. Robison. (3 specimens)

Table 2. All Known Collections of *Fallicambarus petilicarpus* in Arkansas.

TYPE LOCALITY: AR: **Union Co.:** Roadside seepage 0.2 mile east of the Columbia County line on St. Hwy. 57, Union County, Arkansas (Sec. 21, T16S, R18W). Henry W. Robison. April 30, 1982.

Union Co.: Roadside seepage at Marysville Church in Marysville, AR 33.22560 -92.95307 NAD27. 16 March 2006. H. W. Robison (3 specimens)

Union Co.: Roadside seepage on St. Hwy. 57 west of Mt. Holly, AR just east of Columbus County line 33.3190 -92.9779 NAD27. 29 April 2006. H. W. Robison, K. Crandall, B. Wagner, J. Buhay, and M. Kottmyer. (5 specimens)

Union Co.: Roadside seepage at Marysville Church in Marysville, AR 33.22560 -92.95307 NAD27. 29 April 2006. H. W. Robison, K. Crandall, B. Wagner, J. Buhay, and M. Kottmyer. (28 specimens)

Union Co.: Roadside seepage 0.2 mile east of the Columbia County line on St. Hwy. 57, Union County, Arkansas (Sec. 21, T16S, R18W). 25 February 2007. Henry W. Robison. (2 specimens)

Possibly *Fallicambarus petilicarpus*:

AR: **Union Co.:** Roadside at culvert near powerline 33.13106 -92.47953 NAD27. 29 April 2006. H. W. Robison, K. Crandall, B. Wagner, J. Buhay, and M. Kottmyer.

Table 3. Collections of *Faxonella blairi* in Arkansas.

TYPE LOCALITY: OK: McCurtain Co.: Woodland swamp approximately 100 yards west of U.S. Hwy. 259 on north side of Little River, 7 miles south of Broken Bow, OK.

AR: Sevier Co.: Roadside wet area 5.1 miles east of Oklahoma state line on U.S. Hwy. 70. 28 April 2006. H. W. Robison, K. Crandall, B. Wagner, J. Buhay, and M. Kottmyer. (25 specimens)

AR: Sevier Co.: Roadside ditch on St. Hwy. 317, 3 miles southeast of the junction of St. Hwy. 317 and US Hwy. 71 (Sec. 6, T10S, R29W). 11 March 2006. Henry W. Robison. (11 specimens)

AR: Sevier Co.: Roadside ditch on St. Hwy. 317, 2.5 miles southeast of the junction of St. Hwy. 317 and US Hwy. 71 (Sec. 31, T9S, R29W). 19 April 2007. Henry W. Robison. (5 specimens)

AR: Sevier Co.: Roadside ditch on U.S. Hwy. 70, 7 miles west of DeQueen, AR (Sec. 19, T8S, R32W). 19 April 2007. Henry W. Robison. (9 specimens)

AR: Sevier Co.: Roadside ditch on U.S. Hwy. 70, 5.2 miles west of DeQueen, AR. (Sec. 21, T8S, R32W). 15 March 2007. Henry W. Robison. (41 specimens)

AR: Sevier Co.: Roadside ditch on U.S. Hwy. 70, 4 miles west of DeQueen, AR. (Sec. 27, T8S, R32W). 2 May 2006. Henry W. Robison. (22 specimens)

AR: Sevier Co.: Roadside ditch on U.S. Hwy. 70, 3.1 miles west of DeQueen, AR. (Sec. 26, T8S, R32W). 4 May 2006. Henry W. Robison. (6 specimens)

AR: Sevier Co.: Clear Creek at St. Hwy. 24, 1 mile east of jct. of St. Hwy. 24 and St. Hwy. 41 (Sec. 30, T9S, R31W). 15 June 2006. Henry W. Robison. (12 specimens)

AR: Sevier Co.: Roadside ditch on St. Hwy. 41, 1.1 mile south of Horatio, AR. (Sec. 2, T10S, R32W). 18 June 2006. Henry W. Robison. (36 specimens)

AR: Little River Co.: Roadside ditch south of Horatio, AR 33.88128 -94.41887 NAD27. 28 April 2006. H. W. Robison, K. Crandall, B. Wagner, J. Buhay, and M. Kottmyer.

AR: Little River Co.: Roadside ditch on St. Hwy. 41, 4 miles south of Horatio, AR. (Sec. 16, T10S, R32W). 21 April 2007. Henry W. Robison. (17 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 234, 2 miles east of Winthrop, AR. (Sec. 17, T11S, R31W). 21 April 2007. Henry W. Robison. (11 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 32, 7 miles west of Ashdown, AR. (Sec. 1, T13S, R31W). 21 April 2007. Henry W. Robison. (10 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 32, 5.2 miles west of Ashdown, AR. (Sec. 5, T13S, R30W). 22 April 2007. Henry W. Robison. (8 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 41, 6.3 miles south of Horatio, AR. (Sec. 28, T10S, R32W). 24 March 2006. Henry W. Robison. (21 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 41, 2 miles south of Cross Roads, AR. (Sec. 14, T11S, R32W). 24 March 2006. Henry W. Robison. (33 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 41, 3 miles south of Cross Roads, AR. (Sec. 22, T11S, R32W). 24 March 2006. Henry W. Robison. (35 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 234, 1 mile west of Winthrop, AR. (Sec. 2, T11S, R31W). 24 March 2006. Henry W. Robison. (7 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 234, 3.5 miles east of Winthrop, AR. (Sec. 22, T11S, R31W). 20 April 2007. Henry W. Robison. (23 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 234, 1.5 miles west of Alleene, AR. (Sec. 27, T11S, R31W). 20 April 2007. Henry W. Robison. (39 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 234, 1 mile west of Alleene, AR. (Sec. 26, T11S, R31W). 20 April 2007. Henry W. Robison. (19 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 234, 4 miles west of Wilton, AR. (Sec. 4, T12S, R32W). 20 April 2007. Henry W. Robison. (7 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 41, 2 miles north of Foreman, AR. (Sec. 3, T12S, R32W). 20 April 2007. Henry W. Robison. (15 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 41, 4 miles south of Cross Roads, AR. (Sec. 27, T11S, R32W). 21 April 2007. Henry W. Robison. (5 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 41, 1 mile north of Foreman, AR. (Sec. 11, T12S, R32W). 21 April 2007. Henry W. Robison. (3 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 32 at Wallace, AR. (Sec. 36, T12S, R31W). 21 April 2007. Henry W. Robison. (14 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 32, 4 miles east of Foreman, AR. (Sec. 6,

T13S, R31W). 21 April 2007. Henry W. Robison. (9 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 32, 7.5 miles east of Foreman, AR. (Sec. 2, T13S, R31W). 21 April 2007. Henry W. Robison. (26 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 41, 7.2 miles south of Horatio, AR. (Sec. 30, T10S, R32W). 21 April 2007. Henry W. Robison. (6 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 41, 1 mile south of Cross Roads, AR. (Sec. 11, T11S, R32W). 21 April 2007. Henry W. Robison. (19 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 32, 2 miles west of Ashdown, AR. (Sec. 3, T13S, R30W). 27 April 2007. Henry W. Robison. (17 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 32, 1.1 miles west of Ashdown, AR. (Sec. 1, T13S, R30W). 27 April 2007. Henry W. Robison. (2 specimens)

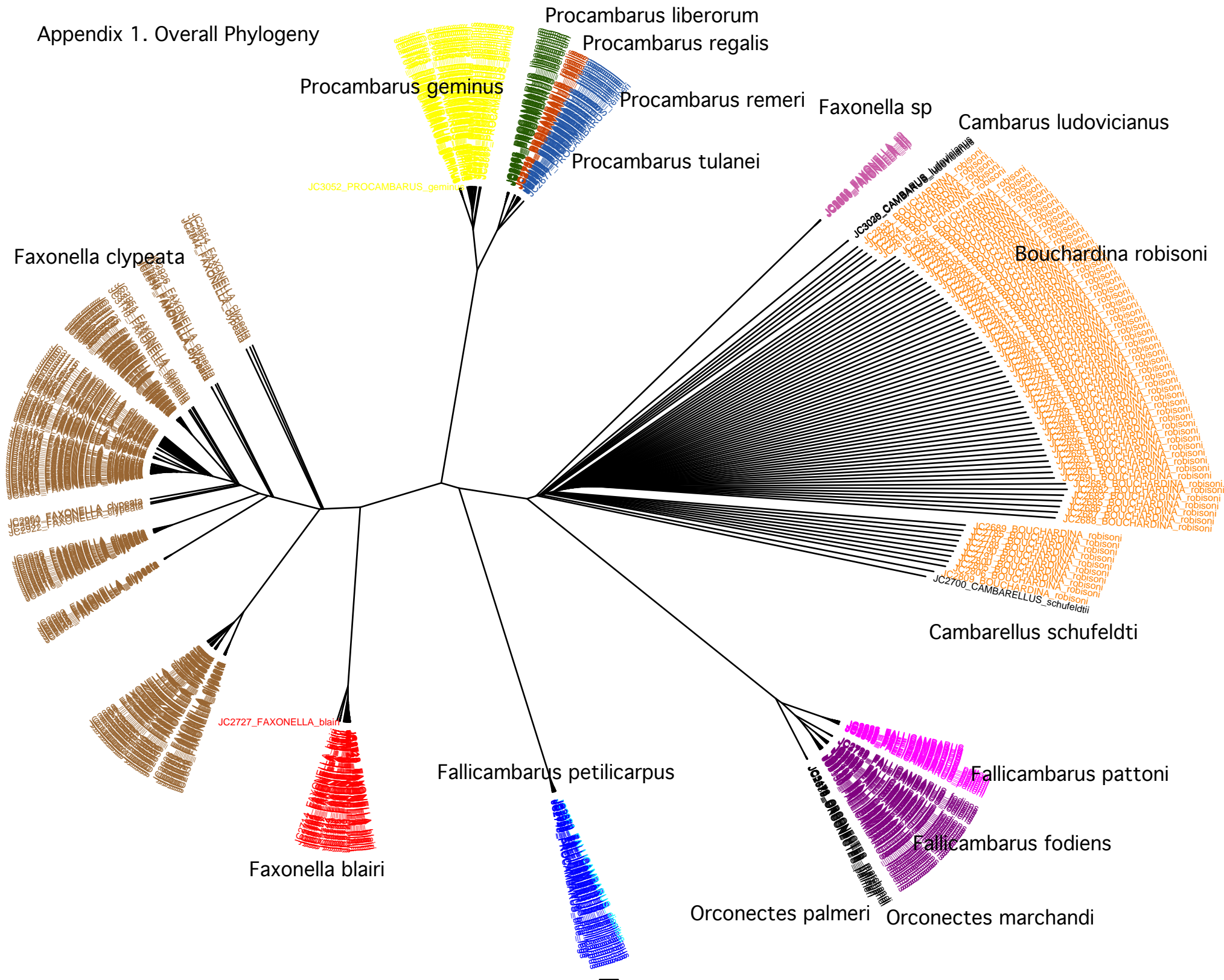
AR: Little River Co.: Roadside ditch on co. road, 4 miles south of Ashdown, AR. (Sec. 19, T13S, R29W). 27 April 2007. Henry W. Robison. (6 specimens)

AR: Little River Co.: Roadside ditch on U.S. Hwy. 71, 1.5 miles south of Ashdown, AR. (Sec. 9, T13S, R29W). 27 April 2007. Henry W. Robison. (22 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 32, 5 miles east of Foreman, AR. (Sec. 5, T13S, R31W). 28 April 2007. Henry W. Robison. (13 specimens)

AR: Little River Co.: Roadside ditch on St. Hwy. 32, 6 miles east of Foreman, AR. (Sec. 4, T13S, R31W). 28 April 2007. Henry W. Robison. (8 specimens)

Appendix 1. Overall Phylogeny



JC#	BYUC#	GENUS	SPECIES	16S	Haplo#	CO1	12S	SEX	FORM	STATE	COUNTY	DRAINAGE	RIVER	LOCALITY	JC SIT	COLLECTOR	LAT	LONG
JC2172	04-98	Cambarus	causeyi	april				male	1	AR	Johnson			Footprint Spring	308	Hrobison, Gleds		
JC2173	04-98	Cambarus	causeyi	april				female	0	AR	Johnson			Footprint Spring	308	Hrobison, Gleds		
JC2174	04-98	Cambarus	causeyi	april				juv	0	AR	Johnson			Footprint Spring	308	Hrobison, Gleds		
JC2175	05-26	Procambarus	SPNOV	april				male	1	AR	Hempstead			Grandview Prairie	309	Hrobison	33.8035	-93.7836
JC2176	05-24	Procambarus	SPNOV	april				female	1	AR	Hempstead			Grandview Prairie	309	Hrobison	33.8035	-93.7836
JC2177	05-32	Procambarus	SPNOV	april			april	male	2	AR	Hempstead			Grandview Prairie	309	Hrobison	33.8035	-93.7836
JC2178	05-21	Fallicambarus	fodiens	april				male	2	AR	Columbia			2 miles W of Waldo	310	Hrobison	33.3508	-93.3286
JC2179	05-21	Fallicambarus	fodiens	april				male	2	AR	Columbia			2 miles W of Waldo	310	Hrobison	33.3508	-93.3286
JC2180	05-24	Fallicambarus	fodiens	april				male	2	AR	Columbia			2 miles W of Waldo	310	Hrobison	33.3508	-93.3286
JC2182	05-24	Cambarus	tudovicianus	april				female	AR	Hempstead				5 miles E of Blevins (Henry's Sil	312	Hrobison	33.8697	-93.4921
JC2183	05-25	Fallicambarus	caesius	april				female	AR	Hempstead				5 miles E of Blevins (Henry's Sil	312	Hrobison	33.8697	-93.4921
JC2184	05-28	Fallicambarus	fodiens	april				female	AR	Hempstead				5 miles E of Blevins (Henry's Sil	312	Hrobison	33.8697	-93.4921
JC2185	05-23	Procambarus	sp	april				male	2	AR	Hempstead			5 miles E of Blevins (Henry's Sil	312	Hrobison	33.8697	-93.4921
JC2186	05-23	Procambarus	sp	april			april	female	0	AR	Hempstead			5 miles E of Blevins (Henry's Sil	312	Hrobison	33.8697	-93.4921
JC2187	05-23	Procambarus	sp	april				juvenile	0	AR	Hempstead			5 miles E of Blevins (Henry's Sil	312	Hrobison	33.8697	-93.4921
JC2188	05-30	Fallicambarus	fodiens	april				male	2	AR	Hempstead			Blevins (Henry's Site 7)	313	Hrobison	33.8718	-93.5701
JC2189	05-33	Fallicambarus	caesius	april				male	2	AR	Hempstead			Blevins (Henry's Site 7)	313	Hrobison	33.8718	-93.5701
JC2190	05-33	Fallicambarus	caesius	april				juvenile	AR	Hempstead				Blevins (Henry's Site 7)	313	Hrobison	33.8718	-93.5701
JC2191	05-33	Fallicambarus	caesius	april				juvenile	AR	Hempstead				Blevins (Henry's Site 7)	313	Hrobison	33.8718	-93.5701
JC2192	05-33	Fallicambarus	caesius	april				juvenile	AR	Hempstead				Blevins (Henry's Site 7)	313	Hrobison	33.8718	-93.5701
JC2193	05-33	Fallicambarus	caesius	april				juvenile	AR	Hempstead				Blevins (Henry's Site 7)	313	Hrobison	33.8718	-93.5701
JC2194	05-33	Fallicambarus	caesius	april				juvenile	AR	Hempstead				Blevins (Henry's Site 7)	313	Hrobison	33.8718	-93.5701
JC2195	05-33	Fallicambarus	caesius	april				juvenile	AR	Hempstead				Blevins (Henry's Site 7)	313	Hrobison	33.8718	-93.5701
JC2196	05-33	Fallicambarus	caesius	april				juvenile	AR	Hempstead				Blevins (Henry's Site 7)	313	Hrobison	33.8718	-93.5701
JC2197	05-33	Fallicambarus	caesius	april				female	AR	Hempstead				Blevins (Henry's Site 7)	313	Hrobison	33.8718	-93.5701
JC2198	05-31	Fallicambarus	caesius	april				female	0	AR	Hempstead			5 mi E of Patmos	314	Hrobison	33.5057	-93.4866
JC2199	05-31	Fallicambarus	caesius	april				male	0	AR	Hempstead			5 mi E of Patmos	314	Hrobison	33.5057	-93.4866
JC2200	05-29	Cambarus	tudovicianus	april				female	0	AR	Hempstead			5 mi E of Patmos	314	Hrobison	33.5057	-93.4866
JC2201	05-31	Fallicambarus	caesius	april				female	0	AR	Hempstead			5 mi E of Patmos	314	Hrobison	33.5057	-93.4866
JC2202	05-27	Procambarus	sp.	april			april	male	2	AR	Hempstead			5 mi E of Patmos	314	Hrobison	33.5057	-93.4866
JC2203	05-27	Procambarus	sp.	april				male	2	AR	Hempstead			5 mi E of Patmos	314	Hrobison	33.5057	-93.4866
JC2204	05-31	Fallicambarus	caesius	april				juv	0	AR	Hempstead			5 mi E of Patmos	314	Hrobison	33.5057	-93.4866
JC2205	05-22	Procambarus	sp.	april				female	0	AR	Lafayette			4 mi N of Lewisville	315	Hrobison	33.4128	-93.5731
JC2206	05-22	Procambarus	sp.	april				male	2	AR	Lafayette			4 mi N of Lewisville	315	Hrobison	33.4128	-93.5731
JC2207	05-22	Procambarus	sp.	april			april	female	0	AR	Lafayette			4 mi N of Lewisville	315	Hrobison	33.4128	-93.5731
JC2208	05-22	Procambarus	sp.	april				female	0	AR	Lafayette			4 mi N of Lewisville	315	Hrobison	33.4128	-93.5731
JC2209	05-22	Procambarus	sp.	april				female	0	AR	Lafayette			4 mi N of Lewisville	315	Hrobison	33.4128	-93.5731
JC2210	05-22	Procambarus	sp.	april				male	2	AR	Lafayette			4 mi N of Lewisville	315	Hrobison	33.4128	-93.5731
JC2211	05-22	Procambarus	sp.	april				female	0	AR	Lafayette			4 mi N of Lewisville	315	Hrobison	33.4128	-93.5731
JC2212	05-22	Procambarus	sp.	april				male	2	AR	Lafayette			4 mi N of Lewisville	315	Hrobison	33.4128	-93.5731
JC2213	05-22	Procambarus	sp.	april				female	0	AR	Lafayette			4 mi N of Lewisville	315	Hrobison	33.4128	-93.5731
JC2214	TISSUE	Cambarus	zophonastes	april				juv	AR	Stone				Hell Creek Cave	316	Bwagner	35.9168	-92.0755
JC2215	TISSUE	Cambarus	zophonastes	april				juv	AR	Stone				Hell Creek Cave	317	Bwagner	35.9168	-92.0755
JC2216	TISSUE	Cambarus	asulabrum?	april				juv	AR	Stone				Nesbitt Cave	317	Bwagner	35.8878	-92.0195
JC2217	TISSUE	Procambarus	liberum	april			april	female	0	AR	Faulkner			Volonia High School, south of H	318	Bwagner	35.085	-92.1972
JC2218	TISSUE	Procambarus	liberum	april				male	2	AR	Faulkner			Volonia High School, south of H	318	Bwagner	35.085	-92.1972
JC2219	TISSUE	Procambarus	liberum	april				male	2	AR	Faulkner			Volonia High School, south of H	318	Bwagner	35.085	-92.1972
JC2220	TISSUE	Procambarus	liberum	april				male	2	AR	Faulkner			Volonia High School, south of H	318	Bwagner	35.085	-92.1972
JC2221	05-19	Fallicambarus	gilpini	april				female	0	AR	Jefferson			0.5 mi N of Type locale, 10.5 mi	319	Hrobison	34.0836	-91.9958
JC2222	05-19	Fallicambarus	gilpini	april				male	2	AR	Jefferson			0.5 mi N of Type locale, 10.5 mi	319	Hrobison	34.0836	-91.9958
JC2223	05-19	Fallicambarus	gilpini	april				male	2	AR	Jefferson			0.5 mi N of Type locale, 10.5 mi	319	Hrobison	34.0836	-91.9958
JC2224	05-19	Fallicambarus	gilpini	april				female	0	AR	Jefferson			0.5 mi N of Type locale, 10.5 mi	319	Hrobison	34.0836	-91.9958
JC2225	05-19	Fallicambarus	gilpini	april				juv	0	AR	Jefferson			0.5 mi N of Type locale, 10.5 mi	319	Hrobison	34.0836	-91.9958
JC2226	05-19	Fallicambarus	gilpini	april				female	0	AR	Jefferson			0.5 mi N of Type locale, 10.5 mi	319	Hrobison	34.0836	-91.9958
JC2279	TISSUE	Procambarus	tenuis	april				juv	AR	Polk				Fourche la small unnamed trib to Cedar Ck	334	Hrobison	34.6833	-94.2
JC2280	TISSUE	Procambarus	tenuis	april				juv	AR	Polk				Fourche la small unnamed trib to Cedar Ck	334	Hrobison	34.6833	-94.2
JC2281	TISSUE	Procambarus	tenuis	april				juv	AR	Polk				Fourche la small unnamed trib to Cedar Ck	334	Hrobison	34.6833	-94.2
JC2282	TISSUE	Procambarus	tenuis	april				juv	AR	Polk				Fourche la small unnamed trib to Cedar Ck	334	Hrobison	34.6833	-94.2
JC2283	05-42	Procambarus	tenuis	april				juv	AR	Polk				Fourche la small unnamed trib to Cedar Ck	334	Hrobison	34.6833	-94.2
JC2300	05-04	Procambarus	liberum	april				male	2	AR	Franklin			West of Bee Rock, on FS1003,	335	Robison, Crandall, trip	35.6672	-93.89267
JC2301	05-04	Procambarus	liberum	april				male	2	AR	Franklin			West of Bee Rock, on FS1003,	335	Robison, Crandall, trip	35.6672	-93.89267
JC2302	05-04	Procambarus	liberum	april				female	0	AR	Franklin			West of Bee Rock, on FS1003,	335	Robison, Crandall, trip	35.6672	-93.89267
JC2303	05-04	Procambarus	liberum	april			april	female	0	AR	Franklin			West of Bee Rock, on FS1003,	335	Robison, Crandall, trip	35.6672	-93.89267
JC2304	05-04	Procambarus	liberum	april				female	0	AR	Franklin			West of Bee Rock, on FS1003,	335	Robison, Crandall, trip	35.6672	-93.89267
JC2305	05-04	Procambarus	liberum	april				male	2	AR	Franklin			West of Bee Rock, on FS1003,	335	Robison, Crandall, trip	35.6672	-93.89267
JC2306	05-04	Procambarus	liberum	april				male	2	AR	Franklin			West of Bee Rock, on FS1003,	335	Robison, Crandall, trip	35.6672	-93.89267
JC2307	05-05	Procambarus	liberum	april				male	2	AR	Crawford			Corner of White Rock Mtn and I	336	Robison, Crandall, trip	35.6761	-93.92035
JC2308	05-05	Procambarus	liberum	april				female	0	AR	Crawford			Corner of White Rock Mtn and I	336	Robison, Crandall, trip	35.6761	-93.92035
JC2309	05-05	Procambarus	liberum	april				female	0	AR	Crawford			Corner of White Rock Mtn and I	336	Robison, Crandall, trip	35.6761	-93.92035
JC2310	05-05	Procambarus	liberum	april				male	2	AR	Crawford			Corner of White Rock Mtn and I	336	Robison, Crandall, trip	35.6761	-93.92035
JC2311	05-05	Procambarus	liberum	april				male	2	AR	Crawford			Corner of White Rock Mtn and I	336	Robison, Crandall, trip	35.6761	-93.92035
JC2312	05-05	Procambarus	liberum	april				male	2	AR	Crawford			Corner of White Rock Mtn and I	336	Robison, Crandall, trip	35.6761	-93.92035
JC2313	05-05	Procambarus	liberum	april				male	2	AR	Crawford			Corner of White Rock Mtn and I	336	Robison, Crandall, trip	35.6761	-93.92035
JC2314	TISSUE	Procambarus	liberum	april				juv	0	AR	Crawford			Corner of White Rock Mtn and I	336	Robison, Crandall, trip	35.6761	-93.92035
JC2315	TISSUE	Procambarus	liberum	april				juv	0	AR	Crawford			Corner of White Rock Mtn and I	336	Robison, Crandall, trip	35.6761	-93.92035
JC2316	05-05	Procambarus	liberum	april			april	juv	0	AR	Crawford			Corner of White Rock Mtn and I	336	Robison, Crandall, trip	35.6761	-93.92035
JC2317	TISSUE	Procambarus	liberum	april				juv	0	AR	Crawford			Roadside, 1/2 mile S of White R	337	Robison, Crandall, trip	35.68327	-93.96545
JC2318	05-06	Procambarus	liberum	april			april	juv	0	AR	Crawford			Roadside, 1/2 mile S of White R	337	Robison, Crandall, trip	35.68327	-93.96545
JC2319	TISSUE	Procambarus	liberum	april				juv	0	AR	Crawford			Roadside, 1/2 mile S of White R	337	Robison, Crandall, trip	35.68327	-93.96545
JC2320	TISSUE	Procambarus	liberum	april				juv	0	AR	Crawford			Roadside, 1/2 mile S of White R	337	Robison, Crandall, trip	35.68327	-93.96545
JC2321	TISSUE	Procambarus	liberum	april				juv	0	AR	Crawford			Roadside, 1/2 mile S of White R	337	Robison, Crandall, trip	35.68327	-93.96545
JC2322	TISSUE	Procambarus	liberum	april				juv	0	AR	Crawford			Roadside, 1/2 mile S of White R	337	Robison, Crandall, trip	35.68327	-93.96545
JC2323	TISSUE	Procambarus	liberum	april				juv	0	AR	Crawford			Roadside, 1/2 mile S of White R	337	Robison, Crandall, trip	35.68327	

JC2375	05-09	Cambarus	ludovicianus	april	female	0	AR	Hempstead	5 mi E of Blevins	312	Robison	33.8697	-93.4921
JC2376	05-10	Fallicambarus	caesius	april	female	0	AR	Hempstead	Blevins	313	Robison	33.8718	-93.5701
JC2377	05-10	Fallicambarus	caesius	april	male	2	AR	Hempstead	Blevins	313	Robison	33.8718	-93.5701
JC2378	05-11	Cambarus	diogenes	april	female	0	AR	Nevada	CR 176	342	Daniel Allen		
JC2379	05-12	Fallicambarus	sp.		female	0	AR	Nevada	CR 176	342	Daniel Allen		
JC2380	05-12	Fallicambarus	sp.	april	female	0	AR	Nevada	CR 176	342	Daniel Allen		
JC2381	05-12	Fallicambarus	sp.	april	female	0	AR	Nevada	CR 176	342	Daniel Allen		
JC2382	05-12	Fallicambarus	sp.	april	female	0	AR	Nevada	CR 176	342	Daniel Allen		
JC2383	05-12	Fallicambarus	sp.	april	female	0	AR	Nevada	CR 176	342	Daniel Allen		
JC2384	05-12	Fallicambarus	sp.	april	female	0	AR	Nevada	CR 176	342	Daniel Allen		
JC2385	05-13	Orconectes	meeki	april	male	2	AR	Johnson	West Fork of Washita Creek	343	Robison, Crandall, trip	35.64466	-93.59547
JC2386	05-13	Orconectes	meeki	april	male	2	AR	Johnson	West Fork of Washita Creek	343	Robison, Crandall, trip	35.64466	-93.59547
JC2387	05-13	Orconectes	meeki		female	0	AR	Johnson	West Fork of Washita Creek	343	Robison, Crandall, trip	35.64466	-93.59547
JC2388	05-13	Orconectes	meeki	april	male	2	AR	Johnson	West Fork of Washita Creek	343	Robison, Crandall, trip	35.64466	-93.59547
JC2389	05-13	Orconectes	meeki	april	female	0	AR	Johnson	West Fork of Washita Creek	343	Robison, Crandall, trip	35.64466	-93.59547
JC2390	05-13	Orconectes	meeki	april	male	2	AR	Johnson	West Fork of Washita Creek	343	Robison, Crandall, trip	35.64466	-93.59547
JC2391	05-13	Orconectes	meeki	april	male	2	AR	Johnson	West Fork of Washita Creek	343	Robison, Crandall, trip	35.64466	-93.59547
JC2392	05-13	Orconectes	meeki		male	2	AR	Johnson	West Fork of Washita Creek	343	Robison, Crandall, trip	35.64466	-93.59547
JC2393	05-13	Orconectes	meeki		male	2	AR	Johnson	West Fork of Washita Creek	343	Robison, Crandall, trip	35.64466	-93.59547
JC2394	05-13	Orconectes	meeki	april	male	2	AR	Johnson	West Fork of Washita Creek	343	Robison, Crandall, trip	35.64466	-93.59547
JC2395	05-14	Orconectes	meeki		female	0	AR	Johnson	Shack, Washita East	344	Robison, Crandall, trip	35.64545	-93.59341
JC2396	05-15	Orconectes	williamsi		female	0	AR	Johnson	Roadside spring pipe	345	Robison, Crandall, trip	35.65456	-93.59431
JC2397	05-16	Cambarus	causeyi	april	female	0	AR	Johnson	School pond spring, North of O	346	Robison, Crandall, trip	35.71966	-93.54984
JC2398		Cambarus	causeyi		female	0	AR	Johnson	Tate spring	347	Robison, Crandall, trip	35.73474	-93.55157
JC2399	05-01	Orconectes	meeki	april	male	2	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2400	05-01	Orconectes	meeki	april	male	2	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2401	05-01	Orconectes	meeki	april	male	1	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2402	05-01	Orconectes	meeki	april	male	2	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2403	05-01	Orconectes	meeki	april	male	2	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2404	05-01	Orconectes	meeki	april	male	2	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2405	05-01	Orconectes	meeki		female	0	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2406	05-01	Orconectes	meeki	april	male	2	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2407	05-01	Orconectes	meeki	april	male	2	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2408	05-01	Orconectes	meeki	april	female	0	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2409	05-01	Orconectes	meeki	april	male	2	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2410	05-01	Orconectes	meeki	april	male	2	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2411	05-01	Orconectes	meeki	april	female	0	AR	Johnson	Little Piney Creek	348	Robison, Crandall, trip	35.68544	-93.4095
JC2541		Procamburus		april			AR		Caddo Hills	Hobison	34.42	-93.6333	
JC2542		Procamburus		april			AR		Caddo Hills	Hobison	34.42	-93.6333	
JC2543		Procamburus		april			AR		Wingfield creek	Hobison	34.1917	-93.2533	
JC2567	06-25	Cambarus	causeyi				AR	Johnson		Hobison			
JC2568	06-25	Cambarus	causeyi				AR	Johnson		Hobison			
JC2569	06-25	Cambarus	causeyi				AR	Johnson		Hobison			
JC2570	06-26	Procamburus	ouachitae		female	0	AR	Pike	Glenwood	Clukhaup			
JC2571	06-26	Procamburus	ouachitae		male	1	AR	Pike	Glenwood	Clukhaup			
JC2572	06-27	Procamburus	ouachitae		male	1	AR	Pulaski	Little Rock at airport	Clukhaup			
JC2573	06-28	Procamburus	curdi		female	0	AR	Johnson	1.5 mi W of Ashdown on St Hwy 32	Hobison			
JC2574	06-29	Procamburus	sp		male	1	AR	Pike	Glenwood	Hobison			
JC2575	06-29	Procamburus	sp		female	0	AR	Pike	Glenwood	Hobison			
JC2576	06-29	Procamburus	sp		male	1	AR	Pike	Glenwood	Hobison			
JC2577	06-29	Procamburus	sp		male	1	AR	Pike	Glenwood	Hobison			
JC2578	06-30	Cambarus	ludovicianus				AR	Pike	Glenwood	Clukhaup			
JC2579	06-31	Orconectes	williamsi?		female	0	AR	Johnson	Arkansas River basin	Hobison			
JC2580	06-31	Orconectes	williamsi?		female	0	AR	Johnson	Arkansas River basin	Hobison			
JC2581	06-31	Orconectes	williamsi?		female	0	AR	Johnson	Arkansas River basin	Hobison			
JC2582	06-31	Orconectes	williamsi?		male	2	AR	Johnson	Arkansas River basin	Hobison			
JC2583	06-32	Orconectes	williamsi		male	1	AR	Madison	White River at Dutton	Hobison			
JC2584	06-32	Orconectes	williamsi		female	0	AR	Madison	White River at Dutton	Hobison			
JC2585	06-32	Orconectes	williamsi		female	0	AR	Madison	White River at Dutton	Hobison			
JC2586	06-32	Orconectes	williamsi		female	0	AR	Madison	White River at Dutton	Hobison			
JC2615		Procamburus	liberorum	april			AR	Scott	Waldron	Hobison	34.89	-94.08	
JC2616		Procamburus	liberorum	april			AR	Scott	Waldron	Hobison	34.89	-94.08	
JC2617		Procamburus	liberorum	april			AR	Scott	Waldron	Hobison	34.89	-94.08	
JC2618		Procamburus	liberorum				AR	Scott	Waldron	Hobison	34.89	-94.08	
JC2619		Procamburus	liberorum	april			AR	Scott	Waldron	Hobison	34.89	-94.08	
JC2620		Procamburus	liberorum	april			AR	Scott	Waldron	Hobison	34.89	-94.08	
JC2621		Procamburus	liberorum	april			AR	Scott	Waldron	Hobison	34.89	-94.08	
JC2622		Cambarus	ludovicianus				AR	Lonoke					
JC2623		Cambarus	ludovicianus				AR	Lonoke					
JC2626	06-46	Fallicambarus		april	male	1	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2627	06-46	Fallicambarus		april	female	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2628	06-46	Fallicambarus		april	female	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2629	06-46	Fallicambarus		april	female	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2630	06-46	Fallicambarus		april	female	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2631	06-46	Fallicambarus		april	female	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2632	06-46	Fallicambarus		april	female	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2633	06-46	Fallicambarus		april	female	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2634	TISSUE	Fallicambarus		april	juv	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2635	TISSUE	Fallicambarus			juv	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2636	TISSUE	Fallicambarus			juv	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2637	TISSUE	Fallicambarus			juv	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2638	TISSUE	Fallicambarus			juv	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2639	TISSUE	Fallicambarus		april	juv	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2640	TISSUE	Fallicambarus			juv	0	AR	Ouachita	Camden city limits, Patrick Daniel hous	Hobison			
JC2651	TISSUE	Faxonella	sp	april	juv	0	AR		Magnolia	Hobison			
JC2652	TISSUE	Faxonella	sp	april	juv	0	AR		Magnolia	Hobison			
JC2653	TISSUE	Faxonella	sp	april	juv	0	AR		Magnolia	Hobison			
JC2654	TISSUE	Faxonella	sp	april	juv	0	AR		Magnolia	Hobison			
JC2655	TISSUE	Procamburus	tulaneii	april	juv	0	AR		Magnolia	Hobison			
JC2656	TISSUE	Faxonella	sp	april	juv	0	AR		Magnolia	Hobison			
JC2657	TISSUE	Faxonella	sp	april	juv	0	AR		Magnolia	Hobison			
JC2658	TISSUE	Faxonella	sp	april	juv	0	AR		Magnolia	Hobison			
JC2659	TISSUE	Faxonella	sp	april	juv	0	AR		Magnolia	Hobison			
JC2660	TISSUE	Faxonella	sp	april	juv	0	AR		Magnolia	Hobison			
JC2661	TISSUE	Faxonella	sp	april	juv	0	AR		Magnolia	Hobison			
JC2662	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2663	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2664	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2665	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2666	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2667	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2668	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2669	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2670	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2671	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2672	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2673	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2674	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2675	TISSUE	Procamburus	liberorum	april	juv	0	AR	Logan	Caulksville, Hwy 22, bank	Hobison			
JC2676	06-58	Orconectes	palmeri	april	female	0	AR	Polk	Mena campus, Acorn	Hobison			
JC2677	06-58	Procamburus	palmeri	april	female	0	AR	Polk	Mena campus, Acorn	Hobison			
JC2678	06-58	Orconectes	palmeri	april	female	0	AR	Polk	Mena campus, Acorn	Hobison			
JC2679	06-58	Orconectes	palmeri	april	female	0	AR	Polk	Mena campus, Acorn	Hobison			
JC2680	06-58	Orconectes	palmeri	april	female	0	AR	Polk	Mena campus, Acorn	Hobison			
JC2681	06-66	Fallicambarus	dissilus	april	male	1	AR	Columbia	2 mi SW Waldo	Hobison			
JC2682	TISSUE	Bouchardina	robisoni	april	juv	0	AR		2nd Bodcaw Swamp	Robison, Crandall trip	33.4182	-93.5724	
JC2683	TISSUE	Bouchardina	robisoni	april	juv	0	AR		2nd Bodcaw Swamp	Robison, Crandall trip	33.4182	-93.5724	
JC2684	TISSUE	Bouchardina	robisoni	april	juv								

