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TWO NEW CRAYFISHES FROM THE HIGHLAND RIM IN TENNESSEE (DECAPODA, ASTACIDAE)

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Several years ago Dr. J. J. Friauf of Vanderbilt University collected several crayfishes from a small stream near the entrance of Montgomery-Bell State Park, Dickson County, Tennessee. Among them were three specimens which belong to an undescribed species. Since that time several unsuccessful attempts have been made by Dr. Friauf to secure additional representatives. On a recent trip in Tennessee, Dr. Perry C. Holt and I collected a good series of this species on the Western Highland Rim, and in addition, found a closely related form on the Eastern Highland Rim.

These two new species together with *Cambarus asperimanus*[2] Faxon (1914, p. 391), *C. distans* Rhoades (1944, p. 136), and *C. parvoculus* Hobbs and Shoup (1947, p. 142) seem to form a natural group which is here designated the Asperimanus Group. These five species are morphologically similar, have, with the possible exception of *C. distans,* similar ecological preferences, and their subcontiguous ranges would support the assumption that they are closely allied. The similarity of *Cambarus ayersii* Steele (1902, p. 18) and *C. setosus* Faxon (1889, p. 237) to the members of this group is also striking; particular reference is here made to the sculpture of the chelae together with their long setae.

I wish to express my sincere thanks to Drs. Friauf and Holt for their help in securing the specimens on which these species are based, and I take great pleasure in naming one of them in honor of Dr. Friauf.

Cambarus **brachydactylus,** sp. nov.

Diagnosis.—Rostrum excavate above, short, with markedly thickened and converging margins; acumen not set off from basal portion of rostrum. Areola 4.0-4.5 times longer than broad with five or six punctations across narrowest part, and constituting 37-39 percent of entire length of carapace. No lateral spines or tubercles present on side of carapace immediately caudad of cervical groove. Suborbital angle prominent and acute. Postorbital ridges very short and terminate cephalad in rounded knobs. Chela with inflated palm along the inner margin of which is a single row of well defined tubercles; fingers with distinct ridges, and in many specimens appearing to be conspicuously short. All of the pereiopods bear conspicuously long setae, and the chelae are more setose than those of any epigean member of the genus with the possible exceptions of *C. asperimanus* Faxon (1914, p. 391) and the species described below. (For pleopods and annulus ventralis, see figures 4, 6, 7, 8, and 10.)

[1]Contribution from the Miller School of Biology, University of Virginia.

[2]There is no reason to retain Faxon's subspecific assignment of *asperimanus* (i.e., *C. bartonii asperimanus*) for there is no evidence of its intergrading with the typical or any other of the so-called subspecies of *C. bartonii.*

Holotypic Male, Form I.—Body subovate, depressed. Abdomen narrower than thorax (8.9-10.5 mm. in widest parts respectively). Width of carapace greater than depth in region of caudodorsal margin of cervical groove (10.5-7.2 mm.). Areola broad (4.2 times longer than broad), conspicuously punctate with five punctations across narrowest portion; cephalic section of carapace 1.6 times as long as areola (length of areola about 38.9 percent of entire length of carapace). Rostrum excavate above with thickened convergent margins, each flanked mesially by a row of deep setiferous punctations; acumen not clearly delimited basally and with its corneous tip distinctly upturned. Subrostral ridges well developed but fuse imperceptibly with marginal thickenings along proximal half of rostrum.

Postorbital ridges short with deep lateral grooves bearing setiferous punctations, and terminating cephalad in rounded tubercles. Suborbital angle acute and prominent. Branchiostegal spine represented by an inconspicuous angle below cephalic extremity of cervical groove. No spines or tubercles on sides of carapace immediately caudad of cervical groove. Carapace conspicuously punctate except for polished U-shaped area in gastric region and granular cephalolateral areas. Abdomen shorter than carapace (19.7-20.3 mm.). Cephalic section of telson with one spine in each caudolateral corner.

Epistome subminarette-shaped (Fig. 2). Antennules of the usual form but with no spine or tubercle on lower surface of basal segment. Antennae extend caudad to fourth abdominal segment. Antennal scale narrow with lamella slightly broader proximally than distally; outer thickened portion as broad as lamella and terminates distad in a prominent heavy spine.

Chela with inflated palm; all surfaces bearing setiferous punctations, and most punctations with at least one very long seta. Inner margin of right chela with a single row of nine conspicuous tubercles flanked above by a row of large punctations. Fingers slightly gaping. Upper and lower surfaces of both fingers with a prominent submedian longitudinal ridge flanked on both sides by deep setiferous punctations. Opposable margins of both fingers with six corneous knob-like tubercles on proximal three-fifths; distal portion bearing minute denticles. Distal tubercle on immovable finger lies below the other tubercles on that finger. Lateral margin of immovable finger with a row of deep setiferous punctations. Mesial margin of movable finger also with conspicuous setiferous punctations.

Carpus of first right pereiopod longer than broad with a prominent longitudinal furrow; scattered setiferous punctations over the entire podomere. Mesial surface with a heavy tubercle near midlength, and with a smaller one proximad of it. Lower distal margin with two prominent tubercles.

Merus of first right pereiopod with deep punctations on upper distal surface. Lower surface with a row of six spike-like tubercles (corresponding to the inner row in most species) and laterad of this row is a single tubercle (corresponding in its position to the distalmost tubercle in the outer row in most species). Long setae project from punctations and from the bases of the tubercles on the lower surface. Lateral and mesial surfaces sparsely punctate.

Hooks on ischiopodites of third pereiopods only; hooks strong and simple with proximal surfaces bearing setae. Coxopodite of fourth pereiopod with a knob-like tubercle on caudal mesioventral angle.

First pleopod reaching the caudal margin of the coxopodite of the third pereiopod when abdomen is flexed, and terminating distally in two distinct parts. Central projection corneous, and bent at an angle slightly greater than a right angle to the main shaft of the appendage; tip simple, not notched. Mesial process noncorneous and inflated proximally but tapers to a point distally; tip directed caudad.

Allotypic Female.—Differs from the holotype in the following respects: Inner margin of palm of right chela with only six tubercles and one much reduced one; opposable margins of fingers with only five tubercles. Large tubercle on mesial surface of carpus subtended by a smaller one lying immediately proximad of it. Lower surface of merus with an inner row of eight tubercles and two lying laterad of this row. Annulus ventralis slightly movable with a submedian trough-like longitudinal depression in cephalic half; sinus

originates near midlength on sinistral side (Fig. 4) makes a hairpin turn to cross median line where it turns sinistrad and then caudad to reach the caudal margin of the annulus near the midcaudal margin.

Morphotypic Male, Form II.—An immature specimen. Differs from the holotype in the following respects. Margins of rostrum not so conspicuously thickened. Epistome subtriangular. Inner margin of palm of chela with seven tubercles. Opposable margins of fingers with four tubercles instead of nine. Small tubercle present on ischiopodite of third pereiopod instead of hook. First pleopod (Figs. 6 and 7) with neither terminal corneous; central projection broad and subtruncate; mesial process short and rounded distally. Juvenile articulation between basipodite and endopodite evident.

Measurements.—In millimeters.

	Holotype	Allotype	Paratypic Male, Form II
Carapace:			
Height	7.2	6.6	6.5
Width	10.5	9.0	8.9
Length	20.3	17.3	17.5
Areola:			
Width	1.9	1.6	1.5
Length	7.9	6.5	6.6
Rostrum:			
Width	2.7	2.2	2.4
Length	3.4	3.1	3.1
Right Chela:			
Length of inner margin of palm	7.5	5.4	6.5
Width of palm	7.3	5.2	6.4
Length of outer margin	17.6	12.9	14.9
Length of dactyl	9.0	6.4	7.3

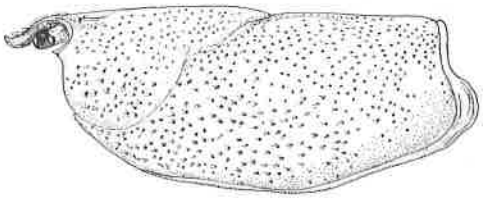
The largest specimen available, a male, form I, has a carapace length of 20.3 mm. The smallest first form male has a carapace length of 14.2 mm.

Type Locality.—Louise Creek, 13.9 miles south of Clarksville, Montgomery County, Tennessee, on State Highway 48. Here the stream, varying in width from 10-25 feet and in depth from one to three feet, is clear, and flows over a rocky bed with alternating quiet and riffle areas. *Cambarus brachydactylus* is very abundant in the riffle areas where it digs shallow excavations below the rocks.

Disposition of Types.—The holotypic male, the allotypic female (no. 93155), the morphotypic male (no. 93156) together with paratypes consisting of three males, form I, and three females are deposited in the United States National Museum. Of the remaining paratypes, one male, form I, and one female are deposited in the Museum of Comparative Zoology; one male form I, and one female in the University of Michigan Museum of Zoology; and 20 males, form I, 25 females, two immature males, and three immature females are in my personal collection at the University of Virginia.

Range.—This species has been collected in tributaries of the Cumberland River in three localities on the western Highland Rim in Montgomery and Dickson counties, Tennessee. *Montgomery Co.*—the type locality, November 10, 1951, P. C. Holt and H. H. Hobbs, Jr., collectors. *Dickson Co.*—(1) a small stream at the eastern city limits of Charlotte on State Highway 47, November 10, 1951, P. C. H. and H. H. H., collectors; (2) a small stream

Plate 1. (Opposite page.) *Cambarus brachydactylus,* sp. nov. Fig. 1, Lateral view of carapace of holotype. Fig. 2, Epistome of holotype. Fig. 3, Dorsal view of carapace of holotype. Fig. 4, Annulus ventralis of allotype. Fig. 5, Distal three podomeres of right cheliped of holotype. Fig. 6, Mesial view of first pleopod of morphotype. Fig. 7, Lateral view of first pleopod of morphotype. Fig. 8, Mesial view of first pleopod of holotype. Fig. 9, Antennal scale of holotype. Fig. 10, Lateral view of first pleopod of holotype.



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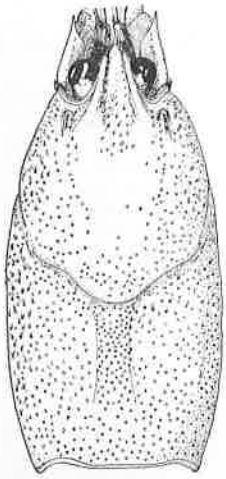

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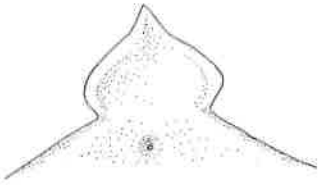

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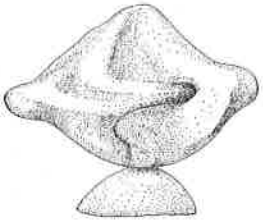

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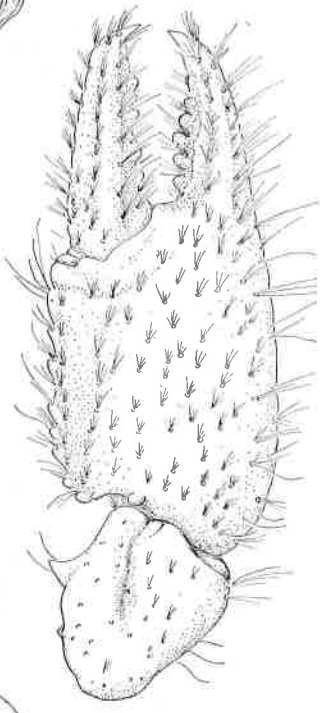

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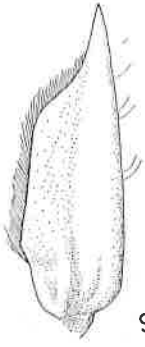

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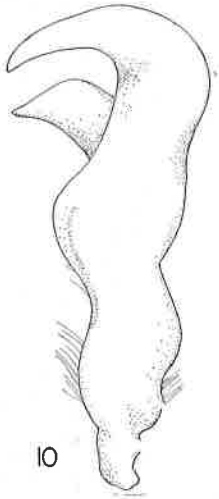

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near entrance to Montgomery-Bell Park, March 23, 1947, J. J. Friauf, collector.

Variations.—The epistome varies in shape from triangular to subtrapezoidal. The other major differences occur in the armature of the chelipeds: number of tubercles along the inner margin of the palm vary from six to nine; the tubercles on the opposable margins of the fingers vary in number from five to seven on the propus and four to six on the dactyl; carpus with one or two tubercles on inner surface; upper distal surface of merus with one or no tubercle, and the lower surface with a row of five to seven tubercles with one or two laterad of it.

Relationships.—*Cambarus brachydactylus* has its closest affinities with the members of the Asperimanus Group (see below).

CAMBARUS **friaufi,** sp. nov.

Diagnosis.—Rostrum excavate above with distinctly thickened and converging margins; acumen not distinctly set off from basal portion of rostrum. Areola 3.8-4.5 times longer than broad, with two or three punctations across narrowest part, and constituting 36.4-41.5 percent of entire length of carapace. No lateral spines or tubercles present on side of carapace immediately caudad of cervical groove. Suborbital angle prominent and acute or subacute. Postorbital ridges very short and terminate cephalad in rounded knobs. Chela with inflated palm along the inner margin of which is a single row of tubercles or a thin emarginate crest; fingers short with distinct ridges. All pereiopods conspicuously setose, thus strongly resembling *C. asperimanus* and *C. brachydactylus;* however, differing from both in possessing a well-defined shoulder at the lateral base of the central projection of the first pleopod of the first form male. (For pleopods and annulus ventralis, see figures 14, 16, and 18.)

Holotypic Mate, Form I.—Body subovate, depressed. Abdomen narrower than thorax (9.9-11.8 mm. in widest parts respectively). Width of carapace greater than depth in region of caudodorsal margin of cervical groove (11.8-8.5 mm.). Areola broad (4.1 times longer than broad) with setiferous punctations in two longitudinal rows and a few scattered ones between—three across narrowest part; cephalic section of carapace 1.4 times as long as areola (length of areola about 40.9 percent of entire length of carapace). Rostrum excavate above with thickened convergent margins (decidedly more thickened along proximal portion); a row of deep setiferous punctations along mesial side of ridge, and distally the setae concealing the margins; acumen not clearly delimited basally, and with a sharply upturned corneous tip. Subrostral ridges prominent but fuse imperceptibly with marginal thickenings on proximal half of rostrum.

Postorbital ridges short with lateral grooves formed by fusion of three deep setiferous punctations, and terminating cephalad in rounded tubercles. Suborbital angle very prominent, subacute (but tip rounded). Branchiostegal spine represented by a small rounded tubercle below cephalic extremity of cervical groove. No spines or tubercles on sides of carapace immediately caudad of cervical groove. Carapace conspicuously punctate except somewhat sparsely so in gastric region, and cephalolatral areas bear small tubercles. Abdomen slightly shorter than carapace (21.2-22.0 mm.). Cephalic section of telson with one spine in each caudolateral corner (both broken).

Epistome irregular in shape (Fig. 12). Antennules of the usual form but without a spine or tubercle on lower surface of basal segment. Antennae extend caudad to third abdominal segment. Antennal scale narrow with lamella broader proximally than distally; at midlength narrower than inflated outer

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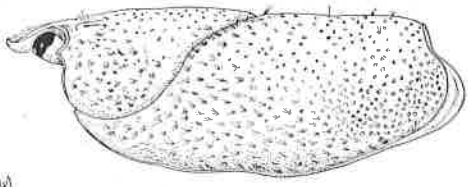
Plate 2. (Opposite page.) *Cambarus friaufi,* sp. nov. Fig. 11, Lateral view of carapace of holotype. Fig. 12, Epistome of holotype. Fig. 13, Dorsal view of carapace of holotype. Fig. 14, Annulus ventralis of allotype. Fig. 15, Distal three podomeres of right cheliped of holotype. Fig. 16, Mesial view of first pleopod of holotype. Fig. 17, Epistome of holotype. Fig. 18, Lateral view of first pleopod of holotype.



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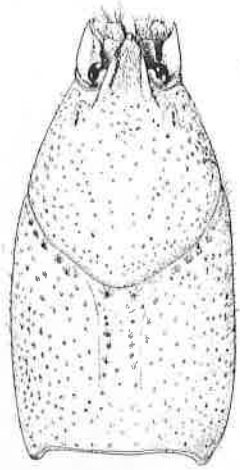

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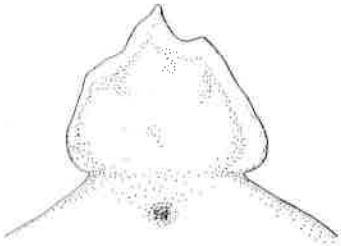

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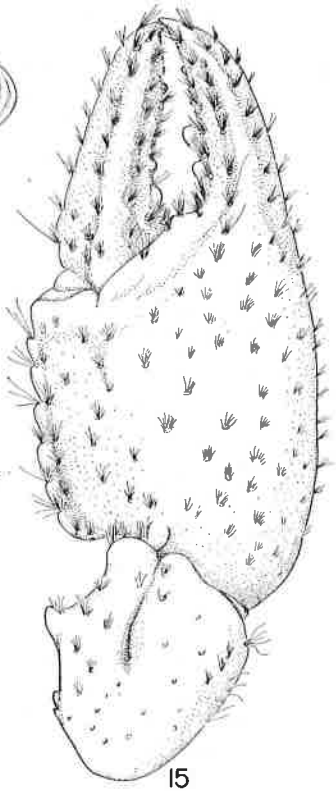

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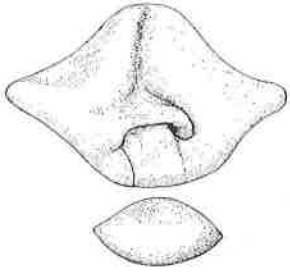

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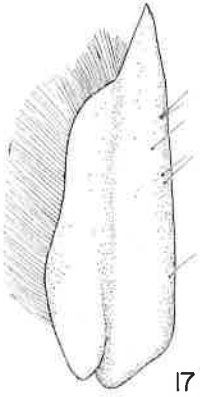

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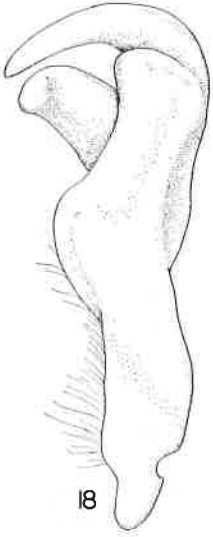

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portion; outer portion comparatively broad and swollen, and terminates distad in a heavy spine.

Chela with inflated palm; all surfaces bearing setiferous punctations, and some punctations with one or more setae longer than the others issuing from the same punctation. Inner margin of right chela with a single row of seven large tubercles flanked above by a row of large setiferous punctations. Fingers slightly gaping. Upper and lower surfaces of both fingers with a prominent submedian ridge flanked on both sides by a row of deep setiferous punctations; ridges on lower surfaces not so well-defined as those on upper. Opposable margin of dactyl with three rounded tubercles and that of immovable finger with four; distal portions of both fingers bearing minute denticles. Distal tubercle on immovable finger lies below the other tubercles on that finger. Lateral margin of immovable finger with a row of setiferous punctations. Mesial margin of movable finger also with setiferous punctations.

Carpus of first right pereiopod longer than broad with a deep longitudinal furrow above; scattered setiferous punctations on all surfaces. Mesial surface with a heavy tubercle near midlength and with two (left with three) smaller ones proximad of it. Lower distal margin with a lateral acute tubercle and a more mesial setae bearing prominence.

Merus of first right pereiopod with deep setiferous punctations on upper distal portion. Lower surface with one spine (two on left pereiopod) in position of the usual distal spine in the outer row; instead of the usual two rows of spines there are deep setiferous punctations arranged, for the most part, in two longitudinal rows. Lateral and mesial surfaces with a few small setiferous punctations.

Hooks on ischiopodites of third pereiopods only; hooks strong and simple with proximal surfaces bearing setae. Coxopodite of fourth pereiopod with a knob-like tubercle on caudal mesioventral angle.

First pleopod reaching coxopodite of third pereiopod when abdomen is flexed, terminating distally in two distinct parts. Central projection corneous, and bent caudally at an angle slightly greater than 90° to the main shaft of the appendage; tip simple not notched. Mesial process noncorneous and inflated; rounded distally. Prominent shoulder present on lateral surface at base of central projection (Figs. 16 and 18).

Allotypic Female.—Differs from the holotype in the following respects: Suborbital angle more acute; areola with three rows of punctations. Inner margin of palm of chelae with seven or eight tubercles; carpus with three small tubercles proximad of the large one on mesial surface; merus with two spines on lower distal surface, representing the distalmost tubercles of the inner and outer rows present in most species. Annulus ventralis slightly movable with a submedian trough-like longitudinal depression in cephalic half; sinus originates near midlength on sinistral side, makes a hairpin turn to cross median line where it turns caudosinistrad to reach the midcaudal margin of the annulus.

Male, Form II.—(Unknown)

Measurements.—In millimeters.

	Holotype	Allotype
Carapace:		
Height	8.5	8.4
Width	11.8	11.5
Length	22.0	22.1
Areola:		
Width	2.2	1.7
Length	9.0	8.7
Rostrum:		
Width	3.5	3.0
Length	3.7	3.9
Right Chela:		
Length of inner margin of palm	7.9	6.2
Width of palm	9.3	8.0
Length of outer margin	19.9	16.0
Length of dactyl	9.9	8.7

The largest specimen available, a female, has a carapace length of 22.1 mm. The smallest first form male has a carapace length of 16.6 mm., while that of the largest is 22.0 mm.

Type Locality.—A small stream tributary of the Cumberland River at Elmwood, Smith County, Tennessee. Here the stream, some four to six feet wide and six inches to a foot in depth, flows along the roadside in an unshaded area. The water is clear, swift, and cascades over a rocky bottom. Considerable debris and garbage have accumulated in the eddies and on the rocks in the swifter reaches.

Disposition of Types.—The holotypic male and the allotypic female are deposited in the United States National Museum, no. 93157. Of the paratypes, one male, form I, and one female are deposited in the Museum of Comparative Zoology; one male, form I, and one female in the University of Michigan Museum of Zoology; and four males, form I, two females, and one immature female are in my personal collection at the University of Virginia.

Range.—This species was collected in the type locality on November 10, 1951, by P. C. Holt and H. H. Hobbs, Jr., and from Sink Creek at the Blue Springs Community, DeKalb County, Tennessee (Caney Fork drainage) on August 4, 1951, by William Hildreth.

Variations.—Among the most conspicuous variations not mentioned in the description of the female are those of the epistome and chelipeds. The epistome may be subovate, subtrapezoidal, or subtriangular, and it may or may not bear a cephalomedian projection. The inner margin of the palm of the chela may have seven or eight well-defined tubercles or they may not be entirely distinct; in some specimens they form a thin emarginate crest along the inner margin of the palm. Inner surface of carpus of first pereiopods with from one to three tubercles proximad of the large one near midlength. Lower surface of merus of first pereiopods with one or two tubercles.

Relationships.—The closely related *Cambarus friaufi* and *C. brachydactylus* have their affinities with the members of the Asperimanus Group: *C. asperimanus* Faxon (1914: 391), *C. distans* Rhoades (1944: 136), and *C. parvoculus* Hobbs and Shoup (1947: 142). All of these species possess a broad areola (less than six times longer than broad); chela with a single well-defined row of tubercles along the inner margin of the palm (or an emarginate crest); and a short rostrum with thickened margins and without lateral tubercles or spines. Too, *C. friaufi* and *C. brachydactylus* have the setiferous chelipeds which are characteristic of *C. asperimanus*. *C. brachydactylus* may be distinguished from the other species by the crowded punctations in the areola, and *C. friaufi* differs from *C. asperimanus, C. parvoculus,* and *C. distans* in possessing an acuminate rostrum and a distinct lateral shoulder at the base of the central projection of the first pleopod of the first form male.

References Cited

Faxon, Walter (in Samuel Garman). 1889. Cave animals from southwestern Missouri. *Bull. Mus. Comp. Zool.*, 17 (6): 237; Pl. I, figs. 1-3, 7; Pl. II, fig. 1.

Faxon, Walter. 1914. Notes on the crayfishes in the United States National Museum and the Museum of Comparative Zoology with descriptions of new species and subspecies to which is appended a catalogue of the known species and subspecies. *Mem. Mus. Comp. Zool., Harvard Coll.*, 40 (8): 347-427, 13 pls.

Hobbs, Horton H., Jr., and C. S. Shoup. 1947. Two new crayfishes (Decapoda, Astacidae) from the Obey River drainage in Tennessee. *Jour. Tenn. Acad. Sci.*, 22 (2): 138-145, 22 figs.

Rhoades, Rendell. 1944. The crayfishes of Kentucky, with notes on variation, distribution and descriptions of new species and subspecies. *Amer. Midl. Nat.*, 31 (1): 111-149, 10 figs, 10 maps.

Steele, Mary. 1902. The crayfishes of Missouri. *Pub. Univ. Cincinnati*, Bull. 10: 1-50, 10 pls.