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TWO NEW CRAYFISHES OF THE GENUS *CAMBARUS*  
FROM GEORGIA, KENTUCKY, AND TENNESSEE  
(DECAPODA, ASTACIDAE)

BY HORTON H. HOBBS, JR.  
*Smithsonian Institution, Washington, D. C.*

It seems likely that no more than two-thirds of the existing species of the genus *Cambarus* have been described. Because the ranges and limits of variation of so few of the 58 recorded species and subspecies are understood, most systematists have hesitated to add further confusion to the already chaotic state of our knowledge of the genus. Unlike the situation which obtains in the genus *Procambarus*, the secondary sexual features of *Cambarus*, particularly the first pleopod of the male, exhibit, by comparison, few conspicuous modifications from basic patterns. Additional difficulties derive from the probable fact that adaptations to different types of habitats exploited by *Cambarus* have been markedly similar in several evolutionary lines. As a result, the recognition of species must be based more on different combinations of these adaptive features than on characters that are unique. Thus, in the absence of adequate series of those species which have already been described, little progress could have been made toward gaining an understanding of the composition of the genus.

Compounding the innate taxonomic difficulties was the unfortunate practice among several workers of designating new "forms," as well as some old ones, as subspecies of previously named species—just because they resembled one another. This has resulted in bringing together totally separate lineages into a single species complex. While such procedures have probably been utilized in many different groups of

organisms, here they have resulted not only in clouding species concepts but also in retarding our understanding of relationships of the members of the genus.

With the acquisition of several large collections of *Cambarus* by the Smithsonian, representatives of all the known members of the genus (many of them in large series) have been made available so that those specimens which have borne the label "*Cambarus* sp?" now can be analyzed with some hope of determining whether or not they can be assigned to previously described taxa.

In view of the fact that so many of the so-called subspecies that have been recognized in the genus are based on superficial considerations, it seems reasonable to propose that, except in those taxa for which there is conclusive evidence of intergradation between populations, subspecific designations be elevated to the specific level. Surely no additional subspecific categories should be proposed for this genus, which are based solely on superficial resemblances.

Specimens of one of the two species described here was first collected in 1938, and, in their report on the crayfishes of the Big South Fork of the Cumberland River, Hobbs and Shoup (1942) referred to it as "*Cambarus bartonii bartonii*, Regionally Restricted Variant 5." At that time, we knew that it was related to Ortmann's "*Cambarus bartonii striatus*" (1931), but we were unable to determine how close those relationships actually are. Consequently, we adopted what we considered to be a conservative view in reporting it as a variant of the typical subspecies. In retrospect, however, it is clear that we lent countenance to and compounded an error of judgment that had already been made. At best, the affinities of *bartonii* with *striatus* and our variant are remote, and most assuredly they are not members of the same species! Furthermore, there is every reason to believe that our variant, although allied to *C. striatus* Hay (1902b:437), is not a race of that species.

#### ***Cambarus sphenoides* new species**

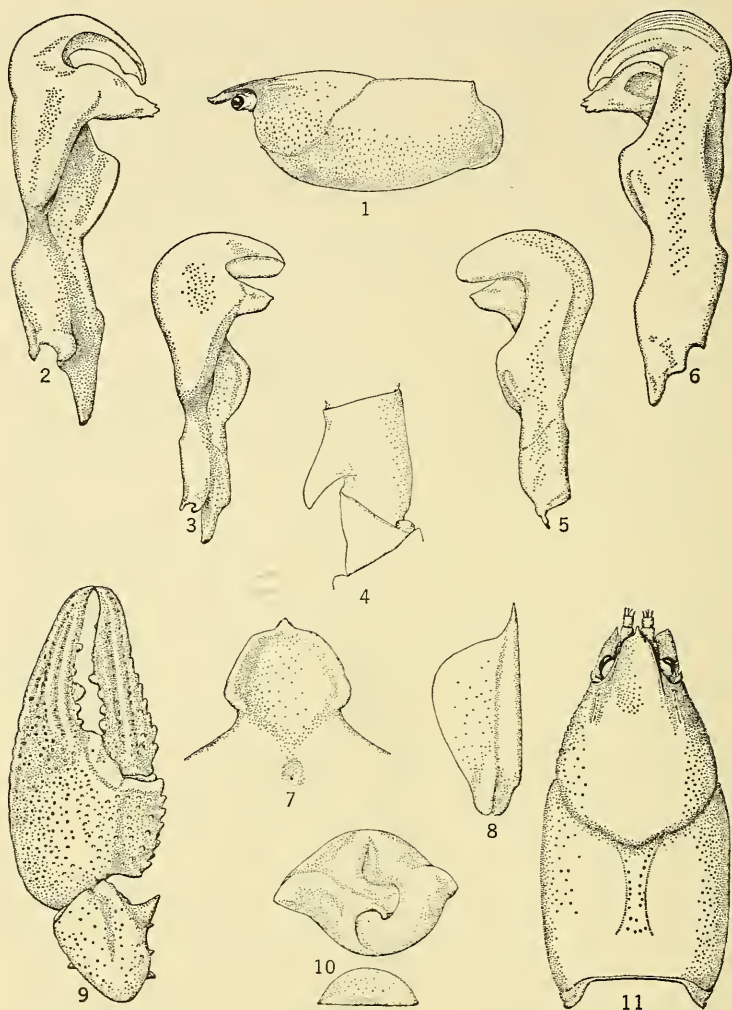
*Cambarus bartonii bartonii* "Regionally Restricted Variant 5," Hobbs and Shoup, 1942: 640-641, Plate 1, figs 5 and 8, and Fig. 1.

*Cambarus* "unidentified species," Hobbs, 1965: 271 (in part).

*Diagnosis:* Body pigmented, eyes small but well developed. Rostrum with convergent margins and adults devoid of marginal spines or tubercles at base of acumen. Areola 4.9 to 11.6 times longer than broad, comprising 32.8 to 37.0 per cent of entire length of carapace and bearing two to four punctations across narrowest part. Lateral surface of carapace with or without small cervical spine with adjacent tubercles or with spine reduced to tubercle. Suborbital angle acute or rounded. Postorbital ridges with or without small cephalic tubercles or spines. Antennal scale between 2.3 and 2.5 times longer than broad. Chela with two rows of tubercles along mesiodorsal portion of palm; lateral margin of hand costate, and both fingers with well defined longitudinal ridges on upper surfaces. First pleopod (Figs. 2, 6) of first form male with central projection recurved at angle much greater than 90 degrees, tapering only slightly and with distinct subterminal notch; mesial process inflated and terminating in two to four small subangular prominences. Annulus ventralis (Fig. 10) asymmetrical with caudosinistral wall strongly convex caudolaterally; caudal portion slightly movable and bearing tilted, reverse S-shaped sinus.

*Holotypic Male, Form I:* Body subcylindrical, not strongly depressed. Abdomen narrower than thorax (17.3 and 19.6 mm). Greatest width of carapace greater than depth at caudodorsal margin of cervical groove (19.6 and 16.5 mm). Areola 7.2 times longer than wide with two longitudinal rows of punctations. Cephalic section of carapace 1.7 times as long as areola (length 36.4 per cent of entire length of carapace). Rostrum excavate dorsally with convergent, slightly thickened margins devoid of marginal spines or tubercles. Acumen not distinctly set off from basal portion of rostrum and terminating in small tubercle; upper surface with usual submarginal punctations and others scattered between. Subrostral ridges moderately prominent and visible in dorsal aspect to base of acumen. Postorbital ridges moderately prominent, grooved dorsolaterally, and rounded cephalically, devoid of tubercles or spines. Sinistral suborbital angle broadly rounded, dextral one obtuse. Branchiostegal spine small and acute. Carapace punctate dorsally and tuberculate laterally with row of tubercles along ventral margin of cephalic portion of cervical groove; cervical spines reduced to small tubercles. Abdomen slightly shorter than carapace (36.2 and 37.6 mm). Cephalic section of telson with two spines in each caudolateral corner. Dorsal surface of telson and uropods not conspicuously setose. Epistome (Fig. 7) distinctly broader than long with small subacute cephalomedian projection, lateral portions elevated, central portion slightly convex ventrally and bearing setae. Antennules of usual form with small spine on ventral surface of basal segment at base of distal third. Antenna extending caudad to fourth abdominal tergum. Antennal scale (Fig. 8) 2.3 times longer than broad, broadest distal to midlength with widest lamellar area about 2.5 times width of thickened lateral portion, latter terminating in small acute spine (dextral one broken).

Left chela (Fig. 9) (right regenerated) depressed but with palm



FIGS. 1-11. *Cambarus sphenoides* new species (pubescence removed from all structures illustrated). 1, Lateral view of carapace of paratypic male, form II. 2, Mesial view of first pleopod of holotype. 3, Mesial view of first pleopod of morphotype. 4, Basis and ischium of third pereopod of holotype. 5, Lateral view of first pleopod of morphotype. 6, Lateral view of first pleopod of holotype. 7, Epistome of holotype. 8, Antennal scale of paratypic male, form II. 9, Dorsal view of distal podomeres of cheliped of holotype. 10, Annulus ventralis of allotype. 11, Dorsal view of carapace of holotype.

somewhat inflated; distal three-fourths of lateral margin of hand costate. Lateral portions of dorsal and ventral surfaces of palm punctate, mesiodorsal portion tuberculate with mesial row of eight tubercles and more lateral one of six; third and fifth members of mesial row slightly ventral to level of remaining six. Mesial portion of ventral surface tuberculate, more distal tubercles larger. Fingers not conspicuously gaping and both with well defined longitudinal ridges dorsally and ventrally. Opposable margin of fixed finger with five tubercles, third from base largest; both fingers with narrow band of crowded minute denticles along distal two-fifths, interrupted on fixed finger by distal tubercle and on dactyl by distal two; corresponding margin of dactyl with eight tubercles, fourth from base largest; mesial surface of dactyl with row of six tubercles decreasing in size distally, row flanked proximally by other tubercles and distally by linear series of punctations.

Carpus of left cheliped longer than broad with arc-like oblique longitudinal furrow dorsally and conspicuously punctate dorsally and laterally; mesial surface with large spine having a smaller one at its base, and another proximal to latter; dorsomesial surface with several tubercles. Lower distal margin with large tubercle on lateral articular knob and another mesial to it; three smaller tubercles present between latter and large spine on mesial surface.

Merus of left cheliped with mesial and lateral surfaces punctate. Upper surface tuberculate with four somewhat prominent ones grouped subdistally. Ventrolateral margin with row of five tubercles and ventromesial margin with 11. Row of three tubercles on ischium corresponding to mesial row on merus.

Hooks on ischia of third pereopods only (Fig. 4); hooks simple and not opposed by tubercle on basis but extending proximad of distal margin of latter. Coxa of fourth pereopod with caudomesial protuberance; fifth without prominence.

Sternum moderately deep between third, fourth, and fifth pereopods, and with tuft of plumose setae between bases of third and fourth.

First pleopods (Figs. 2, 6) symmetrical and reaching coxa of third pereopods when abdomen is flexed. (See diagnosis for description.)

*Morphotypic Male, Form II:* Differs from holotype in following respects: rostrum more acuminate and subrostral ridges not evident so far cephalically; areola 8.4 times longer than broad with few scattered punctations between two lateral rows; inner margin of palm of chela with six tubercles, and fifth tubercle from base largest on opposable surface of dactyl. As usual, hooks on ischiopodites of third pereopod and protuberance on coxa of fourth reduced. First pleopod (Figs. 3, 5) with neither element corneous, and central projection heavier and lacking subterminal notch. (See measurements, Table 1.)

*Allotype Female:* Differs from holotype in following respects: subrostral ridges less conspicuous but slightly evident dorsally to base of acumen; cervical tubercles smaller; areola constituting only 34.6 per cent of entire length of carapace and 5.5 times longer than wide, bear-

ing three rows of punctations; mesial area of palm of left chela with inner row of six tubercles and more lateral one of five; merus with six tubercles in ventrolateral row. Hooks on third pereopods and protuberances on coxae of fourth lacking. (See measurements, Table 1.)

Sternum between fourth pereopods V-shaped and moderately deep. Annulus ventralis (Fig. 10) about 1.5 times longer than broad, firmly fused to sternum cephalically but caudal half movable; caudal wall asymmetrical with sinistral one inflated and convex caudoventrally, dextral one concave; cephalomesial area with distinct longitudinal median furrow, sinus originating sinistrally at end of furrow, curving gently caudomesially and making U-turn cephalomesially before crossing median line; second broad U-turn crossing median line and ending on caudal wall of annulus almost on median line.

*Type-Locality:* Tributary to Clear Creek (Emory River drainage), 11.2 miles north of Crossville, Cumberland County, Tennessee, on U. S. Rte. 127. There the stream is approximately 10 feet wide, and the slightly turbid water flows with a moderate current over a rock and gravel bottom. The stream is partially shaded by a mixed stand of *Quercus* and *Pinus*.

*Disposition of Types:* The holotypic male, form I, the allotypic female, and the morphotypic male, form II, are deposited in the United States National Museum (nos. 129325, 129326, 129327, respectively) as are the paratypes which consist of 2 ♂, form I, 10 ♂, form II, 27 ♀, 27 juvenile ♂, 32 juvenile ♀, and 1 ♀ with eggs.

*Size:* The largest male has a carapace length of 38.4 mm, the largest female, 42.0 mm, and the smallest first form male, 31.3 mm.

*Range and Specimens Examined:* Although the range of this species is poorly known, it is widespread in the Cumberland River drainage on the Plateau and Eastern Highland Rim and is present, but apparently less abundantly so, in the Sequatchie River system.

KENTUCKY—JACKSON COUNTY, 0.1 mi. S of Owsley Co. line on St. Rte. 30 (4 ♂ II, 3 ♀, 8 juv. ♂). LAUREL COUNTY, 1.3 mi. SW of Greenmount on St. Rte. 30 (1 ♂ II, 3 ♀, 4 juv. ♂). TENNESSEE—BLEDSOE COUNTY, 11.3 mi. SE of Spencer on St. Rte. 30 (1 ♂ II, 2 ♀, 7 juv. ♂, 4 juv. ♀). CUMBERLAND COUNTY, type-locality (1 ♂ I, 2 ♀); 6.5 mi. E of White Co. line on U. S. Rte. 70 (2 ♂ II, 1 ♀, 1 juv. ♂); Caney Fork River at U. S. Rte. 70 (2 ♂ II, 2 ♀, 1 juv. ♂); Scotts Creek, 7.0 mi. N of Crossville on U. S. Rte. 127 (2 ♀); 3.9 mi. E of White Co. line on U. S. Rte. 70 (5 ♀, 1 juv. ♂); Clear Creek at Jones Ford (1 ♂ II); No Business Creek S of Clark Range (2 ♂ I, 4 ♂ II, 7 ♀, 2 juv. ♂, 2 juv. ♀); six localities on Clear Creek (7 ♂ II, 12 ♀, 1 juv. ♀); four localities on No Business Creek (to Clear Creek) (1 ♀, 5 juv. ♂, 4 juv. ♀); Grassy Cove (1 ♂ II, 1 ♀, 2 juv. ♀); White Creek, SE of Grassy Cove (1 ♂ II, 1 juv. ♂); Daddys Creek near Crossville (1 ♂ II, 1 ♀, 1 juv. ♂); Creek on Draw Road between U. S. Rtes. 127 and 70 (1 ♀); Fentress Co. line on U. S. Rte. 127 (1 ♂ I, 1 ♂ II); 14.1 mi. N of Cumberland Courthouse on U. S. Rte. 127 (1 ♂ II, 1 juv. ♀);

TABLE 1. Measurements (mm) of *Cambarus sphenoides*.

	Holotype	Allotype	Morphotype
Carapace:			
Height	16.5	16.1	16.0
Width	19.6	19.3	13.0
Length	37.6	36.7	30.3
Areola:			
Width	1.9	2.3	1.3
Length	13.7	12.7	10.9
Rostrum:			
Width	6.0	5.9	6.6
Length	8.7	7.5	5.0
Left Chela:			
Length of inner margin of palm	9.5	8.5	6.4
Width of palm	14.4	13.0	10.0
Length of outer margin of hand	29.6	26.5	20.2
Length of dactyl	19.2	17.2	13.4

4.1 mi. W of Crossville on U. S. Rte. 70 (3 ♂ II, 1 ♀). DEKALB COUNTY, Sink Creek, Blue Springs Community (2 juv. ♀). FENTRESS COUNTY, Big Hurricane Creek west of Clark Range (2 ♂ II, 5 ♀, 10 juv. ♂, 13 juv. ♀, 1 ♀ with eggs); 9.9 mi. S of Jamestown on U. S. Rte. 127 (1 ♂ I, 1 ♀, 3 juv. ♂, 1 juv. ♀); Mill Creek east of Clark Range (1 ♀, 2 juv. ♂, 6 juv. ♀); Long Branch, 1.5 mi. E of Grimsley (2 juv. ♂, 5 juv. ♀); Little Crab Creek near Jamestown (1 ♀, 2 juv. ♀). MARION COUNTY, 2 mi. E of Sewanee on U. S. Rte. 41 (2 ♂ II, 3 ♀, 1 juv. ♂, 1 juv. ♀). MORGAN COUNTY, Clear Fork River at Gatewood Ford (1 ♀). OVERTON COUNTY, East Fork of Obey River at Cliff Springs (5 juv. ♂, 5 juv. ♀); 3.3 mi. SE of Hilham on St. Rte. 85 (2 juv. ♂, 4 juv. ♀). PUTNAM COUNTY, Hurricane Creek W of Clark Range (1 ♂ II, 4 ♀, 12 juv. ♂, 17 juv. ♀); Meadow Creek E of Monterey (1 ♀, 2 juv. ♀); East Fork of Obey River and Meadow Creek (2 ♀, 1 juv. ♀). RHEA COUNTY, Morgan Creek, 4 mi. E of Bledsoe Co. line on St. Rte. 30 (1 ♀). VAN BUREN COUNTY, Long Branch of Rocky River W of Spencer (1 ♀, 1 juv. ♀); 8.4 mi. E of Spencer on St. Rte. 30. WARREN COUNTY, 11.9 mi. SW of McMinnville on St. Rte. 55 (1 juv. ♀); 6.1 mi. SW of McMinnville on St. Rte. 55 (2 juv. ♂); Charles Creek below County Rd. 4399 (1 ♂ II, 1 ♀, 1 juv. ♂, 1 juv. ♀). WHITE COUNTY, 1.1 mi. S of Putnam Co. line on State Rte. 42 (2 ♂ II, 3 ♀); Clifty Creek, near Clifty (1 ♂ II).

*Variations:* The shape of the rostrum ranges from sharply acuminate to one with subangular contractions at the base of the acumen; in the young of some populations, small, acute marginal tubercles are present. The areola varies from 32.8 to 37.0 per cent of the entire length of the

carapace and from 4.9 to 11.6 times longer than broad; few individuals, however, have an areola more than 8.0 times longer than broad. Cervical tubercles are always comparatively small, but occasional individuals exhibit acute ones. The suborbital angle is almost always obtuse if present, but in some juveniles it is produced into a small spine. Differences also occur in the numbers of tubercles on the chelipeds, but, except in regenerated appendages, the numbers are scarcely more variable than differences noted in the primary types.

*Color Notes:* The thorax and abdomen of the holotype were almost concolorous reddish brown with paler rostral margins, postorbital ridges, and indistinct bands along the caudolateral margins of the cervical groove. As in most crayfishes, the branchiostegites are paler ventrally. The chelae were only slightly lighter than the carapace, and the tubercles and spines were about the same color as the rostral margins. The remaining pereopods were pale tan proximally and ventrally but otherwise also dark brown.

*Life History Notes:* Three of the four first form males listed above were collected in April, the other in July. A single female carrying eggs was found on April 27, 1945.

*Relationships:* *Cambarus sphenoides* has its closest affinities with *Cambarus striatus* Hay, from which it differs in possessing a shorter, broader areola, and the central projection of the first pleopod of the first form male possesses a subterminal notch, in this respect resembling the new species described below. It differs from the latter, however, in lacking marginal spines on the rostrum and in possessing a longer, narrower, and less punctate areola. (Compare Figs. 11 and 20.)

*Etymology:* The name *sphenoides* is derived from Greek: sphen—wedge; oides—like; so named because of the shape of the chela.

*Crayfish Associates:* Collected with *Cambarus sphenoides* in one or more localities were *Cambarus friaufi* Hobbs (1953:24), *Cambarus parv-oculus* Hobbs and Shoup (1947:142), *Cambarus tenebrosus* Hay (1902a:232), two undescribed members of the genus *Cambarus* and one of the genus *Orconectes*.

*Remarks:* In discussing this species, Hobbs and Shoup (1942:640) indicated that in the Big South Fork it occurs “. . . in the drainage of the Clear Fork River, the principal western tributary. . . . The stream is characterized by a low total alkalinity averaging only 10.8 parts per million from 9 stations where methyl orange tests were made. The water flows over bed rock and rubble of siliceous nature; there is good shade and excellent cover under rock ledges and in crevices. Aquatic vegetation is extremely limited, and there is a paucity of bottom fauna. The Clear Fork River is considered by us a typical upper Cumberland Plateau stream which flows over weathered sandstone through an extremely unproductive agricultural area.”

Although comparable data are not available for localities other than those in the Clear Fork, *C. sphenoides* is a stream inhabitant occurring among rock litter and burrowing into the submerged banks.

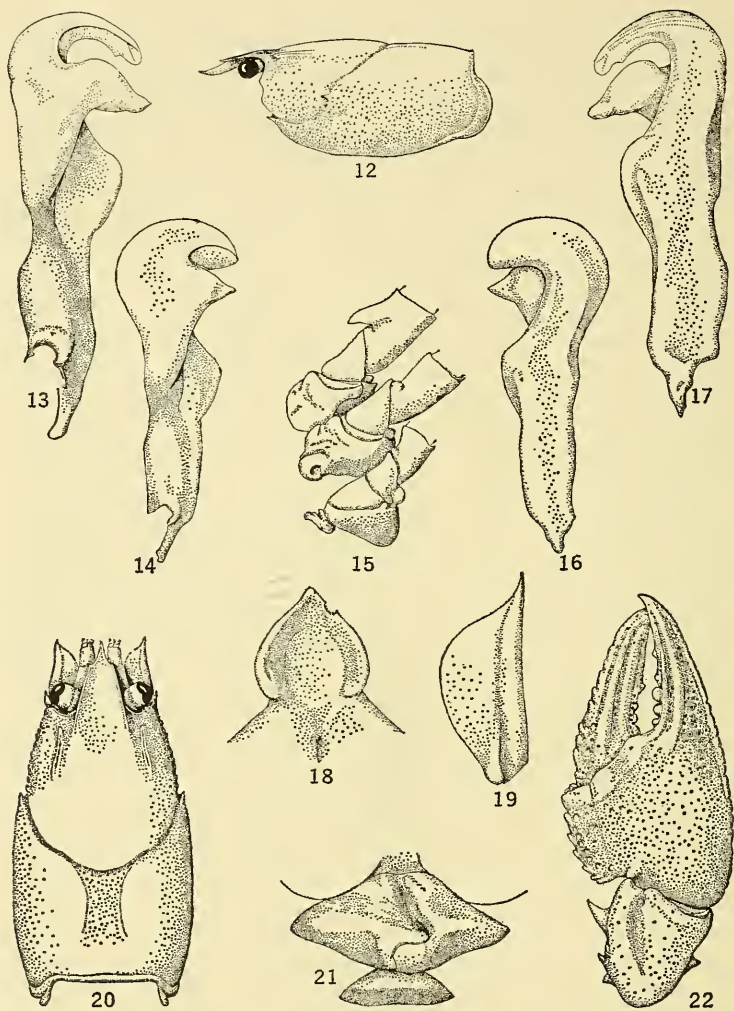


**Cambarus halli** new species

*Diagnosis:* Body pigmented, eyes well developed. Rostrum with slightly convergent margins bearing marginal spines or tubercles at base of acumen. Areola 3.1 to 3.9 times longer than broad, comprising 28.9 to 33 per cent of entire length of carapace, and bearing five to seven punctations across narrowest part. Lateral surface of carapace with moderately strong cervical spine and two or three small cervical tubercles. Suborbital angle obtuse and rounded. Postorbital ridges with cephalic spines or tubercles. Antennal scale about 2.5 times longer than broad. Chela with two rows of tubercles along mesiodorsal portion of palm; lateral margin of hand costate, and both fingers with well defined longitudinal ridges on upper surfaces. First pleopod (Figs. 13, 17) of first form male with central projection recurved at angle much greater than 90 degrees, not markedly tapering distally and with a distinct subterminal notch; mesial process inflated but less bulbous than in most related species; tip rounded and entire. Annulus ventralis (Fig. 21) almost symmetrical and with caudal portion slightly movable and bearing tilted, reverse S-shaped sinus.

*Holotypic male, form I:* Body subovate, depressed. Abdomen narrower than thorax (14.0 and 16.3 mm). Greatest width of carapace greater than depth at caudodorsal margin of cervical groove (16.3 and 13.2 mm). Areola broad (3.1 times longer than wide) with many punctations, six or seven across narrowest portion. Cephalic section of carapace twice as long as areola (length of areola 33 per cent of entire length of carapace). Rostrum excavate dorsally with convergent, slightly thickened margins bearing pair of tubercles at base of moderately long acumen, latter terminating in corneous, slightly upturned tip; upper surface with usual submarginal punctations and with others scattered over entire area. Subrostral ridges weak and visible in dorsal aspect to level of posterior third of base of eyestalk. Postorbital ridges moderately prominent, grooved dorsolaterally, and terminating cephalically in corneous tubercles. Suborbital angle broadly rounded. Branchiostegal spines moderately strong and acute. Carapace punctate dorsally and tuberculate laterally with row of tubercles along ventral margin of cephalic portion of cervical groove; cervical spine strong with several tubercles above and below it. Abdomen longer than carapace (31.4 and 30.3 mm). Cephalic section of telson with two spines in dextral and three in sinistral caudolateral corners. Dorsal surfaces of telson and uropods conspicuously setose.

Epistome (Fig. 18) subequal in length and breadth, with subacute apex, lateral areas elevated, and central portion slightly convex ventrally. Antennules of usual form with small spine on ventral surface of basal segment slightly distal to midlength. Antenna broken in holotype but extending caudad to end of telson in morphotype. Antennal scale (Fig. 19) 2.6 times longer than broad, broadest at midlength with widest lamellar area approximately twice width of thickened lateral area, latter terminating in acute spine.



FIGS. 12-22. *Cambarus halli* new species (pubescence removed from all structures illustrated). 12, Lateral view of carapace of paratypic male, form II. 13, Mesial view of first pleopod of holotype. 14, Mesial view of first pleopod of morphotype. 15, Basal portions of third, fourth, and fifth pereiopods of holotype. 16, Lateral view of first pleopod of morphotype. 17, Lateral view of first pleopod of holotype. 18, Epistome of holotype. 19, Antennal scale of paratypic male, form II. 20, Dorsal view of carapace of holotype. 21, Annulus ventralis of allotype. 22, Dorsal view of distal podomeres of cheliped of holotype.

Right chela (Fig. 22) depressed but with palm inflated; distal three-fourths of lateral margin of hand costate. Ventral surface and lateral portion of dorsal surface of palm mostly punctate, mesiodorsal portion tuberculate with two distinct rows of six tubercles each. Ventral surface with three tubercles—one proximomesial to ventral condyle of dactyl, another at level of condyle but proximal to base of gap between fingers, and third on ridge at base of dactyl. Fingers slightly gaping and both with well-defined longitudinal ridges dorsally and ventrally. Opposable margin of fixed finger with five tubercles, third from base largest; corresponding margin of dactyl with six, fourth from base largest; both fingers with single row of minute denticles along most of distal half interrupted on each by distalmost tubercle. Mesial surface of dactyl with row of tubercles, except for fourth, decreasing in size distally; row flanked proximomesially by other tubercles, and distally by linear series of punctations.

Carpus of right cheliped longer than broad, with oblique longitudinal furrow dorsally and conspicuously punctate dorsally and laterally; mesial surface with one large spine and smaller acute tubercle proximal to it; dorsomesial surface with row of three small subsquamous tubercles. Lower distal margin with large spine on lateral articular knob and large tubercle mesial to it, smaller tubercle present proximal to latter.

Merus of right cheliped with mesial and lateral surfaces punctate. Upper surface with three subdistal tubercles, two large and spiniform. Ventrolateral margin with two tubercles and ventromesial margin with row of eight (left with three and nine, respectively). Row of four tubercles on ischium corresponding to mesial row on merus.

Hooks on ischia of third pereopods only (Fig. 15); hooks simple and not opposed by tubercle on basis but extending proximad of distal end of latter. Coxa of fourth pereopod with prominent caudomesial protuberance; fifth without prominences.

Sternum moderately deep between third, fourth, and fifth pereopods and with moderate tuft of plumose setae between bases of third and fourth pereopods.

First pleopods (Figs. 13, 17) symmetrical and reaching coxa of third pereopods when abdomen is flexed. (See diagnosis for description.)

*Morphotypic Male, Form II:* Differs from holotype in following respects: marginal tubercles on rostrum more acute; areola only 31.7 per cent of entire length of carapace but 3.7 times longer than broad; cephalic section of telson with two spines in each caudolateral corner. Hooks on ischiopodites of third pereopods and protuberance on coxa of fourth reduced. First pleopod (Figs. 14, 16) with neither element corneous, both proportionately much heavier and central projection lacking subapical notch. (See measurements, Table 2.)

*Allotypic Female:* Differs from holotype in following respects: rostrum and postorbital ridges provided with spines instead of tubercles; areola 30.7 per cent of entire length of carapace and 3.4 times longer than wide; cephalic section of telson with two spines in each caudo-

lateral corner; chela with only five tubercles in each row along mesial and dorsomesial surfaces of palm; major tubercles on opposable margins of finger of chela much reduced; mesial surface of carpus of cheliped with moderately conspicuous tubercle at base of major spine; ventral surface of merus with only six tubercles in mesial row. Hooks on third pereiopod and protuberance on coxa of fourth lacking. (See measurements, Table 2.)

Sternum between fourth pereiopods broad and shallow. Annulus ventralis (Fig. 21) twice as broad as long, rather firmly fused with sternum cephalically, but caudal half slightly movable; cephalomesial area with distinct slightly oblique furrow extending caudosinistrally to cephalic end of sinus, latter making broad U-turn dextrally on transverse ridge across median line then turning gently caudodextrally, and finally caudally and slightly caudosinistrally to caudal margin of annulus.

*Type-locality:* Small tributary of the Tallapoosa River, 1.3 miles south of the River on U. S. Rte. 27, Haralson County, Georgia. There the creek is some six feet wide and six inches deep, and the slightly cloudy water flows over a sand bed littered with rocks. The stream is shaded by several species of trees and shrubs among which are *Liquidambar styraciflua*, *Acer* sp., and *Alnus rugosa*. No other crayfishes were collected at this locality.

*Disposition of Types:* The holotypic male, form I, the allotypic female, and the morphotypic male, form II, are deposited in the United States National Museum (nos. 129288, 129289, 129290, respectively) as are the paratypes, which consist of 3 ♂, form I; 4 ♂, form II; 4 ♀; 11 juvenile ♂; and 10 juvenile ♀. No additional specimens of this species are available.

*Size:* The largest male has a carapace length of 30.6 mm, the largest female, 33.3 mm; and the smallest first form male, 30.3 mm.

*Color Notes:* Cephalic portion of carapace dark brown with cream tubercles laterally. Margins of rostrum and postorbital ridges red. Branchiostegites tan, areola dark olive brown. Abdomen dark olive with narrow transverse pinkish yellow band on caudal margin of each tergum; pleura with cream margins. Chela olive with basal articular tubercle and those at base of dactyl red; tubercles on mesial surface of palm orange; fingers dark green basally fading rapidly to cream; tubercles on mesial surface of dactyl orange. Entire ventral surface of animal greenish cream.

*Range and Crayfish Associates:* This species is known from only three localities in the headwaters of the Tallapoosa River in Georgia—the type locality; the Tallapoosa River at U. S. Rte. 27 in Haralson County; and the same river on Georgia Rte. 101 in Paulding County. In the latter two localities it was sharing the stream with *Procambarus spiculifer* (LeConte) and *Cambarus latimanus* (LeConte), respectively.

*Relationships:* *Cambarus halli* seems to combine characters of *C. spicatus* Hobbs (1956b:116) and its allies (*C. acuminatus* Faxon 1884: 113 and *C. robustus* Girard, 1852:90) with those of *Cambarus latimanus*

TABLE 2. Measurements (mm) of *Cambarus halli*.

	Holotype	Allotype	Morphotype
Carapace:			
Height	13.2	11.5	10.5
Width	16.3	13.0	12.6
Length	30.3	28.0	25.9
Areola:			
Width	3.2	2.5	2.2
Length	10.0	8.6	8.2
Rostrum:			
Width	5.1	4.2	4.4
Length	8.3	7.8	7.5
Chela:			
Length of inner margin of palm	6.7	4.2	4.3
Width of palm	10.7	6.4	6.6
Length of outer margin of hand	21.0	15.1	14.6
Length of dactyl	13.2	9.9	9.1

(LeConte, 1856:402) and its relatives. The cervical spine, marginal rostral tubercles, and the short, broad, punctate areola of *C. halli* bestow upon it an aura of primitiveness that is not so obvious in *C. latimanus* and its kin (*C. striatus* Hay, *C. reduncus* Hobbs, 1956a:61, and *C. sphenoides*). *Cambarus halli* shares with *C. spicatus* the primitive features indicated but differs from it chiefly in the shorter chela and the greater curvature of the central projection of the first pleopod.

While the adults of *C. latimanus* have small cervical spines, the marginal rostral spines are absent and the areola is much narrower and less punctate than that of *C. halli*, *C. spicatus*, and its relatives. It is perhaps significant that the young of *C. latimanus* possess rostral spines which are lost before the crayfish reach maturity. Also, while the areola is narrower and has fewer punctations than do *C. halli* and *C. spicatus*, it is much broader than those of *C. striatus* and *C. reduncus*. In the latter two and *C. latimanus*, the central projection of the first pleopods tapers from the base and lacks a subterminal notch which is present in all of the other species mentioned.

*Etymology:* This species is named in honor of my good friend and former student, Edward Taylor Hall, Jr., who has assisted me on several collecting trips and who was with me when this new species was discovered.

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