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NEW CRAYFISHES FROM GEORGIA
(DECAPODA ASTACIDAE)

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Among the several undescribed crayfishes of the genus *Cambarus* occurring in the Piedmont and submontane provinces of Georgia are two species, one which frequents riffles in the Chattahoochee Drainage System and the other which inhabits several clear, swiftly flowing tributaries to the Tennessee River in the northwestern corner of the State.

One of them is here assigned to the typical subgenus which ranges from northern Georgia to New Brunswick and westward to Indiana, and the other to the subgenus *Depressicambarus* which is restricted to the southeastern portion of the United States, from North Carolina and Kentucky southward to the Florida panhandle and southern Mississippi. (See Hobbs, "in press" for diagnosis of the subgenera.)

***Cambarus (Cambarus) howardi*, new species**

Diagnosis: Body pigmented, eyes well-developed. Rostrum with strongly convergent margins devoid of marginal spines or tubercles. Areola 3.0 to 4.9 times longer than broad, comprising 34.3 to 39.3 percent of entire length of carapace, and bearing 3 to 6 punctations across narrowest part. Lateral surface of carapace with small cervical tubercles but lacking cervical spines. Suborbital angle obtuse. Postorbital ridges short with rounded or acute cephalic tubercles. Antennal scale approximately 2.3 times longer than broad. Chela with single row of tubercles on mesial margin of palm; lateral margin of hand costate distally for at least half its length and both fingers with well-defined longitudinal ridge on upper surfaces. First pleopod (Figs. 2, 4, 6) of first form male with corneous central projection recurved at approximately 110°, not markedly tapering distally, with distinct subterminal notch, and not extending so far caudally as tip of mesial process; mesial process inflated, directed caudolaterally and



FIGS. 1-12. *Cambarus howardi* new species (pubescence removed from all structures illustrated except for Fig. 2). 1, Lateral view of carapace of holotype. 2, Mesial view of first pleopod of holotype. 3, Mesial view of first pleopod of morphotype. 4, Caudal view of first pair of pleopods of holotype. 5, Lateral view of first pleopod of morphotype. 6, Lateral view of first pleopod of holotype. 7, Epistome of holotype. 8, Bases of third, fourth, and fifth pereopods of holotype. 9, Antennal scale of holotype. 10, Dorsal view of carapace of holotype. 11, Annulus ventralis and adjacent sternal elements of allotype. 12, Dorsal view of distal podomeres of cheliped of holotype

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

	Holotype	Allotype	Morphotype
Carapace:			
Height	10.1	12.1	8.3
Width	15.0	17.0	11.6
Length	27.0	32.0	22.6
Areola:			
Width	2.2	2.6	2.1
Length	9.9	12.2	8.0
Rostrum:			
Width	4.4	5.2	3.7
Length	6.3	5.6	4.6
Chela:			
Length of inner margin of palm	8.6	8.7	5.7
Width of palm	13.0	12.9	8.4
Length of outer margin of hand	25.4	26.6	16.5
Length of dactyl	15.3	16.0	10.5

tip usually bi- or *trispinose*. Annulus ventralis (Fig. 11) concave with elevated lateral portions, with conspicuous tongue extending under dextral or sinistral wall. Color olive to light green with scarlet markings, latter particularly conspicuous on rostrum and chelae.

Holotypic male, form I: Body subovate, depressed. Abdomen narrower than thorax (12.4 and 15.0 mm). Greatest width of carapace greater than depth at caudodorsal margin of cervical groove (15.0 and 10.1 mm). Areola moderately broad (4.9 times longer than wide) with number of deep punctations, three to six across narrowest portion. Cephalic section of carapace 1.7 times longer than areola (length of areola 36.6 per cent of entire length of carapace). Rostrum strongly acuminate, excavate dorsally with strongly convergent thickened margins devoid of marginal spines or tubercles; submarginal row of punctations deep basally becoming progressively shallower toward apex, median portion with a few scattered tubercles and distinct depression at level of caudal margin of orbit; acumen indistinctly delimited from remainder of rostrum and terminating in dorsally directed tubercle; subrostral ridges strong and visible in dorsal aspect almost to base of acumen. Postorbital ridges heavy but short, grooved dorsolaterally, and terminating cephalically in low rounded tubercles. Suborbital angle obtuse. Branchiostegal spine very weak sinistrally and obsolete dextrally. Carapace punctate dorsally, except in polished gastric area, and tuberculate laterally; tubercles especially strong in hepatic area and in row along ventral margin of cephalic portion of cervical groove; cervical spine lacking but several tubercles present in area usually supporting it. Abdomen and carapace subequal in length. Cephalic section of tel-

son with two spines in each caudolateral corner, mesial spines movable. Dorsal surfaces of telson and uropods conspicuously setose.

Epistome (Fig. 7) broader than long with subtriangular apex; lateral areas elevated, central area somewhat convex ventrally and bearing many setae; caudomedian fovea present. Antennules of usual form with well developed spine on ventral surface of basal segment slightly distal to mid-length. Antenna broken but probably reaching fifth abdominal tergum. Antennal scale (Fig. 9) 2.3 times longer than broad, broadest at mid-length with widest lamellar area approximately 1.5 times width of thickened lateral portion, latter terminating in strong acute spine.

Right chela (Fig. 12) somewhat depressed but with palm distinctly inflated; distal half of lateral margin of hand costate. All surfaces of palm and fingers punctate except opposable margin of latter and mesial margin of former. Mesial margin of palm with single row of seven depressed tubercles. Swollen ridge on dorsal surface of palm at base of dactyl very conspicuous. Ventral surface of palm with very large tubercle at mesial base of dactyl and smaller one proximolateral to it. Fingers gaping and both with well-defined longitudinal ridges dorsally and ventrally. Opposable margin of fixed finger with row of eight tubercles, proximal five much larger than distal three, and third from base largest; large tubercle present at lower level between sixth and seventh tubercles; one or two irregular rows of minute denticles extending distally from base of fifth tubercle; corresponding margin of dactyl with nine tubercles, fourth from base largest and row of minute denticles extending distally from base of seventh tubercle. Mesial surface of dactyl entirely punctate.

Carpus of right cheliped distinctly longer than broad with deep oblique longitudinal furrow dorsally; dorsal surface punctate; mesial surface with large spine slightly distal to midlength and smaller one proximal to midlength. Lower distal margin with large tubercle on lateral articular knob and massive spiniform tubercle mesial to it.

Merus of right cheliped with mesial and lateral surfaces sparsely punctate, upper surface with one subdistal tubercle, ventrolateral margin with two tubercles, and ventromesial margin with row of seven, only six on sinistral chela. Row of three tubercles on ischium corresponding to mesial row on merus.

Hooks on ischia of third pereopods only (Fig. 8); hooks simple and not opposed by tubercle on basis but extending proximad of distal end of latter. Coxa of fourth pereopod with prominent vertically disposed caudomesial protuberance; fifth without prominences.

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

First pleopods (Figs. 2, 4, 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: mesial margin of palm with row of eight tubercles on dextral chela; opposable margin of fixed finger of chela with only five rounded

tubercles; corresponding margin of dactyl with row of eight; ventral surface of merus with mesial row of eight tubercles and ventrolateral margin with one spine on sinistral cheliped; ischium of sinistral cheliped with only two tubercles; hooks on ischia of third pereopods and protuberances on coxae of fourth reduced in size; and first pleopod more shallowly embedded in sternum. (See measurements.)

First pleopod (Figs. 3, 5) with neither element corneous; mesial process fingerlike, rounded distally with only faint indication of bifid condition existing in holotype, and directed caudolaterally and slightly distally (in relation to shaft of appendage); central projection non-corneous, broadly rounded without any indication of subterminal notch, and directed caudally, its tip never extending caudally beyond tip of mesial process.

Allotypic Female: Differs from holotype in following respects: mesial margin of palm of dextral chela with row of eight tubercles; opposable margin of fixed finger of sinistral chela with row of six tubercles; mesial surface of carpus with single major tubercle; ventrolateral margin of merus of dextral cheliped with row of three tubercles and ventromesial margin of sinistral cheliped with row of eight. Sternum between fourth pereopods broad and moderately shallow. (See measurements.) First pleopods uniramous and barely reaching caudal margin of annulus ventralis.

Annulus ventralis (Fig. 11) approximately 1.3 times broader than long, rather firmly fused to sternum cephalically, but caudal half slightly movable; lateral portions elevated (ventrally); cephalomesial areas with distinct median furrow extending caudally to midlength of annulus; sinus extending transversely toward sinistral wall, disappearing beneath it, there making U-shaped turn to cross median line, after which turning caudodextrally and then caudally to caudal margin of annulus.

Type-locality: Sope Creek, tributary to the Chattahoochee River at Paper Mill Road 1.5 miles above mouth, Cobb County, Georgia. There the creek, some 70 feet wide and 2-3 feet in depth, flows with a cascading current over bed rock and scattered stones, the latter entrapping masses of filamentous algae. The steep shoreline is heavily wooded with such tree as *Liriodendron tulipifera*, *Ulmus americana*, *Coma florida*, and *Acer rubrum*. Associated with *Cambarus howardi* were *Procambarus spiculifer* (LeConte, 1856: 401) and *Cambarus latimanus* (LeConte, 1856: 402).

Disposition of Types: The holotypic male, form I, the allotypic female, and the morphotypic male, form II, are deposited in the Smithsonian Institution (nos. 129866, 129867, and 129868, respectively) as are the paratypes, which consist of 6 ♂, form I; 6 ♂, form II; 11 ♀, 3 juvenile ♂; 1 juvenile ♀; and 1 ♀ with eggs.

Size: The largest male, form I, has a carapace length of 31.8 mm, the largest female, 34 mm, and the smallest first form male, 27.6 mm. The former two specimens were collected from Sweetwater Creek and the latter from the type-locality. The largest specimen available is the allotype.

Color Notes: Cephalic portion of carapace and areola olive green dorsally; margins of rostrum, postorbital ridges, and subrostral ridges scarlet. Branchiostegites greenish tan sometimes suffused with red. Terga of abdomen greenish tan margined caudally with narrow band of scarlet, pleura with cream borders; antennal scale margined in scarlet, otherwise green. Antennules and antennae scarlet, latter suffused with brown. Palm of chela light green with tubercles and swollen prominences scarlet, fingers green basally becoming progressively orange distally and terminating in scarlet tips. All legs greenish above fading to cream below but with scarlet markings at joints and scarlet dactyls. Sternum and bases of legs cream.

Range and Crayfish Associates: This crayfish occurs in the upper piedmont portion of the Chattahoochee Drainage System in Georgia where it is known to occur in only five localities:

GEORGIA—Hall County, tributary of Balus Creek in east city limits of Oakwood (1 ♀ with eggs). Cobb County, type-locality, specimens listed above; Sope Creek at Barnes Mill Road SE of Marietta (1 ♂ II, 2 juv. ♂, 1 juv. ♀); Nickajack Creek at Camp Highland, 3.5 mi. S of Smyrna (2 ♂ I, 1 ♀). Douglas County, Sweetwater Creek at Factory Shoals Road south of Austell (1 ♂ I, 4 ♀, 2 juvenile ♂, 8 juvenile ♀); Dog River at State Highway 5 SW of Douglasville (3 ♀). In the Hall County locality, *C. howardi* was associated with *C. latimanus*, and in the remaining localities with both *C. latimanus* and *Procambarus spiculifer*.

Variations: The specimens from Douglas County differ from those of the type-locality in possessing, in general, areolae with more crowded and deeper punctations. This is especially noticeable in the specimens from Sweetwater Creek. Among those from the latter locality, the rostrum is less distinctly acuminate; the postorbital ridges terminate in spiniform tubercles; the lateral margin of the chela is costate throughout most of its length; and, like the larger male from Nickajack Creek, the fingers are distinctly longer and slenderer, and the palm much less inflated than in specimens from the type-locality. In general, the specimens from Dog River are more similar to those from Sweetwater Creek than to specimens from the type-locality. The single female from Hall County possesses a densely punctate areola, and, except for the chelae, which had been regenerated, resembles specimens from the type-locality. The small tubercle on the ventral surface of the palm of the chela, which is located proximolateral to the major tubercle in specimens from the type-locality, is situated proximomesial to that tubercle in the specimens from Sweetwater Creek and Dog River.

In specimens possessing a carapace length of at least 27.5 mm, the length of the areola constitutes 36.5 to 39.4 per cent of the carapace length, and in specimens having a carapace length of less than 27.5 mm, it comprises 34.3 to 35.9 per cent. The length of the areola ranges from 3.0 to 4.9 times its width.

Relationships: *Cambarus howardi* has its closest affinities with *Cambarus bartonii bartonii* (Fabricius, 1798: 407), a highly variable species

which ranges from New Brunswick southward to northeast Georgia. It differs from the typical members of this species in possessing a more sharply acuminate rostrum, a somewhat densely punctate areola, which in larger specimens is usually somewhat longer, and in possessing a usually shorter, more robust chela. The most conspicuous difference occurs in the vivid scarlet markings on an olive to light green background. This crayfish, may eventually prove to be the southernmost subspecies of *Cambarus bartonii*.

Life History Notes: First form males were collected in April, May, and October, and two females with eggs were taken in April and one in May.

Etymology: In token of our appreciation for his interest in the waterways of Georgia and the energy expended by him in preserving and improving them, we are pleased to name this species in honor of Mr. Ralph S. Howard, Jr., of the Georgia Water Quality Control Board.

Remarks: This crayfish is an inhabitant of moderately to swiftly flowing streams and has been found only in areas where there is a rocky or rubble substrate. The type-locality is situated on the heavily polluted Sope Creek which takes its origin in the densely populated area immediately northeast of Marietta, Georgia. Almost at its source, it receives enrichment from storm sewers and an effluent from a sewage treatment plant. Six stations were established above the mouth of the creek approximately (1) 8.0, (2) 7.3, (3) 5.8, (4) 5.0, (5) 3.0 and (6) 1.5 miles above it; just above station 5 it receives water from a relatively unpolluted tributary. On 21 July 1966, the percent saturation of oxygen at these stations was 87, 40, 23, 34, and 80.5, respectively. This crayfish, found only at stations 1 and 6, is believed to require an environment in which a high oxygen concentration exists, and, in view of these data, it seems possible that were it not for the turbulent area immediately above Station 6 which increases the dissolved oxygen concentration, *Cambarus howardi* would not be able to survive in the lower reaches of this stream.

***Cambarus (Depressicambarus) unestami* new species**

Diagnosis: Body pigmented, eyes well-developed. Rostrum with convergent margins devoid of marginal spines or tubercles. Areola 3.5 to 4.7 times longer than broad, comprising 32.6 to 37.4 percent of entire length of carapace, and bearing three to five punctations across narrowest part. Lateral surface of carapace lacking cervical spines or prominent tubercles. Suborbital angle prominent and subacute. Postorbital ridges short and rounded, with or without small cephalic tubercles. Antennal scale approximately 2.2 times longer than broad. Chela with at least two rows of tubercles on mesial and mesiodorsal surfaces of palm, usually additional ones situated dorsolateral to these two rows; lateral margin of hand costate distally for at least half its length and both fingers with well-defined longitudinal ridge on upper surfaces. First pleopod (Figs. 14, 16, 18) of first form male with corneous central projection recurved at approximately 125° to main shaft, not markedly tapering distally, with distinct subterminal notch, and extending caudally beyond tip of mesial process; mesial



FIGS. 13-24. *Cambarus unestami* new species (pubescence removed from all structures except for Fig. 14). 13, Lateral view of carapace of holotype. 14, Mesial view of first pleopod of paratypic male, form 1. 15, Mesial view of first pleopod of morphotype. 16, Caudal view of first pair of pleopods of holotype. 17, Lateral view of first pleopod of morphotype. 18, Lateral view of first pleopod of paratypic male, form 1. 19, Epistome of holotype. 20, Bases of third, fourth, and fifth pereopods of holotype. 21, Antennal scale of holotype. 22, Dorsal view of carapace of holotype. 23, Annulus ventralis and adjacent sternal elements of allotype. 24, Dorsal view of distal podomeres of cheliped of holotype.

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

	Holotype	Allotype	Morphotype
Carapace:			
Height	10.8	16.5	10.7
Width	15.2	21.2	14.1
Length	29.6	40.4	27.8
Areola:			
Width	2.5	3.7	2.6
Length	10.5	15.1	9.5
Rostrum:			
Width	4.9	6.0	4.7
Length	5.7	7.1	6.6
Chela:			
Length of inner margin of palm	7.3	10.9	6.1
Width of palm	10.2	14.3	8.6
Length of outer margin of palm	22.0	32.7	19.4
Length of dactyl	13.2	19.6	11.3

process inflated, directed caudolaterally and somewhat proximally and terminating in simple tip. Annulus ventralis (Fig. 23) somewhat asymmetrical with one lateral wall elevated and with ridge extending transversely from opposite wall to disappear beneath elevated wall. Color brown to olive green with brownish black spots and bars, latter conspicuous on lateral surface of carapace and four broken longitudinal stripes on abdomen.

Holotypic Male, Form I: Body subovate, depressed. Abdomen narrower than thorax (13.5 and 15.2 mm). Greatest width of carapace greater than depth at caudodorsal margin of cervical groove (15.2 and 10.8 mm). Areola moderately broad (4.2 times longer than wide) with scattered punctations, four or five across narrowest portion. Cephalic section of carapace 1.8 times longer than areola (length of areola 35.5 percent of entire length of carapace). Rostrum acuminate, excavate dorsally, with convergent slightly thickened margins devoid of spines or tubercles. Submarginal row of punctations deep basally and becoming progressively shallower toward apex, median portion with few scattered tubercles and broad shallow depression at base; acumen not delimited from remainder of rostrum and terminating in small dorsally directed tubercle. Subrostral ridges moderately well-defined and visible basally, in dorsal aspect, to about midlength of rostrum. Postorbital ridges moderately strong, short, grooved dorsolaterally, and with cephalic extremity blunt; suborbital angle prominent and subacute. Branchiostegal spine reduced to small rounded tubercle. Carapace punctate dorsally and granulatuberculate laterally; tubercles conspicuously strong in hepatic area and in row

along ventral margin of cephalic portion of cervical groove. Cervical spines lacking, and area usually supporting them bearing *tubercles* little, if at all, larger than others on lateral surface. Abdomen longer than carapace (31.4 and 29.6 mm). Cephalic section of telson with two large and one small spine in caudodextral corner and two large ones in caudosinistral corner, medial of two larger spines on each side movable. Dorsal surfaces of uropod and telson strongly setose.

Epistome (Fig. 19) broader than long, subtruncate cephalically, and lacking cephalomedian projection; central area slightly elevated ventrally, densely punctate but bearing few setae; caudomedian fovea almost obsolete. Antennules of usual form with moderate spine on ventral surface of basal segment slightly distal to midlength. Antenna reaching sixth abdominal tergum. Antennal scale (Fig. 21) 2.2 times longer than broad, broadest distal to midlength, widest lamellar area approximately 1.6 times broader than thickened lateral portion, later terminating in strong short subacute spine.

Right chela (Fig. 24) weakly depressed with inflated palm; distal three-fifths of lateral margin of hand costate. Mesial margin of palm with row of nine *tubercles* subtended dorsally by second row of four, three additional ones lateral to second row; remainder of dorsal surface of palm deeply pitted; ventral surface of palm mostly punctate with large submedian distal tubercle; cluster of five smaller tubercles situated proximal to distal tubercle, single one at base of longitudinal ridge extending proximally from fixed finger, and another immediately ventrolateral to distal tubercle along mesial margin of palm. Fingers slightly gaping and both with well-defined ridges dorsally and ventrally. Opposable margin of fixed finger with row of five rounded corneous tubercles, fourth from base injured but probably largest; large tubercle present on level below aforementioned row at base of distal two-fifths of finger; several rows of minute denticles extending from distal base of fifth *tubercle* to base of corneous tip of finger. Corresponding margin of dactyl with row of five rounded corneous tubercles, fourth from base largest; several rows of minute denticles extending from distal base of latter-mentioned *tubercle* to base of corneous tip of finger. Mesial surface of dactyl tuberculate and punctate along basal third, punctate distally.

Carpus of right cheliped distinctly longer than broad with deep sinuous furrow dorsally; dorsomesial surface tuberculate; dorsolateral, lateral, and ventrolateral surfaces punctate; mesial surface with usual major spike-like tubercle, three smaller ones proximal to it, and one at its proximoventral base; distal mesioventral margin with prominent tubercle and group of three *proximomesial* to it; distal ventrolateral margin with prominent tubercle on condyle articulating with carpus and two small marginal tubercles dorsolateral to it.

Merus of right cheliped with mesial and lateral surfaces sparsely punctate, upper surface tuberculate, tubercles generally progressively larger distally; upper distal margin undulate; ventrolateral margins with row of

four tubercles, three of which spikelike, and ventromesial margin with twelve, eleven of which spikelike; oblique ventrodistal margin with two tubercles between terminal spikelike tubercles. Row of four tubercles on ischium corresponding to mesial row on merus.

Hooks on ischia of third pereopods only (Fig. 20); hooks simple, not opposed by tubercle on basis, and extending proximad of distal end of latter. Coxa of fourth pereopod with prominent vertically disposed caudomesial protuberance; fifth without prominences. Sinistral fifth leg absent, probably lost in early injury and not regenerated.

Sternum deep between third, fourth, and fifth pereopods and with prominent tufts of plumose setae between bases of third and fourth pereopods. (See measurements, Table 2.)

First pleopods (Figs. 14, 16, 18) normally symmetrical and reaching coxae of third pereopod when abdomen is flexed. (Actually, in the holotype, the sinistral pleopod does not assume its characteristic attitude, probably due to the absence of the corresponding fifth pereopod. It is abnormally twisted laterally and cannot be brought into its usual position between the bases of the caudal two pairs of pereopods). (See diagnosis for description.)

Morphotypic Male, Form II: Differs from holotype in following respects: cephalic extremity of postorbital ridges terminating in minute corneous tubercles; branchiostegal spine represented by small tubercle with acute corneous tip; lateral tubercles on carapace less prominent; cephalic section of telson with two spines in each caudolateral corner; epistome not truncate cephalically, but like holotype, lacking cephalomedian projection; inner margin of palm of chela bearing row of seven tubercles, and irregular row of six immediately dorsolateral to it; tubercle at base of ventral longitudinal ridge of fixed finger lacking; ventral oblique ridge on palm at base of dactyl bearing prominent tubercle between major tubercle and articular socket; opposable margin of fixed finger with row of only four tubercles, third from base largest; row of minute denticles, broken by tubercles, extending distally from base of proximal tubercle; mesial surface of carpus of cheliped with only two tubercles proximal to spikelike tubercle; ventromesial row of tubercles on merus reduced to ten; hooks on ischia of third pereopods and protuberances on coxae of fourth reduced in size.

First pleopod distinctly more shallowly embedded in sternum than in holotype with tips of gonopod extending ventrally beyond ventralmost portion of coxae of fourth pereopod; first pleopods (Figs. 15, 17) widely separated at base; mesial process heavy but tapering toward acute apex, disposed caudolaterally, and somewhat distally (in relation to the shaft of the appendage); central projection, non-corneous, broadly rounded, and directed caudoproximally, its tip extending caudally beyond tip of mesial process.

Allotypic Female: Differs from holotype in following respects: cephalic section of telson with two spines in each caudolateral corner; right chela

regenerated, left chela with row of five tubercles above mesial row; three tubercles present ventrally opposite distal three tubercles in mesial row on palm; ventral surface of carpus with group of five tubercles proximal to marginal tubercles; merus with ventrolateral row of six tubercles and ventromesial row of thirteen.

Sternum between fourth pereopods broad and moderately shallow. First pleopods uniramous and reaching caudal margin of annulus. Annulus ventralis (Fig. 23) approximately 1.5 times broader than long, firmly fused to sternum cephalically, but caudal half slightly movable; asymmetrical with high steeply sloping sinistral caudal wall; cephalomesial area with distinct median furrow extending caudally and curving dextrally into dextrally situated fossa; dextral wall high and curved; high ridge extending from sinistral margin transversely, continuing onto tongue, and latter disappearing beneath elevated dextral wall; sinus extending along caudal margin of tongue to median line and forming broad arc to end on caudal wall near median line.

Type-locality: Daniel Creek, 2.5 miles west of Walker County line on State Route 143, Dade County, Georgia. There the creek, some 15 feet wide and 1.5 feet deep, flows with a moderate current over bed rock and a sandy bottom, the latter littered with stones and entrapped debris. The water is crystal clear and supports no macroscopic plant growth. The stream bed is located in a deep ravine in which *Pinus* sp. and *Cornus florida* are conspicuous elements. No other crayfish were found at this locality.

Disposition of Types: The holotypic male, form I, the allotypic female with eggs, and the morphotypic male, form II, are deposited in the Smithsonian Institution (nos. 129863, 129864, 129865, respectively) as are the paratypes, which consist of 1 ♂, form I; 14 ♂, form II; 11 ♀; 23 juvenile ♂; 17 juvenile ♀, and 1 ♀ with eggs.

Size: The largest male, form I, has a carapace length of 31.4 mm, the largest female, the allotype, 40.2 mm, and the smallest and only other first form male available, the holotype, 29.6 mm.

Color Notes: Ground color of carapace and abdomen brownish black dorsally fading ventrally to olive green and flecked with irregular brownish black splotches. Postorbital ridges brownish black. Lateral surface of carapace bearing brownish black "horn" (see Hobbs, 1958: 74) originating in hepatic area and increasing in width caudally along branchiostegite at caudal margin of which almost reaching level of branchiocardiac groove. Terga of abdomen with dorsolateral linearly arranged series of oblique brownish black bars, similar series at bases of pleura. Telson and uropod with brownish black spots. Antennules and antennae dark brown. Chela brown with brownish black splotches on all podomeres distal to ischium. Podomeres distal to ischium of remaining pereopods olive green with brownish black spots. Basal podomeres of all pereopods and sternum cream.

Range and Crayfish Associates: This crayfish is known only from tributaries of the Tennessee River in Dade County, Georgia. While we can

cite only the type-locality, a tributary to Lookout Creek, as a definite locality for the species, we have juvenile specimens, which are tentatively assigned to this species, from a stream 0.7 miles east of the Alabama State line on Georgia State Highway 143 and from Rattlesnake Creek, 5.1 miles northwest of U.S. 11 in Murphy Hollow. The only crayfish associate observed with this species was *Cambarus striatus* Hay, 1902: 437, in the stream just east of the Alabama State line.

Variations: The only available adult specimens of this species were collected in the type-locality and are remarkably uniform except for slight differences in the positions occupied by certain tubercles and an occasional loss or addition of a tubercle. Few differences extend beyond the range of variation occurring in the primary types. The number of tubercles along the mesial margin of the palm of the chela varies from six to eight and the row immediately above it from four to six. The areola ranges from 32.6 to 37.4 percent of the total length of the carapace. Only the large allotypic female (carapace length, 40.4 mm) exhibits a percentage larger than 36.6; none of the other specimens have a carapace length greater than 32.9 mm. The length of the areola varies from 3.5 to 4.7 times its width, but in the allotype, it is only 4.1 times longer than broad.

Relationships: Despite the fact that the chela of *Cambarus unestami* is less depressed than that of any other member of the subgenus, the arrangement of the tubercles along the inner surface of the palm is typical of that of the other members; furthermore, the form of the terminal elements of the pleopod and the structure of the annulus ventralis indicate that its affinities are with the members of this segment of the genus. Unlike *Cambarus floridanus* Hobbs, 1941: 114, *C. latimanus* (LeConte), *C. reduncus* Hobbs, 1956: 61, and *C. striatus* Hay, 1902: 437, this species possesses a subterminal notch on the distal end of the central projection of the first pleopod. It differs from *C. balli* Hobbs, 1968: 269, and *C. obstipus* Hall, 1959: 221, in lacking marginal tubercles on the rostrum. Finally, it differs from *C. catagius* Hobbs and Perkins, 1967: 141, and *C. sphenoides* Hobbs, 1968: 262, in that the mesial process of the first pleopod does not extend so far caudally as does the central projection.

Life History Notes: A first form male and a female with eggs were collected in the type-locality on 5, May 1967, and a similar pair on 23, April 1968.

Etymology: This species is named in honor of our mutual friend, Dr. Torgny Unestam, University of Uppsala, who was a most helpful and congenial companion to the senior author on a collecting trip in north Georgia when this species was discovered.

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