

TWO NEW SPECIES OF THE GENUS *CAMBARUS* FROM
ARKANSAS (DECAPODA, ASTACIDAE)

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ABSTRACT

Two new species of the genus *Cambarus* from Arkansas are described. *Cambarus causeyi* from northern Arkansas seems to have its closest affinities with members of the Asperimanus Group. *Cambarus strawni* from the southern slope of the Ouachita Mountains appears to be closely related to members of the Diogenes Section.

The first specimens of two undescribed species were collected in 1963, during a survey of the crawfishes of Arkansas (Reimer, MS). I had hoped to obtain more individuals before publishing my findings, but since I have not been able to return to the areas it seems best to proceed with the description of these two new species.

My appreciation is extended to Dr. Horton H. Hobbs, Jr., United States National Museum, for the verification of these two species, and to Dr. Kirk Strawn and Dr. David Causey, both of the University of Arkansas, for their assistance while collecting in Arkansas. I am pleased to name these species in honor of Drs. Causey and Strawn.

Cambarus causeyi, new species

Diagnosis.—Body pigmented; eyes normal. Rostrum short, excavate, lacking lateral spines; acumen indistinctly delimited at base, with dorsally projecting knob at tip; areola open but narrow, approximately 28 times longer than wide; lateral branchiostegal spines absent; suborbital angle absent; antennal scale widest distal to midlength;

chela slightly depressed; hooks on ischiopodites of third pereopod of male only; first pleopod of Form I male terminating in two distinct processes bent at more than 90 degree angle to main shaft; annulus ventralis as figured (Fig. 2); prominent setiferous punctations over most of carapace and pereopods.

Holotypic male, Form I.—Body subovate. Abdomen narrower than thorax (7 & 9 mm, respectively), shorter than carapace. Cephalic section of telson with one spine on each side. Width of cephalothorax less than depth in region of caudodorsal margin of cervical groove (8.5 & 9 mm, respectively). Areola open but narrow; 28.0 times longer than wide. Cephalic section of cephalothorax 1.4 times longer than areola.

Rostrum (Fig. 6) excavate dorsally; acumen indistinct but with upturned corneous tip; marginal spines absent; tip extending cephalic to penultimate segment of peduncle of antennule. Postorbital ridges well developed, with prominent groove extending almost its full length. Subrostral ridges moderately developed. Suborbital angle, branchiostegal spine, and lateral spines absent. Surface of carapace densely punctate and moderately setiferous.

Epistome (Fig. 7) equal in length and breadth, with indistinct cephalomedial projection; cephalolateral edges elevated ventrally.

Eyes normal. Antennules of usual form. Antennae of usual form and only slightly longer than carapace. Antennal scale (Fig. 4) reaching to distal end of penultimate segment of antennule; widest distal to mid-

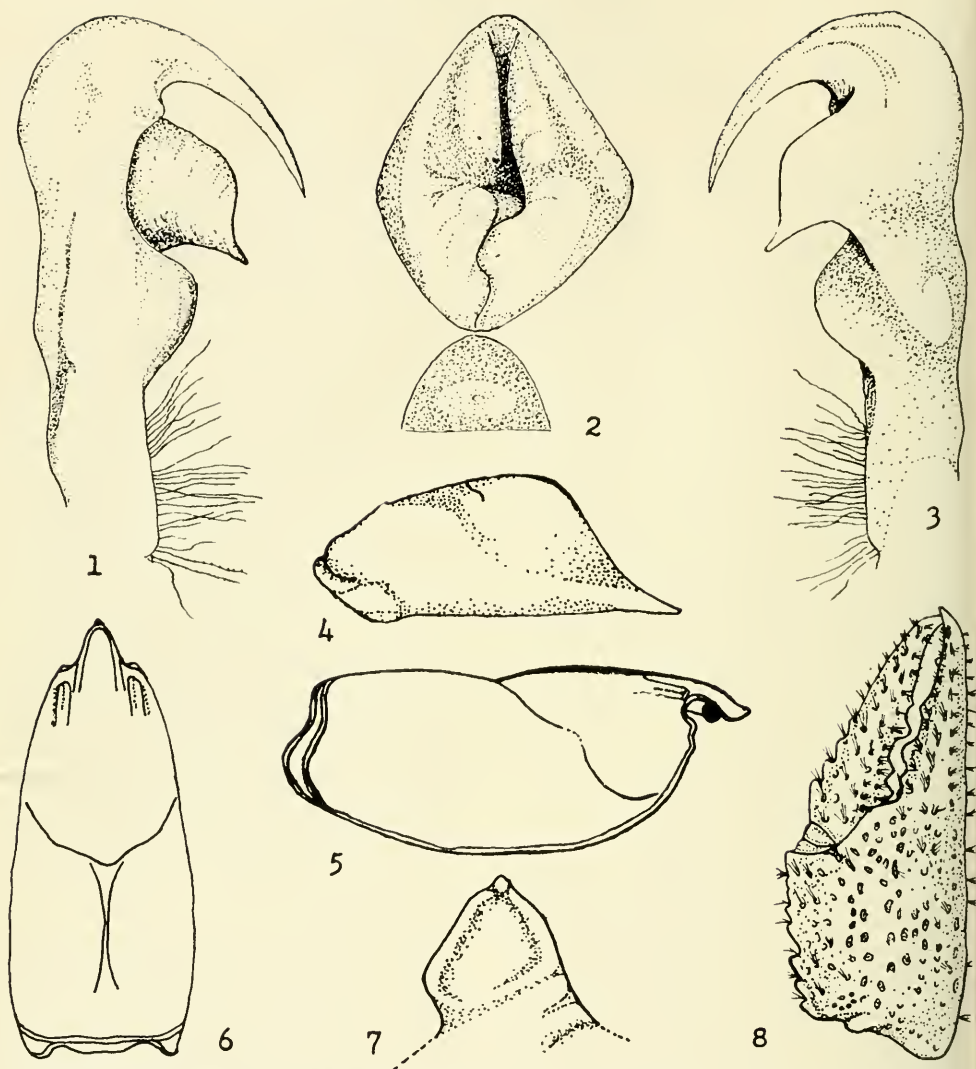
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Figures 1-8. *Cambarus causeyi*, new species: 1. lateral view of first pleopod of holotypic male; 2. annulus ventralis; 3. mesial view of first pleopod of holotypic male; 4. antennal scale of holotypic male; 5. lateral view of carapace of holotypic male; 6. dorsal view of carapace of holotypic male; 7. epistome of holotypic male; 8. upper surface of chela of holotypic male.

length (approximately 2.3 times longer than wide).

Right chela (Fig. 8) slightly depressed and with palm only slightly inflated. Inner margin of palm with one row of six tubercles. Tubercles on lower surface of palm indistinct. All surfaces of chela bearing setiferous punctations, with setae of various lengths within same punctation. Fingers slightly curved ventrally from their bases,

gaping along proximal two-thirds of their length. Inner margin of immovable finger with five distinct tubercles: proximal four noncorneous and placed on mesial border first much smaller than distal three; tubercle at base of distal third of finger, corneous (like tip of fingers), placed laterally. Lower surface of immovable finger without tubercles but with single row of setiferous punctations. Opposable margin of movable finger with four tubercles; third from base largest

Upper surface of movable finger with four tubercles near base.

Carpus longer than wide (6.6 & 4.7 mm, respectively) with well defined longitudinal furrow above; two prominent spines located distally (dorsal distal edge-mesial distal edge), remainder of surface lacking tubercles; all surface with setiferous punctations. Merus with two rows of tubercles along ventral margin, converging proximally, six in mesial row, three in lateral row, becoming larger distally; tubercles absent from dorsal surface; setiferous punctations on dorsal and ventral surfaces, diminishing laterally. Hooks present on ischiopodites of third pereopods only.

First pleopod (Figs. 1, 3) reaching base of third pereopod and terminating in two distinct parts. Central projection corneous, blade-like, strongly curved caudomesiad at more than a right angle to main shaft. Mesial process noncorneous, bulbiform with small nipple-like apical projection, curving caudolaterally at about same angle as central projection.

Allotypic female.—Differs from holotypic male in the following respects: Rostrum longer, with lateral edges upturned dorsally to give deeper excavation. Inner margin of palm with five tubercles. Two rows of tubercles along ventral margins of merus, three in mesial row, seven in lateral row. Cephalic section of telson with three spines on each side.

Annulus ventralis (Fig. 2) situated at caudal end of a deep, narrow V-shaped sternum. Sternum partially hidden by numerous long setae. Annulus ventralis longer than wide with centrally located fossa; sinus extending cephalically and caudally from fossa.

Male, Form II.—Unknown.

Measurements (in millimeters).—

		Holo- type	Allo- type
Carapace	Height	9.0	12.9
	Width	8.5	12.5
	Length	20.4	31.2
Areola	Width	0.3	0.2
	Length	8.4	12.8
Rostrum	Width	2.5	3.6
	Length	2.8	4.8
Chela Right)	Length inner		
	margin of palm	5.7	9.7
	Width of palm	6.0	10.4
	Length outer		
	margin of palm	15.5	23.5
	Length of dactyl	9.1	14.4

Caudal sinus normal, i.e., lateral surfaces slope away from sinus region. Cephalic sinus with lateral surfaces folding mesially as if to close over top of sinus.

Type locality and ecological notes.—Type locality is four miles west of Sandgap, Pope Co., Arkansas, on State Highway 124; from a spring and natural pond. The spring is located on the western side of a gently sloping hill and drains into a small shallow pond about 200 feet away. The hillside and pasture were dotted with several large rocks, under which could almost always be found a burrow. Unconcealed openings to burrows were scattered over the area. No chimneys were observed.

Most burrows had several openings leading to a common tunnel which descended almost vertically. None of the burrows was dug to the bottom. The holotype was taken from a burrow (top capped by a rock) on the hillside. The allotype and paratype, the latter an immature female, were taken from burrows near the natural pond. The pond was clear and contained a large number of frog and toad eggs but lacked crayfish.

Disposition of types.—The holotypic form I male and the allotypic female are deposited in the U. S. National Museum, numbers 116678 and 116679, respectively. A juvenile paratypic female also is deposited in the U. S. National Museum.

Relationships.—*Cambarus causeyi* seems to have its closest affinities with *Cambarus setosus* Faxon, 1889, and *Cambarus zophonastes* Hobbs and Bedinger, 1964, members of the Asperimanus Group in the Ozark Region. Similarities include the narrow areola, setiferous punctations, single row of tubercles on inner margin of palm, and shape of the chela. *Cambarus causeyi* can be distinguished by normal coloration, normal eyes, and absence of lateral spines on the rostrum and sides of carapace. In addition the mesial process of the first pleopod of the Form I male is bulbiform. The shape of the epistome and annulus ventralis is quite different from either *C. setosus* or *C. zophonastes*.

Cambarus strawni, new species

Diagnosis.—Rostrum excavate, lacking marginal spines, with indistinct acumen; areola obliterated; spines absent along surface of carapace; suborbital angle absent; antennal scale widest at (or slightly distal

to) midlength; chela strongly depressed; carapace and chela lacking conspicuous setiferous punctations; hook on ischiopodites of third pereopods only, of male; first pleopod of Form I male terminating in three distinct processes bent at approximately a 90 degree angle to main shaft; annulus ventralis as figured (Fig. 17).

Holotypic male, Form I.—Body ovate. Abdomen narrower than thorax (8.7 & 13.4 mm, respectively) and shorter than carapace. Cephalic section of telson without spines. Width of cephalothorax equal to depth in region of caudodorsal margin of cervical groove. Areola obliterated in middle; cephalic section of cephalothorax 1.5 times as long as areola.

Rostrum depressed; upper surface excavate; margins converging from base; acumen only slightly delimited basally by small tubercle; marginal spines absent; tip extending cephalically to base of penultimate segment of peduncle of antennule. Subrostral and postorbital ridges moderately developed with postorbital ridges terminating cephalically without spine. Suborbital angle, branchiostegal spines, lateral spines absent. Punctations on dorsal surface of carapace few, increasing in number laterally.

Epistome (Fig. 11) wider than long and terminating cephalically in small cephalo-median projection; cephalolateral margins slightly rounded.

Eyes normal. Antennules of usual form. Antennae broken (see allotypic female). Antennal scale small, reaching slightly beyond tip of rostrum; widest at midlength; approximately three times longer than wide (2.8 & 0.8 mm, respectively).

Right chela (Fig. 18) depressed, palm slightly inflated. Inner margin of palm with two rows of tubercles; inner row of eight much more prominent than outer of five. Tubercles on lower surface of palm indistinct. Palm moderately punctate. Fingers curved ventrally from bases, gaping along entire length; both slightly punctate. Inner margin of immovable finger with three tubercles; first from base being largest. Opposable margin of movable finger with four tubercles; second from base largest, terminating arch originating at base of finger. Upper surface of movable finger with single row of seven indistinct tubercles.

Carpus longer than wide (9.6 & 6.7 mm, respectively) with well defined longitudinal

furrow above; dorsal crest with row of four indistinct tubercles; mesial surface with series of 13 irregularly placed spines, largest being near distal dorsal margin; punctations sparsely scattered over all surfaces. Merus with two rows of tubercles along ventral surface converging proximally (8 in lateral row—12 in mesial row); one row of 15 tubercles on dorsal margin becoming indistinct proximally. Punctations few on dorsal and ventral surfaces.

First pleopod (Figs. 9, 13) reaching to base of third pereopod, terminating in three distinct parts. Central projection corneous blade-like; curving caudomesiad at slightly more than right angle to main shaft. Mesial process slightly more than right angle to main shaft of pleopod. Third distinct process lying between and mesial to mesial process and central projection; thin, slightly corneous, half as long as central projection and mesial process. According to its position, third process is probably homologous to the cephalic process in *Procamburn*. (Hobbs, personal communication).

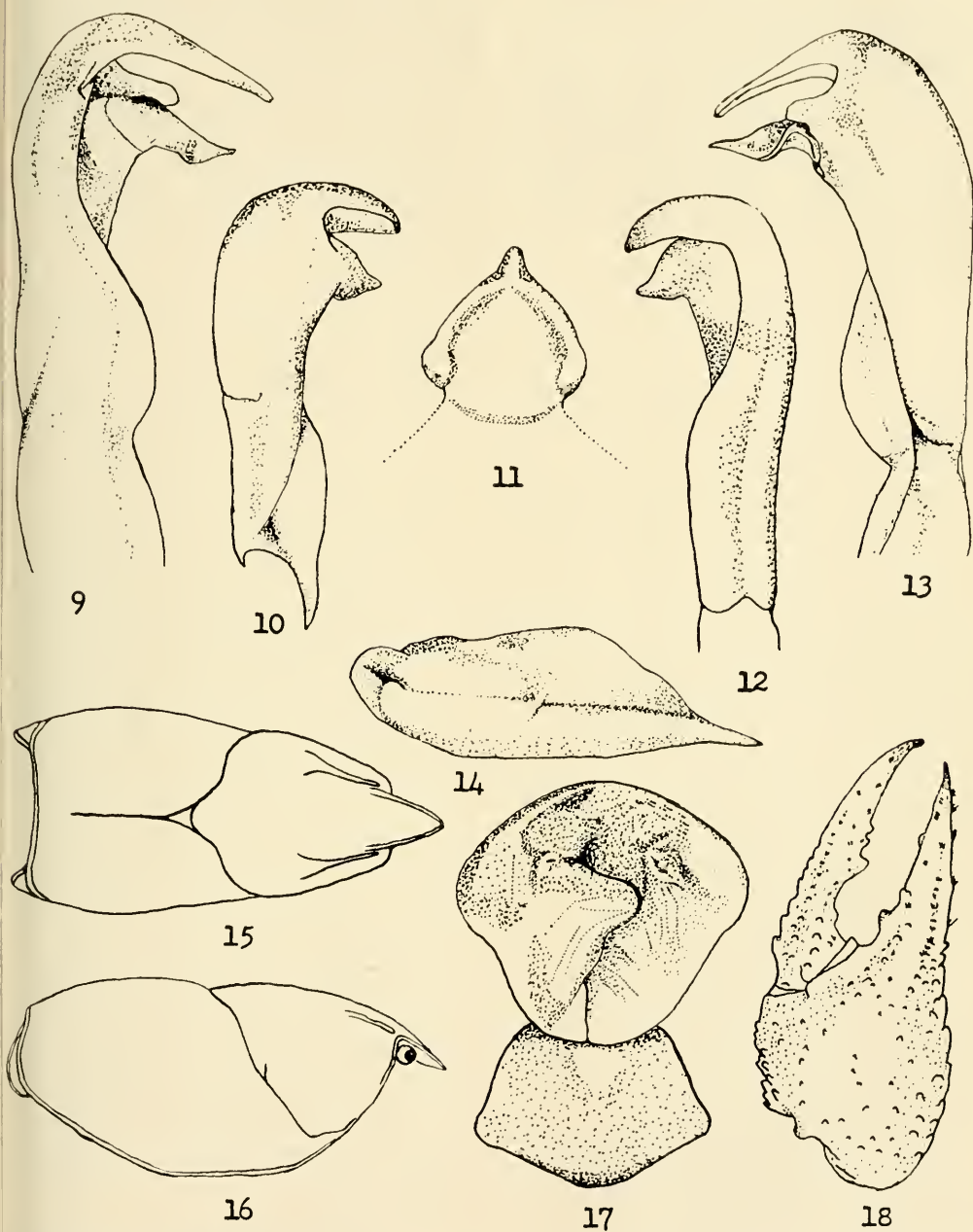
Allotypic female.—Allotypic female differs from the holotypic male in the following respects; tubercles on movable finger not as well defined, antennae approximately equal to length of carapace (one broken) slight variation in size and arrangement of tubercles on carpus and merus.

Annulus ventralis (Fig. 17) situated at caudal end of deep V-shaped sternum and divided into right and left sides by prominent sinus leading caudally from cephalo-mesial fossa.

Morphotypic male, Form II.—Morpho

Measurements (in millimeters).—

		Holo- type	Allo- type	Mor- pho- typ
Carapace	Height	12.4	12.7	9.9
	Width	12.4	12.5	9.9
	Length	28.6	28.7	21.1
Areola	Length	11.2	11.2	8.8
Rostrum	Width	4.3	4.3	3.3
	Length	4.8	4.9	3.3
Chela (Right)	Length inner margin of palm	6.5	5.5	3.3
	Width of palm	5.1	4.5	2.3
	Length outer margin of palm	19.5	16.3	9.3
	Length of dactyl	12.5	10.2	6.6



Figures 9-18. *Cambarus strawni*, new species: 9. lateral view of first pleopod of holotypic male; 10. mesial view of first pleopod of morphotypic male; 11. epistome of holotypic male; 12. lateral view of first pleopod of morphotypic male; 13. mesial view of first pleopod of holotypic male; 14. antennal scale of holotypic male; 15. dorsal view of carapace of holotypic male; 16. lateral view of carapace of holotypic male; 17. annulus ventralis; 18. upper surface of chela of holotypic male.

type differs from holotype in following respects; two rows of tubercles on inner margin of palm of right chela with ratio of 6:5 (5 in inner row), third and fourth tubercles on movable finger indistinct, slight variation in size and arrangement of tubercles on carpus and merus, hooks on ischiopodites of third pereopods greatly reduced in size, first pleopod (Figs. 10, 12) with only two terminal elements (distal half of right pleopod broken).

Variations.—Few variations observed. The more obvious are: second tubercle lacking on immovable finger of one specimen, third and fourth tubercles lacking on movable finger of two others. Tubercle number on dorsolateral crest of carpus varies from four to seven, and on one, tubercles not in definite row. Mesial surface of carpus of one small female with 10 tubercles. Epistome shorter and with rounder cephalolateral borders in some specimens. Annulus ventralis on small female (probably immature) swollen and not resembling that of allotype. First pleopods of both second form males lacking third terminal process. In one male Form II, mesial process twice as long as central projection. One paratypic female with spine on left side of cephalic section of telson.

Type locality and ecological notes.—The type locality is 2.7 miles north of Dierks, Howard County, Arkansas, on State Highway 4; a small marshy area in the Saline River drainage. All specimens were taken from burrows. The burrows were in a low area adjacent to a small permanent creek. During the wet period of the year this area is quite boggy and standing water is common in places. During the dryer parts of the year the surface water is absent and the area loses its boggy nature. The soil is a sandy clay. The stream nearby is shallow, clear, fast running, and paved with a rocky bottom. *Procambarus simulans simulans* (Faxon), 1884, *Procambarus blandingii acutus* (Girard), 1852, and *Orconectes palmeri longimanus* (Faxon), 1898, were taken from the stream.

The holotypic male, allotypic female, and one paratypic female were taken on June 22, 1963. Another collection at the type locality on February 17, 1965 yielded the morphotypic male and two paratypes (male Form II, female).

Two female paratypes were also taken on

June 22, 1963 from the headwaters of the Cossatot River about four miles west of Umpire, Howard County, Arkansas, on State Highway 4.

Color.—The carapace is primarily olive tan with the abdomen being slightly lighter. Ventral surfaces are cream colored. Dactyl, suborbital ridge, lateral borders of the rostrum, and articulating areas of the pereopods grade from a deep olive green to black. The colors are more vivid in the older or larger individuals.

Burrows.—Two types of burrow construction have been observed. The burrows at the type locality consisted of a maze of interconnecting tunnels with the primary tunnel proceeding almost vertically. The burrows west of Umpire, Arkansas lacked the maze and the primary tunnel went down in a spiral manner. Some openings at both locations were capped with chimneys.

Disposition of types.—The holotypic form I male, allotypic female, and morphotypic form II male are deposited in the United States National Museum, numbers 116675, 116676, 116677, respectively. The five paratypes (four females and a form II male) have been retained in my personal collection.

Relationships.—With the exception of having three terminal projections on the first pleopod of the Form I male, *Cambarus strawni* appears to be most closely related to members of the Diogenes Section. *Cambarus diogenes diogenes* Girard (1852), *Cambarus diogenes ludovicianus* Faxon (1884), and *Cambarus hedgpethi* Hobbs (1948) are members of the Diogenes Section which occur in the same area. *Cambarus strawni* can be distinguished from these three species by the three terminal projections on the first pleopod of the Form I male, shape of the antennal scale, shape of the annulus ventralis of the female, tubercle arrangement on the fingers of the chelae, and in the case of *Cambarus diogenes diogenes* and *Cambarus diogenes ludovicianus*, by the absence of suborbital angles.

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