

*HORTON H. HOBBS, JR.*

*The Subgenera  
of the Crayfish  
Genus Procambarus  
(Decapoda: Astacidae)*

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Page 4, couplet 3(2'): Reference to figure should read "... (Figure 13*c*) ...", not 19*c*.

Page 4, couplet 3': Reference to figure should read "... (Figure 19*c*) ...", not 13*c*.



## ABSTRACT

Hobbs, Horton H., Jr. The Subgenera of the Crayfish Genus *Procambarus* (Decapoda: Astacidae). *Smithsonian Contributions to Zoology*, number 117, 22 pages, 20 figures, 1 table. 1972.—A brief nomenclatural history of the genus *Procambarus* is followed by a key to the proposed 16 subgenera comprising 121 species and subspecies. Four of the subgenera, *Girardiella* (5 species and subspecies), *Paracambarus* (2 species), *Procambarus* (monotypic), and *Ortmannicus* (42 species and subspecies) have been previously recognized, and since 1942, *Paracambarus* has been accorded generic rank. The following subgenera are recognized as new: *Acucauda* (monotypic), *Austrocambarus* (16 species and subspecies), *Capillicambarus* (2 species), *Hagenides* (8 species and subspecies), *Leconticambarus* (13 species), *Lonnbergius* (monotypic), *Mexicambarus* (monotypic), *Pennides* (15 species), *Remoticambarus* (monotypic), *Scapulicambarus* (4 species), *Tenuicambarus* (monotypic), and *Villalobosus* (8 species). A diagnosis is provided for each subgenus together with illustrations of the type-species. Maps depicting the range of each subgenus are also included.

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Horton H. Hobbs, Jr.

## The Subgenera of the Crayfish Genus *Procambarus* (Decapoda: Astacidae)

The genus *Procambarus*, the largest of the crayfish genera, comprises 121 species and subspecies and, excluding introductions, is confined to North America, the northern part of Central America, and Cuba. With comparatively few exceptions, its members can be distinguished from those of other Cambarine genera by their possession of three or more terminal elements on the first pleopod of the first form male and a movable annulus ventralis in the female—both characters shared with only a few of the more primitive members of the genera *Orconectes*, *Hobbseus*, *Cambarus*, and *Fallicambarus*. (For discussions of the intergeneric relationships, see Hobbs 1967:8–15 and 1969:119–126.)

Table 1, modified from Hobbs (1962:278), summarizes the currently recognized species-groups of the genus in relation to the modifications that are proposed here. Intrageneric affinities are discussed by Hobbs (1962) and will be expanded in a monograph of the genus now in progress, in which more detailed synonymies for the infrageneric taxa are included.

Labeled illustrations depict the terminology utilized in the key to the 16 subgenera and in their diagnoses, both based solely on the first form male. Comparable figures of the type-species of each of the subgenera, including the first pleopod of the second form male and the annulus ventralis of the female, are also presented.

A few new terms have been introduced into the key and diagnoses. To clarify them, the following ex-

planations are offered, the first three applying to the first pleopod of the male: The *lamellae* comprise the three layers of the doubly folded distal portion of the appendage (Figure 1*a, b*). The *proximomedian lobe* (Figure 2*d*, pml) extends proximally from the caudo-medial base of the appendage; it is well developed in Figure 2*a, d, e, f, g, o*, and *p*. The *proximomesial spur* (Figure 2*l*, pms) is situated immediately proximal to the mesial base of the appendage; it is also conspicuous in Figure 2*c, d, h, l*, and *o*. The *infraorbital spines* (Figure 1*c*, ios) are those which are situated along the anterior margin of the carapace between the anterior extremity of the cervical groove and the suborbital angle.

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### A Brief History of the Genus *Procambarus*

Thirty-two years after the first crayfish had been described from North America, R. Harlan (1830: 464) assigned the name *Astacus Blandingii* to a crayfish that “inhabits the southern states, where it is common in the marshes and rivulets.” This was the first species to be described that is now assigned to the genus *Procambarus*. Erichson (1846), in his study of the genus *Astacus*, assigned nine species (four subsequently placed in the genus *Procambarus*: *A. blandingi*, *A. cubensis*, *A. mexicanus*, and *A. wiegmanni*) to his new subgenus *Cambarus*. Six years later, Girard

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(1852) elevated Erichson's subgenus *Cambarus* to generic rank, assigning to his "Third Groups" *C. Blandingii*, *C. acutissimus*, *C. acutus*, and *C. Clarkii*, the latter three new species. LeConte (1856) was the last person who relegated a member of this species-group (*Procambarus*) to the genus *Astacus*, describing six new members from Georgia: *A. advena*, *A. angustatus*, *A. fossarum*, *A. maniculatus*, *A. penicillatus*, and *A. spiculifer*. Two new species of the group were added by Saussure (1857), *C. aztecus* and *C. consobrinus*.

In Hagen's (1870) monograph of the North American Astacidae, he included 15 members of this species group, introducing three new species. In his "Group I" he placed *C. acutus*, *C. angustatus*, *C. Blandingii*, *C. Clarkii*, *C. Fallax*, *C. Lecontei*, *C. maniculatus*, *C. penicillatus*, *C. spiculifer*, *C. troglodytes*, *C. versutus*, and *C. Wiegmanni*. (*C. acutissimus*, *C. aztecus*, and *C. consobrinus* were considered by Hagen to be synonyms of *C. acutus*, *C. wiegmanni*, and *C. cubensis*, respectively.) In his "Group III" he placed *C. advena*, *C. Cubensis*, and *C. Mexicanus*.

Between 1870 and 1900, only 11 names were added to this species group: *Cambarus gracilis* Bundy, 1876; *C. alleni* Faxon, 1884; *C. hagenianus* Faxon, 1884; *C. hayi* Faxon, 1884; *C. pubescens* Faxon, 1884; *C. simulans* Faxon, 1884; *C. acherontis* Lönnberg, 1895; *C. evermanni* Faxon, 1890; *C. digueti* Bouvier, 1897; *C. barbatus* Faxon, 1898 to replace LeConte's (1856) *Astacus penicillatus*; and *C. gallinus* Cockrell and Porter, 1900.

In Faxon's (1885) revision of the Astacidae, the groupings are essentially similar to those of Hagen's except the latter's "Group III" corresponds to Faxon's "Group II." Only three species were added to Faxon's Group II: *Cambarus gracilis*, *C. simulans*, and *C. carolinus* Hagen (not Erichson) (= *C. hagenianus*). The remaining species mentioned above were assigned to "Group I" with synonymies almost identical to those recognized by Hagen.

Within the decade 1901–1910, Ortmann (1905a–c, 1906, 1909) was the sole contributor to our knowledge of members of the current genus *Procambarus*. In addition to describing four new members, he recognized (1905a) four subgenera of the genus *Cambarus*: *Bartonius*, *Cambarus*, *Faxonius*, and *Cambarellus*, the first three of which were subdivided into "Sections" and "Groups." His subgenus *Cambarus*

(now recognized as the genus *Procambarus*) was subdivided as follows:

	<i>Subgeneric Equivalents Here Proposed</i>
Section of <i>C. digueti</i>	= <i>Procambarus</i> and <i>Austrocambarus</i>
Section of <i>C. gracilis</i>	= <i>Girardiella</i> and <i>Hagenides</i>
Section of <i>C. blandingi</i>	= <i>Pennides</i> and <i>Ortmannicus</i> (part)
Group of <i>C. spiculifer</i>	= <i>Lonnbergius</i> and <i>Ortmannicus</i> (part)
Group of <i>C. blandingi</i>	= <i>Scapulicambarus</i>
Group of <i>C. clarki</i>	= <i>Leonticambarus</i> and <i>Ortmannicus</i> (part)
Group of <i>C. alleni</i>	= <i>Leonticambarus</i> and <i>Ortmannicus</i> (part)

In later papers (1905c and 1906) Ortmann elevated his Section of *C. digueti* to subgeneric rank, designating it *Procambarus*, and proposed the monotypic subgenus *Paracambarus* to receive a new species, *Cambarus (Paracambarus) paradoxus*.

From 1911 to 1920, four additional species were described by Faxon, Pearse, and Ortmann. Fowler (1912), in treating the crayfishes of New Jersey, pointed out an error that Ortmann (1905a) had made in his proposal of the subgenera *Cambarus* and *Bartonius*: he had selected *Cambarus blandingii* as the type of *Cambarus* and *C. bartonii* as that of *Bartonius*. Faxon's (1898:644) earlier designation of *C. bartonii* as the type-species of the genus *Cambarus*, however, invalidated Ortmann's subsequent selection of *C. blandingii* as the type of the nominate subgenus, and inasmuch as Faxon's type-species had been chosen by Ortmann as that of *Bartonius*, the latter became a still-born synonym of *Cambarus*, thus leaving Ortmann's species-group, designated by him as *Cambarus*, without a name. For this assemblage, Fowler proposed the name *Ortmannicus*.

During the years 1921 to 1930, no new taxa were introduced, nor were there any alterations in the supraspecific categories affecting the assemblage of species now assigned to the genus *Procambarus*. In the following 10 years, however, Creaser and Hobbs added 11 new species to the group, and Lyle (1938) proposed that those species Faxon (1885) had referred to his Group II be assigned to a new subgenus, *Girardiella*.

Between 1941 and 1960, Hobbs, Hobbs and Walton, Penn, and Villalobos described 64 additional members of this species-group. Hobbs (1942a) proposed a revision of the genus *Cambarus*, involving

chiefly the elevation of Ortmann's subgenera to generic rank, combining under the older name, *Procambarus*, however, Ortmann's *Procambarus*, Fowler's *Ortmannicus* (=Ortmann's *Cambarus*), and Lyle's *Girardiella*.

Since 1960, only 11 species have been added to the genus, and Hobbs (1962:278) summarized and defined the supraspecific categories that were being utilized at that time. This summary, together with necessary emendations and equivalents of the proposals made herein, are outlined in Table 1.

At the time Hobbs (1942a) elevated Ortmann's subgenera to generic rank, *Paracambarus* was a monotypic subgenus comprising the single, very peculiar *C. paradoxus*, possessing among other unique characters, hooks on the ischia of only the fourth pereopods of the male. With the discovery by Villalobos

(1949) of *Paracambarus ortmanni* in Puebla and related species of *Procambarus* (recorded from 1944 to 1951 and here referred to the subgenus *Villalobosus*) in Puebla and Veracruz, the characteristics which distinguish *Paracambarus* became much less well defined, and, in my opinion, hardly worthy of generic distinction. Therefore, this taxon is here reduced to subgeneric status in the genus *Procambarus*.

From 1942 until the present, no subgenera have been recognized within the genus; however, with the treatment proposed here, Fowler's *Ortmannicus* and Lyle's *Girardiella* are available for the groups that are indicated in Table 1.

Two monotypic subgenera that have no earlier counterparts are proposed to encompass the disjunct *Procambarus pecki* Hobbs, 1967, and *P. fitzpatricki* Hobbs, 1971.

TABLE 1.—Infrageneric Categories of the Genus *Procambarus*

Table 1.-- Infrageneric Categories of the Genus *Procambarus*

Previously Recognized (Modified from Hobbs, 1962)		Proposed	
Sections	Groups	Subgenera	Groups
Blandingii (Ortmann, 1905a:98)	{ Spiculifer (Ortmann, 1905a:100) Clarkii (Ortmann, 1905a:100) Blandingii (Ortmann, 1905a:100) Pictus (Hobbs, 1942b:129) Seminolae (Hobbs, 1942b:142) Lucifugus (Hobbs, 1942b:134) Planirostris (Penn, 1953b:75) Disjunct members	<u>Pennides</u> *(15) <u>Scapulicambarus</u> (4)  <u>Ortmannicus</u> (Fowler, 1912:341) (42)	{ Blandingii Pictus Seminolae Lucifugus Planirostris Disjunct members
Tenuis (Hobbs, 1962:278)		<u>Tenuicambarus</u> (1)	
Riojae (Villalobos, 1955:94)	{ Riojae (Villalobos, 1955:96) Erichsoni (Villalobos, 1955:130)	<u>Villalobosus</u> (8)	{ Riojai Erichsoni
Digueti (Ortmann, 1905a:98)		<u>Procambarus</u> (Ortmann, 1905c:437) (1) <u>Mexicambarus</u> (1)	
Advena (Hobbs, 1942b:73)	{ Advena (Hobbs, 1942b:73) Rogersi (Hobbs, 1942b:88)	<u>Hagenides</u> (8)	{ Advena Rogersi
Acherontis (Hobbs, 1942b:91)		<u>Lonnbergius</u> (1)	
Hinei (Penn, 1953a:67)		<u>Capillicambarus</u> (2)	
Barbatus (Hobbs, 1942b:33)	{ Barbatus (Hobbs, 1942b:35) Alleni (Ortmann, 1905a:100) Disjunct members	<u>Leonticambarus</u> (13)	{ Barbatus Alleni
Gracilis (Ortmann, 1905a:98)	Simulans (Penn, 1956:418)	<u>Girardiella</u> (Lyle, 1938:76) (5)	
Mexicanus (Villalobos, 1955:159)	{ Mexicanus (Villalobos, 1955:160) Pilosimanus (Villalobos, 1955:160) Cubensis (Hobbs, 1962:278)	<u>Austrocambarus</u> (16)	{ Mexicanus Pilosimanus Cubensis
Members not known in 1962		<u>Acucauda</u> (1) <u>Remoticambarus</u> (1)	
Relegated to separate genus in 1962		<u>Paracambarus</u> (Ortmann, 1906:1) (2)	

\*Numbers in parentheses following subgeneric names indicate numbers of species and subspecies assigned to them.

Key to Subgenera of Genus *Procambarus*

- 1 Hooks on ischia of fourth pereopods only (Figure 1*h*) .....2
- 1' Hooks on ischia of third or third and fourth pereopods (Figure 1*g, i, j*) .....4
- 2(1) Median spine on mesial ramus of uropod extending beyond distal margin of ramus (Figure 1*l*) ..... *Acucauda*
- 2' Median spine on mesial ramus of uropod not extending beyond distal margin of ramus (Figure 1*k*), reduced to premarginal tubercle, or absent .....3
- 3(2') First pleopod reaching coxa of third pereopod, central projection beaklike (Figure 19*c*) ..... *Paracambarus*
- 3' First pleopod reaching coxa of second pereopod, central projection never beaklike (Figure 13*c*) ..... *Villalobosus*
- 4(1') Hooks on ischia of third pereopods only (Figure 1*g*) .....5
- 4' Hooks on ischia of third and fourth pereopods (Figure 1*i, j*) .....11
- 5(4) First pleopod reaching coxa of second pereopod .....6
- 5' First pleopod reaching coxa of third pereopod .....7
- 6(5) First pleopods asymmetrical (Figure 2*e*); coxa of fourth pereopod with caudomesial boss (Figure 3*b*) ..... *Hagenides* (part)
- 6' First pleopods symmetrical (Figure 2*h*); coxa of fourth pereopod without caudomesial boss (Figure 3*a*) ..... *Mexicambarus*
- 7(5') Coxa of fourth pereopod with caudomesial boss (Figure 3*b*) .....8
- 7' Coxa of fourth pereopod without caudomesial boss (Figure 3*a*) .....9
- 8(7) Albinistic; first pleopod with only two terminal elements; subapical setae absent (Figure 16*b-d*) ..... *Remoticambarus*
- 8' Pigmented; first pleopod with three or four terminal elements; subapical setae present (Figure 9*b-d*) ..... *Leconticambarus* (part)
- 9(7') First pleopod with platelike cephalic process. (Figure 15*b-d*); rostrum with median carina (Figure 15*a*) ..... *Procambarus*
- 9' First pleopod with cephalic process tapering, rudimentary, or absent (Figures 5*b-d*; 7*b-d*); rostrum without median carina (Figures 5*a, 7a*) .....10
- 10(9') First pleopod with prominent proximomedian lobe (Figure 2*d*); cephalic process well developed, absent only in *Procambarus hagenianus* (latter with median spine on mesial ramus of uropod extending beyond distal margin of ramus (Figure 1*l*); dorsal surface of palm of chela with widely scattered tubercles (Figure 7*g*) ..... *Girardiella*
- 10' First pleopod with reduced proximomedian lobe (Figure 2*b*); cephalic process rudimentary or absent; median spine on mesial ramus of uropod never extending beyond distal margin of ramus (Figure 1*k*); dorsal surface of palm of chela with crowded squamous tubercles (Figure 5*g*) ..... *Austrocambarus*
- 11(4') First three pairs of pereopods with conspicuous brush of plumose setae extending from basis to at least proximal part of merus (Figure 1*n*) ..... *Capillicambarus*
- 11' First three pairs of pereopods never with conspicuous brush of plumose setae extending from basis to merus (Figure 1*m*) .....12
- 12(11') Carapace with two cervical spine on each side (Figure 1*c*) ..... *Pennides*
- 12' Carapace with one or no cervical spine on each side (Figure 1*d*) .....13
- 13(12') First pleopod usually reaching coxa of second pereopod, never with sinuous mesial process nor with bladelike caudal process (Figure 8*b-d*); chela strongly depressed with cristiform row of tubercles on mesial surface of palm (Figure 8*g*).  
*Hagenides* (part)
- 13' First pleopod reaching coxa of third pereopod, if reaching second, mesial process long and sinuous, or caudal process bladelike and cornerous (Figures 9, 10, 12, 17, 18*b-d*); chela not depressed and lacking cristiform row of tubercles on mesial surface of palm (Figures 9, 10, 12, 17, 18*g*) .....14
- 14(13') Bituberculate hooks on ischia of third and fourth pereopods (Figure 1*j*).  
*Lonnbergius*
- 14' Bituberculate hooks never present on ischia of both third and fourth pereopods (Figure 1*i*) .....15

Key to Subgenera of Genus *Procambarus*—Continued

- 15(14') Carapace strongly compressed laterally (Figure 18a); boss on coxa of fourth pereopod greatly expanded ventrally, and directed in longitudinal axis of body (Figure 3d) ..... *Tenuicambarus*
- 15' Carapace never strongly compressed laterally (Figures 9a, 12a, 17a); boss on coxa of fourth pereopod sometimes massive but never greatly expanded ventrally (Figure 3b) ..... 16
- 16(15') Shoulder on cephalic surface of right first pleopod folded caudally against mesial face of mesial lamella (Figure 1e), that on left projecting cephalically. .... *Scapulicambarus*
- 16' Shoulder present or absent on cephalic surface of first pleopods, if present, similarly disposed on both members of pair, that of right member never folded caudomesially (like Figure 1f) ..... 17
- 17(16') Mesial surface of palm of chela barbate (Figure 9g) and/or cephalic process of first pleopod arising from mesial surface of appendage and never hooding central projection (Figure 9d); cephalic surface of appendage never with fingerlike extension ..... *Leonticambarus* (part)
- 17' Mesial surface of palm of chela never barbate (Figure 12g); cephalic process of first pleopod arising from cephalic (Figure 12c) or lateral surface of appendage (often hooding central projection) except in *Procambarus viaeviridis* in which distally directed fingerlike extension, bearing apical tuft of setae, present at cephalic base of central projection ..... *Ortmannicus*

*Acucauda*, new subgenus

(FIGURES 1l, 2a, 4, 20d)

DIAGNOSIS.—Body and eyes pigmented, latter well developed. Rostrum without marginal spines, tubercles, or median carina. Carapace without cervical spines. Areola 3.6 to 5.6 times longer than broad and constituting 29.3 to 34.2 percent of entire length of carapace. First three pairs of pereopods without conspicuous brush of plumose setae extending from basis to merus. Simple hooks on ischia of fourth pereopods, absent on third. Coxa of fourth pereopod with caudally subacute caudomesial boss directed in longitudinal plane of body. First pleopod reaching, or almost reaching, coxa of second pereopod, slightly asymmetrical, with prominent proximomedian lobe, lacking proximomesial spur; cephalic surface with subangular shoulder at base of cephalic process; subapical setae present. Terminal elements of first pleopod consisting of subacute mesial process directed distolaterally beyond other terminal elements; cephalically situated, distally rounded cephalic process; central projection consisting of broad subrectangular, almost bladeliike, centrocaudal process and narrower centrocephalic process; and caudal element represented by ridge around caudal base of centrocephalic process. Mesial ramus of uropod with median spine extending distinctly beyond distal margin of ramus.

TYPE-SPECIES.—*Procambarus fitzpatricki* Hobbs, 1971:461.

GENDER.—Feminine.

LIST OF SPECIES.—Monotypic, *Procambarus (Acucauda) fitzpatricki* Hobbs, 1971.

ETYMOLOGY.—*Acus* (L. = needle) + *Cauda* (L. = tail), signifying the long median spine on the distal margin of the mesial ramus of the uropod.

*Austrocambarus*, new subgenus

(FIGURES 2b, 5, 20a)

Subgenus *Cambarus* Ortmann, 1905a:97 (part).Subgenus *Procambarus* Ortmann, 1905c:437 (part).

DIAGNOSIS.—Body pigmented or albinistic; eyes well developed or with pigment much reduced. Rostrum with or without marginal spines or tubercles, always lacking median carina. Carapace with two, one, or no cervical spines. Areola obliterated at midlength or as wide as 2.1 times longer than broad and constituting 24 to 37 percent of entire length of carapace. First three pairs of pereopods without conspicuous brush of setae extending distally from basis (merus sometimes with weak brush). Simple hooks on ischia of third pereopods, absent on fourth. Coxa of fourth pereopod without caudomesial boss. First pleopod reaching coxa of third pereopod, symmetrical, with or without weak proximomedian lobe but sometimes with small proximomesial spur; cephalic surface with angular or rounded shoulder proximal to bases of terminal elements; subapical setae absent. Terminal

elements of first pleopod consisting of distally or laterodistally directed simple-acute or lanceolate mesial process; cephalically or cephalodistally inclined acute or bladelike central projection; vestigial cephalic process rarely present at cephalomesial base of central projection; and caudal element, although sometimes absent or vestigial, usually represented by variously shaped caudal knob sometimes supporting small dentiform or tuberculiform caudal process. Mesial ramus of uropod with median spine acute or reduced to tubercle but never extending beyond distal margin of ramus.

TYPE-SPECIES.—*Procambarus vazquezae* Villalobos, 1954:328.

GENDER.—Masculine.

LIST OF SPECIES.—Mexicanus Group (those species lacking or possessing one cervical spine, having no infraorbital spines, and with first pleopod lacking prominent bulbous enlargement between level of shoulder and base of central projection, and its mesial lamella not protruding caudally): *Procambarus (Austrocambarus) aztecus* (Saussure, 1857); *P. (A.) mexicanus* (Erichson, 1846); *P. (A.) mirandai* Villalobos, 1954; *P. (A.) rodriguezi* Hobbs, 1943; *P. (A.) ruthveni ruthveni* (Pearse, 1911); *P. (A.) ruthveni zapoapensis* Villalobos, 1954; *P. (A.) vazquezae* Villalobos, 1954; *P. (A.) veracruzanus* Villalobos, 1954.

Pilosimanus Group (those species possessing two or more cervical spines and at least one infraorbital spine): *Procambarus (Austrocambarus) acanthophorus* Villalobos, 1948; *P. (A.) llamas* Villalobos, 1954; *P. (A.) pilosimanus* (Ortmann, 1906); *P. (A.) williamsoni* (Ortmann, 1905c†).

Cubensis Group (those species lacking or possessing only one cervical spine, having no infraorbital spines, and with first pleopod bearing prominent bulbous enlargement between level of shoulder and base of central projection and its mesial lamella protruding caudally beyond principal shaft of appendage): *Procambarus (Austrocambarus) atkinsoni* (Ortmann, 1913); *P. (A.) cubensis cubensis* (Erichson, 1846); *P. (A.) cubensis rivalis* (Faxon, 1912); *P. (A.) niveus* Hobbs and Villalobos, 1964.

ETYMOLOGY.—*Auster* (L. = south) in combination with the generic name *Cambarus*, referring to their occupying the southernmost area of the range of the members of the family Astacidae.

### *Capillicambarus*, new subgenus

(FIGURES 1n, 2c, 6, 20d)

Subgenus *Cambarus* Ortmann, 1905b:401 (part).

Subgenus *Ortmannicus* Fowler, 1912:341 (part).

DIAGNOSIS.—Body and eyes pigmented, latter well developed. Rostrum with or without small marginal tubercles, lacking median carina. Carapace with or without single cervical spine. Areola 2.5 to 4.0 times longer than broad and constituting 29 to 35 percent of entire length of carapace. First three pairs of pereiopods with conspicuous brush of plumose setae extending from basis to at least proximal part of merus. Simple hooks on ischia of third and fourth pereiopods. Coxa of fourth pereiopod with caudomesial boss. First pleopod reaching coxa of third pereiopod, symmetrical, without proximomesial lobe, with prominent proximomesial spur; cephalic surface without shoulder; subapical setae absent. Terminal elements of first pleopod comprising caudally or caudo-distally directed mesial process; small cephalic process present or not, if so, situated on mesial surface caudal to central projection; cephalically located central projection directed distally or caudally; caudal element lacking. Mesial ramus of uropod with median spine acute or reduced to tubercle but never extending beyond distal margin of ramus.

TYPE-SPECIES.—*Cambarus (Cambarus) hinei* Ortmann, 1905b:401.

GENDER.—Masculine.

LIST OF SPECIES.—*Procambarus (Capillicambarus) hinei* (Ortmann, 1905); *P. (C.) incilis* Penn, 1962.

ETYMOLOGY.—*Capillus* (L. = hair) in combination with the generic name, *Cambarus*, alluding to the abundant setation of the gnathal appendages and anterior pereiopods.

### Subgenus *Girardiella* Lyle

(FIGURES 1k, 2d, 7, 20b)

Subgenus *Cambarus* Ortmann, 1905a:97 (part).

Subgenus *Ortmannicus* Fowler, 1912:341 (part).

Subgenus *Girardiella* Lyle, 1938:76.

DIAGNOSIS.—Body and eyes pigmented, latter often small but well developed. Rostrum rarely with small marginal tubercles, lacking spines and median carina.

Carapace without cervical spines, occasionally represented by small tubercles. Areola obliterated at midlength or as wide as 7.5 times longer than broad and constituting 34 to 42 percent (usually more than 36) of entire length of carapace. First three pairs of pereiopods without conspicuous brush of setae extending from basis to merus. Simple hooks on ischia of third pereiopods, absent on fourth. Coxa of fourth pereiopod without caudomesial boss. First pleopods reaching coxa of third pereiopod, symmetrical, with prominent proximomedian lobe, usually with proximomesial spur; prominent shoulder on cephalic surface at cephalic base of terminal elements; subapical setae absent. Terminal elements of first pleopod consisting of distally or caudodistally directed, subspiculi-form mesial process usually extending beyond other terminal elements; cephalomesially situated acute or subacute cephalic process (absent in *Procambarus hagenianus*); caudolaterally placed, usually somewhat compressed, caudal process; and prominent, centrally located, bladellike central projection. Mesial ramus of uropod with median spine extending beyond distal margin of ramus only in *P. hagenianus*.

TYPE-SPECIES.—*Cambarus hagenianus* Faxon, 1884:141; by monotypy. (The subspecies listed by Lyle (1938:76) are nomina nuda.)

LIST OF SPECIES.—*Procambarus (Girardiella) gracilis* (Bundy, 1876); *P. (G.) hagenianus* (Faxon, 1884); *P. (G.) simulans simulans* (Faxon, 1884); *P. (G.) simulans regiomontanus* Villalobos, 1954; *P. (G.) tulaneii* Penn, 1953.

### *Hagenides*, new subgenus

(FIGURES 2e, 8, 20b)

Subgenus *Cambarus* Ortmann, 1905a:97 (part).

Subgenus *Ortmannicus* Fowler, 1912:341 (part).

DIAGNOSIS.—Body and eyes pigmented, latter usually small but well developed. Rostrum without marginal spines, tubercles, or median carina. Carapace without cervical spines. Areola very narrow or obliterated at midlength, or as wide as 32 times longer than broad, and constituting 33 to 42 percent of entire length of carapace. First three pairs of pereiopods without conspicuous brush of setae extending from basis to merus. Simple hooks on ischia of third or third and fourth pereiopods, latter only in *Procambarus geodytes*. Coxa of fourth pereiopod with

caudomesial boss. First pleopod reaching coxa of second pereiopod, asymmetrical, with proximomedian lobe, without proximomesial spur; cephalic surface without shoulder; subapical setae absent. Terminal elements of first pleopod represented by distally to caudally directed, acute, usually long mesial process; prominent beaklike or broad platelike central projection; cephalic process rarely well developed, often vestigial or lacking; and caudal elements usually consisting of prominent caudal knob although much reduced in *Procambarus pygmaeus*. Mesial ramus of uropod with median spine acute or reduced to tubercle but never extending beyond distal margin of ramus.

TYPE-SPECIES.—*Astacus advena* LeConte, 1856:402.

GENDER.—Masculine.

LIST OF SPECIES.—Advena Group (those species with first pleopod bearing acute central projection directed caudodistally or caudally, and with caudal knob, if evident, never fingerlike): *Procambarus (Hagenides) advena* (LeConte, 1856); *P. (H.) geodytes* Hobbs, 1942; *P. (H.) pygmaeus* Hobbs, 1942; *P. (H.) truculentus* Hobbs, 1954.

Rogersi Group (those species with first pleopod bearing platelike central projection directed distolaterally or obliquely, and with prominent finger- or thumblike caudal knob): *Procambarus (Hagenides) rogersi rogersi* (Hobbs, 1938); *P. (H.) rogersi campestris* Hobbs, 1942; *P. (H.) rogersi expletus* Hobbs and Hart, 1959; *P. (H.) rogersi ochlocknensis* Hobbs, 1942.

ETYMOLOGY.—Named in honor of Hermann A. Hagen whose monograph of the North American Astacidae (1870) constituted the first adequate summary of our knowledge of the crayfishes of North America.

### *Leonticambarus*, new subgenus

(FIGURES 1m, 2f, 9, 20d)

Subgenus *Cambarus* Ortmann, 1905a:97 (part).

Subgenus *Ortmannicus* Fowler, 1912:341 (part).

DIAGNOSIS.—Body with or without pigment; eyes usually well developed, pigmented area much reduced in *P. milleri*. Rostrum with or without marginal spines or tubercles, lacking median carina. Carapace with, or more often without, cervical spines.

Areola 2.5 to 13 times longer than broad and constituting 27 to 36 percent of entire length of carapace. First three pairs of pereopods without conspicuous brush of setae extending from basis to merus. Usually simple, occasionally bituberculate, hooks present on ischia of third or third and fourth pereopods. Coxa with well developed, occasionally weakly developed, caudomesial boss. First pleopod reaching coxa of third, rarely second, pereopod, asymmetrical, with or without proximomedian lobe, sometimes with proximomesial spur; setiferous shoulder, rounded knob, or slope present on cephalic surface at base of terminal elements; subapical setae disposed as just indicated. Terminal elements of first pleopod consisting of caudodistally to cephalodistally directed, slender or massive mesial process; cephalomesially situated, usually small, rounded or acute cephalic process; prominent caudal knob or process; and usually small dentiform central projection. Mesial ramus of uropod with median spine acute or reduced to tubercle but never extending beyond distal margin of ramus.

TYPE-SPECIES.—*Cambarus barbatus* Faxon, 1890: 621.

GENDER.—Masculine.

LIST OF SPECIES.—Barbatus Group (those species possessing massive, or slender, curved or straight mesial process on first pleopod): *Procambarus* (*Leconticambarus*) *apalachicola* Hobbs, 1942; *P. (L.) barbatus* (Faxon, 1890); *P. (L.) capillatus* Hobbs, 1971; *P. (L.) econfinae* Hobbs, 1942; *P. (L.) escambiensis* Hobbs, 1942; *P. (L.) hubbelli* (Hobbs, 1940); *P. (L.) kilbyi* (Hobbs, 1940); *P. (L.) latipleurum* Hobbs, 1942; *P. (L.) pubischelae* Hobbs, 1942; *P. (L.) rathbunae* (Hobbs, 1940); *P. (L.) shermani* Hobbs, 1942.

Alleni Group (those species possessing spiculiform, sinuous mesial process on first pleopod): *Procambarus* (*Leconticambarus*) *alleni* (Faxon, 1884); *P. (L.) milleri* Hobbs, 1971.

ETYMOLOGY.—Named in honor of John LeConte, who, in 1856, described the first crayfishes from the area frequented by members of this subgenus.

#### *Lonnbergius*, new subgenus

(FIGURES 2g, 10, 20e)

Subgenus *Cambarus* Ortmann, 1905a:97 (part).

Subgenus *Ortmannicus* Fowler, 1912:341 (part).

DIAGNOSIS.—Albinistic; eyes reduced and without pigment. Rostrum with marginal spines or tubercles, lacking median carina. Carapace without cervical spines. Areola 14 to 16 times longer than broad and constituting 41 to 43 percent of entire length of carapace. First three pairs of pereopods without conspicuous brush of setae extending from basis to merus. Bituberculate hooks on ischia of third and fourth pereopods. Coxa of fourth pereopod with prominent, vertically disposed caudomesial boss. First pleopod reaching coxa of third pereopod, symmetrical, with proximomedian lobe and without proximomesial spur; no shoulder on cephalic surface; subapical setae lacking. Terminal elements of first pleopod comprising mesial process (not reaching distally nearly so far as other terminal elements); cephalic process rudimentary or absent; caudal process prominent, flanked by protuberances on ridge of caudal knob; and central projection very prominent, subacute, and directed distally. (Mesial lamella, joining mesial process and vestigial cephalic process, much shorter than in other members of genus, exposing much of median lamella between caudal process and centrocaudal process.) Mesial ramus of uropod with median spine acute but never reaching distal margin of ramus.

TYPE-SPECIES.—*Cambarus acherontis* Lönnberg, 1895:6.

GENDER.—Masculine.

LIST OF SPECIES.—Monotypic, *Procambarus* (*Lonnbergius*) *acherontis* (Lönnberg, 1895).

ETYMOLOGY.—Named in honor of Einar Lönnberg, who described the only known member of the subgenus.

#### *Mexicambarus*, new subgenus

(FIGURES 2h, 11, 20a)

Subgenus *Cambarus* Ortmann, 1909:159 (part).

Subgenus *Ortmannicus* Fowler, 1912:341 (part).

DIAGNOSIS.—Body and eyes pigmented, latter well developed. Rostrum without marginal spines, tubercles, or median carina. Carapace without cervical spines. Areola 6 to 11 times longer than broad and constituting 29 to 32 percent of entire length of carapace. First three pairs of pereopods without conspicuous brush of setae extending from basis to merus. Simple hooks on ischia of third pereopods, absent on fourth. Coxa of fourth pereopod without caudo-

mesial boss. First pleopod reaching coxa of second pereopod, symmetrical, with proximomedian lobe somewhat laterally situated, proximomesial spur tuberculiform; shoulder absent from cephalic surface; subapical setae lacking. Terminal elements of first pleopod consisting of small, acute caudodistally directed mesial process; very prominent, corneous, curved, lamelliform cephalic process; caudolaterally situated caudal knob at level proximal to other terminal elements; and small central projection at caudolateral base of cephalic process. Mesial ramus of uropod with median spine never extending beyond margin of ramus.

TYPE-SPECIES.—*Cambarus (Cambarus) bouvieri* Ortmann, 1909:159.

GENDER.—Masculine.

LIST OF SPECIES.—Monotypic, *Procambarus (Mexicambarus) bouvieri* (Ortmann, 1909).

ETYMOLOGY.—Prefix of Mexico combined with the generic name, *Cambarus*; of the four peculiarly Mexican subgenera, *Mexicambarus*, *Paracambarus*, *Procambarus*, and *Villalobosus*, its affinities with members of the other subgenera seem most remote.

### Subgenus *Ortmannicus* Fowler

(FIGURE 2i, 12, 20a)

Subgenus *Cambarus* Ortmann, 1905a:97 (part) [not *Cambarus* Erichson, 1846:95].

Subgenus *Ortmannicus* Fowler, 1912:341 (part).

DIAGNOSIS.—Body pigmented or albinistic, eyes with or without pigment, reduced or well developed. Rostrum with or without marginal spines, tubercles, and median carina. Carapace with or without one cervical spine. Areola obliterated or as wide as 2.9 times longer than broad and constituting 25 to 43 percent of entire length of carapace. First three pairs of pereopods without conspicuous brush of setae extending from basis to merus. Simple hooks on ischia of third and fourth pereopods, those on fourth sometimes bituberculate. Coxa of fourth pereopod with bulbous or subangular caudomesial boss. First pleopod reaching coxa of third pereopod, almost always asymmetrical, lacking or with weak proximomedian lobe and seldom bearing proximomesial spur; shoulder on cephalic surface usually absent, if present, shoulder on right pleopod never folded caudally against mesial surface of mesial lamella of pleopod; subapical setae

usually present (absent in *Procambarus bivittatus*, *P. hybus*, *P. jaculus*, and *P. lewisi*). Terminal elements of first pleopod including subspiculiform to sublanceolate mesial process directed caudally, caudodistally or distally and usually somewhat laterally; setiform, hoodlike, or bladelike cephalic process (absent in *P. mancus* and in some populations of *P. viaeviridis*) situated cephalic, mesial, or lateral to central projection, and directed caudally, caudodistally, or distally; caudal process and/or caudal knob usually present (both absent in *P. tolteca*), sometimes vestigial (caudal process bladelike to knoblike, always situated caudally, caudomesially, or caudolaterally; caudal knob highly variable in size and form, varying in position from caudal surface laterally to cephalic surface); and central projection massive to minute, beaklike or bladelike to dentiform, and directed caudally, caudodistally, or distally. Mesial ramus of uropod with median spine often reduced and never extending beyond margin of ramus.

TYPE-SPECIES.—*Astacus blandingii* Harlan, 1830:464; designated by Ortmann, 1905a:97.

LIST OF SPECIES.—Blandingii Group (for diagnosis, see Hobbs, 1962:286.): *Procambarus (Ortmannicus) acutissimus* (Girard, 1852); *P. (O.) acutus acutus* (Girard, 1852); *P. (O.) acutus cuevachicae* (Hobbs, 1941); *P. (O.) blandingii* (Harlan, 1830); *P. (O.) caballeroi* Villalobos, 1944; *P. (O.) hayi* (Faxon, 1884); *P. (O.) lecontei* (Hagen, 1870); *P. (O.) lophotus* Hobbs and Walton, 1960; *P. (O.) texanus* Hobbs, 1971; *P. (O.) verrucosus* Hobbs, 1952; *P. (O.) viaeviridis* (Faxon, 1914).

Pictus Group (for diagnosis, see Hobbs, 1962:283): *Procambarus (Ortmannicus) angustatus* (LeConte, 1856); *P. (O.) chacei* Hobbs, 1958; *P. (O.) enoblosternum* Hobbs, 1947; *P. (O.) epicyrus* Hobbs, 1958; *P. (O.) hirsutus* Hobbs, 1958; *P. (O.) lepidodactylus* Hobbs, 1947; *P. (O.) litosternum* Hobbs, 1947; *P. (O.) pictus* (Hobbs, 1940); *P. (O.) pubescens* (Faxon, 1884); *P. (O.) youngi* Hobbs, 1942.

Seminolae Group (for diagnosis, see Hobbs, 1962:284): *Procambarus (Ortmannicus) ancylus* Hobbs, 1958; *P. (O.) fallax* (Hagen, 1870); *P. (O.) leonensis* Hobbs, 1942; *P. (O.) lunzi* (Hobbs, 1940); *P. (O.) pycnogonopodus* Hobbs, 1942; *P. (O.) seminolae* Hobbs, 1942.

Lucifugus Group (for diagnosis, see Hobbs, 1962:285): *Procambarus (Ortmannicus) lucifugus* luci-

*fugus* (Hobbs, 1940); *P. (O.) lucifugus alachua* (Hobbs, 1940); *P. (O.) pallidus* (Hobbs, 1940).

Planirostris Group (for diagnosis, see Hobbs, 1962: 288): *Procambarus (Ortmannicus) evermanni* (Faxon, 1890); *P. (O.) hybus* Hobbs and Walton, 1957; *P. (O.) jaculus* Hobbs and Walton, 1957; *P. (O.) mancus* Hobbs and Walton, 1957; *P. (O.) pearsei pearsei* (Creaser, 1934); *P. (O.) pearsei plumimanus* Hobbs and Walton, 1958; *P. (O.) planirostris* Penn, 1953.

Disjunct Species: *Procambarus (Ortmannicus) bivittatus* Hobbs, 1942; *P. (O.) gonopodocristatus* Villalobos, 1958; *P. (O.) lewisi* Hobbs and Walton, 1959; *P. (O.) tolteca* Hobbs, 1943; *P. (O.) villalobosi* Hobbs, 1969.

#### Subgenus *Paracambarus* Ortmann

(FIGURES 2j, 13, 20a)

Subgenus *Paracambarus* Ortmann, 1906: 1.

Genus *Paracambarus*.—Hobbs, 1942a: 344.

DIAGNOSIS.—Body and eyes pigmented, latter well developed. Rostrum without marginal spines, tubercles, or median carina. Areola 3 to 4 times longer than broad and constituting 31 to 36 percent of entire length of carapace. First three pairs of pereopods without conspicuous brush of setae extending from basis to merus. Simple hooks on ischia of fourth pereopods, absent on third. Coxa of fourth pereopod with prominent simple or bituberculate caudomesial boss. First pleopod reaching coxa of second pereopod, asymmetrical, with proximomedian lobe situated somewhat laterally, without well-defined proximomesial spur; shoulder on cephalic surface poorly developed or lacking; subapical setae absent. Terminal elements of first pleopod consisting of large caudodistally or smaller caudolaterally disposed mesial processes; cephalic process very small or absent; central projection beaklike; caudal element obsolete. Mesial ramus of uropod with median spine never extending beyond margin of ramus.

TYPE-SPECIES.—*Cambarus (Paracambarus) paradoxus* Ortmann, 1906: 3; designated by Ortmann, 1906: 1.

LIST OF SPECIES.—*Procambarus (Paracambarus) ortmanni* (Villalobos, 1949); *P. (P.) paradoxus* (Ortmann, 1906).

#### *Pennides*, new subgenus

(FIGURES 2k, 14, 20e)

Subgenus *Cambarus* Ortmann, 1905a: 97 (part).

Subgenus *Ortmannicus* Fowler, 1912: 341 (part).

DIAGNOSIS.—Body and eyes pigmented, latter well developed. Rostrum with marginal spines, seldom with median carina. Carapace with two or more cervical spines. Areola 3 to 5 times longer than broad and constituting 25 to 29 percent of entire length of carapace. First three pairs of pereopods without conspicuous brush of setae extending from basis to merus. Simple hooks on ischia of third and fourth pereopods. Coxa of fourth pereopod with bulbous or subangular caudomesial boss. First pleopod reaching coxa of third pereopod, asymmetrical, with or without broad, somewhat laterally situated proximomedian lobe, without proximomesial spur; seldom with shoulder on cephalic surface; subapical setae present. Terminal elements of first pleopod with caudally to distally directed, slender, usually acute mesial process; mesially to cephalolaterally situated cephalic process (absent in *Procambarus gibbus*, *P. raneyi*, *P. spiculifer*, and occasionally in *P. ouachitae*); caudal element variable, typically with caudal knob and process, but sometimes reduced, and occasionally lacking process; and central projection subdentiform to almost blade-like. Mesial ramus of uropod with median spine never extending markedly beyond margin of ramus, usually not reaching margin.

TYPE-SPECIES.—*Procambarus natchitochae* Penn, 1953c: 5.

GENDER.—Masculine.

LIST OF SPECIES.—*Procambarus (Pennides) ablusus* Penn, 1963; *P. (P.) dupratzi* Penn, 1953; *P. (P.) echinatus* Hobbs, 1956; *P. (P.) elegans* Hobbs, 1969; *P. (P.) gibbus* Hobbs, 1969; *P. (P.) lagniappe* Black, 1968; *P. (P.) lylei* Fitzpatrick and Hobbs, 1971; *P. (P.) natchitochae* Penn, 1953; *P. (P.) ouachitae* Penn, 1956; *P. (P.) penni* Hobbs, 1951; *P. (P.) raneyi* Hobbs, 1953; *P. (P.) spiculifer* (LeConte, 1856); *P. (P.) suttkusi* Hobbs, 1953; *P. (P.) versutus* (Hagen, 1870); *P. (P.) vioscai* Penn, 1946.

ETYMOLOGY.—Named in honor of my good friend, the late George H. Penn, Jr., who contributed much to our knowledge of the crayfishes of the southern part of the United States and who was in the process

of monographing this species-group at the time of his death.

### Subgenus *Procambarus* Ortmann

(FIGURES 2l, 3a, 15, 20a)

Subgenus *Cambarus* Ortmann, 1905a:97 (part).

Subgenus *Procambarus* Ortmann, 1905c:437 (part).

DIAGNOSIS.—Body and eyes pigmented, latter well developed. Rostrum with marginal spines or tubercles and median carina. Carapace with one cervical spine. Areola 4 to 6 times longer than broad and constituting 30 to 32 percent of entire length of carapace. Second pair of pereiopods with moderately conspicuous brush of setae extending from basis to merus, first and third with brush much reduced. Simple hooks on ischia of third pereiopods, absent on fourth. Coxa of fourth pereiopod without caudomesial boss. First pleopod reaching coxa of third pereiopod, symmetrical, without proximomedian lobe, with proximomesial spur; angular shoulder present on cephalic surface at base of terminal elements; subapical setae lacking. Terminal elements of first pleopod consisting of setiform, distally directed mesial process; lamelliform, mesially situated cephalic process; and very small caudal process contiguous with caudal base of prominent, bladelike central projection. Mesial ramus of uropod with median spine never extending beyond margin of ramus.

TYPE-SPECIES.—*Cambarus digueti* Bouvier, 1897:225; designated by Hobbs, 1942a:341.

LIST OF SPECIES.—Monotypic, *Procambarus (Procambarus) digueti* (Bouvier, 1897).

### *Remoticambarus*, new subgenus

(FIGURES 2m, 16, 20b)

DIAGNOSIS.—Albinistic; eyes without pigment and reduced. Rostrum with marginal spines, lacking median carina. Carapace with one to three cervical spines. Areola 5 to 6.5 times longer than broad and constituting 38 to 43 percent of entire length of carapace. First three pairs of pereiopods without conspicuous brush of setae extending from basis to merus. Simple hooks on ischia of third pereiopods, absent on fourth. Coxa of fourth pereiopod with caudomesial

bulbous boss. First pleopod reaching coxa of third pereiopod, symmetrical, without proximomedian lobe or proximomesial spur; shoulder present on cephalic surface proximal to terminal elements; subapical setae lacking. Terminal elements of first pleopod consisting of heavy, cephalically grooved, distolaterally directed mesial process obscuring, in caudal aspect, acute, cephalodistally directed central projection; cephalic and caudal processes lacking. Mesial ramus of uropod without median spine.

TYPE-SPECIES.—*Procambarus pecki* Hobbs, 1967:2.

GENDER.—Masculine.

LIST OF SPECIES.—Monotypic, *Procambarus (Remoticambarus) pecki* Hobbs, 1967.

ETYMOLOGY.—*Remotus* (L. = distant) in combination with the generic name *Cambarus*, alluding to the apparent distant relationships with other members of the genus.

### *Scapulicambarus*, new subgenus

(FIGURES 2n, 3b, 17, 20c)

Subgenus *Cambarus* Ortmann, 1905a:97 (part).

Subgenus *Ortmannicus* Fowler, 1912:341 (part).

DIAGNOSIS.—Body and eyes pigmented, latter well developed. Rostrum with or without marginal spines or tubercles, lacking median carina. Carapace with or without one cervical spine or tubercle. Areola obliterated or as wide as 7.5 times as long as broad, and constituting 22 to 38 percent of entire length of carapace. First three pairs of pereiopods without conspicuous brush of setae extending from basis to merus. Simple hooks on ischia of third and fourth pereiopods. Coxa of fourth pereiopod with bulbous caudomesial boss. First pleopod reaching coxa of third pereiopod, symmetrical or asymmetrical, with broad, short proximomedian lobe, without proximomesial spur; prominent shoulder on cephalic surface of left pleopod, that on right always folded caudomesially to lie against mesial face of mesial lamella, thus making shoulders asymmetrical; subapical setae present but often sparse. First pleopod with terminal elements consisting of caudodistally directed acute mesial process; cephalically situated acute or lamelliform cephalic process; caudolateral subspatulate caudal process (distinct caudal knob always absent); and small to prominent central projection. Mesial ramus of uropod

with median spine never extending beyond margin of ramus.

TYPE-SPECIES.—*Cambarus paeninsulanus* Faxon, 1914:369.

GENDER.—Masculine.

LIST OF SPECIES.—*Procambarus (Scapularcambarus) clarkii* (Girard, 1852); *P. (S.) howellae* Hobbs, 1952; *P. (S.) okaloosae* Hobbs, 1942; *P. (S.) paeninsulanus* (Faxon, 1914); *P. (S.) troglodytes* (LeConte, 1856).

ETYMOLOGY.—*Scapula* (L. = shoulder-blade) in combination with the generic name *Cambarus*, referring to the peculiar folded shoulder on the right first pleopod of the first form male.

#### *Tenuicambarus*, new subgenus

(FIGURES 2o, 3d, 18, 20d)

DIAGNOSIS.—Body strongly compressed laterally and pigmented; eyes with pigment and well developed. Rostrum without marginal spines, tubercles or median carina. Carapace without cervical spines. Areola 15 to 18 times longer than broad and constituting 35 to 37 percent of entire length of carapace. First three pairs of pereopods without conspicuous brush of setae extending from basis to merus. Simple hooks on ischia of third and fourth pereopods. Coxa of fourth pereopod with very massive caudomesial boss, somewhat compressed in proximodistal axis of podomere and flared. First pleopod of male reaching coxa of third pereopod, symmetrical, with long proximomesial lobe and with small proximomesial spur; shoulder on cephalic surface absent; subapical setae lacking. First pleopod with terminal elements comprising caudally directed, slender, acute mesial process; broad, acute, mesially situated cephalic process; curved scythelike central projection; caudal element lacking. Mesial ramus of uropod with median spine never extending beyond margin of ramus.

TYPE-SPECIES.—*Procambarus tenuis* Hobbs, 1950:194.

GENDER.—Masculine.

LIST OF SPECIES.—Monotypic, *Procambarus (Tenuicambarus) tenuis* Hobbs, 1950.

ETYMOLOGY.—*Tenuis* (L. = thin) in combination with the generic name *Cambarus*, in token of the compressed body of the only member of the subgenus.

#### *Villalobosus*, new subgenus

(FIGURES 2p, 3c, 19, 20a)

DIAGNOSIS.—Body and eyes pigmented, latter well developed. Rostrum without marginal spines or tubercles; median carina present or absent. Carapace without cervical spines. Areola 3 to 37 times longer than broad and constituting 29 to 38 percent of entire length of carapace. First three pairs of pereopods without conspicuous brush of setae extending from basis to merus. Simple or bituberculate hooks on ischia of fourth pereopods, occasionally vestigial ones on ischia of third. Coxa of fourth pereopod with subcylindrical, subacute, caudomesial boss directed distally. First pleopod of first form male reaching coxa of second pereopod, asymmetrical with proximomesial lobe (sometimes displaced laterally); proximomesial spur and shoulder on cephalic surface absent; subapical setae usually absent, present on *Procambarus teziutlanensis*, *P. tlapacoyanensis*, and sparsely in *P. zihuatlensis*. Terminal elements of first pleopod consisting of subspiculiform to massive, short or long mesial process; spiniform, platelike, or vestigial cephalic or cephalomesially situated cephalic process; toothlike to prominent, flared caudal process; and tuberculiform to acute centrally located central projection. Mesial ramus of uropod with median spine sometimes almost obsolete, never extending beyond margin of ramus.

TYPE-SPECIES.—*Paracambarus riojai* [sic] Villalobos, 1944:161.

GENDER.—Masculine.

LIST OF SPECIES.—Erichsoni Group (those species in which caudal process of first pleopod consists of broad curved or flared corneous plate): *Procambarus (Villalobosus) contrerasi* (Creaser, 1931); *P. (V.) erichsoni* Villalobos, 1950; *P. (V.) zihuatlensis* Villalobos, 1950.

Riojai Group (those species in which caudal process of first pleopod never consists of broad curved or flared corneous plate): *Procambarus (Villalobosus) hoffmanni* (Villalobos, 1944); *P. (V.) hortonhobbsi* Villalobos, 1950; *P. (V.) riojai* (Villalobos, 1944); *P. (V.) teziutlanensis* (Villalobos, 1947); *P. (V.) tlapacoyanensis* (Villalobos, 1947).

ETYMOLOGY.—Named in honor of Alejandro Villalobos F., whose detailed study of the crayfishes of Mexico will remain a classic for that faunal region.

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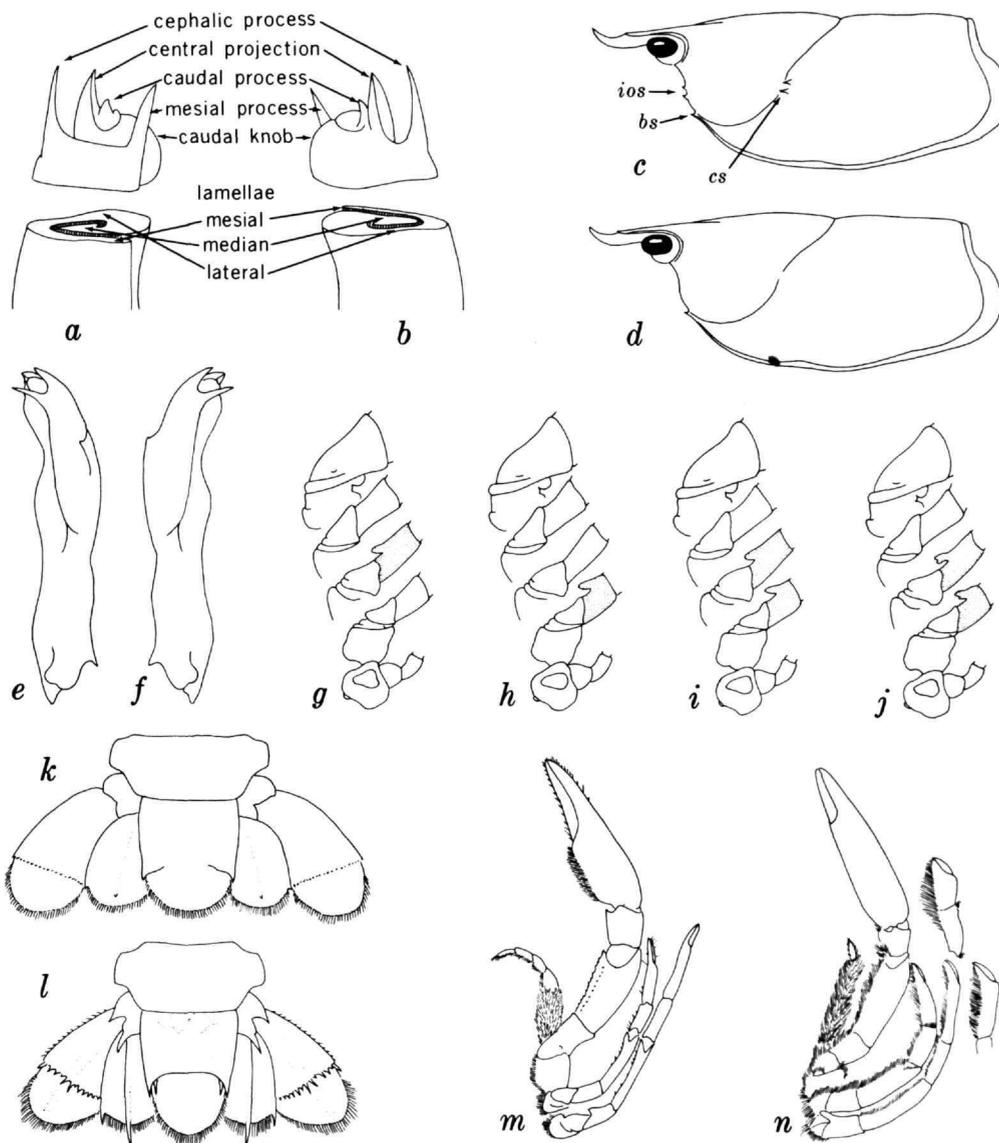


FIGURE 1.—Characters utilized in distinguishing between the subgenera of the genus *Procambarus*: a, mesial view of hypothetical first pleopod of first form male; b, lateral view of same; c, lateral view of carapace showing two cervical spines [ios, infraorbital spines; bs, branchiostegal spine; cs, cervical spines]; d, lateral view of carapace showing no cervical spines; e, caudo-mesial view of first right pleopod of first form male with shoulder folded caudally against surface of mesial lamella [*P. (Scapulicambarus) paeninsulanus*]; f, caudomesial view of first left pleopod of first form male with shoulder extending cephalically [same]; g-j, ventral view of basal podomeres of pereopods showing variation in number and form of hooks on ischia (stippled) of third and fourth; k, l, dorsal view of sixth abdominal segment, telson, and uropods [k, *P. (Girardiella) gracilis*; l, *P. (Acucauda) fitzpatricki*]; m, n, ventral view of third maxillipeds and first three pereopods [m, *P. (Leonticambarus) barbatus*; n, *P. (Capillicambarus) hinei*].

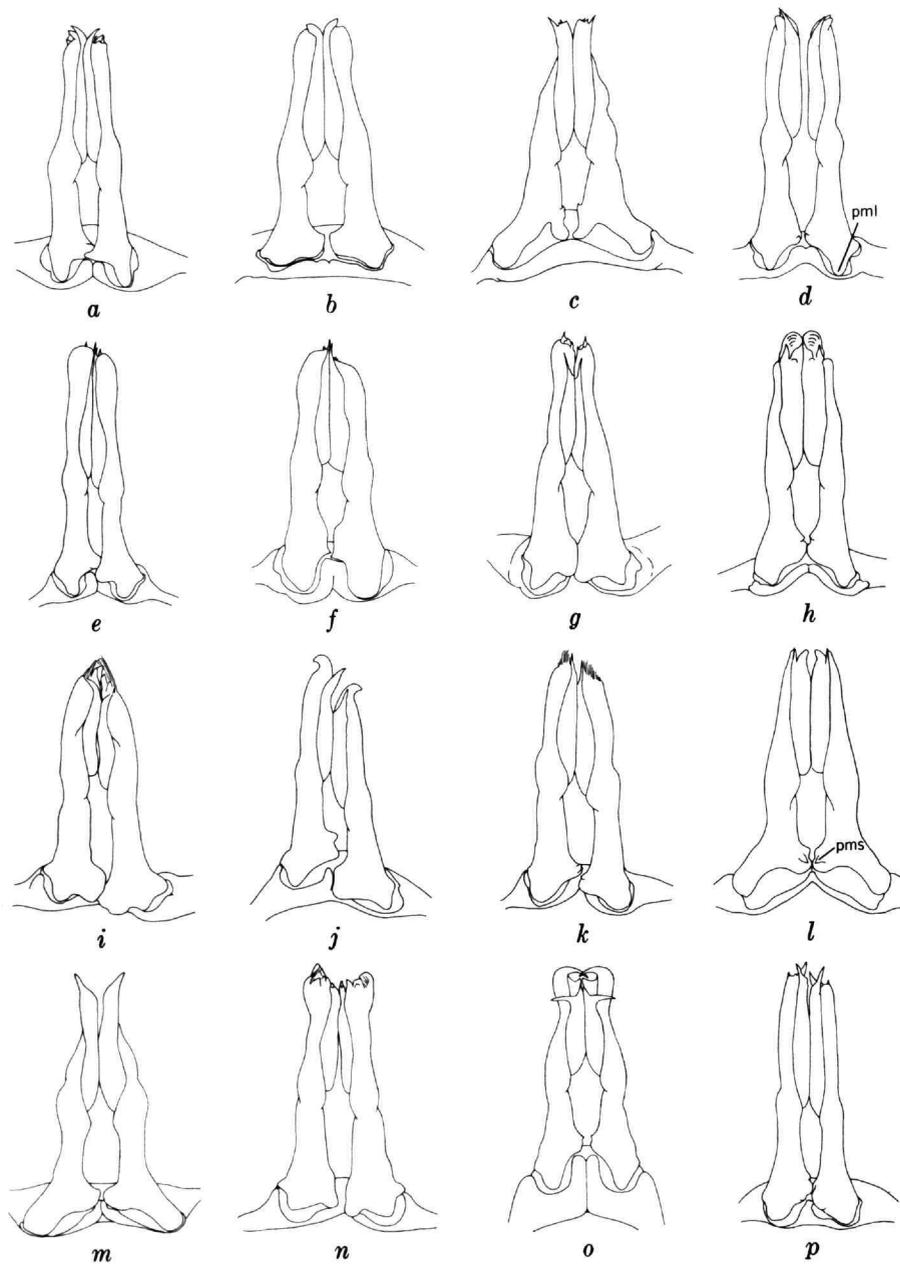


FIGURE 2.—Caudal views of first pleopods of first form males of the type-species of the subgenera of the genus *Procambarus*: a, *P. (Acucauda) fitzpatricki*; b, *P. (Austrocambarus) vazquezae*; c, *P. (Capillicambarus) hinei*; d, *P. (Girardiella) hagenianus* [pml, proximomedian lobe]; e, *P. (Hagenides) advena*; f, *P. (Leonticambarus) barbatus*; g, *P. (Lonnergius) acherontis*; h, *P. (Mexicambarus) bouvieri*; i, *P. (Ortmannicus) blandingi*; j, *P. (Paracambarus) paradoxus*; k, *P. (Pennides) natchitochae*; l, *P. (Procambarus) digueti* [pms, proximomesial spur]; m, *P. (Remoticambarus) pecki*; n, *P. (Scapulicambarus) paeninsulanus*; o, *P. (Tenuicambarus) tenuis*; p, *P. (Villalobosus) riojai*.

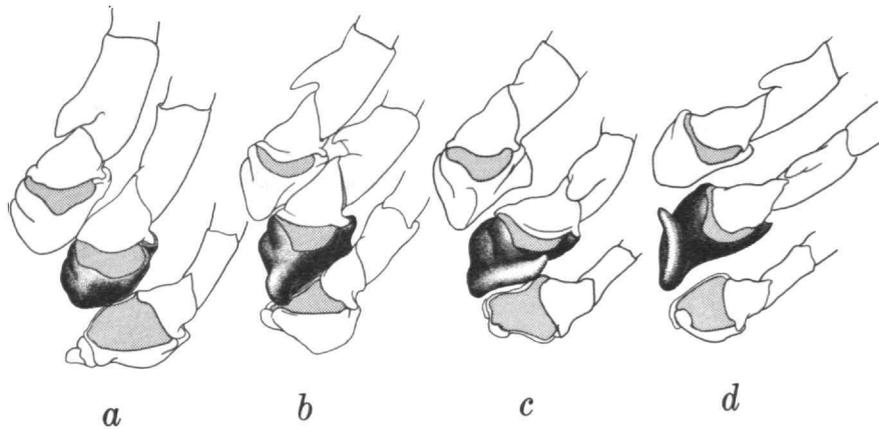
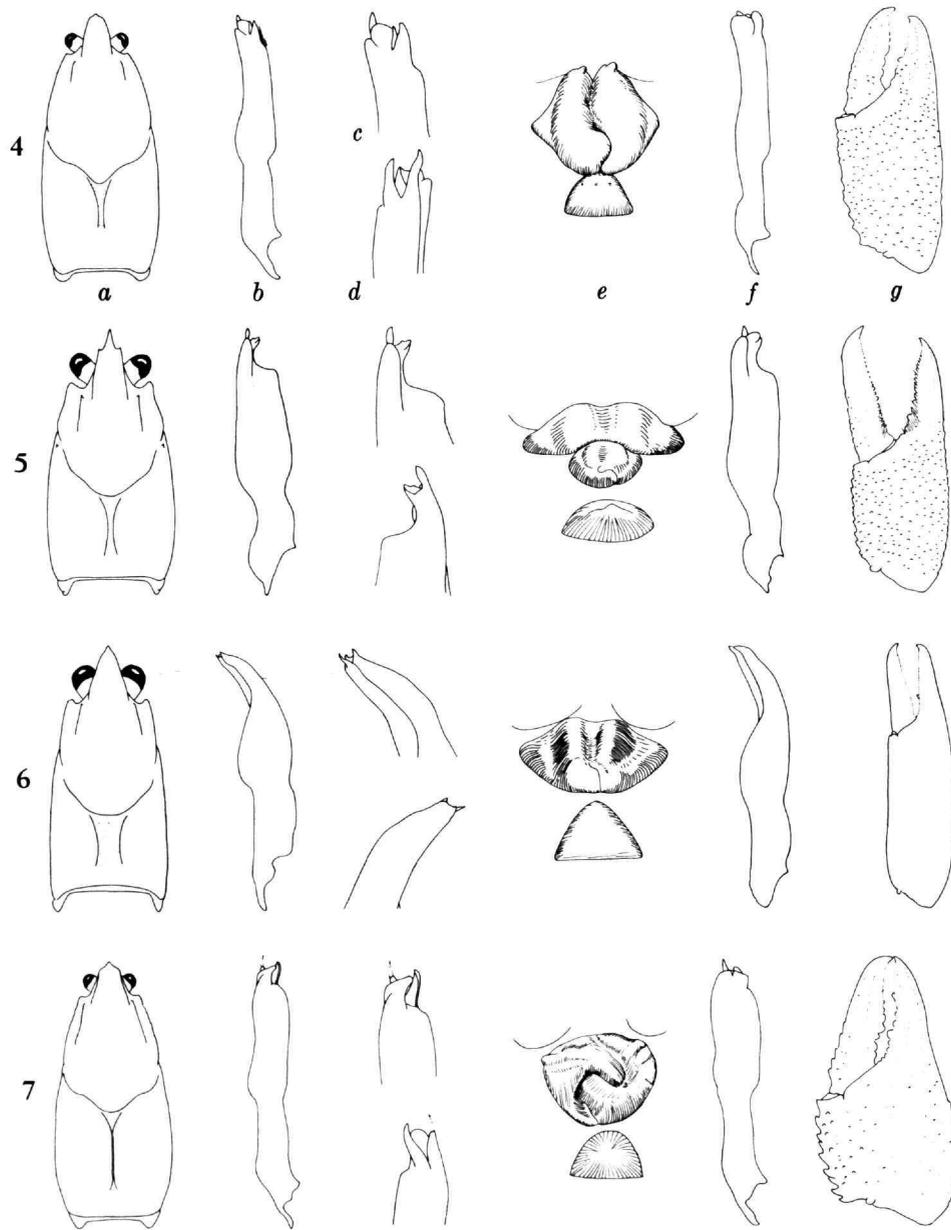
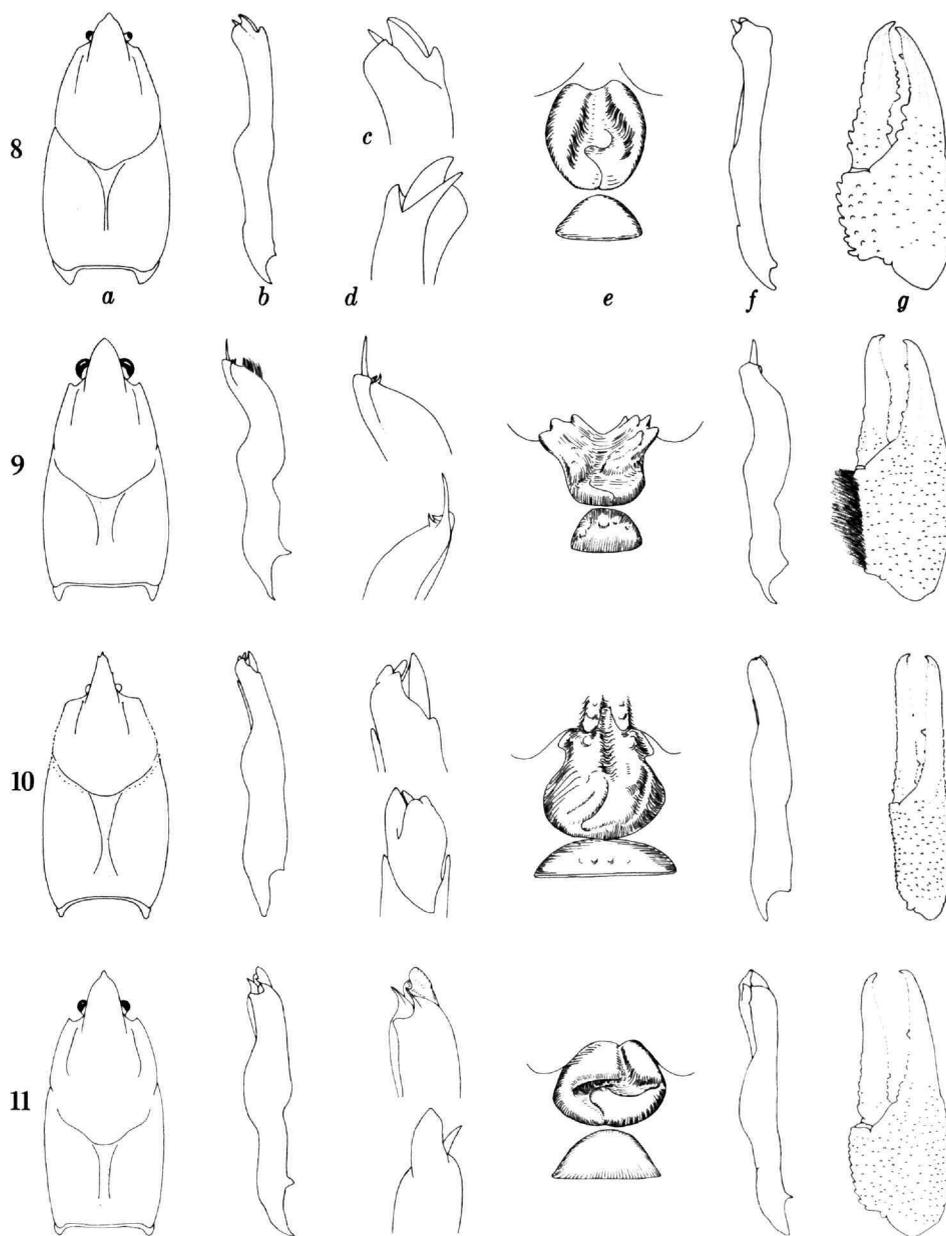


FIGURE 3.—Ventral views of basal podomeres of third, fourth, and fifth pereiopods of *Procambarus* showing certain variations in the coxa (shaded) of the fourth: *a*, *P. (Procambarus) digueti*, lacking a caudomesial boss; *b*, *P. (Scapulicambarus) paeninsulanus*, with bulbiform caudomesial boss; *c*, *P. (Villalobosus) riojai*, with acute caudomesial boss directed distally; *d*, *P. (Tenuicambarus) tenuis*, with compressed caudomesial boss directed in longitudinal axis of body. (Broad articular membranes in flat tone.)



FIGURES 4-7.—Type-species of the subgenera of *Procambarus* (4, *Procambarus (Acucauda) fitzpatricki* Hobbs; 5, *Procambarus (Austrocambarus) vazquezae* Villalobos; 6, *Procambarus (Capillicambarus) hinei* (Ortmann); 7, *Procambarus (Girardiella) hagenianus* (Faxon)): a, dorsal view of carapace; b, lateral view of first left pleopod of first form male; c, lateral view of distal portion of first left pleopod of first form male (subapical setae, if present, removed); d, mesial view of distal portion of first left pleopod of first form male; e, annulus ventralis of female; f, lateral view of first left pleopod of second form male; g, dorsal view of chela of first form male.



FIGURES 8-11.—Type-species of the subgenera of *Procambarus* (8, *Procambarus* (*Hagenides*) *advena* (LeConte); 9, *Procambarus* (*Leonticambarus*) *barbatus* (Faxon); 10, *Procambarus* (*Lonnbergius*) *acherontis* (Lönnerberg); 11, *Procambarus* (*Mexicambarus*) *bouvieri* (Ortmann)): *a*, dorsal view of carapace; *b*, lateral view of first left pleopod of first form male; *c*, lateral view of distal portion of first left pleopod of first form male (subapical setae, if present, removed); *d*, mesial view of distal portion of first left pleopod of first form male; *e*, annulus ventralis of female; *f*, lateral view of first left pleopod of second form male; *g*, dorsal view of chela of first form male.

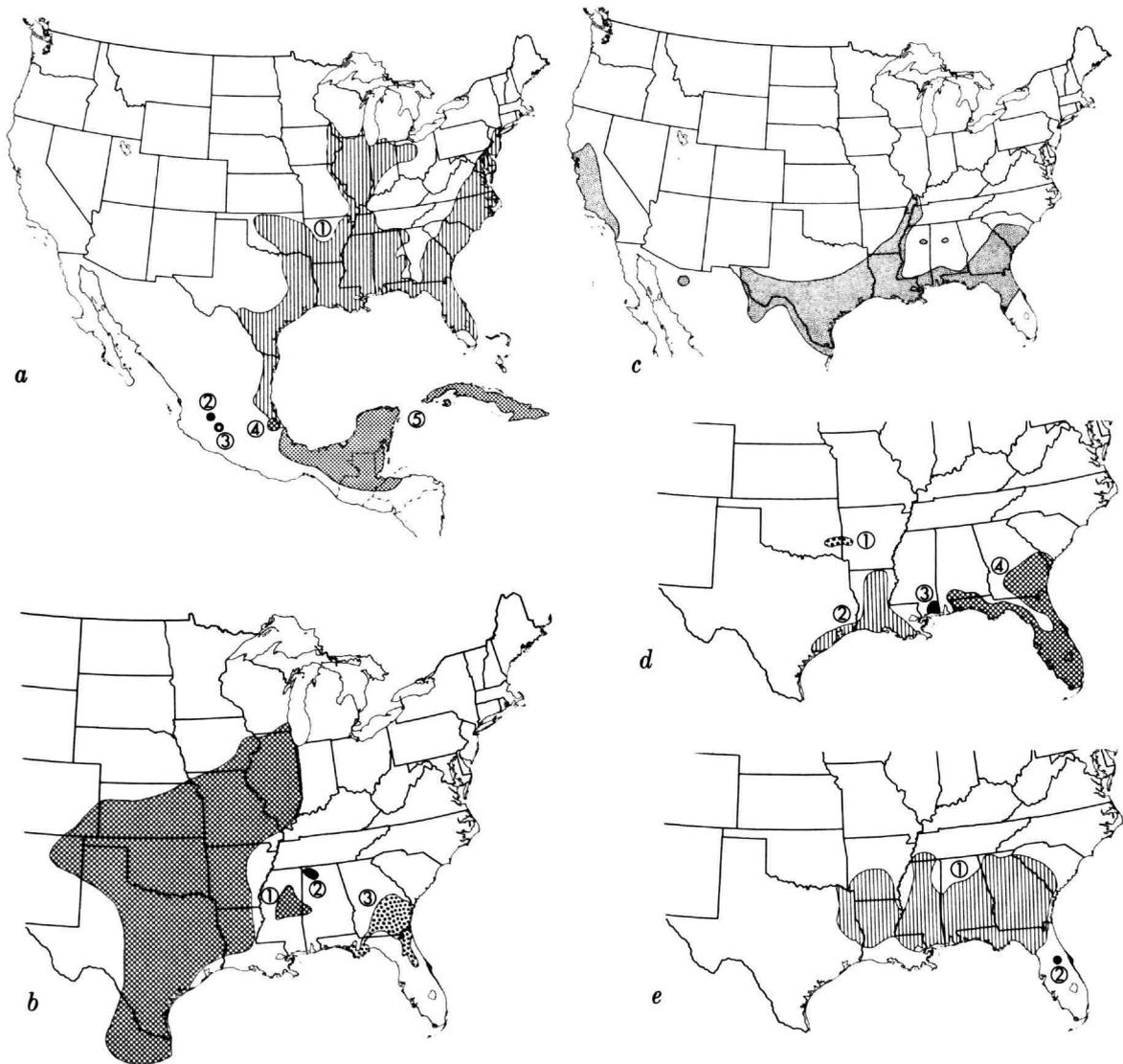


FIGURE 20.—Ranges of the subgenera of the genus *Procambarus*: a, 1: *Ortmannicus*; 2: *Procambarus*; 3: *Mexicambarus*; 4: *Paracambarus* and *Villalobosus*; 5: *Austrocambarus*; b, 1: *Girardiella*; 2: *Remoticambarus*; 3: *Hagenides*; c, *Scapulicambarus*; d, 1: *Tenuicambarus*; 2: *Capillicambarus*; 3: *Acucauda*; 4: *Leonticambarus*; e, 1: *Pennides*; 2: *Lonnerbergius*.

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