

AN ILLUSTRATED KEY TO THE CRAWFISHES OF LOUISIANA WITH A SUMMARY OF THEIR DISTRIBUTION WITHIN THE STATE

(DECAPODA, ASTACIDAE)¹

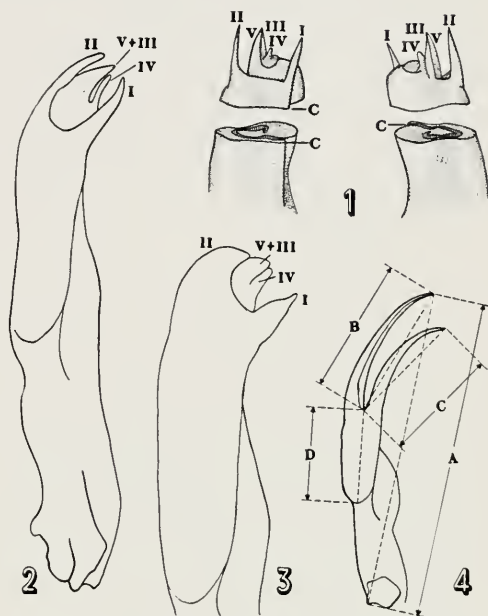
GEORGE HENRY PENN,

Department of Zoology, Tulane University,
New Orleans, Louisiana

In 1940 the writer began a study of the crawfishes of Louisiana. Since that date he has collected in all parts of the State (Map 1) and examined over 20,000 specimens, about a third of which are currently in museum collections. A number of papers on this group of our fauna have been published. Four of these (Penn, 1950b, 1952a, 1956; Penn and Marlow, 1959) summarized in detail what was known at the time of the taxonomy, geographical and ecological distribution, and life history of each of the species of the four genera represented in the State. In the present contribution my purpose is to give a key that will be useful to any zoologist in identifying the 29 species and subspecies known to be present in Louisiana, and to bring the geographic data up-to-date.

TAXONOMIC CHARACTERS

In general, crawfishes of the subfamily Cambarinae (as defined by Hobbs, 1942a) are identified primarily on the basis of the structure of the first pleopods (or, swimmerets) of the adult males. Other superficial morphological characters of the males and females may be useful, but are of secondary importance. Adult males crawfishes exhibit two distinctly different and alternating external appearances; these are referred to as Form I and II (or, first and second form) males. Form is related directly to the seasonal reproductive cycle: males of Form I are capable of copulation, those of Form II (and juveniles) are not. A Form I male may be distinguished by the sharper appearance and corneous (yellowish) condition of one or more of the apical elements of the first pleopods (figs. 1, 2) and the presence of prominent hooks on the

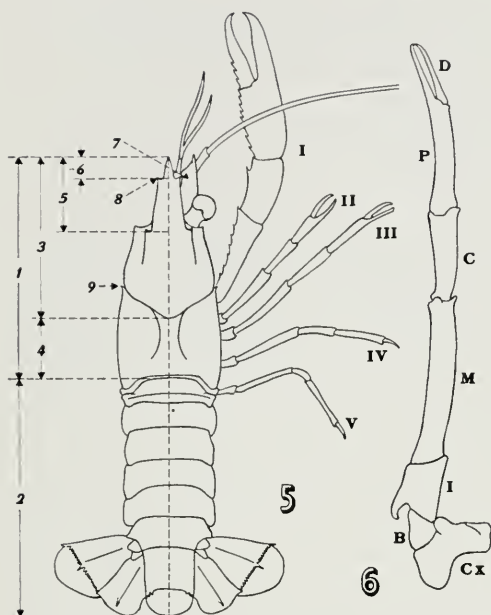


Figures 1-4. First pleopod of male crawfishes. 1. Hypothetical first pleopod: I = mesial process, II = cephalic process, III = centrocaudal process, IV = caudal process, III-V = central projection, C = caudomesial margin (after Hobbs, 1942). 2. Mesial view of first pleopod of form I male of *Procambarus blandingi acutus*. 3. Mesial view of first pleopod of form II male of *P. b. acutus*. 4. Mesial view of first pleopod of form I male of *Orconectes palmeri longimanus*: A = total length, B = length of central projection, C = length of mesial process, D = length of distal mesial shaft.

ischiopodites of one or more pairs of the pereopods (or, walking legs) (fig. 6-1). Form II males have blunter apical elements on the first pleopods (fig. 3) and have the hooks of the ischiopodites less well-developed.

Although there are considerable differences in the shapes and proportions of the apical parts of the first pleopods of the different species, the pleopods have been homologized with a four-parted structure (fig.

¹ Many of the specimens collected between July 1954 and June 1957 were a "by-product" of researches supported by the National Science Foundation under grants G-947 and G-2330. Most of the illustrations were completed from the writer's pencil sketches by Miss Sue Blackshear.



Figures 5-6. Crawfish terminology. 5. Whole crawfish, dorsal view: 1 = cephalothorax, 2 = abdomen, 3 = cephalic section of cephalothorax, 4 = areola (or, thoracic section of cephalothorax), 5 = rostrum, 6 = acumen, 7 = antennal scale, 8 = lateral spine of rostrum, 9 = lateral spine of cephalothorax, I-V = pereopods (or, walking legs). 6. Third pereopod of form I male of *P. b. acutus*: D = dactylopodite, P = propodite, C = carpopodite, M = meropodite, I = ischiopodite (with hook), B = basipodite, Cx = coxopodite.

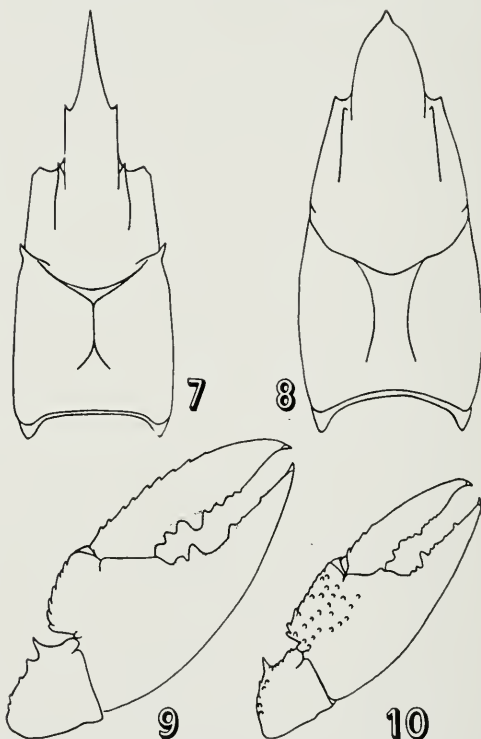
1) by Hobbs (1942b). All apical elements are present in most species of *Procambarus* (figs. 2, 11-22); the cephalic element is lacking in species of *Cambarellus* (figs. 23, 24); and, only the mesial process and central projection are present in species of *Cambarus* (figs. 25-28), and *Orconectes* (figs. 29-35).

Other characters frequently used in crawfish identification include the following (fig. 5): (1) *rostrum* (length relative to cephalothorax length; and, with or without lateral spines); (2) *lateral spines of cephalothorax* (present or absent, number); (3) *areola* (length relative to length of cephalic section of cephalothorax; whether open or obliterated; and, if open, its length/width ratio); (4) *antennal scale* (shape; length/width ratio; length relative to cephalothorax length); (5) *chela* (length/width ratio; number and arrangement of tubercles

on the fingers). The sculpture of the surface of the *annulus ventralis* (figs. 36-55), or sperm receptacle, of the female is a useful taxonomic character particularly in the genus *Procambarus*.

KEY TO FORM I MALES OF LOUISIANA CRAWFISHES

1. First pleopod terminating in three or more distinct parts (figs. 2, 11-24) 2
- First pleopod terminating in only two distinct parts (figs. 4, 25-35) 16
2. Hooks present on ischiopodites of the 3rd, or 3rd and 4th pereopods (Genus *Procambarus*) 3
- Hooks present on ischiopodites of the 2nd and 3rd pereopods (Genus *Cambarellus*) 15



Figures 7-10. Examples of variation in structure of cephalothorax and chela. 7. Cephalothorax of *Orconectes lanceifer* (rostrum with lateral spines, areola obliterated). 8. Cephalothorax of *O. clypeatus* (rostrum without lateral spines, areola open). 9. Chela and carpus of *Cambarus hedgpethi* (two prominent teeth on immovable finger). 10. Chela and carpus of *Cambarus diogenes diogenes* (one prominent tooth on immovable finger).



Figures 11-35. Apices of first pleopods of form I males; mesial view unless otherwise indicated. Pubescence removed from all structures; not drawn to scale. 11. *P. tulanei*. 12. *P. s. simulans*. 13. *P. clarki*. 14. *P. bivittatus*. 15. *P. shermani*. 16. *P. viaeviridis*. 17. *P. planirostris*. 18. *P. hinci*. 19. *P. vioscai* (A—mesial, B—lateral). 20. *P. penni* (A—mesial, B—lateral). 21. *P. natchitochae*. 22. *P. dupratzi*. 23. *C. puer*. 24. *C. shufeldti*. 25. *C. dissitus*. 26. *C. oryktos*. 27. *C. hedgpethi*. 28. *C. d. ludovicianus*. 29. *O. beyeri* (caudal view). 30. *O. clypeatus* (caudal view). 31. *O. lancifer*. 32. *O. hobbsi*. 33. *O. p. longimanus*. 34. *O. difficilis*. 35. *O. hathawayi*.

3. Hooks present on ischiopodites of 3rd pereopods only 4
 Hooks present on ischiopodites of 3rd and 4th pereopods 5
4. Central projection of first pleopod (fig. 1) extending well distad of caudal knob (fig. 11); basal structure of caudal knob (lateral view) straight or nearly so
Procambarus tulanei Penn
 Central projection not extending distad beyond caudal knob (fig. 12); basal structure of caudal knob (lateral view) more-or-less S-shaped
Procambarus simulans simulans (Faxon) 5
5. Areola obliterated (as in fig. 7), or very narrow (length-width ratio not less than 8) 6
 Areola open (as in fig. 8) and broad (length-width ratio not greater than 5) 11
6. Areola obliterated in middle (fig. 58)
Procambarus clarki (Girard)
 Areola open, but very narrow 7
7. Rostrum with lateral spines (as in fig. 7) 8
 Rostrum without lateral spines (as in fig. 8) 9
8. Acumen (fig. 5) and lateral spines of rostrum long; areola about half length of cephalic section of cephalothorax (fig. 57)
Procambarus bivittatus Hobbs
 Acumen short, lateral spines of rostrum inconspicuous; areola about one-third length of cephalic section of cephalothorax (fig. 56)
Procambarus blandingi acutus (Girard)
 Mesial process of first pleopod extending distally beyond apices of all other terminal elements (fig. 15)
Procambarus shermani Hobbs
 Mesial process not extending beyond all other terminal elements 10
10. First pleopod with prominent "finger-like" knob on cephalic margin (fig. 16)
Procambarus viacviridis (Faxon)
 First pleopod with shoulder, but not with prominent knob on cephalic margin (fig. 17)
Procambarus planirostris Penn
11. Cephalothorax without lateral spine on each side; or, with a very small one (fig. 60); all terminal elements of first pleopod small; pleopod appears twisted (fig. 18)
Procambarus hinei (Ortmann)
 Cephalothorax with two lateral spines on each side; at least some terminal elements of first pleopod conspicuous; pleopod not twisted in appearance 12
12. Caudal knob of first pleopod rounded distally in lateral aspect (fig. 19-B)
Procambarus vioscai Penn
 Caudal knob of first pleopod subacute in lateral aspect (as in fig. 20-B) 13
13. Mesial process extending more-or-less straight distally (never bent at more than 10° angle) (fig. 21)
Procambarus natchitochae Penn
 Mesial process extending caudad at or greater than 30° angle to shaft of pleopod 14
14. All terminal elements of first pleopod bent caudad at greater than 50° angle (fig. 22)
Procambarus dupratzi Penn
 Terminal elements bent caudad at about 30° angle (fig. 20-A) *Procambarus penni* Hobbs
15. All terminal elements of first pleopod straight or nearly so (fig. 24)
Cambarellus shufeldti (Faxon)
 All terminal elements of first pleopod bent caudad at about 40° angle to shaft (fig. 23)
Cambarellus puer Hobbs
16. Terminal elements of first pleopod heavy, both bent at 90° angle to shaft (figs. 25-28) (Genus *Cambarus*) 17
 Terminal elements straight or gently curved caudad, never both bent at more than 45° angle to shaft (figs. 29-35) (Genus *Orconectes*) 21
17. Hooks on ischiopodites of 3rd and 4th pereopods
Cambarus dissitus Penn
 Hooks on ischiopodites of 3rd pereopods only 18
18. Immovable finger of chela with two prominent teeth on opposable margin (fig. 9); base of immovable finger bearded 19

Figures 36-55. Annuli ventrales of mature females of some Louisiana crawfishes. Not drawn to scale. 36. *P. b. acutus*. 37. *P. bivittatus*. 38. *P. clarki*. 39. *P. planirostris*. 40. *P. hinei*. 41. *P. tulane*. 42. *P. s. simulans*. 43. *P. dupratzi*. 44. *P. natchitochae*. 45. *C. shufeldti*. 46. *C. hedgpethi*. 47. *C. oryktos*. 48. *C. dissitus*. 49. *O. clypeatus*. 50. *O. beyeri*. 51. *O. lanceifer*. 52. *O. hobbsi*. 53. *O. p. longimanus*. 54. *O. hathawayi*. 55. *O. difficilis*.



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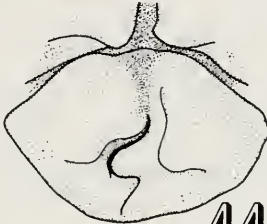
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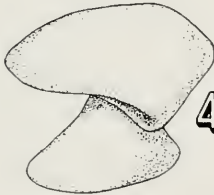
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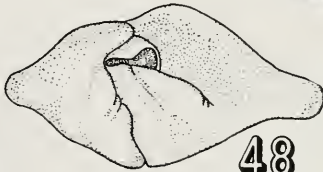
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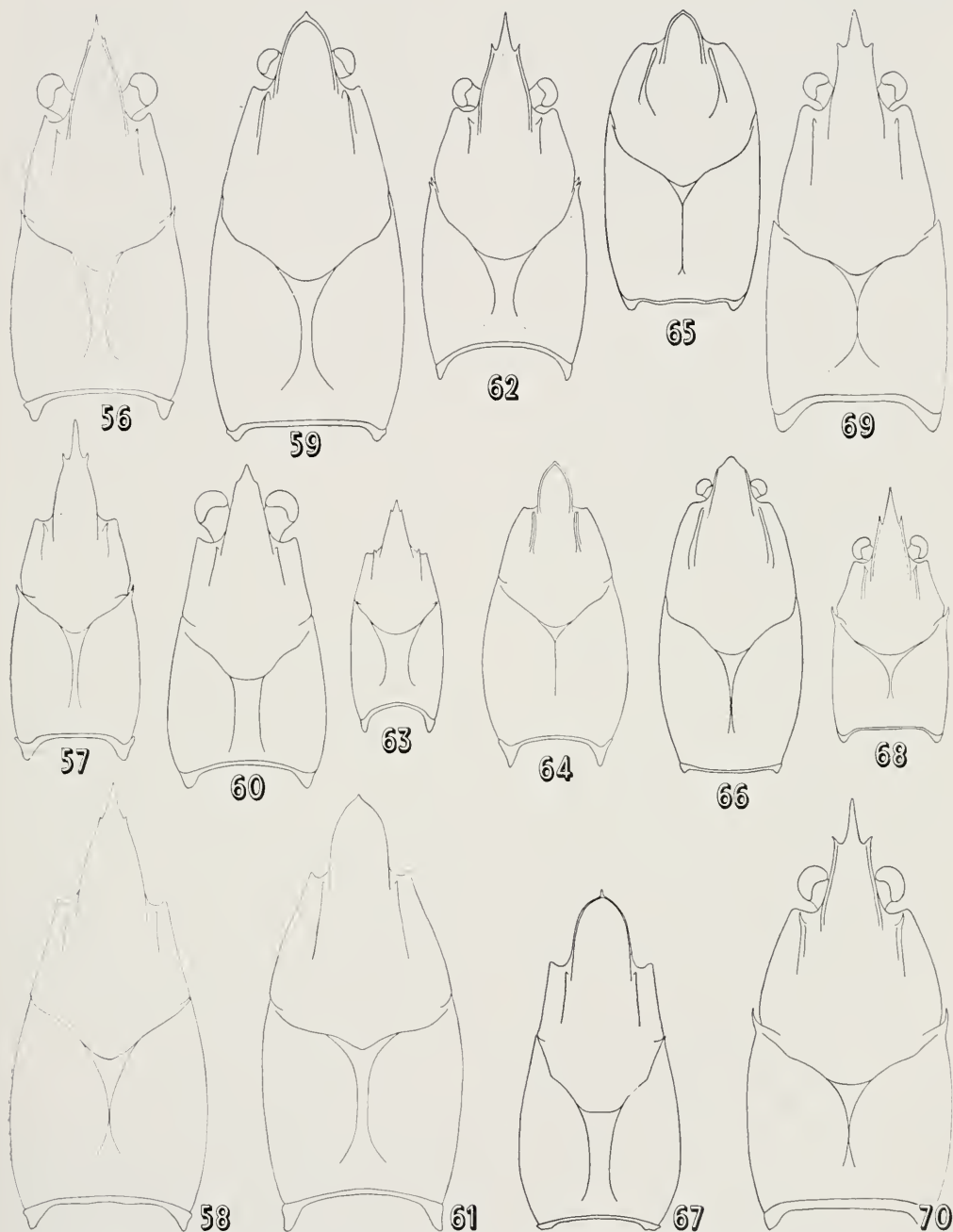


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- Immovable finger of chela with one prominent tooth on opposable margin (fig. 10); base of immovable finger not bearded 20
19. Antennal scale widest beyond middle; areola/antennal scale ratio not greater than 3.5.....*Cambarus hedgpethi* Hobbs
- Antennal scale widest at middle; areola/antennal scale ratio not less than 4.0
Cambarus oryktes Penn and Marlow
20. Ratio of cephalic section of cephalothorax to areola greater than 1.4; antennal scale length/width ratio less than 1.45
.....*Cambarus diogenes diogenes* Girard
- Ratio of cephalic section of cephalothorax to areola less than 1.3; antennal scale length/width ratio greater than 1.45
.....*Cambarus diogenes ludovicianus* Faxon
21. The two rami of first pleopod unequal in length (central projection at least twice length of mesial process) (fig. 29, 30); areola wide (length/width ratio less than 4.0); rostrum without lateral spines (as in fig. 8) 22
- The two rami of first pleopod subequal in length (figs. 31-35); areola narrow or obliterated; rostrum with lateral spines (as in fig. 7) 23
22. Central projection flattened, somewhat sickle-shaped, about twice length of mesial process (fig. 29)
.....*Orconectes beyeri* Penn
- Central projection subcylindrical and more-or-less straight beyond basal bend, about three times length of mesial process (fig. 30)
.....*Orconectes clypeatus* (Hay)
23. The two rami of pleopod short, stout, gently curved caudad; central projection bladelike (fig. 31); rostrum and antennal scale exceptionally elongate (fig. 7)
.....*Orconectes laevis* (Hagen)
- The two rami of pleopod long, more-or-less setiform, and at least mesial process strongly recurved caudad (figs. 32-35); rostrum and antennal scale not exceptionally elongate 24
24. Central projection longer than distal mesial shaft (fig. 4) 25
- Central projection shorter than distal mesial shaft (fig. 4) 28
25. Areola narrowly open (fig. 68); ratio of cephalothorax length/pleopod length usually less than 3.0; see also fig. 32.....*Orconectes hobbsi* Penn
- Areola usually obliterated; ratio of cephalothorax length/pleopod length usually greater than 3.0 where ranges of *O. p. creolanus* and *O. hobbsi* overlap (Maps 11, 12) 26
26. West of the Mississippi River in tributaries of Red River and rivers draining into Gulf of Mexico (Map 11)
.....*Orconectes palmeri longimanus* (Faxon)
- East of Mississippi River 27
27. In streams tributary to Lake Pontchartrain and Pearl River (Map 11)
.....*Orconectes palmeri creolanus* (Creaser)
- In streams tributary to east side of Mississippi River (Map 11)
.....*Orconectes palmeri palmeri* (Faxon)
28. Central projection greater than half length of distal mesial shaft (fig. 4); apex of mesial process bent caudad at about 90° angle to shaft of pleopod (fig. 34)
.....*Orconectes difficilis* (Faxon)
- Central projection less than one third length of distal mesial shaft (fig. 4); apex of mesial process bent caudad at no greater than 30° angle to shaft of pleopod (fig. 35)
.....*Orconectes hathawayi* Penn

ANNOTATED LIST OF SPECIES AND SUBSPECIES

In the following list, the paragraphs headed "recognition characters" supplement those "key" characters used above, and are intended to help students in associating females and form II males with form I males from the same collection; the paragraphs headed "distribution" include brief statements on ecological as well as geographical range in Louisiana. A supplementary parish check list is included (fig. 86) following this annotated list. References to separately published studies of life cycles are cited under each species where applicable, but no attempt has been made to cite references to studies of an experimental nature. Note should be made, however, that three of our crawfishes (*P. clarki*, *C. shufeldti*, and *O. clypeatus*) have proved



Figures 56-70. Cephalothoraxes of form I males of some Louisiana crawfishes. Not drawn to scale. 56. *P. b. acutus*. 57. *P. bivittatus*. 58. *P. clarki*. 59. *P. planirostris*. 60. *P. hinei*. 61. *P. s. simulans*. 62. *P. dupratzi*. 63. *C. shufeldti*. 64. *C. hedgpethi*. 65. *C. oryktos*. 66. *C. dissitus*. 67. *O. beyeri*. 68. *O. hobbsi*. 69. *O. p. longimanus*. 70. *O. hathawayi*.

useful in experimental studies of various aspects of physiology, behavior, and genetics.

PROCAMBARUS BLANDINGI
ACUTUS (Girard, 1852)

(Figures 2, 3, 6, 36, 56, 71)

Recognition characters.—Rostrum with small lateral spines near apex (absent in some specimens); areola narrow, but open; one lateral spine on each side of cephalothorax; chela long and slender. Range of cephalothorax length of form I males: 25 to 57 mm. This is the so-called "white" or "river crawfish" of the markets; when alive, mature specimens have a pinkish overall color with the abdomen bearing a wide, mid-dorsal, darker longitudinal stripe.

Distribution.—The crawfish is ubiquitous in habitat, but has been found most abundantly in creeks, rivers, ponds, borrow pits, and roadside ditches. Statewide (Map 2) and recorded from 53 of the 64 parishes, this crawfish eventually should be found in every parish when more intensive collecting is carried on.

PROCAMBARUS BIVITTATUS
Hobbs, 1942b

(Figures 14, 37, 57)

Recognition characters.—Rostrum long, with conspicuous lateral spines and conspicuous acumen; areola narrow, but open; one large lateral spine on each side of cephalothorax; chelae long and slender. Superficially, preserved individuals resemble those of *P. b. acutus*, but when alive they are distinct in having a pair of dark, longitudinal stripes along each side of abdomen. Range of cephalothorax length of form I males: 47 to 59 mm.

Distribution.—Restricted in Louisiana to the Pearl River drainage (Map 5) where they have been taken only from the deeper, shaded pools of the smaller tributaries in St. Tammany and Washington parishes.

PROCAMBARUS CLARKI
(Girard, 1852)

(Figures 13, 38, 58, 72)

Recognition characters.—Rostrum with small lateral spines; areola obliterated in middle; one lateral spine on each side of cephalothorax; chela long but heavy; cephalothorax conspicuously tuberculate. Range

of cephalothorax length of form I males: 31 to 57 mm. Known as the "swamp" or "red" crawfish in the markets, this animal when mature has a dark red overall color; however, in recent years anomalous bright blue specimens have appeared in several parts of the state (Penn, 1951).

Distribution.—Statewide, and recorded from 41 of the 64 parishes (Map 3), this crawfish should be found in many more parishes when intensive collecting is done. It is most abundant in shallow, temporary bodies of water such as marshes, swamps, and roadside ditches, but it is taken commercially in the deep waters of the swamps near Pierre Part (Assumption Parish), and a few individuals have been found even in slow-flowing streams and springs.

The life history has been carefully studied by Viosca (1939, 1953) and Penn (1943).

PROCAMBARUS PLANIROSTRIS
Penn, 1953c

(Figures 17, 39, 59, 73)

Recognition characters.—Rostrum without lateral spines; areola narrow; lateral spine on cephalothorax reduced to the size of a small tubercle; chela narrow. Range of cephalothorax length of form I males: 22 to 28 mm. Not a conspicuously colored crawfish; it has a light tan to olive background dorsally, and abdomen has a wide, mid-dorsal, longitudinal stripe of slightly darker hue.

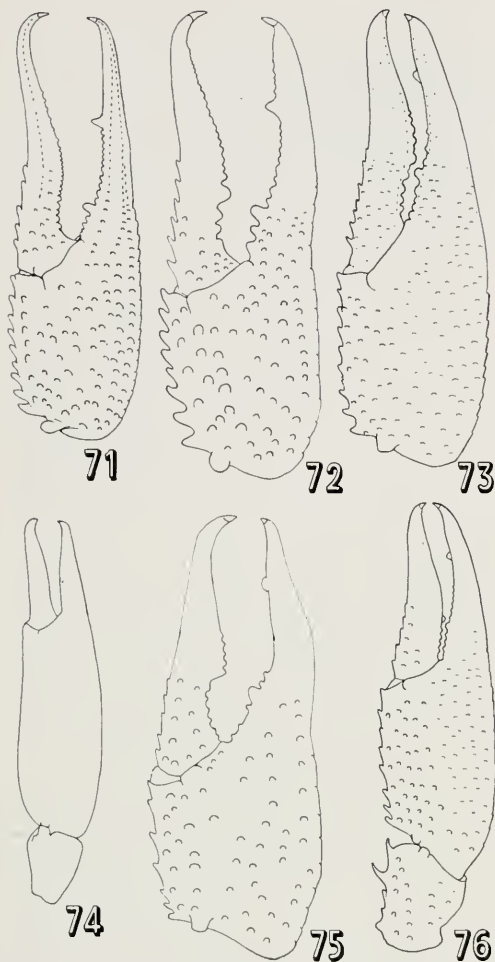
Distribution.—In Louisiana this crawfish is restricted to the Florida parishes (Map 6) where it is usually found in shallow burrows and temporary surface waters.

PROCAMBARUS VIAEVIRIDIS
(Faxon, 1914)

(Figure 16)

Recognition characters.—Rostrum without lateral spines; areola narrow; without lateral spines on cephalothorax; chela long and narrow. Range of cephalothorax length of form I males: 23 to 30 mm.

Distribution.—Hitherto unrecorded from the State, this crawfish has been collected at one locality only, *viz.* Wham, Ouachita Parish (Map 6).



Figures 71-76. Chelae of some form I male Louisiana crawfishes. Pubescence removed from all structures; not drawn to scale. 71. *P. b. acutus*. 72. *P. clarki*. 73. *P. planirostris*. 74. *P. hinei*. 75. *P. s. simulans*. 76. *P. dupratzi*.

PROCAMBARUS HINEI

(Ortmann, 1905)

(Figures 18, 40, 60, 74)

Recognition characters.—Rostrum tapering sharply, with slight indication of lateral spines; areola broad; without lateral spines on cephalothorax (or, with only a small one on each side in some specimens); chela subcylindrical, palm longer than fingers in males. Range of cephalothorax length of form I males: 11 to 20 mm. A redescription of the species was prepared by Penn (1953b). Dorsally it has a pair of conspicuous dark, broad, parallel, longitudinal

stripes that run on each side of the areola; on the abdomen the stripes converge slightly and become narrower.

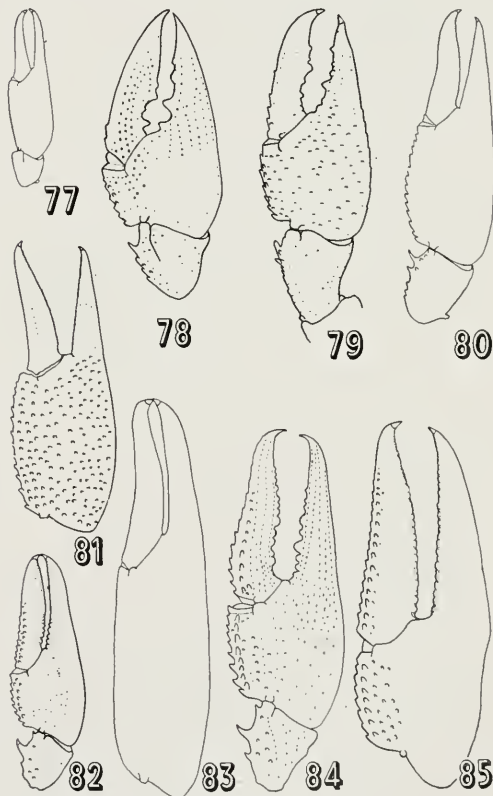
Distribution.—This crawfish is abundant in certain localities, but its distribution is spotty. It has been found primarily in semi-permanent ponds, borrow pits, and ditches in twelve parishes (May 5) within the Quaternary lowlands of the state.

PROCAMBARUS SHERMANI

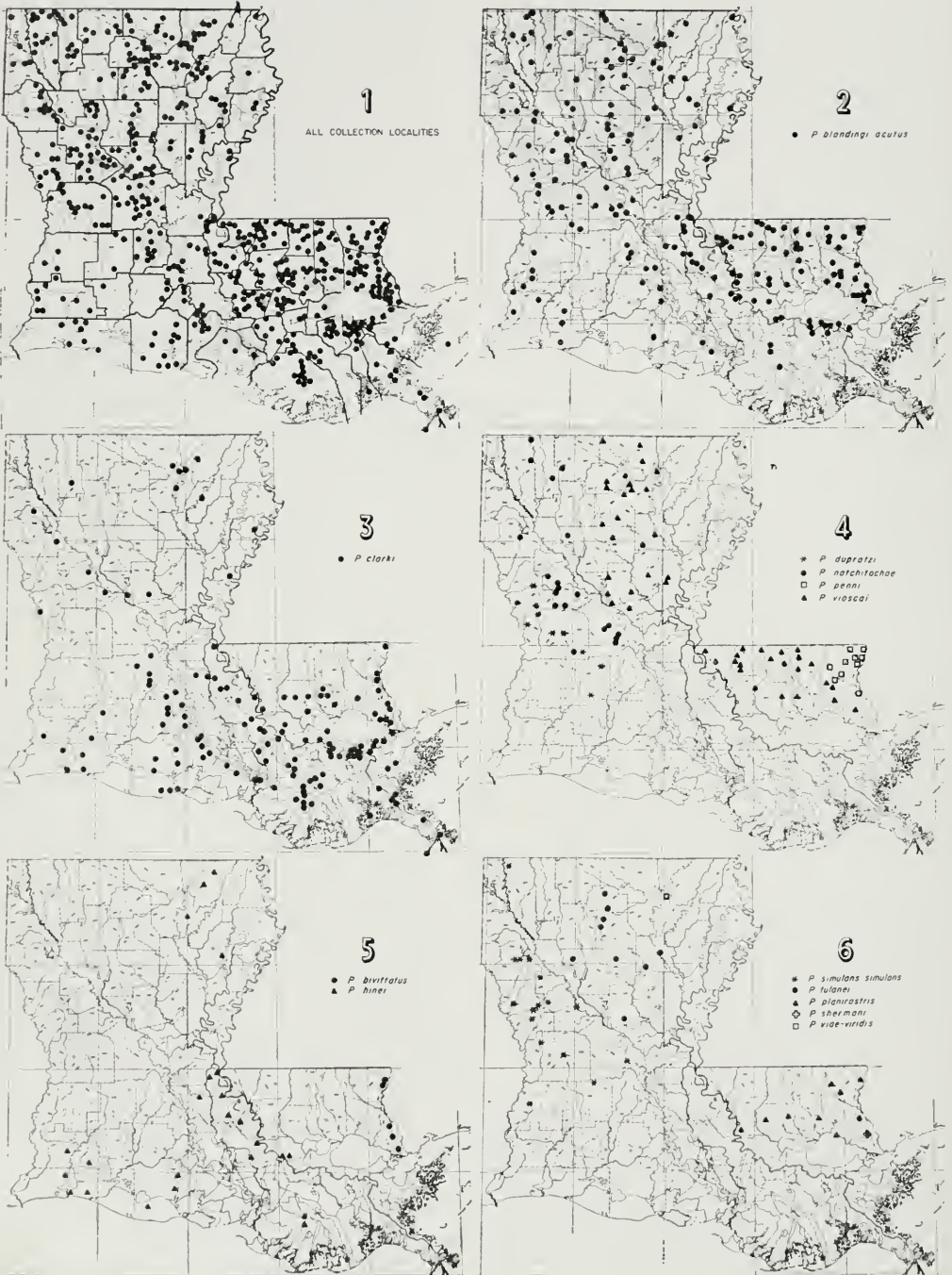
Hobbs, 1942b

(Figure 15)

Recognition characters.—Rostrum without lateral spines; areola relatively narrow; with one small lateral spine on each side of cephalothorax; palm of chela usually bearded in form I males. Range of cephalothorax length of form I males: 28 to 40



Figures 77-85. Chelae of some form I male Louisiana crawfishes. Pubescence removed from all structures; not drawn to scale. 77. *C. shufeldti*. 78. *C. oryktes*. 79. *C. dissitus*. 80. *O. clypeatus*. 81. *O. beyeri*. 82. *O. hobbsi*. 83. *O. lancifer*. 84. *O. p. longimanus*. 85. *O. difficilis*.



Maps 1-6. Distribution of Louisiana crawfishes.

mm. This is a drab-colored crawfish without conspicuous markings.

Distribution.—Hitherto unrecorded from the State, this crawfish has been found in ditches in only several localities; these are near Talisheek and near Hickory in St. Tammany Parish (Map 6).

PROCAMBARUS TULANEI

Penn, 1953a

(Figures 11, 41)

Recognition characters.—Rostrum spatulate and without lateral spines; areola relatively wide (length/width not greater than 10); without lateral spines on cephalothorax; chela long and narrow; palm of chela of form I males usually heavily bearded. Range of cephalothorax length of form I males: 43 to 55 mm.

Distribution.—Mature individuals have been taken from burrows in the banks of streams tributary to the Ouachita and Red rivers in parishes lying between the Red River and the Arkansas-Louisiana line (Map 6). Juveniles have been found primarily in the streams of the same area.

PROCAMBARUS SIMULANS

SIMULANS (Faxon, 1884)

(Figures 12, 42, 61, 75)

Recognition characters.—Rostrum spatulate and without lateral spines; areola relatively narrow (length/width not less than 15); one much reduced lateral spine on each side of cephalothorax; chela long, but palm wide. Range of cephalothorax length of form I males: 29 to 50 mm.

Distribution.—This western crawfish has been found mainly in creeks and flowing ditches in the Sabine, Red, Calcasieu and Bayou Teche river systems, mostly west of the Red River (Map 6).

PROCAMBARUS VIOSCAI

Penn, 1946

(Figure 19)

Recognition characters.—Rostrum with prominent lateral spines and usually with median carina; areola broad; two lateral spines on each side of cephalothorax; chela about three times longer than wide. Range of cephalothorax length of form I males: 18 to 42 mm. Basic color of this crawfish is light olive-green or tan; cephalic and thoracic sections of cephalothorax in dorsal

view each with a pair of irregular, wide, dark olive-green, longitudinal stripes that curve toward the midline at the posterior margin of their respective sections (each is somewhat suggestive of a lyre); areola of same dark color; stripes of cephalothorax continue as narrower, lateral markings on abdomen.

Distribution.—In Louisiana this crawfish has been found in streams west of the Mississippi in the Ouachita and Red River drainages, and east of the Mississippi in tributaries of the Mississippi River and Lake Pontchartrain (Map 4).

PROCAMBARUS PENNI

Hobbs, 1951

(Figure 20)

Recognition characters.—Rostrum with prominent lateral spines and without a median carina; areola broad; two lateral spines on each side of cephalothorax; chela about 3.5 to 4 times longer than wide. Range of cephalothorax length of form I males: 23 to 43 mm. Basic color is light chocolate-tan; marking of cephalothorax essentially as in *P. vioscai* except that the color is blackish brown; in lateral view each abdominal segment has a V-shaped marking of dark brown, and in the opening of each V there is an irregular spindle-shaped area of chimney red.

Distribution.—In Louisiana this crawfish has been found only in streams of the Pearl River drainage (Map 4).

PROCAMBARUS DUPRATZI

Penn, 1953d

(Figures 22, 43, 62, 76)

Recognition characters.—Rostrum with prominent lateral spines and some specimens with a weak median carina; areola broad; two lateral spines on each side of cephalothorax; chela about three times longer than wide. Range of cephalothorax length of form I males: 23 to 42 mm. Basic color light olive-tan; pattern of cephalothorax essentially as in *P. vioscai*, but the dark color is olive; abdomen also similar to that of *P. vioscai*, but dark color is blue-black, and the stripes are wider and more irregular.

Distribution.—In Louisiana this crawfish has been found only in streams of the Sabine and Calcasieu river systems (Map 4).

PROCAMBARUS NATCHITOAHE

Penn, 1953d

(Figures 21, 44)

Recognition characters.—Rostrum with prominent lateral spines and usually with median carina; areola broad; two lateral spines on each side of cephalothorax; chela about 3.5 times longer than wide. Range of length of cephalothorax of form I males: 23 to 43 mm. Color and color pattern essentially as in *P. dupratzi*.

Distribution.—In Louisiana this crawfish has been found in creeks tributary to the Red, Calcasieu, and Bayou Teche river systems (Map. 4).

CAMBARELLUS SHUFELDTI

(Faxon, 1884)

(Figures 24, 45, 63, 77)

Recognition characters.—Rostrum with lateral spines; areola broad (length/width ratio 3.5 to 5); one lateral spine on each side of cephalothorax; chela relatively short, with palm inflated (subcylindrical) and longer than fingers. Range of cephalothorax length of form I males: 8 to 11 mm. Color pattern may be one of two types: two rows of dark spots on either side of the areola and down the abdomen, or two dark stripes in place of the spots.

Distribution.—The dwarf crawfish has been found in all types of shallow, semi-permanent bodies of water in and east of the Mississippi valley and the Atchafalaya River, and in the Red River valley to Texas (Penn and Hobbs, 1958) (Map 7).

The life history has been studied by Penn (1942, 1950b).

CAMBARELLUS PUER

Hobbs, 1945

(Figure 23)

Recognition characters.—Rostrum with lateral spines; areola broad (length/width ratio 5 to 6); lateral spines of cephalothorax small or absent; chela as in *C. shufeldti*. Range of cephalothorax length of form I males: 8 to 11 mm. Color pattern as in *C. shufeldti*.

Distribution.—This dwarf crawfish has been found in the same types of habitats as *C. shufeldti* in and west of the Mississippi valley (Map 7) overlapping the range of *C. shufeldti* in the Mississippi valley and

between the Mississippi and Atchafalaya rivers.

CAMBARUS DIOGENES DIOGENES

Girard, 1852

(Figure 10)

Recognition characters.—Rostrum without lateral spines; antennal scale length/width ratio less than 1.45; sides of antennal scale nearly straight, and parallel; ratio of cephalic section of cephalothorax to areola greater than 1.40; chela not bearded, immovable finger with one prominent tooth. Range of cephalothorax length of form I male: 32 to 54 mm. Ground color of cephalothorax and abdomen shades dorsal to ventral from olive-green to brown; chela with red tips on fingers.

Distribution.—Typically this crawfish is a chimney builder and adults may have an extensive system of underground burrows. The juveniles are found occasionally in shallow burrows, but more frequently in a variety of aquatic habitats, particularly small creeks. The crawfish has been taken in twenty-two parishes throughout the state (Map 8) and should be anticipated in at least twenty more.

CAMBARUS DIOGENES

LUDOVICIANUS Faxon, 1884

(Figure 28)

Recognition characters.—Rostrum without lateral spines; antennal scale length/width ratio greater than 1.45, shape as in *C. d. diogenes*; ratio of cephalic section of cephalothorax to areola less than 1.30; chela as in *C. d. diogenes*. Range of cephalothorax length of form I males: 33 to 43 mm. Abdomen with three longitudinal red stripes; base of telson and uropods as well as margins of the uropods marked with red; basic color bluish; colors are most brilliant in smaller individuals.

Distribution.—This burrowing, chimney-building crawfish is found only in the southeastern part of the State (Map 8).

CAMBARUS HEDGPETHI

Hobbs, 1948

(Figures 27, 46, 64)

Recognition characters.—Rostrum without lateral spines; areola obliterated; antennal scale length/width ratio not over 2.5; lateral margin of antennal scale straight,



Maps 7-12. Distribution of Louisiana crawfishes.

medial margin strongly curved; chela with prominent tuft of plumose hairs along base of immovable finger; immovable finger with two prominent teeth. Range of cephalothorax length of form I males: 21 to 31 mm. This is a rather drab-colored crawfish: cephalothorax and abdomen olive-tan dorsally, shading into a lighter hue of the same color laterally; abdomen with two faint, wide, bluish stripes extending its full length and onto the telson and uropods.

Distribution.—About one-fourth of the specimens seen have been taken from burrows; the remainder were from a wide variety of shallow bodies of water, including roadside ditches, overflow puddles, sloughs, swamps, swamp pools and ponds. This crawfish has a statewide distribution; at present it is known from localities in twenty-seven parishes (Map 9).

CAMBARUS ORYKTES

Penn and Marlow, 1959

(Figures 26, 47, 65, 78)

Recognition characters.—Rostrum without lateral spines; antennal scale not extending beyond tip of rostrum (length/width ratio not over 2.5); areola obliterated; lateral spines on cephalothorax absent; chela relatively short (cephalothorax length/chela length ratio not less than 1.3); fingers of chela gently curved inward (*i.e.*, ventrally); basal half of immovable finger heavily bearded in form I males. Range of cephalothorax length of form I males: 22 to 24 mm. This is an inconspicuously colored crawfish in which the cephalothorax is blackish-brown dorsally, shading ventrally into tan; abdomen with a wide mid-dorsal stripe of blackish-brown that narrows posteriorly; lateral to the stripe the abdomen has a fine reticulate pattern of blackish-brown on a tan background.

Distribution.—Most of the specimens examined were dug from burrows in dry roadside ditches in the vicinities of Covington and Alton, St. Tammany Parish (Map 9).

CAMBARUS DISSITUS

Penn, 1955

(Figures 25, 48, 66, 79)

Recognition characters.—Rostrum without lateral spines; antennal scale short, not reaching tip of rostrum (length/width ratio ranges from 1.9 to 2.8); areola obliterated

in most specimens (if open, its length/width ratio not less than 35); lateral spines of cephalothorax absent; chela relatively short (cephalothorax length/chela length ratio not less than 1.35); immovable finger without beard, and with only one prominent tooth; both fingers curved ventrally. Range of cephalothorax length of form I males: 24 to 32 mm.

Distribution.—This crawfish is known only from specimens taken from shallow burrows in the upland shortleaf and longleaf pinehills of Caldwell and Lincoln parishes (Map 9).

ORCONECTES CLYPEATUS

(Hay, 1899)

(Figures 8, 30, 49, 80)

Recognition characters.—Rostrum spatulate, without lateral spines; areola broad (length/width ratio averages 4); lateral spines of cephalothorax absent (or, if present, greatly reduced and inconspicuous); chela with palm inflated and subcylindrical, fingers and palm subequal in length. A re-description of the species was prepared by Creaser (1933). Range of cephalothorax length of form I males: 10.5 to 18 mm. Basic color olive-tan on cephalothorax and abdomen; two darker blue-black, longitudinal stripes extend from behind eyes, on either side of areola, to end of abdomen.

Distribution.—This little crawfish is found in a variety of shallow aquatic habitats, including such diverse locations as roadside ditches, ponds, creeks, pineland sloughs, swamps, borrow pits, and burrows. With the exception of the recent alluvial deposits it has a statewide distribution (Map 10).

The life history has been studied by Smith (1953).

ORCONECTES BEYERI

Penn, 1950a

(Figures 29, 50, 67, 81)

Recognition characters.—Rostrum, lateral spines of cephalothorax, and chela as in *O. clypeatus*; areola broad (length/width ratio about 3.0). Range of length of cephalothorax of form I males: 11 to 18 mm.

Distribution.—This crawfish is known only from several localities in DeSoto and Natchitoches parishes (Map 10). Appar-

Figure 86. Parish checklist of Louisiana crawfishes. Although specimens have been seen from each of the 64 parishes (see also Map 1), some parishes have hardly been touched, and additions to the list from any parish should be anticipated.

ently its habitat requirements do not differ markedly from those of *O. clypeatus*.

ORCONECTES LANCIFER

(Hagen, 1870)

(Figures 7, 31, 51, 83)

Recognition characters.—Rostrum with lateral spines; rostrum, acumen, and antennal scales unusually elongate; acumen always greater than half total length of rostrum; areola obliterated; chela narrow, without conspicuous tubercles, fingers shorter than palm. Range of cephalothorax length of form I males: 29 to 35 mm. Its overall basic color is olive-green, but the entire surface is covered irregularly with small, but conspicuous, somewhat stellate, darker markings.

Distribution.—This relatively rare crawfish has a statewide distribution (Map 12). Its apparent rarity probably is due to its ecological requirements; it seems to thrive best in deeper bodies of water with mud bottoms into which it burrows.

ORCONECTES HOBBSI

Penn, 1950c

(Figures 32, 52, 68, 82)

Recognition characters.—Rostrum with prominent lateral spines and without median carina; areola open in most specimens but very narrow (length/width ratio averages 24); with one conspicuous lateral spine on each side of cephalothorax. Chela of moderate length (cephalothorax length/chela length ranges from 1.4 to 2.0). Range of cephalothorax length of form I males: 18 to 22.5 mm. Its basic color is olive with a decided bluish cast; tips of chelae, post-orbital spines, and margins of abdominal tergites are bright red.

Distribution.—This colorful little crawfish apparently is restricted to the sand-bottomed streams of the Lake Pontchartrain drainage (Map 12).

ORCONECTES PALMERI PALMERI

(Faxon, 1884)

Recognition characters.—Rostrum with lateral spines and usually with median carina; areola obliterated in most specimens (slightly open in some); one conspicuous lateral spine on each side of cephalothorax. Range of length of cephalothorax of form I males: 24 to 37 mm. Its olive-tan base

color is superimposed by irregular-shaped spots of darker olive-brown giving a mottled appearance; posterior margins of abdominal tergites, uropods, and telson are marked by transverse, thin, bright-red lines; apical fourth of fingers of chela are creamy white with claws bright red. The variations and geographic ranges of the three subspecies of *O. palmeri* were studied by Penn (1957).

Distribution.—In Louisiana this crawfish is known only from the fast-flowing creeks tributary to the east side of the Mississippi River (Map 11).

ORCONECTES PALMERI CREOLANUS

(Creaser, 1933)

Recognition characters.—Rostrum, areola, and cephalothoracic spines as in *O. p. palmeri*. Range of cephalothorax length of form I males: 33 to 42 mm. Its color pattern is generally as in *O. p. palmeri*, but with fingers of chelae lacking creamy-white area on apical fourth.

Distribution.—This crawfish is known only from fast-flowing creeks of the Lake Pontchartrain and Pearl River drainages (Map 11).

ORCONECTES PALMERI

LONGIMANUS (Faxon, 1898)

(Figures 33, 53, 69, 84)

Recognition characters.—Rostrum, areola, and cephalothoracic spines as in *O. p. palmeri*. Range of cephalothorax length of form I males: 17 to 44 mm. Its color pattern is as in *O. p. palmeri*, but base color is olive with mottlings of darker olive or blue, and posterior margins of abdominal tergites bear thin transverse lines of dark-olive or bluish-black.

Distribution.—In Louisiana this crawfish occurs in streams tributary to the Red River and Ouachita River, and in smaller streams draining directly into the Gulf of Mexico west of the Mississippi valley (Map 11).

ORCONECTES HATHAWAYI

Penn, 1952b

(Figures 35, 54, 70)

Recognition characters.—Rostrum with lateral spines, no median carina; areola obliterated; one prominent lateral spine on each side of cephalothorax. Chela long (approaching length of cephalothorax), outer margin definitely keeled. Cephalothorax

length of only form I male known: 36.5 mm. Its overall basic color is grayish-blue; postorbital ridges, margins of rostrum, and lateral spines of cephalothorax are bright crimson; posterior margins of abdominal tergites bear transverse lines of dark blue.

Distribution.— This crawfish is known only from the fast-flowing headwater creeks of the Bayou Teche system in Rapides Parish (Map 12).

ORCONECTES DIFFICILIS

(Faxon, 1898)

(Figures 34, 55, 85)

Recognition characters.— Superficially resembling *O. bathawayi* in most respects except structure of first pleopod of male and annulus ventralis of female. Range of cephalothorax length of form I males: 35 to 45 mm.

Distribution.— This crawfish is known only from streams in the headwaters of Bayou Teche and the Calcasieu River in Louisiana (Map 12).

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ABSTRACT

Recognition characters, a key, and maps of distribution records are given for the following 29 species and subspecies of crawfishes known to be present in Louisiana: *Procambarus blandingi acutus*, *P. bivittatus*, *P. clarki*, *P. planirostris*, *P. viaviridis*, *P. hinei*, *P. shermani*, *P. tulane*, *P. simulans simulans*, *P. vioscai*, *P. penni*, *P. dupratzi*, *P. natchitochae*, *Cambarellus shufeldti*, *C. puer*, *Cambarus diogenes diogenes*, *C. d. ludovicianus*, *C. hedgpethi*, *C. oryktes*, *C. dissitus*, *Orconectes clypeatus*, *O. beyeri*, *O. lancifer*, *O. hobbsi*, *O. palmeri palmeri*, *O. p. creolanus*, *O. p. longimanus*, *O. hathawayi*, and *O. difficilis*. Eighty-five figures illustrating taxonomic characters of these crawfishes, and twelve maps showing distribution are included.