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## Decapods of Iowa (Part III)

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## DECAPODS OF IOWA (PART III)

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### Background Information

The Order Decapoda is represented in Iowa by seven species of Cambaridae and a single species of Palaemonidae. Members of these two families can be distinguished by the morphology of the rostrum, number of chelate legs, and shape of the abdomen. The Cambaridae have a smooth rostrum, three pairs of chelate legs, and a dorsoventrally flattened abdomen. The Palaemonidae possess a serrated rostrum, two pairs of chelate legs, and a laterally flattened abdomen. The Palaemonidae is represented in Iowa by *Palaemonetes kadiakensis* (Fig. 1). Characteristics of this species include second pereiopods which are only slightly longer than the first, a rostrum with teeth above and usually below, mandibles which are deeply cleft and without a palp, and gills developed as phyllobranchiae. The length of this species is typically 25 to 45 mm.

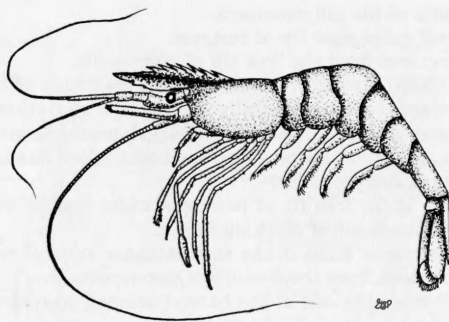


Fig. 1. *Palaemonetes kadiakensis*.

Identification of crayfish is based largely upon the structure of the first pair of abdominal appendages of the male. These appendages are modified swimmerets and are located immediately posterior to the last pair of walking legs (pereiopods). They and the other swimmerets are known as pleopods. The first pair of pleopods serves as guides for sperm transfer during copulation by transporting sperm from the openings of the vas deferentia, located at the base of the fifth pair of walking legs, to the sperm receptacle of the female known as the annulus ventralis. The annulus ventralis is a cup-like structure situated on the sternum between the last pairs of walking legs (Williams and Leonard, 1952).

According to Hobbs (1972), two forms of the first pair of pleopods are known in most species of crayfish. These are usually designated as Form I and Form II, with sexual maturity being recognized by the attainment of Form I in males. The first pair of abdominal appendages in Form II males are similar to the same pair of appendages in immature males. In Form I males, these appendages have distal terminations which are more slender and often fine-pointed, instead of blunt distal terminations as found in Form II males. Form I males may also be distinguished by the horny color of the tips of the outer part of the sexual organ.

After the breeding season, males typically molt, bringing them into the Form II condition. This stage usually lasts until the next mating period, when molting to the Form I condition occurs again. Males frequently engage in two annual mating periods, but seldom live longer. Following copulation, females do not molt until a clutch of eggs is hatched and the immatures have left. Females seldom survive three mating seasons (Pennak, 1953).

#### Glossary of Terms Used in the Study of Crayfish

**ANNULUS VENTRALIS:** sperm receptacle on sternum of female between posterior two pairs of walking legs; also called seminal receptacle.

**AREOLA:** an area on the mid-dorsal surface of the thorax, bound by grooves which mark the dorsomedial limits of the gill chambers.

**CARINA:** median dorsal ridge near tip of rostrum.

**CARPUS:** the third segment from the free tip of pereopods.

**CENTRAL PROJECTION:** strong projection formed by fusion of centrocephalic and centrocaudal processes; located centrally on tip of *Procambarus* first pleopod, laterally on *Orconectes* and *Cambarus* first pleopod; corneous in Form I male.

**CHELA:** grasping pincer or claw; large chelae sometimes called hands; composed of the segments called dactyl and propodus.

**DACTYL:** first segment at the free tip of pereopods; the smaller movable part of the pincer or chela; sometimes called movable finger.

**FOSSA:** a wide, deep cavity or sinus in the surface of the seminal receptacle.

**ISCHIUM:** the fifth segment from the free tip of pereopods.

**MARGINAL SPINES:** lateral spines at the base of acumen on rostrum.

**PEREIOPOD:** any of the ten walking legs on the thoracic region.

**PLEOPOD:** any of the appendages of the abdominal segments excluding uropods; also called swimmerets.

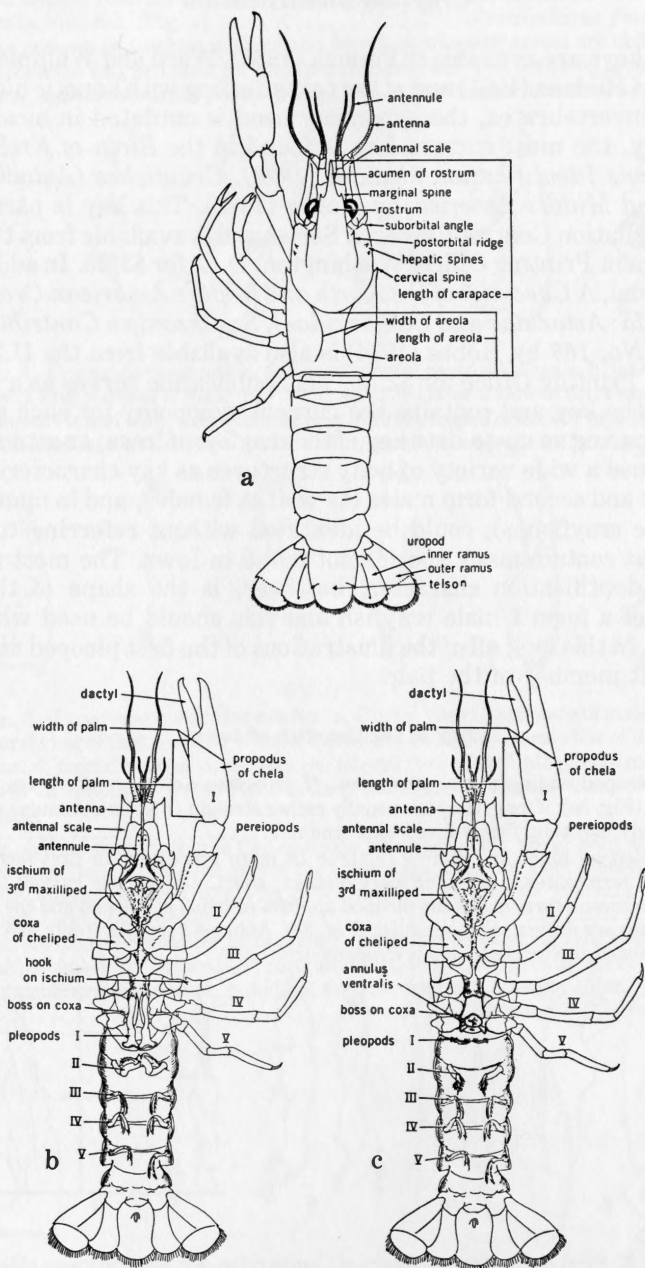
**PROCESS:** any projecting structure; particularly a terminal part of the male first pleopod.

**ROSTRUM:** dorsomedial, cephalic extension of carapace partially covering eyestalks and bases of antennae and antennules.

**STERNUM:** the ventral, sclerotized plate or bar of a segment.

**TUBERCLE:** a low, rounded eminence of the exoskeleton.

Many of the terms listed in the preceding glossary are illustrated in Figure 2, which also illustrates structures and measurements referred to in the "Key to the Crayfish of Iowa," which follows.



**Fig. 2.** Generalized crayfish showing structures and measurements. a, Dorsal view of male crayfish. b, Ventral view of male crayfish. c, Ventral view of female crayfish. (After Hobbs, 1972).

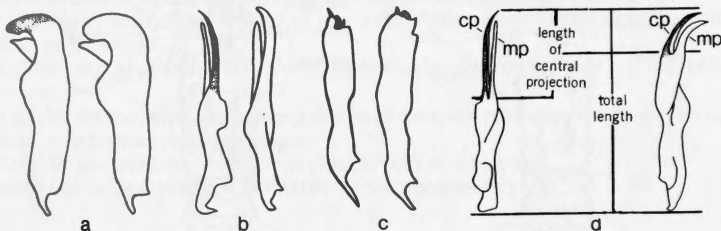
## Crayfish Identification

While keys are available in Pennak (1953), Ward and Whipple (1959), Eddy and Hodson (1961) and other texts dealing with aquatic biology or aquatic invertebrates, the synonymy used is outdated in most cases. Presently, the most current key is found in the *Biota of Freshwater Ecosystems Identification Manual* (1972), *Crayfishes (Astacidae) of North and Middle America* by Hobbs (1972). This key is part of the Water Pollution Control Research Series and is available from the U.S. Government Printing Office, Washington, D.C. for \$3.25. In addition to this manual, *A Checklist of the North and Middle American Crayfishes (Decapoda: Astacidae and Cambaridae)*, *Smithsonian Contribution to Zoology No. 166* by Hobbs (1974) is also available from the U.S. Government Printing Office for \$2.50. This publication serves as a supplement to the key and contains the current synonymy for each species.

In preparing an up-to-date key of the crayfish of Iowa, an attempt was made to use a wide variety of body structures as key characteristics so that first and second form males (as well as females, and in many cases immature crayfishes), could be identified without referring to references that contain many species not found in Iowa. The most reliable species identification character, however, is the shape of the first pleopod of a form I male crayfish and this should be used whenever possible. In this key, all of the illustrations of the first pleopod are made of the left member of the pair.

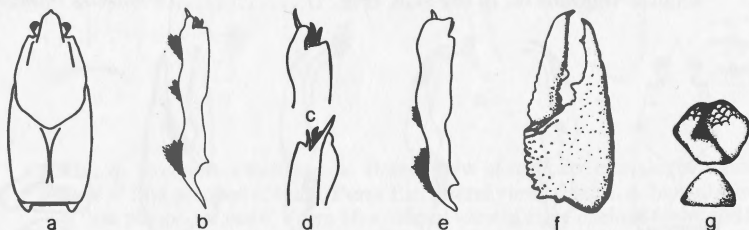
### Key to the Crayfish of Iowa

- 1a. First pleopod ending in two processes. If processes are short, they are strongly hooked (Fig. 3a); if long, they are usually rather straight (Fig. 3b). Annulus ventralis not freely movable; firmly fused to sternum .....3
- 1b. First pleopod blunt and ending in three or more processes. In first form males, pleopod terminates in three or more distinct, short, and slightly curved processes while in second form males the pleopod appears rounded at the end and the terminal processes are difficult to distinguish (Fig. 3c). Annulus ventralis freely movable; not firmly fused to sternum. Genus *Procambarus* .....2

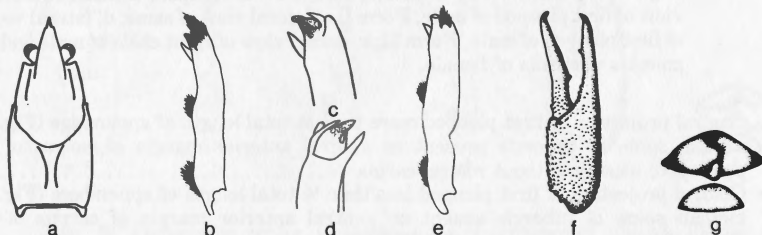


**Fig. 3.** First pleopods of members of Cambaridae. a-c, Lateral views of left pleopods of first and second form males, respectively, with corneous central projection (cp) typical of Form I males shaded; a, *Cambarus*; b, *Orconectes*; and c, *Procambarus*. d, Methods of measuring first pleopods (mesial view) in *Orconectes* (cp, central projection; mp, mesial process).

- 2a. Hooks present only on ischium of third pereopods; areola obliterated, at least at mid length; rostrum short and blunt; chela broad and flattened. Annulus ventralis rounded. (Fig. 4) ..... *Procambarus gracilis*
- 2b. Hooks present on ischium of third and fourth pereopods; areola not obliterated; rostrum long and pointed; chela slender, rounded, and with long, pointed fingers. Annulus ventralis not rounded. (Fig. 5). *Procambarus acutus acutus*

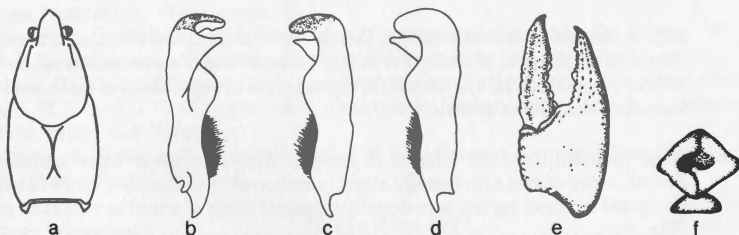


**Fig. 4.** *Procambarus gracilis*. a, Dorsal view of carapace of male; b, lateral view of first pleopod of male, Form I; c, enlarged lateral view of tip of same; d, mesial view of tip of same; e, lateral view of first pleopod of male, Form II; f, dorsal view of right chela of male; and g, annulus ventralis of female.



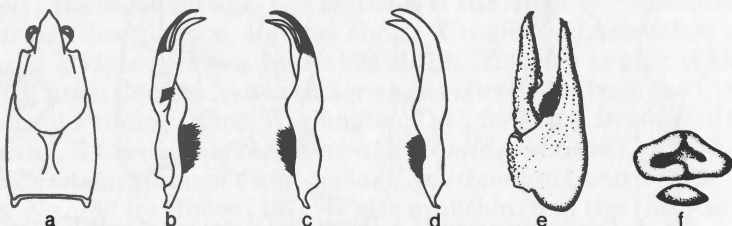
**Fig. 5.** *Procambarus acutus acutus*. a, Dorsal view of carapace of male; b, lateral view of first pleopod of male, Form I; c, enlarged lateral view of tip of same; d, mesial view of tip of same; e, lateral view of first pleopod of male, Form II; f, dorsal view of right chela of male; and g, annulus ventralis of female.

- 3a. First pleopod terminating in two elongate processes, both never bent at an angle as great as 90° to the principal axis of the appendage; rostrum long, pointed, and never greatly curved downward; areola never obliterated; annulus ventralis usually oval shaped. Genus *Orconectes* ..... 4
- 3b. First pleopod terminating in two short processes hooked no less than 90° to the principal axis of the appendage; rostrum short, blunt, and greatly curved downward; areola obliterated at least in middle; annulus ventralis quadrangular. (Fig. 6) ....  
..... *Cambarus Diogenes diogenes*



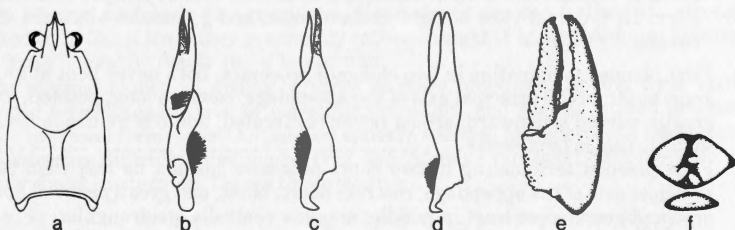
**Fig. 6.** *Cambarus diogenes diogenes*. a, Dorsal view of carapace of male; b, mesial view of first pleopod of male, Form I; c, lateral view of same; d, lateral view of first pleopod of male, Form II; e, dorsal view of right chela of male; and f, annulus ventralis of female.

- 4a. Terminal process of first pleopod straight or slightly curved; dactyl of chela without notch at base on inner side; rostrum usually with marginal spines; fossa of annulus ventralis central .....5  
 4b. Terminal process of first pleopod strongly curved caudally; dactyl of chela with notch at base of inner side; rostrum usually without marginal spines; fossa of annulus ventralis off to one side. (Fig. 7) .....*Orconectes immunis*



**Fig. 7.** *Orconectes immunis*. a, Dorsal view of carapace of male; b, mesial view of first pleopod of male, Form I; c, lateral view of same; d, lateral view of first pleopod of male, Form II; e, dorsal view of right chela of male and f, annulus ventralis of female.

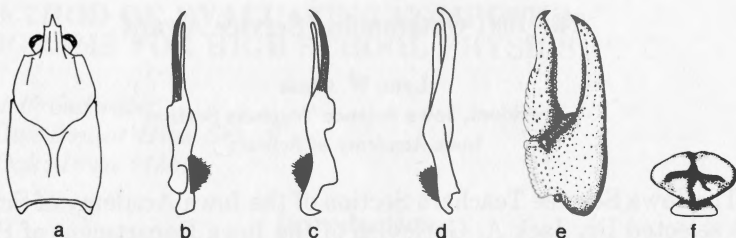
- 5a. Central projection of first pleopod more than  $\frac{1}{4}$  total length of appendage (Fig. 3d); median spine or tubercle present on ventral anterior margin of carpus of first pereiopod; usually without rostral carina .....6  
 5b. Central projection of first pleopod less than  $\frac{1}{4}$  total length of appendage (Fig. 3d); median spine or tubercle absent on ventral anterior margin of carpus of first pereiopod; rostral carina present. (Fig. 8) .....*Orconectes iowaensis*



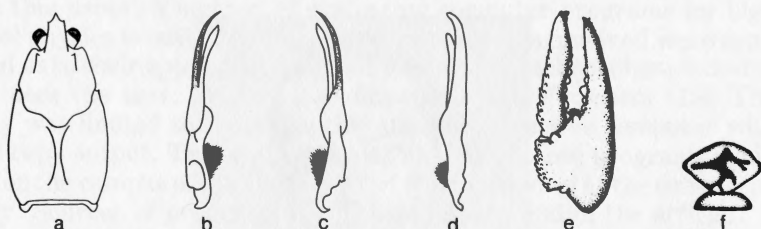
**Fig. 8.** *Orconectes iowaensis*. a, Dorsal view of carapace of male; b, mesial view of first pleopod of male, Form I; c, lateral view of same; d, lateral view of first pleopod of male, Form II; e, dorsal view of right chela of male, and f, annulus ventralis of female.

- 6a. First pleopod does not extend to base of first pereiopod when abdomen is flexed; sides of rostrum usually slightly concave; chela lacking large tubercles on dorsal surface; carina occasionally present; fossa of annulus ventralis small. (Fig. 9) .....*Orconectes rusticus*  
 6b. First pleopod extends to base of first pereiopod when abdomen is flexed; sides of rostrum usually straight; chela usually with large tubercles on dorsal surface; carina never present; fossa of annulus ventralis large. (Fig. 10) .....  
 .....*Orconectes virilis*





**Fig. 9.** *Orconectes rusticus*. a, Dorsal view of carapace of male; b, mesial view of first pleopod of male, Form I; c, lateral view of same; d, lateral view of first pleopod of male, Form II; e, dorsal view of right chela of male; and f, annulus ventralis of female.



**Fig. 10.** *Orconectes virilis*. a, Dorsal view of carapace of male; b, mesial view of first pleopod of male, Form I; c, lateral view of same; d, lateral view of first pleopod of male, Form II; e, dorsal view of right chela of male; and f, annulus ventralis of female.

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## Buzz On(off)

If the energy in sound waves could be converted into electrical power, it would take the combined output of  $10^{17}$  mosquito buzzes to provide enough energy to light a reading lamp.

*Comparisons*

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