*Zootaxa* 2015: 42–54 (2009)
www.mapress.com/zootaxa/


**Article**

ISSN 1175-5326 (print edition)
**ZOOTAXA**
ISSN 1175-5334 (online edition)

# A new species of the genus *Gammarus* (Crustacea: Amphipoda: Gammaridae) from the low salinity habitats in the northern Gulf of Mexico

BRENT P. THOMA[1,3] & RICHARD W. HEARD[2]

*The University of Southern Mississippi, Department of Coastal Sciences, P.O. Box 7000 Ocean Springs, Mississippi 39566-7000, U.S.A. E-mail: [1]brent.thoma@gmail.com; [2]richard.heard@usm.edu.*

*[3]Corresponding author*

## Abstract

In the northern Gulf of Mexico, *Gammarus mucronatus* sensu lato is represented by at least two forms, *G. mucronatus* sensu stricto and a less common "macromucronate" form, which appears to be restricted to low salinity habitats. These two forms have traditionally been separated using the size or angle of projection of the dorsal mucronations (processes). However, because of variability in the development of the processes, it is unclear whether this and other morphological differences between *G. mucronatus* sensu stricto and the "macromucronate" form are ecophenotypic or reflect distinct and separate species. Detailed morphological analyses indicate that these two forms represent distinct species; *Gammarus lecroyae*, new species, is described in detail and a key to the marine and estuarine *Gammarus* species from the northern Gulf of Mexico is provided.

**Key words:** Gulf of Mexico, *Gammarus*, Amphipoda, taxonomy

## Introduction

The common estuarine amphipod *Gammarus mucronatus* Say, 1818, originally described based on material from Egg Harbor, New Jersey and material from near the mouth of the St. John's River, Florida (Say 1818), reportedly ranges from the Gulf of St. Lawrence through the northern Gulf of Mexico, reaching as far south as Laguna Alvarado, Mexico (LeCroy 2000). This species is euryhaline and is found in shallow bays, the upper portions of estuaries and salt marsh tide pools (Bousfield 1973; Heard 1982; LeCroy 2000). It is commonly associated with submerged aquatic vegetation (*Ruppia*, *Halodule*, *Syringodium*, and *Thalassia*), epiphytic algae and decaying wood as well as amongst hydroids and the submerged roots of marsh grasses (Barnard and Gray 1968; Farrell 1970; Thomas 1976; Heard 1982; LeCroy 2000). Throughout its range, it is an important contributor to the breakdown and recycling of organic material in salt marshes and submerged aquatic vegetation communities across a wide range of salinities (Heard 1982). Although specimens attributed to this species are highly variable, both in morphology and in habitat preference (Barnard and Gray 1968; Farrell 1970; Thomas 1976; Heard 1982; LeCroy 2000), little effort has gone into clarifying the taxonomic status of these variants. The lack of clarity in the taxonomic status of *G. mucronatus* sensu lato has led to a variety of names being found throughout the literature (Barnard and Gray 1968; Farrell 1970; Thomas 1976; Stoner 1979, 1980; Heard 1982; Mason 1998; LeCroy 2000), which only serves to diminish our understanding of the ecology of *G. mucronatus*.

For more than 30 years two superficially similar forms of the *G. mucronatus* species complex have been known from the northern Gulf of Mexico. These forms include the typical form of *G. mucronatus* sensu lato, referred to herein as *G. mucronatus*, which is know from the meso- and polyhaline waters of the east coast of North America and the Gulf of Mexico (Bousfield 1973, Heard 1982, LeCroy 2000), and the less common

 *Accepted by G. Karaman: 29 Dec. 2008; published: 18 Feb. 2009*

"macromucronate" form, which is apparently restricted to low salinity habitats in the northern Gulf of Mexico (Farrell 1970; Thomas 1976; Heard 1982; LeCroy 2000).

Prior to the work by LeCroy in 2000, workers relied primarily upon the size or angle of projection of the dorsal mucronations or processes in order to distinguish between the "macromucronate" form and *G. mucronatus*. However, because of variability in the development of the processes, their size alone is not a reliable distinguishing characteristic for the two forms (Barnard and Gray 1968; LeCroy 2000). LeCroy (2000) suggested that these forms may be characterized by differences in the setation of the male pereiopods, setation of the male second antenna, and spination of the telson; however, due to the limited samples examined by LeCroy it remains unclear whether the "macromucronate" form represents an ecophenotypic variant of *G. mucronatus* or a new species in need of description.

In the present study, specimens of both *G. mucronatus* and the "macromucronate" form were examined from sites in Mississippi and Florida. Despite individual and developmental variation, detailed morphological examination revealed these two forms to represent two distinct species. The description of the previously undescribed "macromucronate" species is provided.

Museums in this paper are abbreviated as USNM (United States National Museum of National History, Smithsonian Institution, Washington, DC) and GCRL (Gulf Coast Research Laboratory Museum, The University of Southern Mississippi, Ocean Springs, Mississippi). Body length was measured in millimeters (mm) from the tip of the rostrum to the base of the telson (TL). Following Barnard and Karaman (1991) 'spines' are defined as thick inflexible setae, while thin flexible setae are called 'setae.' Setae that do not clearly fit either of these definitions will be referred to as 'stout setae.'

***Gammarus lecroyae* sp. nov.**
Figures 1–6

*Gammarus* (*Mucrogammarus*) sp. A: Farrell, 1970, p. 29, Fig. 4.
*Mucrogammarus* sp.: Thomas, 1976, p. 91.
*Mucrogammarus* sp.: Sheridan, 1979, p. 70.
*Gammarus macromucronatus*: Stoner, 1979, p. 203; 1980, p. 67; *nomen nudum*.
*Gammarus* sp. (macromucronate form): Heard, 1982, p. 37, Fig. 41.
*Gammarus* sp. B: LeCroy, 2000, p. 66, Fig. 120.

**Material examined: Holotype**: USNM 1122177, male, 7.0 mm TL, near headwaters of Davis Bayou, Ocean Springs, Jackson County, Mississippi, USA, 88°45'07" W, 30°24'12" N, in filamentous green algae, 1.5–2 m, 7–9 ppt, 17 January 2005, collected by B.P. Thoma and R.W. Heard, specimen dissected for illustration. **Paratypes**: USNM 1122178, 3 males, 3 females, 3 ovigerous females, 3 subadults, all other data same as holotype. USNM 1122179, 1 female, 5.5 mm TL, all other data same as holotype, specimen dissected for illustration. GCRL 2935, 3 males, 3 females, 3 ovigerous females, 3 subadults, all other data same as holotype. **Other material examined:** 5 males, 2 females, other data same as holotype. 5 males, 1 female, Sandy Creek just north of boat ramp, Panama City, Bay County, Florida, USA, 85°24'59" W, 30°06'54" N, in *Ruppia maritima*, <1 m, 4–6 ppt, 19 February 2005, collected by B.P. Thoma and J.M. Foster.

**Diagnosis.** Eyes medium, reniform, not reaching dorsal margin of head. Antennae subequal; antenna 2 of male without long curly setae, antennal flagellum with short setae, not more than one flagellar article in length. Pereiopods 5–7 of male having distal articles with margins sparsely setose. Pleonites 1–3 (rarely only pleonites 1–2) having posterodorsal margin with enlarged mucronate process, process often directed dorsally away from body, with few or no apical setae. Urosomites 1–2, dorsolateral spine groups with 1–2 spines each. Telson of both sexes lacking medial spines in distal half; lacking terminal setae or if setae present, not as long as terminal spines.

**Description of male. Head**: (Fig. 1) Lateral lobe truncate; inferior antennal sinus shallow; eyes reniform, medium, not reaching top of head.

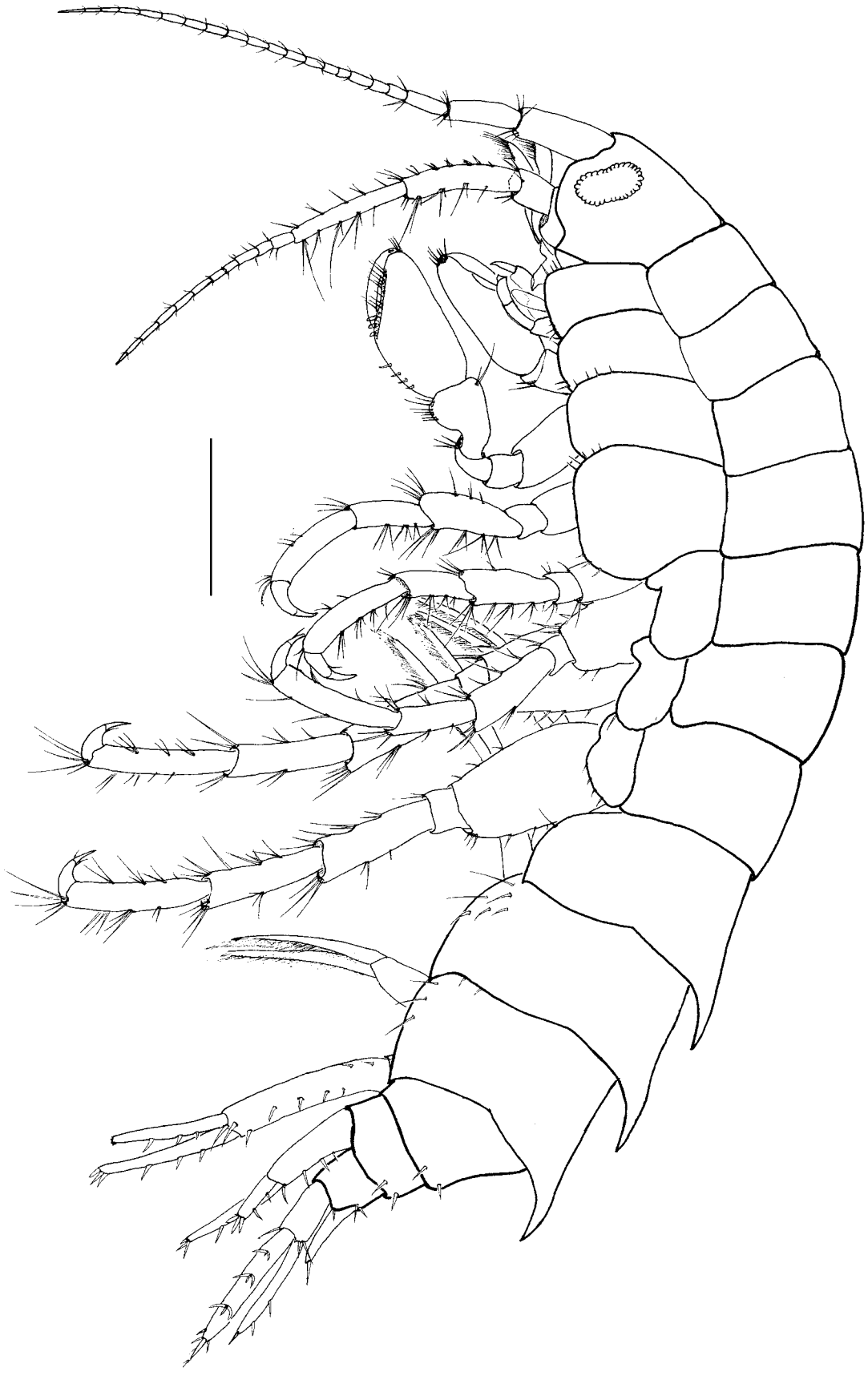

**FIGURE 1.** *Gammarus lecroyae* **sp. nov.**, Male holotype, 7.0 mm TL, headwaters of Davis Bayou, Ocean Springs, Mississippi, USA, USNM 1122177. Whole animal, lateral view. Scale = 1 mm.

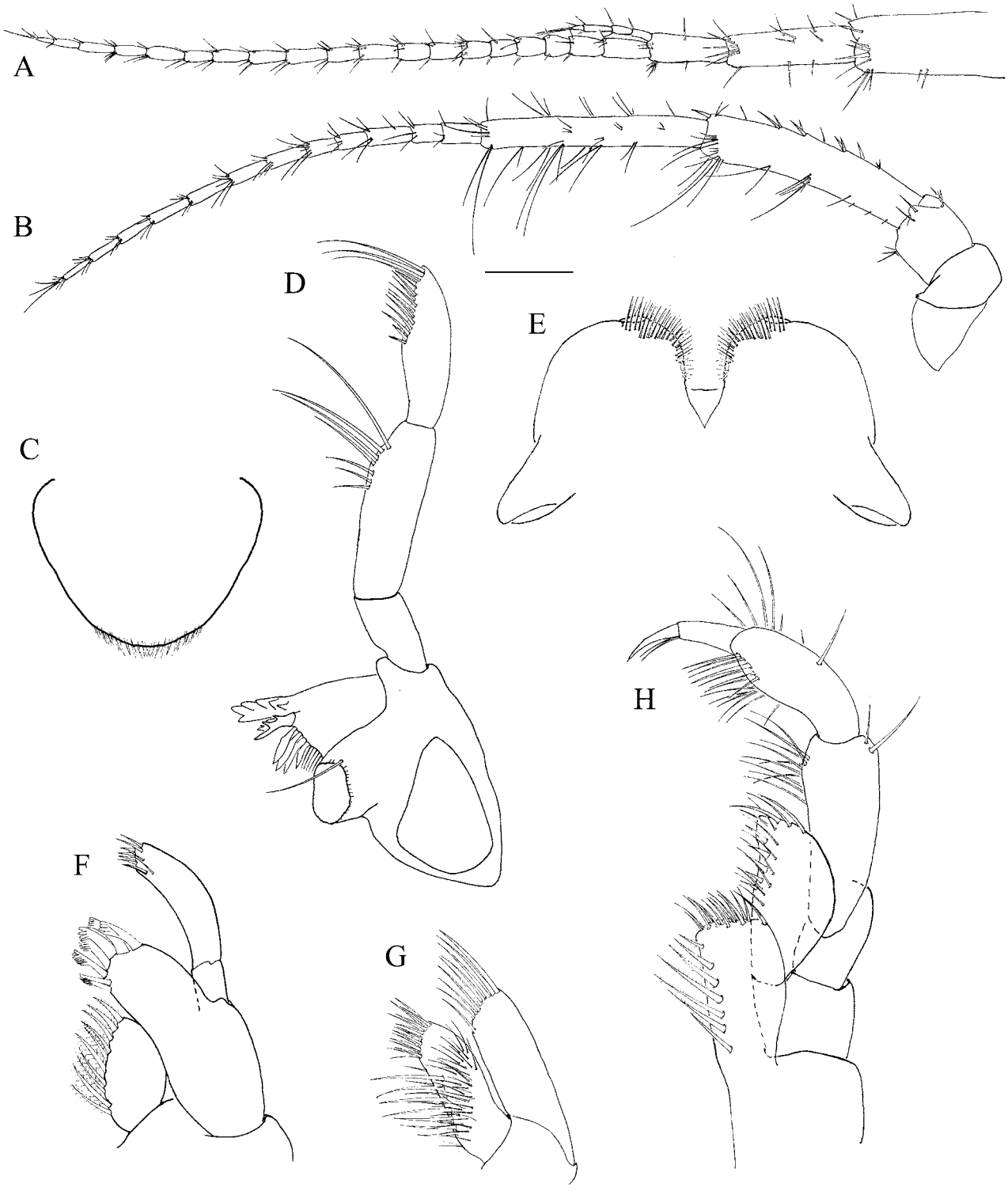


**FIGURE 2.** *Gammarus lecroyae* **sp. nov.**, Male holotype, 7.0 mm TL, headwaters of Davis Bayou, Ocean Springs, Mississippi, USA, USNM 1122177. A, antenna 1; B, antenna 2; C, upper lip (labrum); D, mandible; E, lower lip (labium); F, maxilla 1; G maxilla 2; H, maxilliped. Scale = 0.3 mm (A–B), 0.1 mm (C, E, H), 0.15 mm (D, F–G).

**Antenna 1**: (Figs. 1, 2A) Not distinctly longer than antenna 2; peduncle article 1 > 2 > 3, distal margins with fringe of simple setae, sparsely setose throughout; article 2 slightly more setose than article 1 or 3. Primary flagellum with 15–24 articles, typically 18–22; distal margin of each flagellar article sparsely setose, setae rarely as long as subsequent article. Accessory flagellum of 3–4 articles, typically 4, reaching distal margin of second article of primary flagellum; terminal article with 2–4 apical setae.

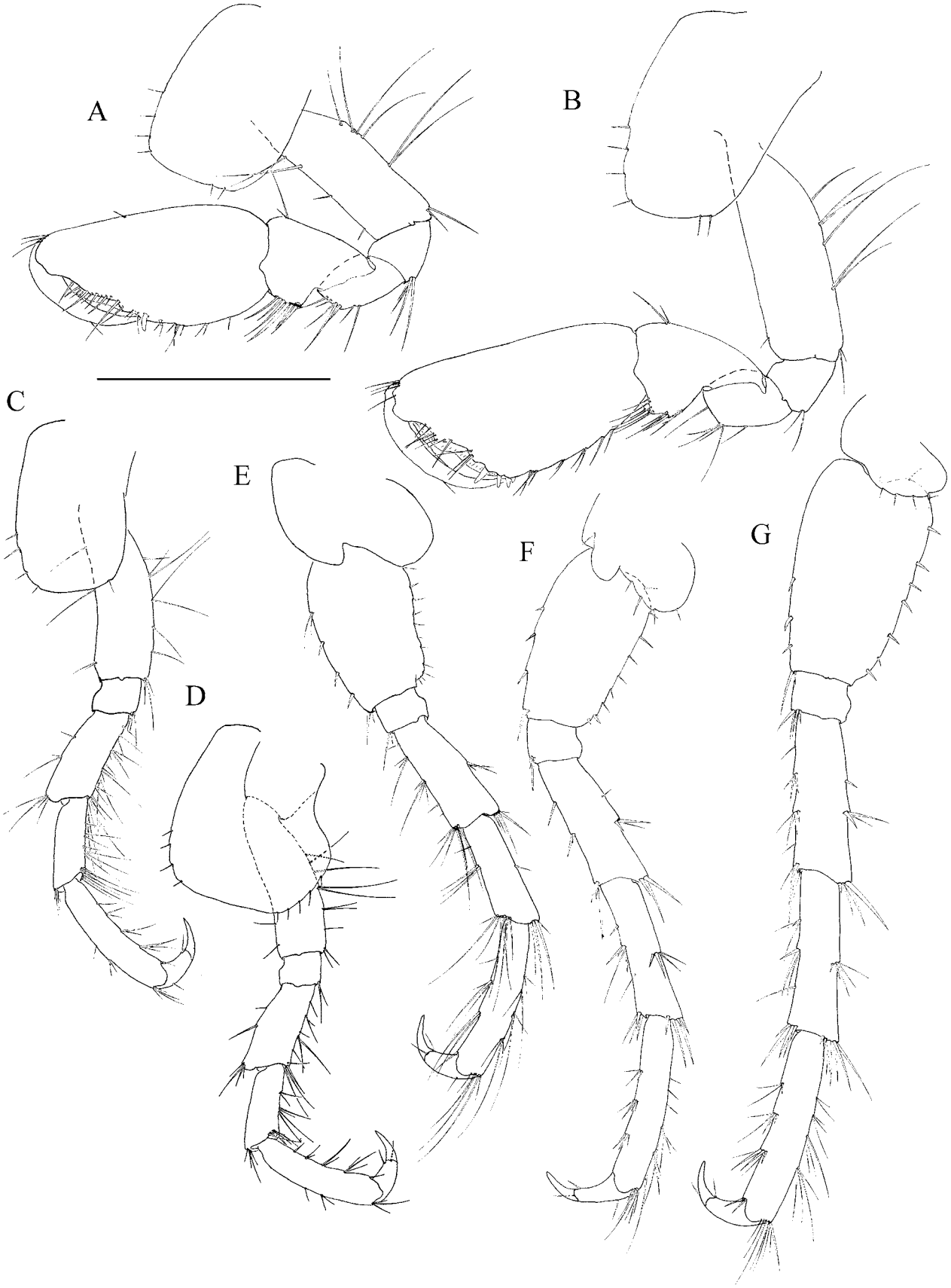


**FIGURE 3.** *Gammarus lecroyae* **sp. nov.**, Male holotype, 7.0 mm TL, headwaters of Davis Bayou, Ocean Springs, Mississippi, USA, USNM 1122177. A, gnathopod 1; B, gnathopod 2; C, pereiopod 3; D, pereiopod 4; E, pereiopod 5; F, pereiopod 6; G , pereiopod 7. Scale = 0.75 mm (A–B), 1.0 mm (C–G).

**Antenna 2**: (Figs. 1, 2B) As long or nearly as long as antenna 1. Gland cone reaching just beyond distal margin of second peduncular article. Peduncle articles 4–5 with several clusters of long setae on ventral surface, clusters of short setae on dorsal surface. Flagellum noncalceolate, with 9–14 articles, typically 11–12; distal margins of flagellar articles sparsely fringed with short setae, setae not as long as subsequent article.

**Upper Lip (Labrum)**: (Fig. 2C) Simple, convex, fringed with minute setae distally.

**Mandible**: (Fig. 2D) Incisor process with 5–6 teeth, typically 5; lacina mobilis multidentate, center gently excavated so as to appear spoon-shaped or folded; spine row with 4–6 serrate setae; molar triturative with single simple seta. Palp of 3 articles; article 2 longest, with large cluster or patch of simple setae medially on distal half of article; article 3 with row of simple setae medially on distal half of article, setae increasing in length distally.

**Lower Lip (Labium)**: (Fig. 2E) Inner lobe absent; distomedial margin with numerous fine setae.

**Maxilla 1**: (Fig. 2F) Inner plate fringed medially by row of stout, plumose setae; outer plate with several distal rows of very stout, serrate setae; article 2 of palp distally with numerous simple setae.

**Maxilla 2**: (Fig. 2G) Inner plate with diagonal band of numerous small, simple setae on inner surface, medial margin with several stout, plumose setae, distomedial margin lined with simple setae; outer plate with marginal row of simple setae distally.

**Maxilliped**: (Fig. 2H) Inner plate with numerous simple setae distally, medial margin with row of stout, plumose setae; outer plate with submarginal row of stout, short setae medially, numerous simple setae medially and distally; palp unguiform, of 4 articles.

**Gnathopod 1**: (Fig. 3A) Coxal plate subrectangular, deeper than wide; anterior margin with about 4 short setae; posteroventral margin with 2 short setae. Basis elongate; anterior and posterior margins with several clusters of long, simple setae; posterodistal margin with cluster of simple setae. Ischium short, nearly as wide as long; posterodistal margin with cluster of simple setae nearly as long as ischium. Merus longer than wide; posterior margin with several simple setae distally; distal margin with numerous simple setae. Carpus inflated distally; small cluster of simple setae on anterodistal margin; posterodistal margin with numerous stout, simple setae. Propodus robust, much larger than carpus; anterior margin with minute cluster of simple setae mid-length; anterior-most portion of articulation with dactylus fringed with simple setae; posterior margin with several clusters of simple setae. Palm having cutting-edge complex, with several short, stout setae among numerous longer simple setae; several blunt spines present at palmar angle; cutting-edge present as thin, micro-serrate, blade-like edge. Dactylus unguiform, not in contact with cutting-edge along entire length; single simple seta on outer margin.

**Gnathopod 2**: (Fig. 3B) Coxal plate subrectangular, deeper than wide, tapering distally; anterior margin with 3–5, usually 4, short, simple setae; posteroventral margin with 2 simple setae. Basis elongate; posterior margin with several clusters of long, simple setae; anterior margin with minute cluster of simple setae distally; posterodistal margin with cluster of simple setae. Ischium short, slightly longer than wide; posterodistal margin with cluster of simple setae. Merus longer than wide; posterior margin with minute cluster of simple setae in distal third; posterodistal margin with numerous simple setae. Carpus inflated distally; anterodistal margin with small cluster of simple setae; posterodistal margin with numerous simple setae (arranged in clusters or rows). Propodus robust; anterior-most portion of articulation with dactylus fringed with simple setae; posterior margin with about 5 clusters of simple setae. Palm having cutting-edge complex, with numerous simple setae; several blunt spines present at palmar angle; cutting-edge present as thin, micro-serrate, blade-like edge. Dactylus unguiform, not in contact with cutting-edge along entire length; single simple seta on outer margin.

**Pereiopod 3**: (Fig. 3C) Coxal plate subrectangular, deeper than wide, tapering slightly in distal half; anterior margin with 3–5, usually 4, short, simple setae; posteroventral margin normally with single simple seta. Basis elongate; posterior margin with several clusters of long simple setae; anterior margin with several long simple setae, single cluster of simple setae distally; posterodistal margin with cluster of simple setae. Ischium short, subquadrate, slightly wider than long; posterodistal margin with cluster of simple setae. Merus twice as long as wide; posterior margin with numerous simple setae, increasing in length and density distally;

posterodistal margin with numerous clusters of simple setae; anterior margin with several small clusters of simple setae; anterodistally produced, with cluster of simple setae. Carpus elongate, 2.5 to 3 times longer than wide; posterior margin densely setose, with numerous clusters of long, simple setae; posterodistal margin fringed with numerous long, simple setae; anterodistal margin with fringe of short, simple setae. Propodus slender; anterior margin with several minute clusters of short, simple setae; anterior-most portion of articulation with dactylus fringed with simple setae; posterior margin with 3–5, usually 4, clusters of simple setae, setae increasing in length and density distally; posterodistal margin with single spine on either side of articulation. Dactylus unguiform; single short, simple seta proximally on anterior margin; single, simple seta medially on posterior margin.

**Pereiopod 4**: (Fig. 3D) Similar to pereiopod 3 except for following: Coxal plate tapering slightly distally, slightly deeper than wide; posterior margin excavate proximally; anterior margin with 3–5, usually 4, short, simple setae; posteroventral margin with 4–6 single simple setae. Dactylus unguiform; anterior margin with single short, simple seta proximally (not shown); posterior margin with single, simple seta medially; margin of nail with single, simple, seta laterally.

**Pereiopod 5**: (Fig. 3E) Coxal plate subovate, wider than deep, anterior lobe produced ventrally. Basis robust, 1.5 times longer than wide at widest point; posterior margin very sparsely fringed with short, simple setae; anterior margin with small cluster of simple setae in proximal half, distal half with several stout setae; anterodistal margin with cluster of simple setae. Ischium short, subquadrate, slightly wider than long; anterodistal margin with cluster of simple setae. Merus slightly more than 2 times longer than wide; anterior margin with several clusters of simple setae; anterodistal margin fringed with numerous simple setae; posterior margin with single small cluster of simple setae; posterodistal margin produced with cluster of simple setae. Carpus elongate, 2 to 2.5 times longer than wide; anterior margin with single cluster of long simple setae; anterodistal margin fringed with numerous long, simple setae; posterior margin with single minute cluster of simple setae; posterodistal margin with fringe of simple setae. Propodus slender; anterior margin with several clusters of long simple setae; anterior-most portion of articulation with dactylus with single spine on either side of articulation (not shown); posterior margin with about 4 clusters of simple setae, setae increasing in length and density distally; posterior-most portion of articulation with dactylus fringed with simple setae. Dactylus unguiform; anterior margin with single short, simple seta distally; posterior margin with single, simple seta proximally; proximal margin of nail with single simple seta laterally.

**Pereiopod 6**: (Fig. 3F) Coxal plate subovate, wider than deep, anterior lobe produced ventrally; posteroventral margin with 3–5, usually 4, simple setae. Basis robust, 1.5 times longer than wide at widest point; posterior margin very sparsely fringed with short simple setae, 2–4 stout setae near distal margin; anterior margin with several stout setae in distal half, increasing in length distally; anterodistal margin with cluster of stout, simple setae. Ischium short, subquadrate, slightly wider than long; anterodistal margin with cluster of simple setae. Merus 2 to 2.5 times longer than wide; anterior margin with several clusters of simple setae; anterodistal margin fringed with numerous stout, simple setae; posterior margin with single cluster of stout, simple setae; posterodistally produced with cluster of stout, simple setae. Carpus elongate, slightly more than 3 times longer than wide; anterior margin with several single setae and cluster of long simple setae; anterodistal margin fringed with numerous simple setae; posterior margin with single cluster of simple setae; posterodistal margin slightly produced with fringe of simple setae. Propodus slender; anterior margin with several clusters of simple setae; anterior-most portion of articulation with dactylus with single spine on either side of articulation (not shown); posterior margin with several simple setae in proximal half, 1–3, usually 2, clusters of simple setae in distal half, setae increasing in length and density distally; posterior-most portion of articulation with dactylus fringed with simple setae. Dactylus unguiform; anterior margin with single short, simple seta distally; posterior margin with single, simple seta proximally; proximal margin of nail with single, simple, seta laterally.

**Pereiopod 7**: (Fig. 3G) Coxal plate subovate, wider than deep, anterior lobe very slightly produced ventrally, posterior lobe narrowing posteriorly; posteroventral margin with 3–5, usually 4, simple setae. Basis robust, 1.5 to 2 times longer than wide at widest point; posterior margin very sparsely fringed with short,

stout, simple setae; anterior margin with several short, stout setae in distal half; anterodistal margin with small cluster of stout, simple setae. Ischium short, subquadrate, slightly wider than long; anterodistal margin with cluster of simple setae. Merus elongate, 2.5 to 3 times longer than wide; anterior margin with several clusters of simple setae; anterodistal margin fringed with numerous simple setae; posterior margin with two small clusters of stout, simple setae; posterodistally produced with cluster of stout, simple setae. Carpus elongate, nearly 3 times longer than wide; anterior margin with several clusters of long simple setae; anterodistal margin fringed with numerous simple setae; posterior margin with single cluster of simple setae; posterodistal margin slightly produced, with fringe of simple setae. Propodus slender; anterior margin with several clusters of simple setae, increasing in length and density distally; anterior-most portion of articulation with dactylus with single spine on either side of articulation (not shown); posterior margin with several clusters of long, simple setae, setae increasing in length and density distally; posterior-most portion of articulation with dactylus fringed with simple setae. Dactylus unguiform; posterior margin with single short, simple seta proximally (not shown); anterior margin with single, simple seta distally; proximal margin of nail with single, simple seta laterally.

**Pleopods 1–3**: (Fig. 4A) Pleopods subequal in length, pleopod 3 with peduncle slightly shorter than that of pleopods 1–2 (not shown), 2 retinaculae present distally; rami about 12–14 articulate, armed with plumose setae.

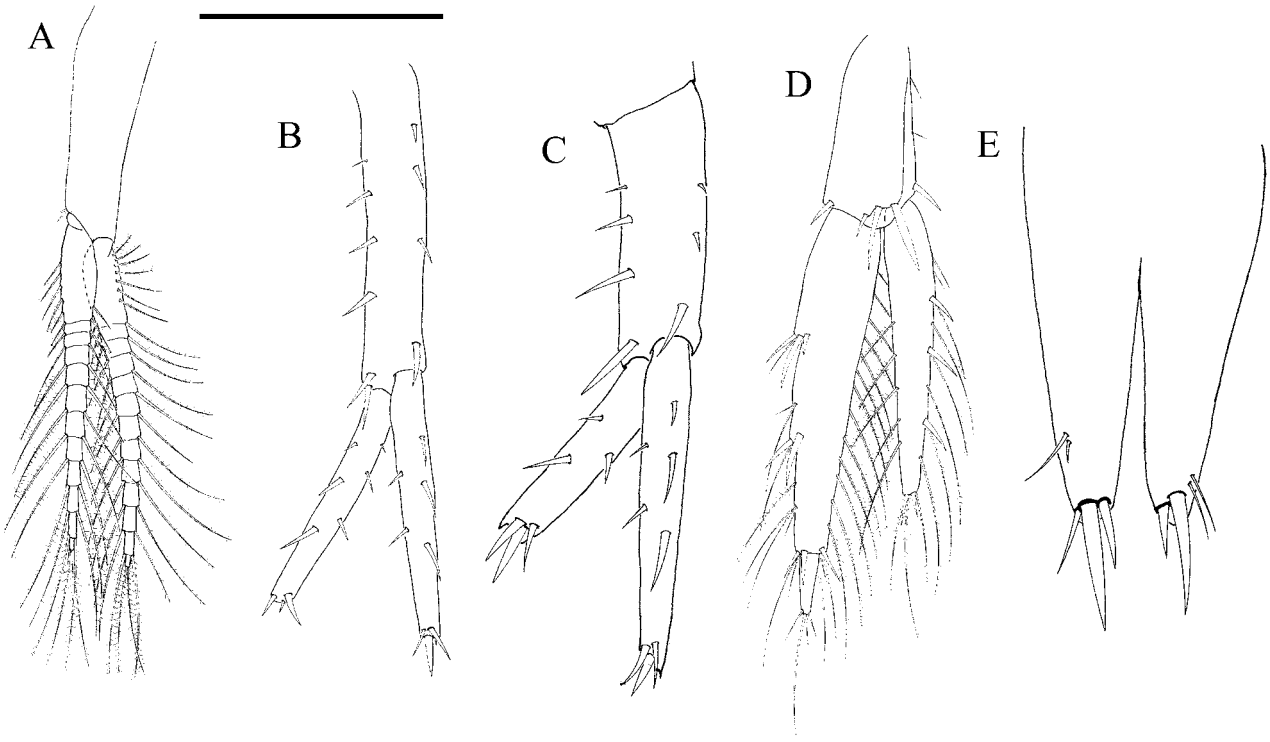


**FIGURE 4.** *Gammarus lecroyae* **sp. nov.**, Male holotype, 7.0 mm TL, headwaters of Davis Bayou, Ocean Springs, Mississippi, USA, USNM 1122177. A, pleopod 1; B, uropod 1; C, uropod 2; D, uropod 3; E, telson. Scale = 0.75 mm (A–B), 0.5 mm (C–D), 0.25 mm (E).

**Pleonites 1–3**: (Fig. 1) Pleonite 1 with prominent posterodorsal mucronate process, often distinctly angled dorsally away from body; posterior margin lacking setae or rarely with very few apical setae. Epimeral plate 1 with posteroventral corner acute, not greatly produced; anteroventral region sparsely setose. Pleonites 2–3 similar to pleonite 1 except posteroventral corner of epimera 2–3 slightly more produced; anteroventral region of epimera 2–3 slightly more setose.

**Uropod 1**: (Fig. 4B) Peduncle longer than rami; 1–3 (normally 2) basofacial spines present; outer margin

with 5–7 spines, typically 6, increasing in size distally; inner margin with 3–5 spines, typically 4, increasing in size distally. Rami subequal, outer ramus slightly shorter than inner ramus; outer ramus with 2–4, usually 3, spines on each margin, terminating in 3–5 spines; inner ramus with 2–3 spines on each margin, terminating in 3–5 spines.

**Uropod 2**: (Fig. 4C) Peduncle longer than outer ramus, slightly shorter than inner ramus; outer margin with about 4 spines, increasing in size distally; inner margin with about 3 spines, increasing in size distally. Outer ramus distinctly shorter than inner, with 1–2 spines on each margin, terminating in 3–5 spines; inner ramus with 2–3 spines on each margin, terminating in 3–5 spines.

**Uropod 3**: (Fig. 4D) Peduncle distinctly shorter than rami; inner margin with 1–3, usually 2, simple setae; peduncle distally with 3–6, usually 5, stout spines. Rami unequal, outer ramus distinctly longer. Outer ramus with two articles; article 1 with outer margin with 3 or more clusters of stout spines, long thin plumose setae and smaller simple setae; inner margin lined with long, plumose setae; distally fringed with spines and simple setae; article 2 short, coniform, terminating in cluster of simple setae. Inner ramus with inner margin lined with long, plumose setae; outer margin with several stout spines dorsally along length of margin, margin lined with long, plumose setae; ramus terminating in cluster of short spines and longer plumose setae.

**Telson**: (Fig. 4E) Lobes elongate; lateral margins with at most one spine in proximal one third, distally with at most few short, simple setae; terminating in spines only, setae, if present, small and not exceeding length of spines; medial margins lacking spines.

**Description of female.** General appearance similar to male. Differs as follows:

**Antenna 1** (Fig. 5A) with primary flagellum of 11–18 articles, typically 12–14; accessory flagellum typically of 3 articles. **Antenna 2** (Fig. 5B) with 8–9 flagellar articles, typically 8. **Gnathopod 1** (Fig. 5C) with propodus subequal to carpus; propodus with single cluster of long, simple setae in distal half of anterior margin; dactylus meeting palm across entire length of cutting edge or nearly so. **Gnathopod 2** (Fig. 5D) with propodus subequal to carpus, not robust or greatly enlarged, anterior margin with 1–2 clusters of long, simple setae; dactylus meeting palm across entire length of cutting edge or nearly so. **Pereiopods 3–7** (Fig. 5E–I) generally similar to those of the male, appearing slightly less setose. **Uropod 1** (Fig. 6A) with peduncle not distinctly longer than rami; outer margin of peduncle with 2–4, usually 3, spines; inner margin with 3–6, usually 5, stout spines; outer ramus with 2 spines on each margin. **Uropod 2** (Fig. 6B) slightly stouter in general appearance than uropod 1; peduncle with 2–3 spines per margin; outer ramus distinctly shorter than inner ramus, with single spines on each margin; inner ramus with one spine medially and two laterally. **Uropod 3** (Fig. 6C) distinctly less densely setose than in male; inner margin of outer ramus with fewer plumose setae than in male; inner ramus nearly asetose. **Telson** (Fig. 6D) with lobes shorter than in male.

**Etymology.** This taxon is named in honor of Sara E. LeCroy for her many contributions to our understanding of the Amphipoda of the northern Gulf of Mexico and surrounding waters.

**Type-locality.** Headwaters of Davis Bayou, 88°45’07” W, 30°24’12” N, Ocean Springs, Mississippi, USA.

**Distribution.** Tampa Bay, Florida to Barataria Bay, Louisiana (Thomas 1976; Heard 1982; LeCroy 2000; present study).

**Ecology.** Common among submerged aquatic vegetation and assorted algae in low salinity bays, bayous, and estuaries; subtidal, rarely intertidal in marshes (Thomas 1976; Heard 1982; LeCroy 2000).

**Color.** Clear to slightly opaque with irregular brown mottling, especially prominent dorsally; occasionally small red blotches laterally on pleonites.

**Remarks.** *Gammarus lecroyae* is most superficially similar to *Gammarus mucronatus*, the only other gammarid amphipod known from the northwestern Atlantic with dorsal mucronate processes on the first three pleonites. However, the mucronations of *G. lecroyae* are generally much more pronounced and tend to angle dorsally away from the dorsal surface of the following pleonite; whereas the mucronations of *G. mucronatus* tend to be smaller and follow the contour of the following pleonite. In juveniles and subadults of both species the mucronations are not well-developed, making identification more difficult.

In addition to the differences in the mucronations, males of *Gammarus lecroyae* can be distinguished from

those of *Gammarus mucronatus* by the setation of the second antenna, the setation of pereiopods 5–7, the setation of the dorsal pleonites and the spination and setation of the telson. Although females of the two species are generally more difficult to distinguish, they can be separated by the setation of the gnathopods, general setation of the pereiopods (although to a lesser degree than in the males), the setation of the dorsal pleonites, and the spination and setation of the telson.

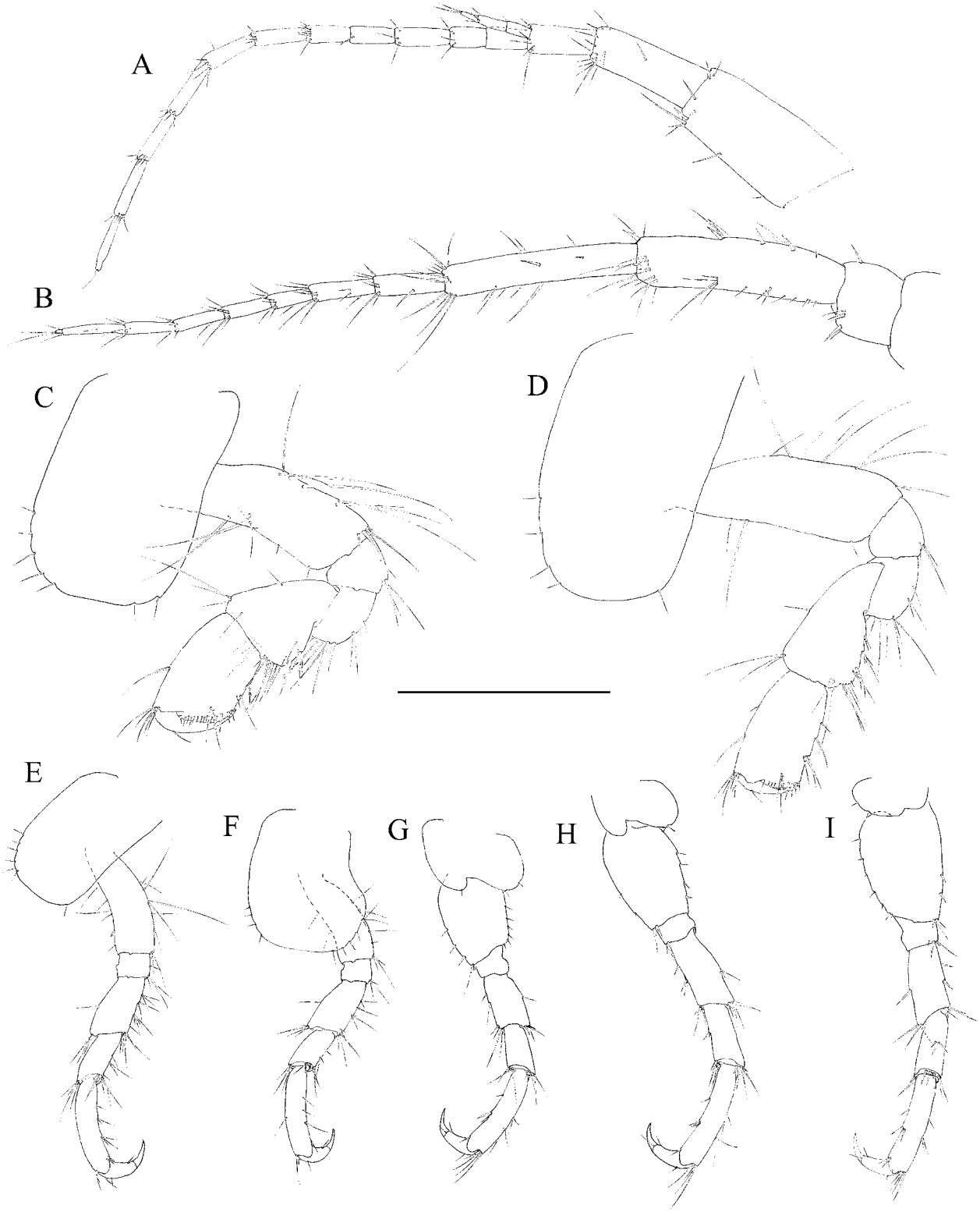


**FIGURE 5.** *Gammarus lecroyae* **sp. nov.**, Female paratype, 5.5 mm TL, headwaters of Davis Bayou, Ocean Springs, Mississippi, USA, USNM 1122179. A, antenna 1; B, antenna 2 (basal segment omitted); C, gnathopod 1; D, gnathopod 2; E, pereiopod 3; F, pereiopod 4; G, pereiopod 5; H, pereiopod 6; I, pereiopod 7. Scale = 0.5 mm (A–D), 1.0 mm (E–I).

In males of *Gammarus lecroyae*, the flagellum of antenna 2 has setae the length of which does not exceed the length of the following flagellar article. However, in males of *G. mucronatus*, antenna 2 has setae on the flagellum greatly exceeding the length of the following flagellar article. In addition, both sexes of *G. lecroyae* have a telson which lacks medial spines in the distal half and, when present, terminal setae that never exceed the length of the terminal spines. In *G. mucronatus*, one or more spines are present along the medial margin of the telson lobes and the terminal setae typically exceed the length of the spines. Also the dorsal pleonites of both sexes of *G. mucronatus* typically have posterior margins with several minute setae. In *G. lecroyae*, the dorsal pleonites have at most a few apical setae on the mucronate processes.

In general appearance, specimens of *Gammarus mucronatus* are more densely setose, especially in the setation of pereiopods 5–7, than those of *Gammarus lecroyae*. This difference is much more noticeable in males of both species than in females. During the preliminary identification of specimens, setation of the pereiopods often served as a reliable secondary character when used in conjunction with the dorsal mucronations.

The carpus and propodus of the female gnathopods can also be used to separate the two species. Gnathopod 2 of female *G. mucronatus* has the posterior margin of the propodus densely fringed with rows or clusters of setae, while in *G. lecroyae*, the propodus has distinctly fewer clusters of setae. Furthermore, the anterior surface of the carpus has several large clusters of setae in *G. mucronatus* and in *G. lecroyae*, the carpus again has noticeably fewer clusters. In *G. mucronatus*, gnathopod 1 has the propodus and carpus with several disjunct rows of setae on the lateral surface, whereas *G. lecroyae* has the propodus and carpus with at most a few setae near the distal margin of the carpus. Despite the developmental variation in the setation of the female gnathopods, these characters appear to work on subadult females as well as mature females; however, the differences are more apparent in adults.

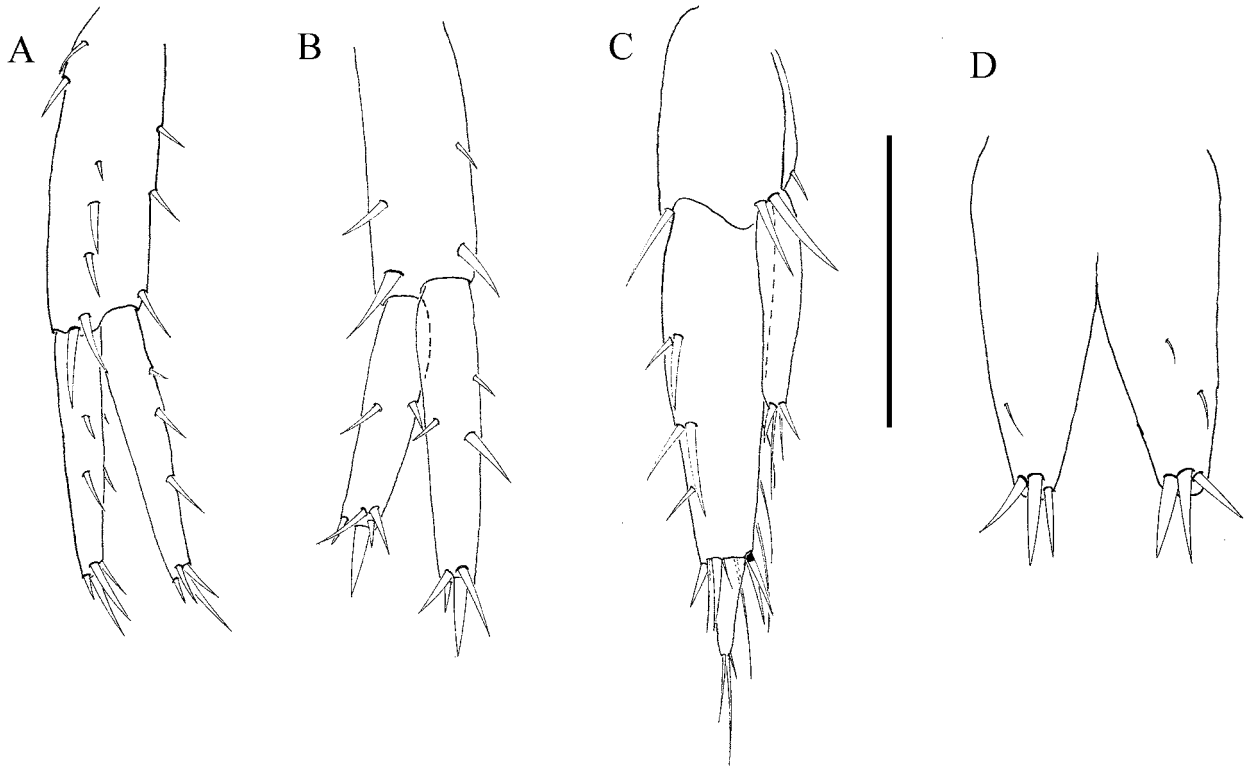


**FIGURE 6.** *Gammarus lecroyae* **sp. nov.**, Female paratype, 5.5 mm TL, headwaters of Davis Bayou, Ocean Springs, Mississippi, USA, USNM 1122179. A, uropod 1; B, uropod 2; C, uropod 3; D, telson. Scale = 0.75 mm (A), 0.30 mm (B–D).

LeCroy (2000) suggested that *Gammarus lecroyae* could be separated from *Gammarus mucronatus* by the presence of a posteromedial patch of setae on the basis of pereiopod 7 in both sexes of *Gammarus lecroyae*; however, the current study would indicate that this character is not reliable for the separation of these two species. Fewer than 30% of the specimens of *G. lecroyae* examined had this submarginal patch of setae present; however, the same patch of setae was never found on specimens of *G. mucronatus*. So while the presence of this character is a good indication that a specimen is referable to *G. lecroyae*, its absence does not necessarily indicate that the specimen represents *G. mucronatus*.

Although the coloration pattern of these two species is generally similar, *Gammarus lecroyae* tends to be more vibrantly colored. Furthermore, *G. mucronatus* typically has larger red blotches on the pleonites than does *G. lecroyae*.

The type materials of *Gammarus mucronatus* were deposited in the collections of The Academy of Natural Sciences of Philadelphia by Say (1818); however, Spamer and Bogan (1992) reported the specimens as "missing." Subsequent efforts to locate the type materials within the collections of The Academy also proved unsuccessful (P. Callomon, pers. comm.). Presumably, the type material has been lost. The materials examined by Say at the time of his original description were collected from Egg Harbor, New Jersey and St. John's River, Florida. Materials from as far north as Holden, North Carolina to as far south as St. Lucie, Florida, which includes material from St. John's River, Florida, were examined and are believed to be representative of the materials described by Say. Although there appears to some variation between the *G. mucronatus* from the East Coast and the specimens of G. *mucronatus* from the Gulf of Mexico, it is unclear if this variation represents inter- or intraspecific variation. In either case, all materials believed to represent the complex of *G. mucronatus* can be distinguished from *G. lecroyae* using the characters presented herein.

As previously mentioned, other than *Gammarus mucronatus* and *Gammarus lecroyae*, there are no western Atlantic gammarid amphipods that have dorsal mucronations, which should allow specimens of these two species to be easily separated from all other regional *Gammarus* species.

**Key to the species of *Gammarus* known to occur in the waters of the northern Gulf of Mexico (modified from LeCroy 2000).**

1. Pleon 1–3 having posterodorsal margin entire, without dorsal processes; eye large, extending almost to dorsal margin of head; telson lobes of male not elongate, tip with spines interspersed with long setae, setae longer than spines. ..... *Gammarus tigrinus*
- Pleon 1–3 (occasionally only 1–2), posterodorsal margin with median posteriorly directed process; eye medium, not extending almost to dorsal margin of head; telson lobes of male elongate, tip with spines only, lacking terminal setae, or with spines interspersed with short setae, setae not longer than spines..... 2
2. Pleon 1–3 (occasionally only 1–2) with dorsal processes enlarged, angled dorsally away from following pleonite, having at most a few apical setae; 2nd antenna having setae with lengths not exceeding length of following flagellar article; telson lacking medial spines in distal half, terminal setae, when present, never exceeding the length of terminal spines..... *Gammarus lecroyae* **n.sp.**
- Pleon 1–3 (occasionally only 1–2) with dorsal processes small, following contour of following pleonite, typically with posterior margin having several minute setae; 2nd antenna having setae with lengths greatly exceeding length of following flagellar article; telson with one or more medial spines in distal half, terminal setae typically exceeding length of terminal spines..... *Gammarus mucronatus*

**Acknowledgements**

The authors would like to thank S.E. LeCroy and J. Campbell for their advice and encouragement throughout the duration of this project. Special thanks are extended to J.M. Foster for his assistance in collecting material. Thanks go to the staff of the Gunter Library for their assistance in retrieving hard to find literature and help with inter-library loans.

## References


Barnard, J.L. & Gray, W.S. (1968) Introduction of an amphipod crustacean into the Salton Sea, California. *Bulletin of the Southern California Academy of Sciences*, 67, 219–232.

Barnard, J.L. & Karaman, G.S. (1991) The families and genera of marine gammaridean Amphipoda (except marine gammaroids). Parts 1 & 2. *Records of the Australian Museum, Supplement*, 13, 866 pp.

Bousfield, E.L. (1973) *Shallow-water Gammaridean Amphipoda of New England*. Cornell University Press, Ithaca, N.Y., 312 pp.

Farrell, D.H. (1970) *Ecology and seasonal abundance of littoral amphipods from Mississippi*. MS Thesis, Mississippi State University, 62 pp.

Heard, R.W. (1982) *Guide to common tidal marsh invertebrates of the northeastern Gulf of Mexico*. Mississippi Alabama Sea Grant Consortium, MASGP-79-004, 82 pp.

LeCroy, S.E. (2000) *An Illustrated Identification Guide to the Nearshore Marine and Estuarine Gammaridean Amphipoda of Florida. Volume 1. Families Gammaridae, Hadziidae, Isaeidae, Melitidae and Oedicerotidae*. Annual report, Contract No. WM724, Florida Department of Environmental Protection, 195 pp.

Mason, W.T. (1998) Macrobenthic monitoring in the lower St. John's River, Florida. *Environmental Monitoring and Assessment*, 50, 101–130.

Say, T. (1818) An account of the Crustacea of the United States. *Journal of the Academy of Natural Sciences of Philadelphia*, 1, 37–401.

Sheridan, P.F. (1979) Three new special [*sic*] of *Melita* (Crustacea: Amphipoda), with notes on the amphipod fauna of the Apalachicola estuary of northwest Florida. *Northeast Gulf Science*, 3, 60–73.

Spamer, E.E. & Bogan, A.E. (1992) General Invertebrates Collection of the Academy of Natural Sciences of Philadelphia. Part 1: Guide to the General Invertebrates Collection. Part 2: Annotated Catalogue of Recent Type Specimens: Protozoa, Porifera, Cnidaria, Platyhelminthes, Rotifera, Nemata, Nematomorpha, Annelida, Arthropoda (Merostomata, Pycnogonida, and Crustacea), Brachiopoda, and Echinodermata. Tryonia 26:vi, 1–305

Stoner, A.W. (1979) Species specific predation on amphipod Crustacea by the pinfish *Lagodon rhomboides*: Mediation by macrophyte standing crop. *Marine Biology*, 55, 201–207.

Stoner, A.W. (1980) Abundance, reproductive seasonality and habitat preferences of amphipod crustaceans in seagrass meadows of Apalachee Bay, Florida. *Contributions in Marine Science*, 23, 63–77.

Thomas, J.D. (1976) A survey of gammarid amphipods of the Barataria Bay, Louisiana region. *Contributions in Marine Science*, 20, 87–100.