

Gulf and Caribbean Research

Volume 23 | Issue 1

2011

Caribbean Leucothoidae (Crustacea: Amphipoda) of Panama

Kristine N. White

University of the Ryukyus, Japan

DOI: 10.18785/gcr.2301.03

Follow this and additional works at: <http://aquila.usm.edu/gcr>

 Part of the [Marine Biology Commons](#)

Recommended Citation

White, K. N. 2011. Caribbean Leucothoidae (Crustacea: Amphipoda) of Panama. *Gulf and Caribbean Research* 23 (1): 23-35.
Retrieved from <http://aquila.usm.edu/gcr/vol23/iss1/3>

This Article is brought to you for free and open access by The Aquila Digital Community. It has been accepted for inclusion in *Gulf and Caribbean Research* by an authorized editor of The Aquila Digital Community. For more information, please contact Joshua.Cromwell@usm.edu.

CARIBBEAN LEUCOTHOIDAE (CRUSTACEA: AMPHIPODA) OF PANAMA

Kristine N. White

University of the Ryukyus, 1 Senbaru, Nishihara, Okinawa, Japan 903-0213; e-mail: white.kristinen@gmail.com

Abstract: Leucothoid amphipods were collected from sponge, ascidian, and bivalve mollusk hosts around Bocas del Toro, Panama. New host and locality records are reported for 10 species. Morphological variation is noted in some species originally described from Belize and South Florida. Future molecular research will help to clarify the importance of this variation. A key to the Caribbean species of the Leucothoidae collected around Bocas del Toro, Panama is provided based on morphological characters.

Key Words: *Anamixis* spp., *Leucothoe* spp., taxonomy, amphipods

Introduction

The Leucothoidae Dana, 1852 is a family of amphipods found worldwide in coral reef environments, seagrass beds, and mangrove forests. Leucothoids typically occur inside of sessile invertebrate hosts such as sponges, ascidians, and bivalve mollusks, and are frequently found in crevices in coral rubble. A long history of a problematic taxonomy confounds the use of leucothoid amphipods in applied ecological studies. The incidental collection of many species and lack of strong morphological characters used in past taxonomic analysis have led to several species being misidentified as *Leucothoe spinicarpa* Abildgaard, 1789, a situation that requires further investigation.

The species collected around Bocas del Toro, Panama are typical of the Caribbean Sea and Western Atlantic Ocean with some morphological differences from specimens previously described from Belize and South Florida. *Leucothoe garifunae* Thomas and Klebba, 2007 and *Leucothoe saron* Thomas and Klebba, 2007 are the only described Caribbean species not reported from Panama. This paper describes the leucothoid amphipods collected around Bocas del Toro, Panama and notes some morphological variation from specimens collected from Belize and South Florida.

Materials and Methods

Amphipods were collected with their hosts in June of 2009 near The Smithsonian Tropical Research Institute (STRI) in Bocas del Toro, Panama. Specimens were captured directly from their hosts using a modified squirt bottle, with their entire host in zip-lock plastic bags, or among coral rubble. Ascidian hosts were identified by Rosana Rocha (Universidade Federal do Paraná, Curitiba, Brasil). Sponge and bivalve mollusk hosts were identified using the STRI species database and literature collection unless noted in station data. Amphipods were preserved in 95% alcohol for further molecular studies. Specimens from all samples were identified to species and those selected for dissection

and illustration were transferred to glycerin. Lengths listed in descriptions represent body length of the amphipods. Morphological structures were illustrated using a drawing tube attached to a Wild M11 compound microscope and digitally inked with a Wacom® tablet following Coleman (2003). Specimens used for dissection and illustration are deposited in the Gulf Coast Research Laboratory (GCRL) Museum. All other specimens are maintained in the laboratory of the author. Diagnoses of species were generated via comparison of all species in the Leucothoidae.

Results and Discussion

Ten leucothoid species were collected on the Caribbean side of Panama near Bocas del Toro. A diagnostic description and illustrations are provided for each species. Table 1 lists host records for each leucothoid species collected in Panama, including new host records.

Ten species of leucothoid amphipods are reported from Bocas del Toro, Panama, representing new locality and host records (Table 1). With the exception of *A. vanga*, all species were reported from multiple hosts (not including species only found in coral rubble). *Leucothoe ashleyae* was collected from 9 sponge hosts (8 previously unreported); *L. barana* was collected from 6 sponge hosts (5 previously unreported); *L. flammosa* was collected from 2 bivalve mollusk hosts (one previously unreported); *L. ubouhu* was collected from 2 sponge hosts (both previously unreported); *L. wuriti* was collected from 6 ascidian hosts (5 previously unreported); and *L. sp. C* Thomas and Klebba, 2007 was collected from 2 sponge hosts (one previously unreported). Eighteen tunicates were collected, one tunicate contained one *L. wuriti* specimen, and 14 tunicates contained between 2 and 19 *L. wuriti* specimens. Thirty-three sponges were collected with 23 containing leucothoid amphipods. *Leucothoe ashleyae* was collected with *L. barana* and *L. ubouhu* in 3 sponges. Otherwise, only a single leucothoid species was collected from

TABLE 1. List of hosts recorded for each leucothoid species in Panama. A.=Anamixis; L.= Leucothoe; * = new host records; ? = could occur in both species

	A. cavatura	A. vanga	L. ashleyae	L. barana	L. kensleyi	L. flammosa	L. laurensi	L. ubouhu	L. wuriti	L. sp. C
Sponge host										
<i>Spongia pertusa</i>			X*	X*						
<i>Amphimedon viridis</i>			X*					X*		
<i>Callyspongia vaginalis</i>			X							
<i>Chalinula molitba</i>			X*							
<i>Haliclona mucifibrosa</i>			X*							
<i>Haliclona (S.) twincaensis</i>		X*								
<i>Haliclona vansoesti</i>								X*		
<i>Niphates caycedoci</i>				X*						
<i>Niphates erecta</i>				X						
<i>Mycale (orange)</i>			X*							
<i>Mycale (white)</i>			X*	X*						
<i>Iotrochota birotulata</i>			X							
<i>Lissodendoryx columbiensis</i>			X*	X*						
<i>Tedania ignis</i>										X*?
<i>Tedania klausii</i>										X*?
Unidentified grey chimney sponge				X*						
Bivalve Mollusk Host										
<i>Barbatia (Cucullearca) candida</i>						X*				
<i>Lima scabra</i>						X				
Ascidian Host										
<i>Ascidia</i>									X*	
<i>Ascidia curvata</i>									X*	
<i>Ascidia sydeiensis</i>									X*	
<i>Phallusia nigra</i>									X	
<i>Rhodosoma turcicum</i>									X*	
<i>Herdmania pallida</i>									X*	
<i>Microcosmus exasperatus</i>									X*	
<i>Pyura</i>									X*	
<i>Pyura torpida</i>									X*	
Coral Rubble	X	X		X	X		X	X		

each sponge, with colomastigid amphipods present in 4 sponges. The numbers of leucothoids ranged from one to 32 individuals per sponge. Two bivalve mollusks were collected with 2 and 5 *L. flammosa* specimens collected from each one.

Systematics

ANAMIXIS CAVATURA Thomas, 1997 (Figure 1)

Leucothoides pottsi Shoemaker, 1933, pp. 249–251, figure 3; ~ Ledoyer, 1967, p. 127, figure 5b; ~ Ruffo, 1969, p. 12–13; ~ Sivaprakasam, 1967(1969), p. 373, figures 1e–g; ~ Ledoyer, 1978a, p. 375; ~ Ledoyer, 1978b, pp. 300–301; ~ Ledoyer, 1979a, p. 169; ~ Ledoyer, 1979b, p. 111, figure 68(II); ~ Thomas, 1979, pp. 107–109; ~ J.L. Barnard, 1979, p. 130.

Anamixis hanseni Pearse, 1912, p. 370; ~ Thomas, 1979, pp. 107–109; ~ Thomas and Taylor, 1981, pp. 462–467, figures 1–5; ~ Thomas and Barnard, 1983, pp. 154–157 (not *Anamixis hanseni* Stebbing, 1897).

Anamixis pottsi. ~ Ortiz and Lemaitre, 1994, p. 124.

Anamixis cavatura Thomas, 1997, pp. 47–50, figures 3–4.

Type locality: Carrie Bow Caye, Belize, Caribbean Sea, 1–2 m.

Material examined: Two male anamorphs, 23 male and female leucomorphs; Bocas 09–13B, Hospital Point, Bocas del Toro, Panama; 0–3 m; coral rubble wash; Kristine N. White collector; 15 June 2009.

Material illustrated: One male anamorph, 4.1 mm; one female leucomorph, 3.5 mm. Bocas 09–13B. GCRL 3059.

Diagnostic description: Male. Head, anterodistal margin oblique with cusp; ventral cephalic keel anterior margin oblique, anterodistal margin with downward projecting cusp (Figure 1A). Gnathopod 1 coxa anterodistal corner bicuspidate; basis anterior and posterior margins bare; carpus proximal margin smooth with a single long terminal seta; propodus posterior margin with a single, long seta, palm dentate; dactylus absent (Figure 1D). Gnathopod 2 coxa slightly larger than coxae 3 and 4, anterior margin with cusp; basis anterodistally expanded with serrate ridge, anterior margin with 2 setae, posterior margin bare; carpus distally tapered, anterior margin smooth; propodus with 1 mediofacial setal row above midline, reaching less than 0.5 x propodus length, palm with 2 major tubercles; dactylus posterior proximal margin with 2 setae, 2 tubercles, and distal margin serrate (Figure 1E). Pereopods 5–7 bases broadly expanded, posterior margins setose. Epimera 1–3 bare, epimeron 3 posteroventral corner subquadrate. Female. Head, anterior margin truncate. Gnathopod 1 carpus with 2 terminal serrate blades; propodus palm dentate; dactylus reaching less than 0.1 x propodus length (Figure 1C). Gnathopod 2 carpus length relative to propodus length 0.5, straight, distally truncate; propodus palm sub-triangular, primary mediofacial setal row above midline; dactylus curved, posterior proximal margin smooth (Figure 1B).

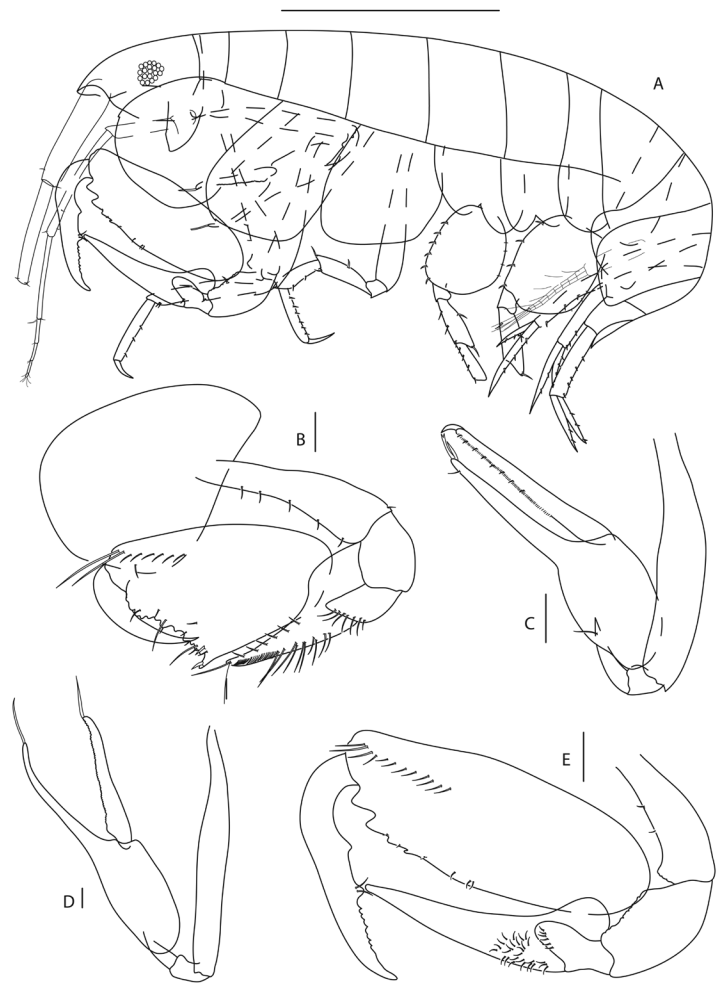


Figure 1. *Anamixis cavatura* Thomas (1997). Bocas 09-13B; anamorph male, 4.1 mm; leucomorph female, 3.5 mm; GCRL 3059; all scale bars 0.1 mm unless noted. A: anamorph male, scale bar 1 mm; B: leucomorph female gnathopod 2 medial; C: leucomorph female gnathopod 1 medial; D: anamorph male gnathopod 1 medial; E: anamorph male gnathopod 2 medial.

Remarks: Juvenile morphology dissimilar to adult males. The anamorph specimens collected in Panama differ from the original description of *A. cavatura* in the following: gnathopod 2 basis anterior margin with 2 setae (bare in the original description); and dactylus only distally serrate (entire proximal margin serrate in original description).

Distribution: Western Atlantic Ocean: Ft. Pierce Florida to Biscayne Bay, Florida Keys; Gulf of Mexico: Key West to Tampa; Caribbean Sea: Yucatan, Belize, Honduras, Jamaica, The Bahamas, Greater and Lesser Antilles, and Panama.

ANAMIXIS VANGA Thomas, 1997 (Figure 2)

Anamixis vanga Thomas, 1997, pp. 70–73, figures 17–18.

Type locality: Carrie Bow Cay, Belize, Caribbean Sea, 13.3 m.

Material examined: One male anamorph; Bocas 09–10A, San Cristobal, Panama; 0–2 m; coral rubble wash; Kristine N. White collector; 13 June 2009. One male anamorph, 11 male and female leucomorphs; Bocas 09–11F, Crawl Key, Panama; 1–3 m; coral rubble wash (possibly from sponge

Haliclona (S.) *twincayensis* de Weerd et al., 1991); Kristine N. White collector; 14 June 2009.

Material illustrated: One male anamorph, 2.9 mm; one female leucomorph 3.5 mm. Bocas 09-11F. GCRL3060.

Diagnostic description: Male. Head, anterodistal margin obliquely excavate with lateral ridge; ventral cephalic keel anterior margin oblique, anterodistal margin with an anteriorly projecting cusp (Figure 2A). Gnathopod 1 carpus

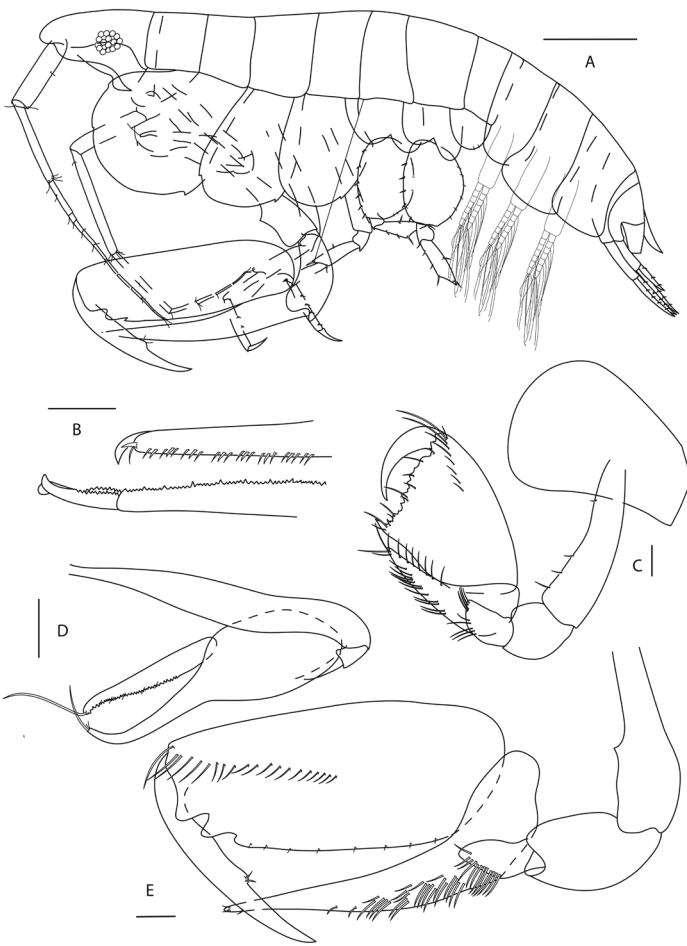


Figure 2. *Anamixis vanga* Thomas, 1997. Bocas 09-11F; anamorph male, 2.9 mm; leucomorph female, 3.5 mm; GCRL 3060; all scale bars 0.1 mm. A: anamorph male; B: leucomorph female, gnathopod 1 medial; C: leucomorph female gnathopod 2 medial; D: anamorph male gnathopod 1 medial; E: anamorph male gnathopod 2 medial.

proximal margin smooth, with long terminal seta; propodus posterior margin with a single, long seta, palm serrate with proximal setae; dactylus absent (Figure 2D). Gnathopod 2 coxa anterior and posterior margins with a single distal cusp; basis with slight anterodistal tubercle, bare; carpus length relative to propodus length 0.8, distally tapered; propodus with 1 mediofacial setal row displaced to midline, reaching between 0.5 and 0.7 x propodus length, palm linear with 3 major tubercles; dactylus proximal margin with

one tubercle and two setae (Figure 2E). Pereopods 5-7 bases narrowly expanded, posterior margins serrate, setose. Epimera 1-3 bare; epimeron 3 posteroventral corner subquadrate. Female. Head, anterior margin rounded. Gnathopod 1 carpus length 7 x width, proximal margin dentate with terminal spines, palm dentate, dactylus smooth, reaching less than 0.1 x propodus length (Figure 2B). Gnathopod 2 carpus length relative to propodus length 0.4, straight, distally truncate; propodus posterior margin smooth, primary mediofacial setal row above midline, palm sub-rectangular; dactylus curved, proximal margin smooth (Figure 2C).

Remarks: Juvenile morphology dissimilar to adult males. Leucomorphs agree closely with Thomas (1997). Anamorphs collected in Panama were yellowish in color, with white spots on coxae. Leucomorphs transparent, no color. Anamorph male specimens of *A. vanga* collected in Panama differ from those of Thomas (1997) in the following: habitus with yellow coloration (pink in original description); gnathopod 2 basis with slight anterodistal tubercle (smooth in original description), propodus without submarginal seta (1 seta in original description); pereopod 4 coxa distally rounded (slightly excavate in original description); and pereopods 5-7 posterior margins rounded (slightly excavate in original description).

Distribution: Western Atlantic Ocean: Georgia to the Florida Keys; Caribbean Sea: Belize, Panama.

LEUCOTHOE ASHLEYAE Thomas and Klebba, 2006 (Figure 3)

Leucothoe ashleyae Thomas and Klebba, 2006 pp.14-16, figures 1-3.

Type locality: Whale Shoals, Belize, Central America, Caribbean Sea, 1-20 m.

Material examined: Two males, Bocas 09-5A, Punta Caracol, Panama; 0-3 m; in sponge *Lissodendoryx columbiensis* Zea and van Soest, 1986; Kristin Hultgren collector; 9 June 2009. Five males and 8 females, Bocas 09-6A, Punta Caracol, Panama; 0-3 m; in sponge *Iothochota birotulata* (Higgin, 1877); Kristin Hultgren collector; 10 June 2009. Thirteen males and 7 females, Bocas 09-6E, Punta Caracol, Panama; 0-3 m; in sponge *Mycale* of Gray, 1867; Kristin Hultgren collector; 10 June 2009. One male, Bocas 09-7D, The Gardens, Panama; 15 m; in sponge *Mycale* of Gray, 1867; Kristine N. White collector; 11 June 2009. Two females, Bocas 09-7E, Solarte, Panama; 10 m; in sponge *Amphimedon viridis* Duchassaing and Michelotti, 1864; Kristine N. White collector; 11 June 2009. Fifteen males and 19 females, Bocas 09-8F, J, K, mangroves and seagrass between and STRI dock and STRI point, Bocas del Toro, Panama; 1-3 m; in sponges *Haliclona mucifibrosa* de Weerd et al., 1991, *Callyspongia vaginalis* Lamarck, 1814, and *Lissodendoryx columbiensis*, 1986; Kristine N. White collector; 12 June 2009. Five males and 10 females, Bocas 09-9A-B, Los Pastores, Panama; 1-4 m; in sponges *Spongia pertusa* Hyatt, 1877 and *Iothochota birot-*

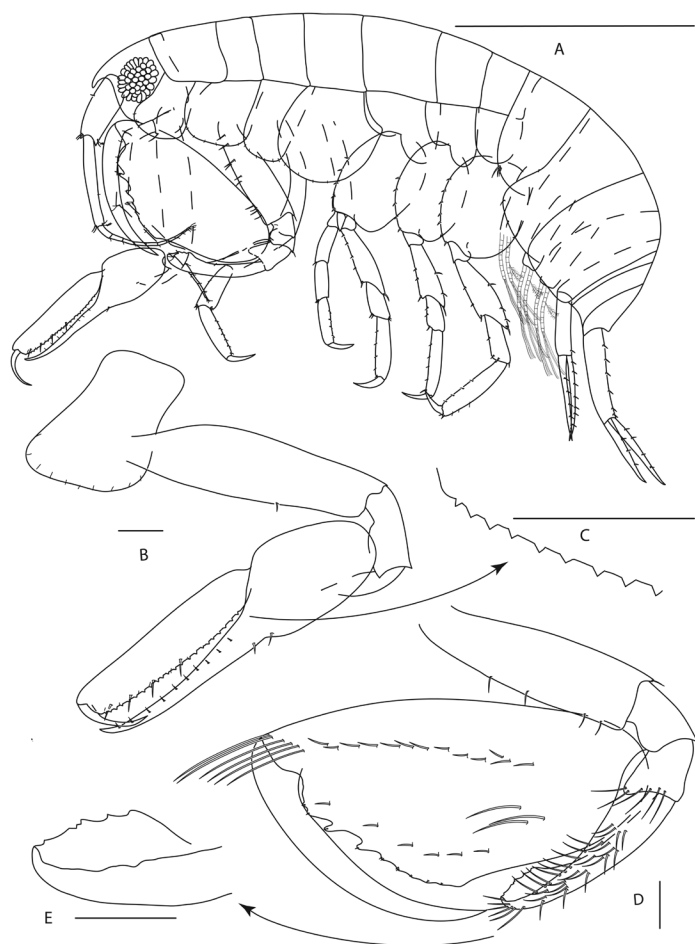


Figure 3. *Leucothoe ashleyae* Thomas and Klebba, 2006. Bocas 09-8F; male, 3.3 mm; female, 3.6 mm; GCRL 3061; all scale bars 0.1 mm unless noted. A: male, scale bar 1 mm; B: male gnathopod 1 medial; C: male gnathopod 1 propodus palm magnified; D: male gnathopod 2 medial; E: male gnathopod 2 carpus magnified.

ulata (Higgin, 1877); Kristine N. White collector; 13 June 2009.

Material illustrated: One male, 3.3 mm; one female 3.6 mm. Bocas 09-8F. GCRL 3061.

Diagnostic description: Male. Head, anterodistal margin evenly rounded; ventral cephalic keel anteroventral margin rounded, ventral margin excavate (Figure 3A). Gnathopod 1 coxa distal margin setose; basis anterior margin with 1 seta, posterior margin bare; carpus proximal margin dentate; propodus palm serrate (Figure 3C) with 4 proximal setae; dactylus reaching greater than 0.2 x propodus length (Figure 3B). Gnathopod 2 coxa distal margin setose; basis anterior margin with 6 setae, posterior margin bare; carpus distally expanded, anterior margin dentate (Figure 3E); propodus with 2 mediofacial setal rows, primary mediofacial setal row above midline, reaching between 0.5 and 0.7 x propodus length, secondary mediofacial setal row with 3 setae, with submarginal setae, palm with 3 major tubercles (Figure 3D). Pereopods 3-4 coxae distal margins setose. Pereopods 5-7

bases broadly expanded. Epimeron 1 with tuft of anteroventral setae, epimeron 2 with ventral setae, epimeron 3 posteroventral corner subquadrate. Female. Gnathopod 2 propodus palm with slightly smaller tubercles.

Remarks: Male specimens of *L. ashleyae* Thomas and Klebba, 2006 collected in Panama differ from the original description in the following characters: gnathopod 1 coxa anterodistal corner smooth, carpus with distal setae (bare in original description); gnathopod 2 coxa distal margin setose, propodus with longer setae in secondary mediofacial row and submarginal setal row than in original description, secondary mediofacial setal row with 3 setae (2 in original description); coxae 3-4 distal margins setose; pereopods 5-7 bases posterior margin smooth and bare (serrate and setose in original description); and uropods with variations in number of robust setae.

Distribution: Western Atlantic Ocean: Southeast Florida, Florida Keys; Caribbean Sea: Belize, Roatan, Bahamas, Viques, Puerto Rico, Panama.

LEUCOTHOE BARANA Thomas and Klebba, 2007 (Figure 4)

Leucothoe barana Thomas and Klebba, 2007, pp. 5-10, figures 1-3.

Type locality: Co Cat Cay, Pelican Cays, Belize, Caribbean Sea, 1-15 m.

Material examined: Two males, one female, Bocas 09-5A, Punta Caracol, Panama; 0-3 m; in sponge *Lissodendoryx columbiensis*; Kristin Hultgren collector; 9 June 2009. Two females, Bocas 09-6D, F, Punta Caracol, Panama; 0-3 m; in sponges *Spongia pertusa* and *Niphates caycedoci* Zea and van Soest, 1986; Kristin Hultgren collector; 10 June 2009. One male and one female, Bocas 09-7E, The Gardens, Panama; 15 m; in sponge *Mycale*; Kristine N. White collector; 11 June 2009. One female, Bocas 09-7C, Solarte, Panama; 10 m; in unidentified grey chimney sponge; Kristine N. White collector; 11 June 2009. Four males and 2 females, Bocas 09-8H, mangroves and seagrass between and STRI dock and STRI point, Bocas del Toro, Panama; 1-3 m; in sponge *Niphates erecta* Duchassaing and Michelotti, 1864; Kristine N. White collector; 12 June 2009. One male and 1 female, Bocas 09-11G, Crawl Key, Panama; 1-4 m; coral rubble wash; Kristine N. White collector; 14 June 2009. One male, Bocas 09-12B, Hospital Point, Panama; 0-2 m; in sponge *Lissodendoryx columbiensis*; Kristin Hultgren collector; 14 June 2009; **Material illustrated:** One male, 6.9 mm; one female 7.0 mm. Bocas 09-8H. GCRL 3062.

Diagnostic description: Male. Head, anterodistal margin quadrate, with cusp; ventral cephalic keel anteroventral margin with anteriorly projecting cusp (Figure 4A). Gnathopod 1 coxa anterodistally serrate; basis anterior margin with 1-10 setae, posterior margin with 2 setae; carpus proximal margin serrate, propodus palm dentate with six distal setae; dactylus



Figure 4. *Leucothoe barana* Thomas and Klebba, 2007. Bocas 09-8H; male, 6.9 mm; female, 7.0 mm; GCRL 3062; all scale bars 0.1 mm unless noted. A: male, scale bar 1 mm; B: male gnathopod 2 medial; C: male gnathopod 1 medial; D: female gnathopod 2 medial.

reaching greater than 0.2 x propodus length (Figure 4C). Gnathopod 2 coxa distal margin anteriorly and posteriorly serrate; basis anterior margin with 12–16 setae, posterior margin bare; carpus distally truncate, anterior margin dentate; propodus with 2 mediofacial setal rows, primary mediofacial setal row above midline, reaching greater than 0.7 x propodus length, secondary mediofacial setal row with 4 setae, palm with 3 major tubercles; dactylus curved, reaching 0.5–0.7 x propodus length (Figure 4B). Pereopod 3 coxa anteriorly and posterodistal margin serrate. Pereopod 4 coxa distal margin anteriorly and posteriorly serrate. Pereopods 5–7 bases narrowly expanded, posterior margins serrate. Epimera 1–2 with ventral setae, epimeron 3 posteroventral corner narrowly rounded. **Female.** Gnathopod 2 propodus palm with smaller tubercles, secondary mediofacial row with 8 setae (Figure 4D).

Remarks: Male specimens of *L. barana* collected in Panama differ from the original description of this species by Thomas and Klebba (2007) in the following: gnathopod 1 basis with 2 posterior setae and lacking distal setae on the carpus; gnathopod 2 basis with fewer anterior and posterior setae, propodus with fewer setae in the secondary mediofacial se-

tal row (8 in original description); pereopod 3 coxa less serrate; and epimeron 1 with ventral setae.

Distribution: Western Atlantic Ocean: Florida Keys; Caribbean Sea: Belize, Panama.

LEUCOTHOE FLAMMOSA Thomas and Klebba, 2007 (Figure 5)

Leucothoe spinicarpa. ~ Ortiz, 1975, p. 8.

Leucothoe flammosa Thomas and Klebba, 2007, pp. 10–15, figures 4–6.

Type locality: Key West, Florida, U.S.A., Western Atlantic Ocean, 1–3 m.

Material examined: Three males and 4 females, Bocas 09-8A–B, mangroves and seagrass between and STRI dock and STRI point, Bocas del Toro, Panama; 1–3 m; in bivalve mollusks *Lima scabra* Born, 1778 and *Barbatia (Cucullearca) candida* (Helbling, 1779) (ID by Amy Moran, Clemson University, South Carolina); Kristine N. White collector; 12 June 2009.

Material illustrated: One male, 3.8 mm; one female 3.2 mm. Bocas 09-8B. GCRL 3063.

Diagnostic description: Male. Head, anterodistal margin even-

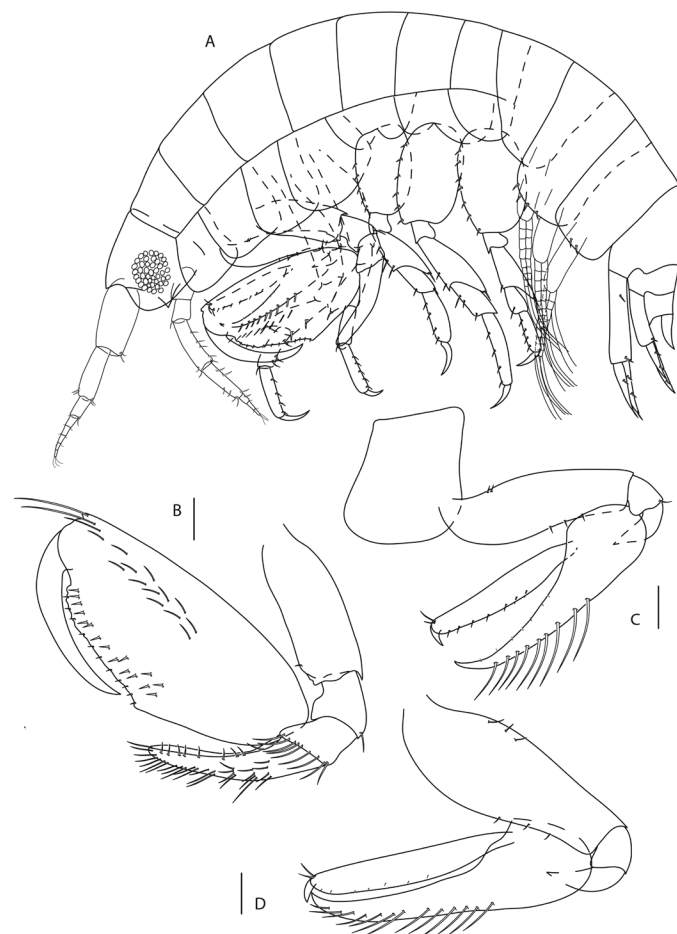


Figure 5. *Leucothoe flammosa* Thomas and Klebba, 2007. Bocas 09-8B; male, 3.8 mm; female, 3.2 mm; GCRL 3063; all scale bars 0.1 mm unless noted. A: male, scale bar 1 mm; B: male gnathopod 2 medial; C: male gnathopod 1 medial; D: female gnathopod 1 medial.

ly rounded; ventral cephalic keel anterior margin excavate, anteroventral margin with simple cusp (Figure 5A). Gnathopod 1 basis proximally widened, anterior margin with 3 setae, posterior margin bare; carpus distal margin with several long setae; propodus palm smooth with 7 distal setae; dactylus reaching 0.1–0.2 x propodus length (Figure 5C). Gnathopod 2 basis anterior margin with 2 setae, posterior margin bare; carpus distally tapered, anterior margin dentate; propodus with 1 mediofacial setal row above midline, reaching between 0.5 and 0.7 x propodus length, with field of submarginal setae, palm with 6 small tubercles (Figure 5B). Pereopods 5–7 bases narrowly expanded. Uropod 1 peduncle with proximal seta. Epimera 1–3 with ventral setae, epimeron 3 posteroventral corner subquadrate. Female. Gnathopod 1 carpus with shorter distal setae (Figure 5D).

Remarks: Male specimens of *L. flammosa* collected in Panama differ from the original description of this species by Thomas and Klebba (2007) in the following: gnathopod 1 carpus with fewer, shorter distal setae; gnathopod 2 basis with fewer anterior setae, propodus mediofacial and submarginal setae less dense.

Distribution: Western Atlantic Ocean: Florida; Caribbean Sea: Belize, Panama.

LEUCOTHOE KENSLEYI Thomas and Klebba, 2006 (Figure 6)

Leucothoe tridens J.L. Barnard, 1965, p. 492; ~ J.L. Barnard, 1970, p. 211, figure 137; ~ J.L. Barnard, 1971, p.103.

Leucothoe kensleyi Thomas and Klebba, 2006, pp. 17–22, figures 4–6.

Type locality: Ft. Lauderdale, Florida, U.S.A, Western Atlantic Ocean, 1–20 m.

Material examined: One female, Bocas 09–8C, mangroves and seagrass between and STRI dock and STRI point, Bocas del Toro, Panama; 1–3 m; in sponge *Chalinula molitba* (de Laubenfels, 1949); Kristine N. White collector; 12 June 2009. One male, 2 females, Bocas 09–11A, Crawl Key, Bocas del Toro, Panama; 1–3 m; coral rubble with calcareous green alga *Halimeda* of Lamouroux (1812) and red alga *Gracilaria* of Greville, 1830; Kristine N. White collector; 14 June 2009.

Material illustrated: One male, 3.4 mm; one female 3.2 mm. Bocas 09–11A. GCRL 3064.

Diagnostic description: Male. Head, anterior margin truncate, anterodistal margin quadrate with cusp; ventral cephalic keel anteroventral margin with simple cusp (Figure 6A). Gnathopod 1 coxa with anterodistal cusp; basis anterior margin with 2 setae, posterior margin bare; carpus proximal margin smooth, with distal seta; propodus palm dentate with 3 distal setae; dactylus reaching greater than 0.2 x propodus length (Figure 6C). Gnathopod 2 coxa margins subacute; basis anterior margin with 5 setae, posterior margin bare; carpus distally tapered, anterior margin dentate; propodus

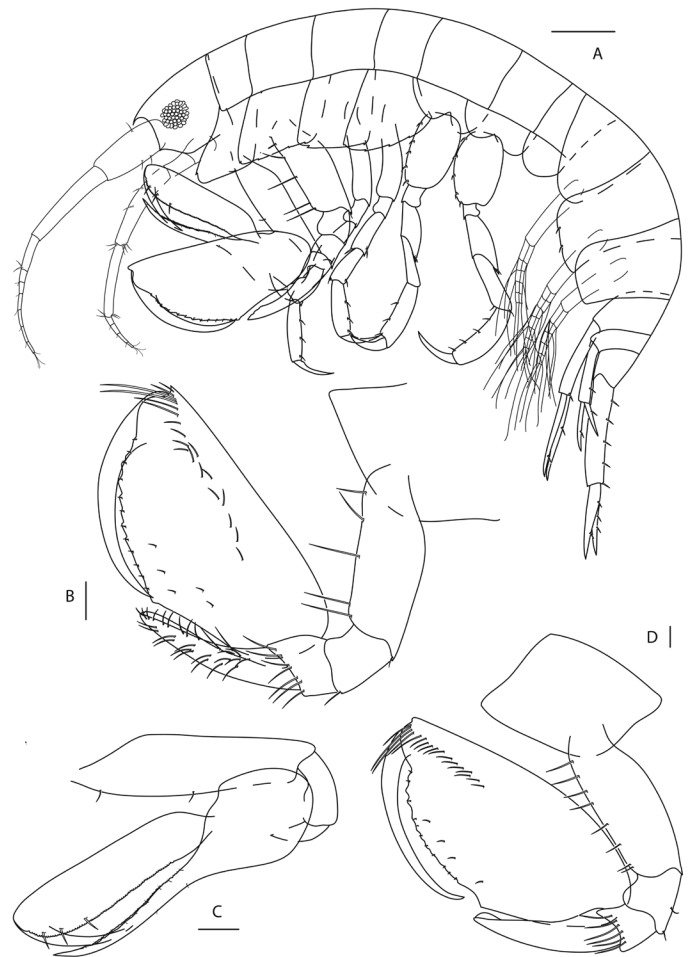


Figure 6. *Leucothoe kensleyi* Thomas and Klebba, 2006. Bocas 09-11A; male, 3.4 mm; female, 3.2 mm; GCRL 3064; all scale bars 0.1 mm. A: male; B: male gnathopod 2 medial; C: male gnathopod 1 medial; D: female gnathopod 2 medial.

with 2 mediofacial setal rows, primary mediofacial setal row above midline, reaching between 0.5 and 0.7 x propodus length, secondary mediofacial setal row with 2 setae, palm with small tubercles (Figure 6B). Pereopod 3–4 coxae distal margins serrate. Pereopods 5–7 bases narrowly expanded, pereopods 5 and 7 posterior margins setose. Epimeron 2 ventral margin setose; epimeron 3 posteroventral corner subquadrate. Female. Gnathopod 2 with 1 mediofacial setal row reaching between 0.4 and 0.5 x propodus length (Figure 6D).

Remarks: Male specimens of *L. kensleyi* collected in Panama differ from the original description of this species by Thomas and Klebba (2006) in the following: gnathopod 1 carpus with distal seta and propodus with one less distal seta; gnathopod 2 basis with fewer anterior setae, propodus with fewer setae in the secondary mediofacial row and submarginal setal row. Females differ in having a shorter mediofacial setal row.

Distribution: Western Atlantic Ocean: South Florida, Florida

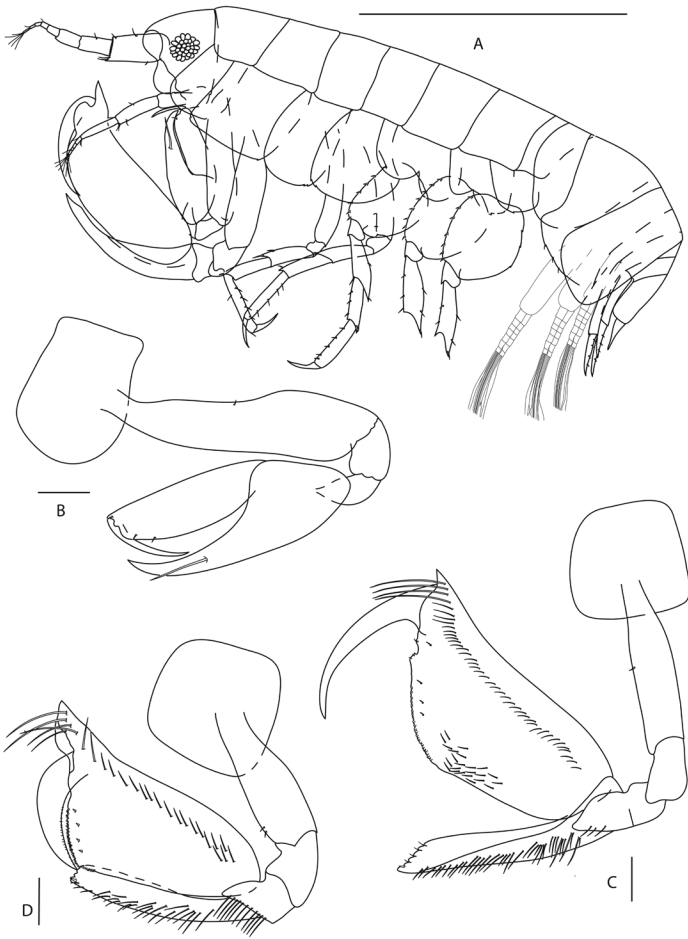


Figure 7. *Leucothoe laurensi* Thomas and Ortiz, 1995. Bocas 09-11D; male, 3.7 mm; female, 2.4 mm; GCRL 3065; all scale bars 0.1 mm unless noted. A: male, scale bar 1 mm; B: male gnathopod 1 medial; C: male gnathopod 2 medial; D: female gnathopod 2 medial.

Keys; Caribbean Sea: Belize, Panama; Brazil: Bahia; Pacific: Hawaii, Oahu.

LEUCOTHOE LAURENSI Thomas and Ortiz, 1995 (Figure 7) *Leucothoe laurensi* Thomas and Ortiz, 1995, pp. 613–616, figures 1–2; ~ Serejo, 1998 pp. 117–119, figure 8.

Type locality: Punta Pedernales, Isla de la Juventud, Cuba, 50 m.

Material examined: One male, Bocas 09-10B, San Cristobal, Panama; 0–2 m; coral rubble covered with zooanthids; Kristine N. White collector; 13 June 2009. Six males and 8 females, Bocas 09-11D, Crawl Key, Bocas del Toro, Panama; 1–3 m; coral rubble with calcareous green alga *Halimeda* and red alga *Gracilaria*; Kristine N. White collector; 14 June 2009.

Material illustrated: One male, 3.7 mm; one female 2.4 mm. Bocas 09-11D. GCRL 3065.

Diagnostic description: Male. Head, anterior margin with cusp; ventral cephalic keel anteroventrally rounded (Figure 7A). Gnathopod 1 coxa anterodistally rounded; basis

distally expanded, anterior margin bare, posterior margin with single seta; carpus proximal margin smooth with long distal seta; propodus palm smooth with 2 distal setae; dactylus reaching greater than 0.2 x propodus length (Figure 7B). Gnathopod 2 basis anterior margin with 1 seta; posterior margin bare; carpus length relative to propodus length 0.7, distally truncate, anteriorly dentate; propodus distal margin with blade-like process, with 1 mediofacial setal row above midline, reaching greater than 0.7 x propodus length, with field of submarginal setae, palm sub-rectangular, with one large tubercle; dactylus curved, proximal margin bare (Figure 7C). Pereopod 3 coxa distal margin serrate. Pereopod 4 coxa anterodistal margin serrate. Pereopods 5–7 bases broadly expanded. Pereopod 7 basis posterior margin serrate. Epimera 1–3 with ventral setae; epimeron 3 posteroventral corner rounded. Female. Gnathopod 2 carpus slightly less truncate than found in male, propodus with larger distal blade-like process, more triangular, palm smooth with embedded truncate spines, dactylus proximal margin dentate (Figure 7D).

Remarks: Male specimens of *L. laurensi* were not drawn in the original description of this species by Thomas and Ortiz (1995). Female specimens collected in Panama differ in the absence of a secondary mediofacial setal row on the gnathopod 2 propodus (1 seta in original description).

Distribution: Western Atlantic Ocean: Florida Keys, Cuba, Brazil (Pernambuco, Alagoas); Caribbean Sea, Panama.

LEUCOTHOE UBOUHU Thomas and Klebba, 2007 (Figure 8)

Leucothoe ubouhu Thomas and Klebba, 2007, pp. 25–30, figures 15–18.

Type locality: Co Cat Cay, Pelican Cays, Belize, Caribbean Sea, 1–15 m.

Material examined: Two females, Bocas 09-7D; Solarte, Satchem, Panama; 10 m; in *Amphimedon viridis*; Kristine N. White collector; 11 June 2009. One male and one female, Bocas 09-11H, Crawl Key, Bocas del Toro, Panama; 1–3 m; in *Haliclona vansoesti* de Weerd et al., 1999; Kristine N. White collector; 14 June 2009.

Material illustrated: One male, 6.2 mm; one female 7.4 mm. Bocas 09-11H. GCRL 3066.

Diagnostic description: Male. Head, anterior margin truncate, anterodistal margin with cusp; ventral cephalic keel anterior margin transverse, anteroventral margin rounded (Figure 8A). Gnathopod 1 coxa with anterodistal cusp; basis anterior margin with 5 setae, posterior margin bare; carpus proximal margin dentate; propodus palm dentate with 9 distal setae; dactylus reaching greater than 0.2 x propodus length (Figure 8C). Gnathopod 2 basis anterior margin with 8 setae, posterior margin bare; carpus distally truncate, anterior margin dentate; propodus with 1 mediofacial setal row above midline, reaching between 0.5 and 0.7 x propodus length, with 1 row of submarginal setae, palm with 2

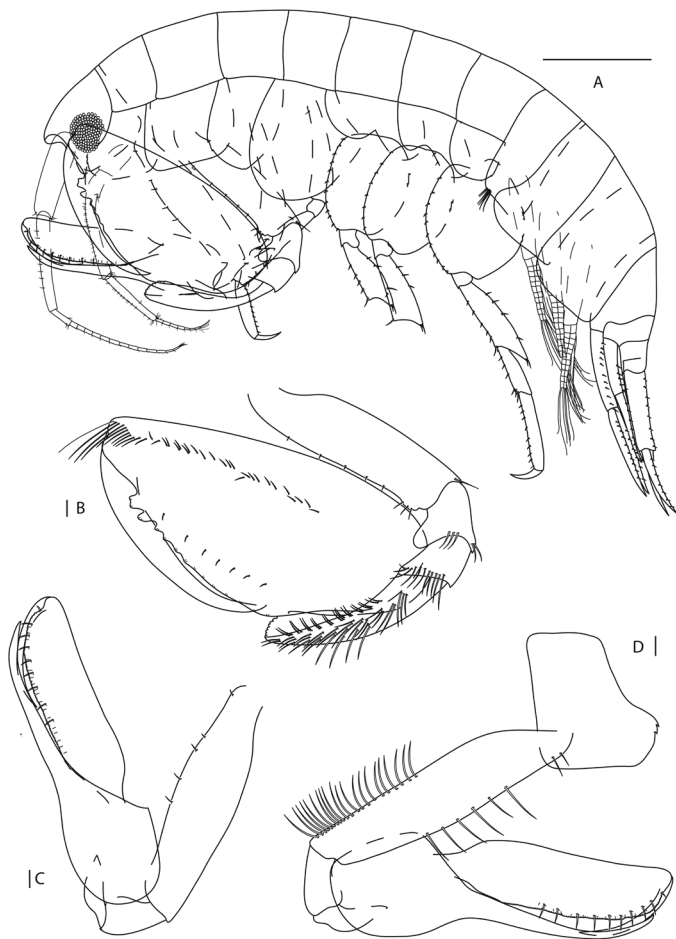


Figure 8. *Leucothoe ubouhu* Thomas and Klebba, 2007. Bocas 09-11H; male, 6.2 mm; female, 7.4 mm; GCRL 3066; all scale bars 0.1 mm unless noted. A: male, scale bar 1 mm; B: male gnathopod 2 medial; C: male gnathopod 1 medial; D: female gnathopod 1 medial.

major tubercles (Figure 8B). Pereopod 3 coxa distal margin anteriorly serrate. Pereopods 5–7 bases broadly expanded, posterior margins serrate. Epimeron 1 with tuft of ventral setae, epimeron 2 bare, epimeron 3 posteroventral corner rounded. **Female.** Gnathopod 1 basis posterior margin with 21 long setae and propodus with 10 distal setae (Figure 8D).

Remarks: Male specimens of *L. ubouhu* collected in Panama differ from the original description of this species by Thomas and Klebba (2007) in the following: gnathopod 2 propodus with 1 mediofacial setal row (secondary row of 4 setae in original description); pereopod 3 coxa with distal serrations; epimeron 1 with a tuft of setae (bare in the original description), and epimeron 2 bare (with 4 ventral setae in original description). Females differ in the higher number of posterior setae on the basis of gnathopod 1 and the 10 distal setae on the propodus (9 in the original description).

Distribution: Western Atlantic Ocean: Florida; Caribbean Sea: Belize, Panama.

LEUCOTHOE WURITI Thomas and Klebba, 2007 (Figure 9)

Leucothoe spinicarpa Ortiz, 1975, p. 10, figure 5.

Leucothoe wuriti Thomas and Klebba, 2007, pp. 30–35, figures 19–21.

Type locality: Co Cat Cay, Pelican Cays, Belize, Caribbean Sea, 2–15 m.

Material examined: One male, one female, Bocas 09-01A, Bocas City, Panama; in ascidian *Pyura torpida* (Sluiter, 1898); Rosana Rocha collector; 2 August 2008. Four males, 4 females, Bocas 09-01B, STRI dock, Bocas del Toro, Panama; in ascidian *Microcosmus exasperatus* Heller, 1878; Rosana Rocha collector; 3 August 2008. Seven males, 12 females, Bocas 09-01C, Marina Bocas, Bocas del Toro, Panama; in ascidian *Ascidia* of Linnaeus, 1767; Rosana Rocha collector; 3 May 2009. Two males, 4 females, Bocas 09-02A–C, Big Bight, Panama; in ascidians *Microcosmus exasperatus*, *Herdmania pallida* (Heller, 1878), and *Ascidia sydeiensis* Stimpson, 1855; Rosana Rocha's tunicate class collector; 5 June 2009. Two males, 2 females, Bocas 09-02E–F, Marina Bocas, Panama; in ascidians *Ascidia curvata* (Traustedt, 1882) and *Phallusia*

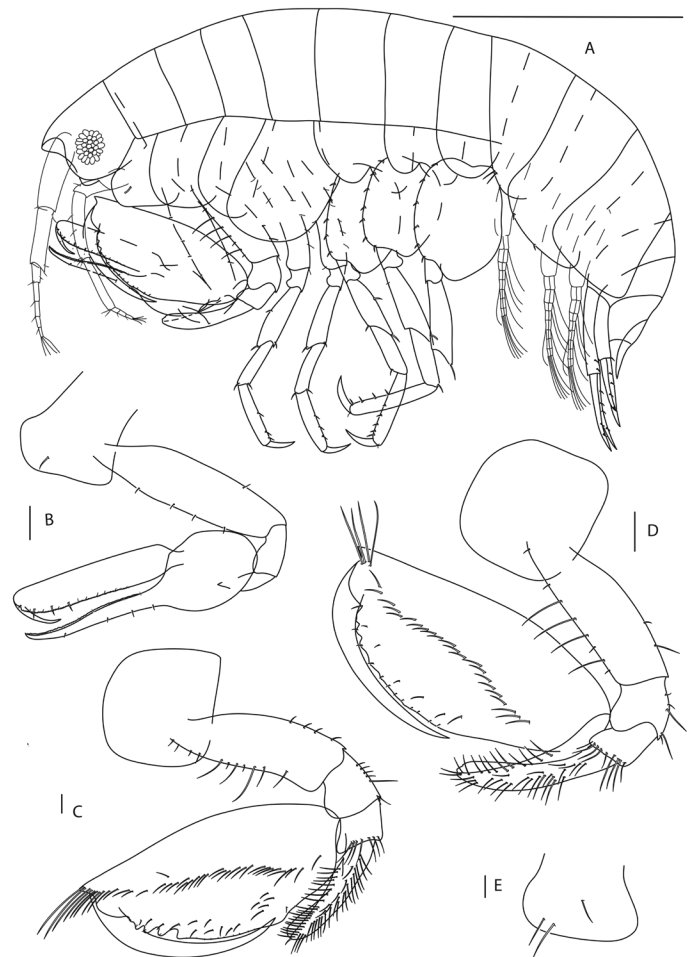


Figure 9. *Leucothoe wuriti* Thomas and Klebba, 2007. Bocas 09-01C; male, 3.8 mm; female, 6.2 mm; GCRL 3067; all scale bars 0.1 mm unless noted. A: male, scale bar 1 mm; B: male gnathopod 1 medial; C: female gnathopod 2 medial; D: male gnathopod 2 medial; E: female coxa 1 medial.

nigra; Rosana Rocha's tunicate class collector; 5 June 2009. Three males, 7 females, Bocas 09-03A-B, Big Bight, Panama; in ascidians *Pyura* and *Ascidia sydeiensis*; Rosana Rocha's tunicate class collector; 6 June 2009. One male, 1 female, Bocas 09-04A, Jolarte, Panama; in ascidian *Herdmania pallida*; Rosana Rocha's tunicate class collector; 7 June 2009. One female, Bocas 09-04B, Isla Cristobal, Panama; in ascidian *Rhodosoma turcicum* (Savigny, 1816); Rosana Rocha's tunicate class collector; 7 June 2009. Two males, 4 females, Bocas 09-08G, mangroves and seagrass between and STRI dock and STRI point, Bocas del Toro, Panama; 1-3 m; in ascidian *Phallusia nigra*; Kristine N. White collector; 12 June 2009.

Material illustrated: One male, 3.8 mm; one female, 6.2 mm. Bocas 09-01C. GCRL 3067.

Diagnostic description: **Male**. Head, anterodistal margin evenly rounded; ventral cephalic keel anterior margin excavate, anteroventral margin with simple cusp (Figure 9A). Gnathopod 1 coxa with single facial seta on medial surface; basis anterior margin with 4 setae, posterior margin with single short seta; carpus proximal margin dentate; propodus palm dentate with 3 distal setae; dactylus reaching greater than 0.2 x propodus length (Figure 9B). Gnathopod 2 basis anterior margin with 8 setae, posterior margin with 2 setae; carpus distally truncate, anterior margin dentate; propodus with 1 mediofacial setal row displaced to midline, reaching greater than 0.7 x propodus length, with submarginal setae, palm with 3 major tubercles (Figure 9D). Pereopods 5-7 bases narrowly expanded, posterior margins bare. Epimera 1 and 2 each with 2 ventral setae, epimeron 3 posteroventral corner subquadrate, slightly produced. **Female**. Gnathopod 1 coxa with 3 facial setae on medial surface (Figure 9E); gnathopod 2 more setose overall (Figure 9C).

Remarks: Male specimens of *L. wuriti* collected in Panama differ from the original description of this species by Thomas and Klebba (2007) in the following: antenna 1 with fewer setae; gnathopod 1 coxa with shorter facial seta, propodus palm with fewer distal setae (5 in the original description); gnathopod 2 propodus palm with smaller projections and fewer submarginal setae; epimeron 1 with two ventral setae (bare in original description), and epimeron 2 with only 2 ventral setae (4 in original description). The male used in this diagnosis is much smaller than the female examined here and the male in the original description, which may explain the less developed structures described here, particularly the more setose condition found in the female.

Distribution: Western Atlantic Ocean: Florida; Caribbean Sea: Belize, Panama.

LEUCOTHOE sp. C Thomas and Klebba, 2007 (Figure 10)

Leucothoe n. sp. C Thomas and Klebba, 2007, p. 41, figure 25c.

Material examined and illustrated: One male, 4.9 mm; one female 4.5 mm. Bocas 09-11I, Crawl Key, Bocas del Toro, Panama; 1-3 m; in sponge *Tedania ignis* Duchassaing and Michelotti, 1864 (possibly *Tedania klausii* Wulff, 2006); Kristine N. White collector; 14 June 2009; GCRL 3068.

Diagnostic description: **Male**. Head, anterodistal margin evenly rounded; ventral cephalic keel anteroventral margin rounded (Figure 10A). Gnathopod 1 basis anterior margin with 4 setae, posterior margin bare; carpus proximal margin dentate; propodus palm dentate with 6 distal setae; dactylus reaching greater than 0.2 x propodus length (Figure 10E). Gnathopod 2 basis anterior margin with 6 setae, posterior margin bare; carpus distally rounded, expanded, anterior margin dentate (Figure 10C); propodus with 2 mediofacial setal rows, primary mediofacial row above midline, reaching greater than 0.7 x propodus length, secondary mediofacial row with 1 seta, palm with 3 major tubercles (Figures 10B). Pereopods 5-7 bases broadly expanded, posterior margins setose. Epimeron 2 with 2 ventral setae, epimeron 3 posteroventral corner subquadrate, slightly produced. **Female**.

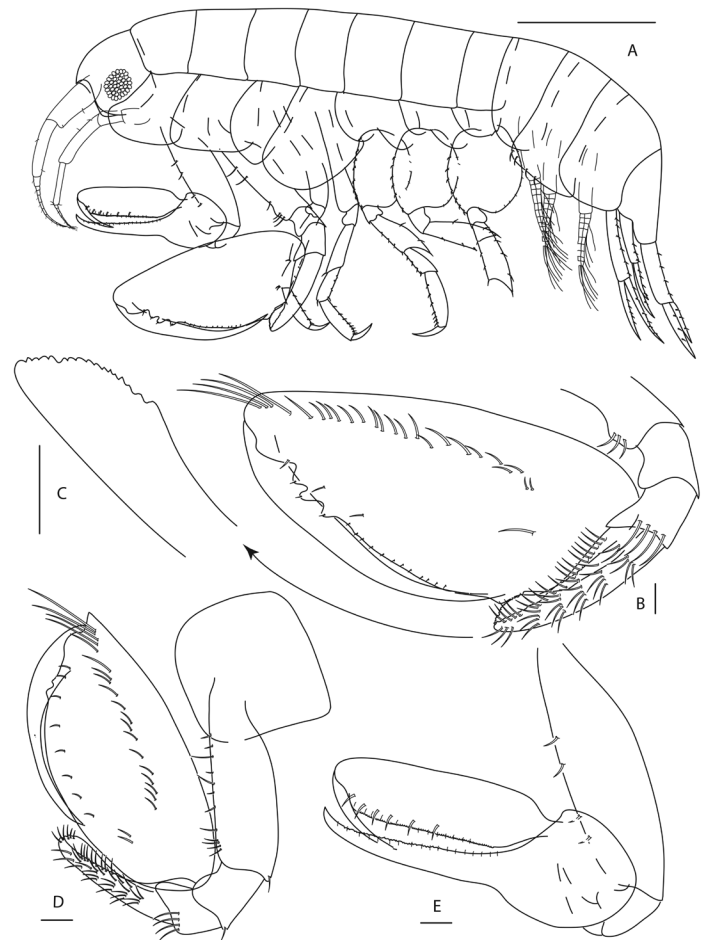


Figure 10. *Leucothoe* sp. C Thomas and Klebba, 2007. Bocas 09-11I; male, 4.9 mm; female, 4.5 mm; GCRL 3068; all scale bars 0.1 mm unless noted. A: male, scale bar 1 mm; B: male gnathopod 2 medial; C: male gnathopod 2 carpus lateral; D: female gnathopod 2 medial; E: male gnathopod 1 medial.

Gnathopod 2 basis anterior margin with 12 setae; carpus less expanded distally; propodus secondary mediofacial setal row with 2 setae, and palm projections smaller than in male (Figure 10D).

Remarks: Male specimens of *Leucothoe* sp. collected in Panama differ from the original remarks of *Leucothoe* n. sp. C in Thomas and Klebba (2007) in the following: gnathopod 1 basis with fewer setae on anterior margin (11 setae in Thomas and Klebba 2007), propodus palm with 6 distal setae (5 in Thomas and Klebba 2007); gnathopod 2 propodus with shorter secondary mediofacial setal row (8 setae in Thomas and Klebba 2007). Due to the morphological differences noted between specimens, this species will continue to be referred to as *Leucothoe* sp. C pending further analyses and comparison to material from Florida and Belize.

Distribution: Western Atlantic Ocean: Florida; Caribbean Sea: Belize, Panama.

Key to Caribbean Leucothoid species of Panama

1. Extreme sexual dimorphism; coxa 1 reduced; mouthparts reduced in adult males 2
Moderate to no sexual dimorphism; coxae 1–4 relatively equal in widths; mouthparts well developed 3
2. Head anterior margin rounded, anterodistal margin with cusp, without lateral ridge; gnathopod 1 propodus palm dentate; gnathopod 2 basis with serrate ridge, primary mediofacial setal row above midline, dactylus proximal margin with 2 tubercles, serrate
..... *Anamixis cavatura*
Head anterior margin excavate, anterodistal margin without cusp, with lateral ridge; gnathopod 1 propodus palm serrate; gnathopod 2 basis without small tubercle, primary mediofacial setal row displaced to midline, dactylus proximal margin with 1 tubercle, smooth
..... *Anamixis vanga*
3. Gnathopod 1 basis anterior margin bare; gnathopod 2 carpus reaching greater than 0.6 x propodus length, anterior margin smooth, propodus subrectangular, distal margin with blade-like process.....*Leucothoe laurensi*
Gnathopod 1 basis anterior margin setose; gnathopod 2 carpus reaching less than 0.6 x propodus length, anterior margin with ornamentation, propodus convex, distal margin broadly rounded 4
4. Gnathopod 1 carpus with long distal setae, propodus palm smooth, dactylus reaching 0.1–0.2 x propodus length *Leucothoe flammosa*
Gnathopod 1 carpus without long distal setae, propodus palm with ornamentation, dactylus reaching greater than 0.2 x propodus length 5
5. Gnathopod 1 coxa with medial facial seta(e), gnathopod 2 propodus mediofacial setal row displaced to midline *Leucothoe wuriti*
Gnathopod 1 coxa without medial facial seta(e), gnathopod 2 propodus mediofacial setal row above midline 6
6. Gnathopod 1 propodus palm serrate
..... *Leucothoe ashleyae*
Gnathopod 1 propodus palm dentate 7
7. Head rounded, anterodistal margin without cusp
..... *Leucothoe* sp. C Thomas and Klebba, 2007
Head truncate, anterodistal margin with cusp 8
8. Gnathopod 1 carpus proximal margin smooth, gnathopod 2 carpus distally tapered..... *Leucothoe kensleyi*
Gnathopod 1 carpus proximal margin dentate, gnathopod 2 carpus distally truncate..... 9
9. Gnathopod 1 basis posterior margin bare, pereopods 5–7 bases narrowly expanded *Leucothoe barana*
Gnathopod 1 basis posterior margin setose, pereopods 5–7 bases broadly expanded *Leucothoe ubouhu*

Conclusions

The slight intraspecific morphological variation between some specimens collected in Panama and other parts of the Caribbean Sea or Western Atlantic Ocean suggest that cryptic speciation may be occurring as documented in *Leucothoe ashleyae* (Richards et al. 2006). This variation is more than the author has personally observed in previous material examined from the Caribbean. Future molecular research will help to clarify whether this is cryptic speciation or simply intraspecific variation as well as evolutionary relationships between species.

Acknowledgments

The author would like to acknowledge S.E. LeCroy, R. Collin, and R. Rocha for making the trip to The Smithsonian Tropical Research Institute at Bocas del Toro, Panama successful. Special thanks go to R. Rocha and her ascidian class for collecting and identifying ascidians during my stay there. This research was funded by a 2009 Lerner Gray Marine Research Grant, a 2009 University of Southern Mississippi Lytle Scholarship, and a 2009 MEGSA student travel award.

Literature Cited

- Abildgaard, P.C. 1789. Zoologica Danica seu animalium Daniae et Norvegiae rariorum ac minus notorum Descriptiones et Historia. N. Möller et filius, Havniae, 71 p.
- Barnard, J.L. 1965. Marine Amphipoda of atolls in Micronesia. Proceedings of the United States National Museum 117:459-552.
- Barnard, J.L. 1970. Sublittoral Gammaridea (Amphipoda) of the Hawaiian Islands. Smithsonian Contributions to Zoology 34:1-286.
- Barnard, J.L. 1971. Keys to the Hawaiian marine Gammaridea, 0-30 meters. Smithsonian Contributions to Zoology 58:1-135.
- Barnard, J.L. 1979. Littoral Gammaridean Amphipoda from the Gulf of California and the Galapagos Islands. Smithsonian Contributions to Zoology 271:1-160.
- Born, I. 1778. Index Rerum Naturalium Musei Caesarei Vindobonensis, Pars I. Testacea. Verzeichniss der Natürlichen Seltenheiten des K. K. Naturalien Kabinetts zu Wien. Officina Krausiana, Schalthiere Vienna, 458 p.
- Coleman, C.O. 2003. "digital Inking": How to make perfect line drawings on computers. Organisms Diversity and Evolution 3 (Electronic Supplement 14):1-14.
- Dana, J.D. 1852. On the classification of the Crustacea Choristopoda or Tetracapoda. American Journal of Science and Arts 2 14:297-316.
- de Laubenfels, M.W. 1949. Sponges of the western Bahamas. American Museum Novitates 1431:1-25.
- de Weerd, W.H., K. Rützler, and K.P. Smith. 1991. The Chalinidae (Porifera) of Twin Cayes, Belize, and adjacent waters. Proceedings of the Biological Society of Washington 104:189-205.
- de Weerd, W.H., M.J. de Kluijver, and R. Gomez. 1999. *Haliclona (Halichoelona) vansoesti* n.sp., a new chalinid sponge species (Porifera, Demospongiae, Haplosclerida) from the Caribbean. Beaufortia 49:47-64.
- Duchassaing, P. and G. Michelotti. 1864. Spongiaires de la mer Caraïbe. Natuurkundige verhandelingen van de Hollandsche maatschappij der wetenschappen te Haarlem 21:1-124.
- Gray, J.E. 1867. Notes on the arrangement of sponges, with the descriptions of some new genera. Proceedings of the Zoological Society of London 1867 2:492-558.
- Greville, R.K. 1830. Algae britannicae, or descriptions of the marine and other inarticulated plants of the British islands, belonging to the order Algae; with plates illustrative of the genera. McLachlan & Stewart, Baldwin & Cradock, Edinburgh & London, 218 p.
- Helbling, G.S. 1779. Beiträge zur Kenntniss neuer und seltener Konchylien. Abhandlungen einer Privatgesellschaft in Böhmen 4:102-131.
- Heller, C. 1878. Beiträge zur nahern Kenntniss der Tunicaten Sitzber. Akademie der Wissenschaften in Wien 77:2-28.
- Higgin, T. 1877. Description of some sponges obtained during a cruise of the Steam-Yacht 'Argo' in the Caribbean and neighbouring Seas. Annals and Magazine of Natural History 4:291-299.
- Hyatt, A. 1877. Revision of the North American Porifera; with remarks upon foreign species. Part II. Memoirs of the Boston Society of Natural History 2:481-554.
- Lamarck, J.B.P. De Monet, Comte De. 1814. Sur les polypiers empâtés. Suite du mémoire intitulé: Sur les Polypiers empâtés. Suite des éponges. Annales du Muséum national d'histoire naturelle, Paris 20:370-386, 432-458.
- Lamouroux, J.V.F. 1812. Extrait d'un mémoire sur la classification des polypes coralligènes non entièrement pierreux. Nouveau Bulletin des sciences de la Société Philomathique de Paris 3:181-188.
- Ledoyer, M. 1967. Amphipodes gammariens des herbiers de phanérogames marines de la région de Tuléar (République Malgache). Étude systématique et écologique. Annales de l'Université de Madagascar 5:121-170.
- Ledoyer, M. 1978a. Amphipodes Gammariens (Crustacea) des biotopes cavitaires organogènes récifaux de l'île Maurice (Océan Indien). The Mauritius Institute Bulletin 8:197-332.
- Ledoyer, M. 1978b. Contribution A L'Etude Des Amphipodes Gammariens Profonds de Madagascar (Crustacea). Tethys 8:365-382.
- Ledoyer, M. 1979a. Expédition Rumphius II (1975) Crustacés parasites, commensaux, etc. (Th. Monod et R. Serène, éd.) VI. Crustacés Amphipodes Gammariens. Bulletin du Muséum national d'Histoire naturelle, Series 4, 7, Section A 1:137-181.
- Ledoyer, M. 1979b. Les Gammariens de la Pente Externe du Grand Recif de Tuléar (Madagascar) (Crustacea Amphipoda). Memorie del Museo Civico di Storia Naturale, Verona, Series 2, Sezione Science della Vita 2:1-150.
- Linnaeus, C. 1767. Systema Naturae sive regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Volume 1, part 2. Laurentii Salvii, Homiae, Paris, p. 533-1327.
- Molina, G.I. 1782. Saggio sulla storia natural del Chili. 4, Animali del Chili. Bologna, 367 p.
- Ortiz, M.L. 1975. Algunos datos ecologicos de *Leucothoe spinicarpa* Abildgaard, (Amphipoda, Gammaridea), en aguas Cubanas. Investigaciones Marinas Seri 8 16:1-12.
- Ortiz, M. and R. Lemaitre. 1994. Crustaceos Anfipodos (Gammaridea) Colectados en Las Costas del Caribe Colombiano, al sur de Cartagena. Anales del Instituto de Investigaciones Marinas de Punta de Betin 23:119-127.
- Pearse, A.S. 1912. Notes on certain amphipods from the Gulf of Mexico, with descriptions of new genera and new species. Proceedings of the United States National Museum 43:369-379.
- Richards, V., J.D. Thomas, M.J. Stanhope, and M.S. Shivji. 2006. Genetic connectivity in the Florida reef system, comparative phylogeography of commensal invertebrates with contrasting reproductive strategies. Molecular Ecology 16:139-157.
- Ruffo, S. 1969. Study sui Crostacei Anfipodi LXXVII. Terzo contributo alla conoscenza degli anfipodi del Mar Rosso. Memorie del Museo Civico di Storia Naturale di Verona 17:1-77.
- Savigny, J.C. 1816. Observations generals sur la bouche des arachnides des crustaces et des entomostraces. Memoires sur les Animaux sans vertebres. Premiere partie. Description et classification des animaux invertebres et articules, connus sous les noms de Crustaces, d'Insectes, d'Annelides, etc. Deterville, Paris, 84 p.
- Serejo, C.S. 1998. The genus *Leucothoe* (Crustacea, Amphipoda, Leucothoidae) on the Brazilian coast. Beaufortia 48:105-135.

- Shoemaker, C.R. 1933. Amphipoda from Florida and the West Indies. *American Museum Novitates* 598:1-24.
- Sivaprakasam, T.E. (1967)1969. Notes on some amphipods from the south east coast of India. *Journal of the Marine Biological Association of India* 9:372-383.
- Sluiter, C.P. (1898) Tuniciers recueilli en 1896, par la Charalie, dans la mer des Antilles. *Memoires Societe Zoologique de France* 11:5-34.
- Stebbing, T.R.R. 1897. Amphipods from the Copenhagen Museum and Other Sources. *Transactions of the Linnean Society of London*, 2 Zoology 7:25-45.
- Stimpson, W. 1855. Descriptions of some of new marine invertebrata from Chinese and Japanese seas. *Proceedings of the Academy of Natural Sciences in Philadelphia* 7:375-384.
- Thomas, J.D. 1979. Occurrence of the amphipod *Leucothoides pottsi* Shoemaker in the tunicate *Ecteinascidia turbinata* Herdman from Big Pine Key, Florida, U.S.A. *Crustaceana* 37:107-109.
- Thomas, J.D. 1997. Systematics, ecology, & phylogeny of the Anamixidae (Crustacea, Amphipoda). *Records of the Australian Museum* 49:35-98.
- Thomas, J.D. and J.L. Barnard. 1983. Transformation of the *Leucothoides* morph into the *Anamixis* morph (Amphipoda). *Journal of Crustacean Biology* 3:154-157.
- Thomas, J.D. and K.N. Klebba. 2006. Studies of commensal leucothoid amphipods, two new sponge-inhabiting species from south Florida and the western Caribbean. *Journal of Crustacean Biology* 26:13-22.
- Thomas, J.D. and K.N. Klebba. 2007. New species and host associations of commensal leucothoid amphipods from coral reefs in Florida and Belize (Crustacea, Amphipoda). *Zootaxa* 1494:1-44.
- Thomas, J.D. and M. Ortiz. 1995. *Leucothoe laurensi*, a new species of leucothoid amphipod from Cuban waters (Crustacea, Amphipoda, Leucothoidae). *Proceedings of the Biological Society of Washington* 108:613-616.
- Thomas, J.D. and G.W. Taylor. 1981. Mouthpart morphology and feeding strategies of the commensal amphipod, *Anamixis hanseni* Stebbing. *Bulletin of Marine Science* 31:462-467.
- Traustedt, M.P.A. 1882 Vestindiske Ascidae Simplicis, Forsie Afdeling. Phallusiadae. *Videnskabelige Meddelelser fra dansk naturhistorisk Forening i Kjøbenhavn* 1881:257-288.
- Wulff, J.L. 2006. Sponge systematic by starfish: predators distinguish cryptic sympatric species of Caribbean fire sponges, *Tedania ignis* and *Tedania klausii* n.sp. (Demospongiae, Poecilosclerida). *Biological Bulletin* 211:83-94.
- Zea, S. and R.W.M. van Soest. 1986. Three new species of sponges from the Columbian Caribbean. *Bulletin of Marine Science* 38:355-365.