A new species of *Lysmata* Risso, 1816 (Crustacea, Decapoda, Lysmatidae) from the Gulf of Mexico

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Abstract

A new species of peppermint shrimp, *Lysmata baueri* n. sp., is described based on a single specimen from the eastern Gulf of Mexico. The new species can be distinguished from other morphologically similar species of *Lysmata* Risso, 1816 by the number of teeth, length and shape of the rostrum, the length of the antennular peduncle relative to the scaphocerite, the number of meral and ischial articles in the second pereiopods, and the number of spines on the flexor margin of the dactyl from the third to fifth pereiopods. Morphological characters demonstrate that *L. baueri* n. sp., is most closely related to the eastern Pacific *L. californica* (Stimpson, 1866), *L. nayaritensis* Wicksten, 2000 and *L. porteri* (Rathbun, 1907).

Key words: *Lysmata*, Lysmatidae, Hippolytidae, Gulf of Mexico, Florida, hermaphrodite

Introduction

Caridean shrimps belonging to the genus *Lysmata* Risso, 1816 are recognized because of their wide disparity of lifestyles. A few species have a striking coloration, live as socially monogamous pairs, and provide cleaning services to fishes (e.g., *L. splendida* Burukovsky, 2000, *L. debelius* Bruce, 1983, *L. amboinensis* (De Man 1888) and *L. grabhami* (Gordon 1935) – Limbaugh et al. 1961; Bruce 1983; Fiedler 1998). Many other species are not conspicuous in terms of coloration, occur in aggregations, and dwell freely among rocks at intertidal and/or subtidal temperate and subtropical zones (e.g., *L. californica* (Stimpson 1866) and *L. nayaritensis* Wicksten 2000 – Bauer & Newman 2004; Baeza et al. 2008). Lastly, other species live in small groups and some of them develop symbiotic associations with sessile macroinvertebrates such as tube sponges (i.e., *L. pederseni* Rhyne & Lin 2006 – Baeza 2009; Baeza et al. 2016). Considering this lifestyle disparity, the genus *Lysmata* has captured the attention of systematists, aquaculturists, natural historians and evolutionary biologists (d’Udekem d’Acoz 2003; Rhyne & Lin 2006; Rhyne & Anker 2007; Baeza & Bau er 2004; Baeza et al. 2008). Furthermore, the genus *Lysmata* has been used to explore the role of environmental conditions in favouring particular behavioural and morphological features (See, for example, Baeza 2009; Baeza et al. 2009). Shrimps belonging to the genus *Lysmata* are also recognized because of their rare sexual system. All species studied so far are protandric simultaneous hermaphrodites, in which individuals consistently mature and reproduce initially as males to become functional simultaneous hermaphrodites later in life (Bauer & Holt 1998; Braga et al. 2009; Baeza 2009).

In the north-western Atlantic, Caribbean Sea, and Gulf of Mexico, there are 15 species of *Lysmata* (Baeza et al. 2009; Laubenheimer & Rhyne 2010; Anker & Cox 2011; Rhyne et al. 2012). During an intensive sampling program conducted throughout the Gulf of Mexico, a single specimen of *Lysmata* was collected in Tampa Bay, Florida, USA. Detailed examination of the material in the laboratory and careful comparison with other species...
from the eastern Pacific Ocean, north-western Atlantic, Caribbean Sea, and Gulf of Mexico indicated that the specimen belongs to an undescribed species. Here, we describe the species as new.

Materials and methods

The specimen was collected from crab pots settled in the shallow subtidal zone (3–7 m) at Tampa Bay, Florida, USA, preserved in 95–99% ethanol immediately after collection, and transported to the laboratory. The holotype is deposited in the Florida Museum of Natural History (FMNH), University of Florida (UF), Gainesville, Florida, USA. The carapace length (CL, in mm) was measured along the dorsal midline from the orbital to the posterior margins of the carapace.

Taxonomy

Family Lysmatidae Dana, 1852

Genus Lysmata Risso, 1816

*Lysmata baueri* n. sp.

(Figures 1–3)

**Type material.** Holotype male (CL: 5.85 mm; rostrum: 4.40 mm), UF 43989, Tampa Bay (27°34’10.56” N 82°42’27.13” W), Florida, USA, from crab pots, depth 2–7 m, coll. J.A. Baeza, July 2016.

**Description.** Rostrum nearly straight, 0.75 times as long as carapace, not reaching distal margin of second article of antennular peduncle (Figs. 1a–c); dorsal margin with 4 teeth (2 on carapace, 2 on rostrum), posterior tooth situated just anterior to middle of carapace, second tooth slightly posterior to the postorbital margin, third and fourth teeth anterior to the orbital margin, single seta present between teeth; ventral margin with 4 teeth, all teeth anterior to first dorsal tooth, first two ventral teeth beyond anterior margin of cornea (Figs. 1a, b). Carapace smooth, 0.77 times as long as wide, posteroverentral margin rounded; pterygostomial angle rounded, without tooth (Figs. 1a, b). Cornea moderately large, not reaching dorsal margin of rostrum (Figs. 1a, b), Antennal tooth long, slightly reaching beyond posterior margin of cornea (Figs. 1a, b). Antennular peduncle not reaching distal margin of scaphocerite (Fig. 1c), 0.75 times as long as scaphocerite, first segment 1.76 times as long as second segment, single spine on dorsal margin slightly posterior to distal margin, second segment 1.46 times as long as third segment; all three segments with pair of spines on distodorsal margin; stylocerite slightly reaching anterior margin of eye, reaching mid-length of first segment of antennular peduncle (Figs. 1a, b); upper antennular flagellum long, aesthetasc present from second to 24th segment (Fig. 1e); accessory branch of outer ramus with 25 segments, distal segment free (Figs. 1e, f). Scaphocerite 5.8 times as long as wide, lateral margin slightly concave, distolateral tooth greatly overreaching distal margin of blade (Figs. 1c, d).

Abdomen more than twice as long as carapace. Pleura of first four abdominal somites with margins rounded, unarmed; fifth abdominal somite with sharp posterolateral tooth; sixth abdominal somite 1.52 times as long as fifth somite, posteroverentral angle with acute tooth, posterior angle near base of telson with acute tooth (Fig. 1g). Telson elongated posteriorly, about 1.6 times as long as sixth abdominal somite; dorsal surface with two pairs of spines (Fig. 1h); posterior margin blunt with pair of long slender spines each flanked laterally by shorter spines (Figs. 1h, i); pair of long plumose setae present between long spines (Figs. 1h, i); uropods broad and long, outer margin of exopod with three distal spines, intermediate spine slightly longer than adjacent ones (Fig. 1j).

Mouthparts typical for genus, third maxilliped slightly overreaching scaphocerite; exopod 0.54 times as long as antepenultimate segment of endopod; endopod with ultimate segment 0.75 times as long as penultimate segment, tip furnished with 8 spines, distal pair smallest and covered with tuft of serrated setae (Figs. 2f, g).

First pereiopod with simple chela (Figs. 2a, b), not reaching beyond anterior margin of scaphocerite when fully extended; merus 1.04 times as long as propodus (including fixed finger); chela subequal in length, propodus (including fixed finger) nearly 3.8 times as long as dactylus; carpus 0.90 times as long as merus; ischium with row
of cuspidate setae along ventral margin (Figs. 2a, b). Second pereiopod slender, chelae simple, subequal in length, reaching beyond third article of antennular peduncle and scaphocerite when fully extended; tip of chela furnished with several tufts of setae (Figs. 2c, d); merus with 14 articles, 1.1 times as long as ischiun; carpus with 26 articles, 1.86 times as long as merus, 6.1 times as long as propodus (including fixed finger), ischiun with 3 articles, proximal article with row of cuspidate setae along ventral margin (Figs. 2c, e). Third to fifth pereiopods similar in appearance, decreasing in length from third to fifth. Third pereiopod reaching beyond third article of antennular peduncle, merus with seven spines, 1.35 times as long as carpus; carpus with four spines on ventral margin; propodus 1.52 times as long as carpus, ten to eleven spines on ventral margin (Fig. 2h); tip of dactylus biunguiculate (Figs. 2h, i), dorsal unguis slightly longer than ventral unguis, flexor margin of dactylus armed with four spines, increasing in size from proximal to distal (Fig. 2i). Fourth pereiopod like third, propodus 1.55 times as long as carpus, ventral margin with ten spines, merus about 1.77 times as long as carpus, lateral margin with six to seven spines. Fifth pereiopod (Figs. 2j, k) like third and fourth, merus about 1.13 times as long as carpus, lateral margin with six spines, propodus about 1.28 times as long as carpus, ventral margin with eight spines, carpus with ventral margin unarmed.

**Type locality.** Tampa Bay, Florida, USA.

**Distribution.** Presently known only from type locality.

**Etymology.** The new species is named in honor of Dr. Raymond T. Bauer, Professor Emeritus, Department of Biology, University of Louisiana, USA for his outstanding academic contribution to the reproductive biology of caridean shrimps, including the genus *Lysmata*.

**Remarks.** The new species is morphologically related to *L. californica* and *L. nayaritensis* from the northeastern Pacific and *L. porteri* from the southeastern Pacific (Rathbun 1907; Wicksten 2000). For instance, the number of ventral rostral teeth overlaps among *L. baueri* n. sp. (4), *L. californica* (2–4), and *L. nayaritensis* (3–6). However, *L. californica*, *L. nayaritensis* and *L. porteri* each differs from the new species in having a rostrum that is slightly pointed downwards. The rostrum in *L. baueri* n. sp. is nearly straight. Also, *L. baueri* n. sp., can be easily distinguished from *L. californica*, *L. nayaritensis* and *L. porteri* by a set of characters that include the number of dorsal teeth, the length of the rostrum relative to the antennular peduncle, and/or the length of the antennular peduncle relative to the scaphocerite. The dorsal rostral teeth formula is 4 in *L. baueri* n. sp., compared to 5–7 in *L. californica*, 6–7 in *L. nayaritensis* and 5–6 in *L. porteri*. Likewise, the ventral rostral teeth formula is 4 in *L. baueri* n. sp., compared to 1–2 in *L. porteri*. The length of the rostrum relative to the antennular peduncle is also useful to differentiate *L. baueri* n. sp. from *L. californica*, *L. nayaritensis*, and *L. porteri*. In *L. baueri* n. sp., the rostrum nearly reaches the distal margin of the 2nd article, in *L. californica* the rostrum reaches beyond the second article of the antennular peduncle, in *L. nayaritensis* the rostrum overreaches the 2nd article, and in *L. porteri* the rostrum slightly exceeds the distal margin of the 1st article of the antennular peduncle. The relative length of the antennular peduncle to scaphocerite is 0.75 times in *L. baueri* n. sp., compared to 0.25 times in *L. nayaritensis* and 0.3 times in *L. porteri*. The number of meral and ischial segments in the second pereiopod is 14 and 2 in *L. baueri* n. sp., compared to 16 and 4 in *L. californica*, (based on 2 specimens collected in California by JAB) and 15–18 and 4–5 in *L. nayaritensis*. Lastly, the number of spines on the flexor margins on the dactyls of the 3rd to 5th pereiopods are different among the compared species: 4 spines in *L. baueri* n. sp., 2–3 in *L. californica*, and 2 in *L. nayaritensis* and *L. porteri*.

*Lysmata baueri* n. sp., can also be distinguished from other congeneric species that inhabit the Gulf of Mexico (*Lysmata boggessi* Rhyne & Lin, 2006, *L. wurdemanni* Gibbes, 1850, *L. ankeri* Rhyne & Lin, 2006, *L. pederseni* Kingsley 1879, *L. rafa* Rhyne & Anker, 2007, *L. rathbunae* Chace, 1970, and *L. jundalini* Rhyne et al., 2012) based on a combination of characters that includes the rostrum length and/or the rostral teeth formula. In *L. baueri* n. sp., the rostrum is ~0.75 times as long as the carapace compared to 0.4–0.7 times in *L. wurdemanni*, 1.2 times in *L. rafa*, and 0.56–0.68 times in *L. jundalini*. The length of the rostrum in *L. baueri* n. sp. slightly overlaps with that of three other species: *L. boggessi* (0.6–1.0 times), *L. ankeri* (0.6–0.8 times), and *L. pederseni* (0.7–1.1 times). The number of dorsal rostral teeth in *L. baueri* n. sp. is 4 and differs from that reported for *L. ankeri* (6–8), *L. pederseni* (7–8), *L. rafa* (7), *L. rathbunae* (5–6) and *L. jundalini* (6–7), but overlaps with *L. wurdemanni* (2–6) and *L. boggessi* (3–6). Similarly, the number of ventral rostral teeth in *L. baueri* n. sp., is 4 and differs from *L. pederseni* (5–7), *L. rafa* (7–9), and *L. jundalini* (2–3) but overlaps with *L. wurdemanni* (2–6), *L. boggessi* (3–4), *L. ankeri* (4–6), and *L. rathbunae* (3–5).
NEW SPECIES OF LYSMATA IN GULF OF MEXICO

**FIGURE 1. Lysmata baueri n. sp.:** holotype male (UF 43989); a, frontal region of carapace and cephalic appendages, lateral view; b, rostrum and cephalic appendages, lateral view; c, frontal region of carapace and cephalic appendages, dorsal view; d, scaphocerite, dorsal view; e, right antennule, lateral view; f, same, detail of accessory branch of outer ramus; g, abdomen, lateral view; h, telson, dorsal view; i, detail of distal margin of telson, dorsal view; j, right uropod, dorsal view.
FIGURE 2. *Lysmata baueri* n. sp.: holotype male (UF 43989); a, first pereiopod, lateral view; b, same, chela and fingers, ventral view; c, second pereiopod, lateral view; d, same, chela, ventral view; e, same, detail of ischium, lateral view; f, third maxilliped, lateral view; g, same, tip of ultimate segment, ventral view; h, third pereiopod, lateral view; i, same, distal propodus and dactylus; j, fifth pereiopod, lateral view; k, same, distal propodus and dactylus.
The length of the rostrum relative to that of the antennular peduncle is also a valuable character to distinguish the new species from other sympatric species. For instance, the tip of the rostrum nearly reaches the distal margin of the 2nd article of the antennular peduncle in L. baueri n. sp., whereas the rostrum reaches mid-length or the distal margin of the 3rd article of the antennular peduncle in L. wurdemanni, reaches the distal margin of the 3rd article in L. boggessi, L. ankeri, and L. jundalini and over-reaches the distal margin of the 3rd article of the antennular peduncle in L. pederseni, L. rafa, and L. rathbunae. The carpal and meral segments of the second pereiopod also permits differentiating the new species from other congeneric species inhabiting the Gulf of Mexico. In L. baueri n. sp. the carpal segments are 26 compared to 27–30 in L. wurdemanni, 33–41 in L. ankeri and L. pederseni, 40–43 in L. rafa, 30–35 in L. rathbunae and 28 in L. jundalini. Lastly, the number of flexor spines on the dactyls of 3rd to 5th pereiopods in L. baueri n. sp., is 4 and differs from that reported for L. pederseni (2–3), and L. jundalini (3), but overlaps with L. ankeri and L. rathbunae (3–4 each), L. wurdemanni and L. boggessi (3–6 each) and L. rafa (4–5).

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