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Alpheus zimmermani sp. nov., a new colourful snapping shrimp (Crustacea: Decapoda) from the Caribbean Sea

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Abstract: A new snapping shrimp, *Alpheus zimmermani* sp. nov. is described on the basis of a single specimen collected on a coral reef off Guana Island, British Virgin Islands, Caribbean Sea. The new species has some morphological similarities with *A. bouvieri* A. Milne-Edwards and *A. leviusculus* Dana, but differs from these taxa by the strong mediodorsal carina reaching far beyond the mid-length of the carapace, several features on the chelipeds, and by the conspicuous colour pattern.

Résumé : Alpheus zimmermani *sp. nov., une nouvelle crevette pistolet très colorée (Crustacea : Decapoda) de la Mer Caraïbe.* Une nouvelle espèce de crevette-pistolet, *Alpheus zimmermani* sp. nov., est décrite avec un seul spécimen récolté sur un récif de corail au large de l'île de Guana faisant partie des Îles Vierges Britanniques, dans la Mer Caraïbe. L'espèce nouvelle possède quelques similarités avec *A. bouvieri* A. Milne-Edwards et *A. leviusculus* Dana, mais diffère nettement de ces deux espèces par la carène médiodorsale très prononcée et atteignant la moitié postérieure de la carapace, par plusieurs caractères sur les chélipèdes, ainsi que par sa remarquable coloration.

Keywords: Alpheidae • *Alpheus* • Snapping shrimp • New species • Western Atlantic • Coral reef • Colour pattern.

Introduction

The best known snapping shrimp genus, *Alpheus* Fabricius, 1798, is represented by at least 40 species in the western Atlantic Ocean (e.g., Chace, 1972; Carvacho, 1979; Christoffersen, 1979 & 1984; Knowlton & Keller, 1983 & 1985; McClure, 1995; Martínez-Iglesias et al., 1997; Wicksten & McClure, 2003). Some of them are however species complexes (e.g., Knowlton & Mills, 1992; Knowlton et al., 1993; Anker, 2001) in urgent need of taxonomic revision.

In 2000 numerous specimens of alpheid shrimps, including an unusual, conspicuously coloured specimen of *Alpheus*, were collected during the Guana Island Marine Invertebrates Project off Guana, British Virgin Islands (see Zimmerman & Martin, 2004 for more details). The *Alpheus* specimen from Guana is somewhat incomplete, missing both fifth pereiopods and the left second pereiopod; the

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right second pereiopod is regenerating and so taxonomically uninformative. Furthermore, both second pleopods are missing endopods. On the other hand, numerous features of the carapace, eyestalks, major and minor chelipeds, antennules, antennae and third pereiopod, as well as the unique colour pattern, clearly indicate that this specimen belongs to an undescribed species. This species is described and illustrated below.

Material and methods

The single specimen was collected by hand while scuba diving on a coral reef off Guana Island, British Virgin Islands, photographed alive, and preserved in 70% ethanol. All drawings were made under the dissection microscope with the aid of a camera lucida. Carapace length (CL) and total length (TL) were measured along the middorsal line from the rostrum tip to the posterior margin of the carapace and telson, respectively. The mouthparts were observed externally and not dissected in order to leave the holotype as intact as possible. Some muscular tissue was taken through a small incision in the body for DNA analyses. The holotype of the new species is deposited in the crustacean collections of the Natural History Museum of the Los Angeles County, Los Angeles, USA (LACM).

Taxonomy

Alpheus zimmermani sp. nov.

Material examined

Holotype: 1 male (CL 5.3 mm, TL 16.2 mm), LACM CR 2000-037.1 (BVI-00-084, VC1140), Caribbean Sea, British Virgin Islands, Guana Island, near end of Long Point, coral reef, 1.5-11 m (5-35 ft), scuba diving, collected by hand, T. Zimmerman et al., mid-morning of 19 July 2000.

Description

Body relatively slender, laterally not compressed, glabrous except for numerous minute pits on surface of carapace and abdomen. Rostrum short, subtriangular, subacute distally (Fig. 1a, b), tip not reaching proximal 1/3 of first segment of antennular peduncle; rostral carina thick and high, continued posteriorly by mediodorsal carina to about 3/4 of carapace length (Fig. 1a, b). Orbital hoods feebly inflated, unarmed (Fig. 1a), frontally open: eyes visible in frontal view and partly in lateral view (Fig. 1b); orbitorostral region without marked grooves. Pterygostomian angle rounded, slightly protruding (Fig. 1b); cardiac notch well developed. Eyestalks with cornea relatively small, bean-shaped in dorsal view (Fig. 1a); anterior surface of each eye with subtriangular tubercle (Fig. 1b, c). Ocellar beak protruding, subacute dorsally (Fig. 1c). Epistomial sclerite with acute ventral projection.

Antennular peduncles moderately slender; stylocerite short, with acute tip, not reaching distal margin of first segment (Fig. 1a, b); ventromesial carina with subacute tooth as illustrated (Fig. 1d); second segment distinctly longer than dorsally visible portion of first segment, about twice as long as wide; third segment shortest, about half as long as second; lateral flagellum with groups of long aesthetascs starting at 11th segment (Fig. 1a, b). Antenna with basicerite bearing small, acute ventrolateral tooth (Fig. 1b); carpocerite slender, reaching far beyond both scaphocerite and antennular peduncle (Fig. 1a, b); scaphocerite subrectangular-ovate, not reaching distal margin of antennular peduncle, lateral margin straight; distolateral tooth slightly curved mesially, reaching slightly beyond anterior margin of blade (Fig. 1a).

Mouthparts not dissected, appearing typical for *Alpheus* in external view. Third maxilliped moderately slender (Fig. 1e); coxa with lateral plate ear-shaped, acute (Fig. 1e); exopod not reaching penultimate segment, with long flexible setae on posterior margin; antepenultimate segment somewhat flattened, ventral margin slightly rugose distally; dorsal margin not projecting distally; penultimate segment elongate, about three times as long as wide at base; ultimate segment tapering distally, setose, about 2/3 length of antepenultimate segment (Fig. 1e).

Major cheliped (Fig. 2a-c) with ischium short, cup-shaped; merus relatively slender, distally slightly widening, dorsal margin distally blunt, not projecting, ventromesial margin distally unarmed (Fig. 2a); carpus cup-shaped, with protruding distoventral lobes (Fig. 2a, c); chela subrectangular in shape, slightly compressed, ovate in cross-section; palm with two notches, one on superior and one on inferior margin, superior notch shallow, shoulder gradually sloping into transverse groove, latter continued on lateral face of palm by shallow longitudinal groove (Fig. 2b, c), and on mesial face of palm by short saddle-like depression (Fig. 2a); inferior shoulder blunt, not protruding beyond transverse groove (Fig. 2a, b), linea impressa well marked (Fig. 2b, c), rest of palmar surface smooth except for some minute setiferous pits; fingers about half as long as palm, adhesive discs small (Fig. 2c); pollex slightly shorter than dactylus, tip curved, fossa well developed (Fig. 2b); dactylus with rounded tip, plunger short, truncate (Fig. 2a, b). Minor cheliped (Fig. 2d, e) with ischium and merus as in major cheliped; ventrolateral margin of merus slightly rugose; carpus cup-shaped, longer than that of major cheliped (Fig. 2a, d); chela relatively slender; palm with slight longitudinal groove on mesial surface, running from distal end of linea impressa to finger bases, rest of palmar surface smooth, except for minute setiferous pits; fingers

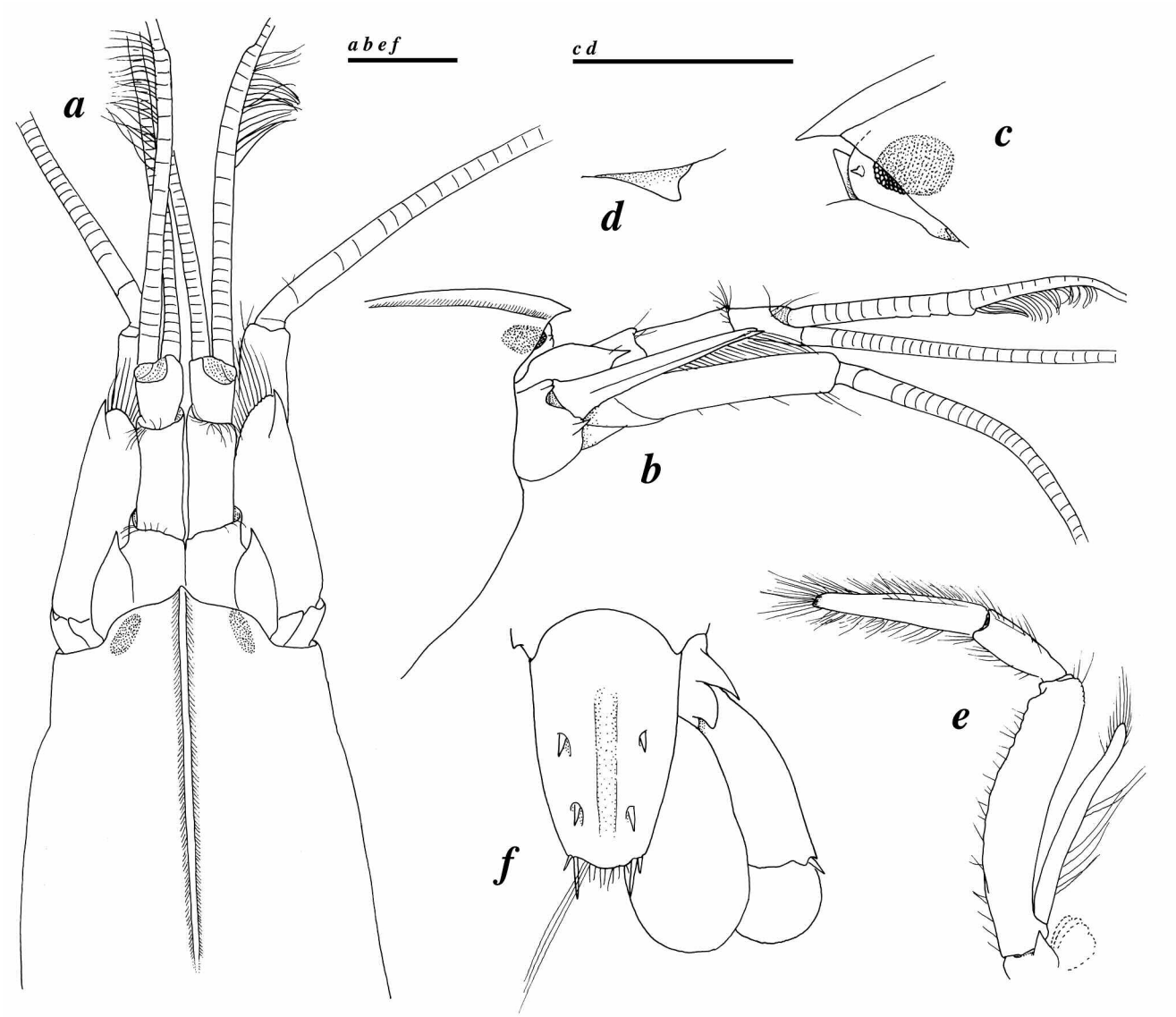

Figure 1. *Alpheus zimmermani* sp. nov. Holotype (LACM 2000-037.1). **a.** Anterior carapace and frontal appendages, dorsal view. **b.** Frontal margin of carapace and frontal appendages, lateral view. **c.** Visible portion of eyestalk and ocellar beak, lateral view. **d.** Antennule, tooth on ventromesial carina, lateral view. **e.** Third maxilliped, lateral view. **f.** Telson and uropod, dorsal view. Scale bars: 1 mm.

Figure 1. *Alpheus zimmermani* sp. nov. Holotype (LACM 2000-037.1). **a.** Carapace antérieure et appendices frontaux, vue dorsale. **b.** Bord frontal de la carapace et appendices frontaux, vue latérale. **c.** Partie visible du pédoncule oculaire et du bec ocellaire, vue latérale. **d.** Antennule, dent sur la carène médioventrale, vue latérale. **e.** Troisième maxillipède, vue latérale. **f.** Telson et uropode, vue dorsale. Echelle : 1 mm.

slightly longer than palm, tips distally crossing, cutting edges unarmed (Fig. 2e).

Left second pereiopod missing; right second pereiopod regenerating, present as elongate bud. Third and fourth pereiopods slender, similar in size and shape. Third pereiopod (Fig. 2f) with ischium armed with small ventrolateral spine; merus about six times as long as wide, compressed, unarmed; carpus about half as long as, and more slender than merus, unarmed; propodus longer than carpus, ventral margin with eight spines and distal pairs of slender spines (Fig. 2f); dactylus about 2/5 length of propodus, simple, conical, distally acute, with tufts of setae subdistally (Fig. 2f).

Abdominal segments with posteroventral margins broadly rounded; sixth segment without articulated flap; preanal plate rounded. Pleopod protopods with one stiff

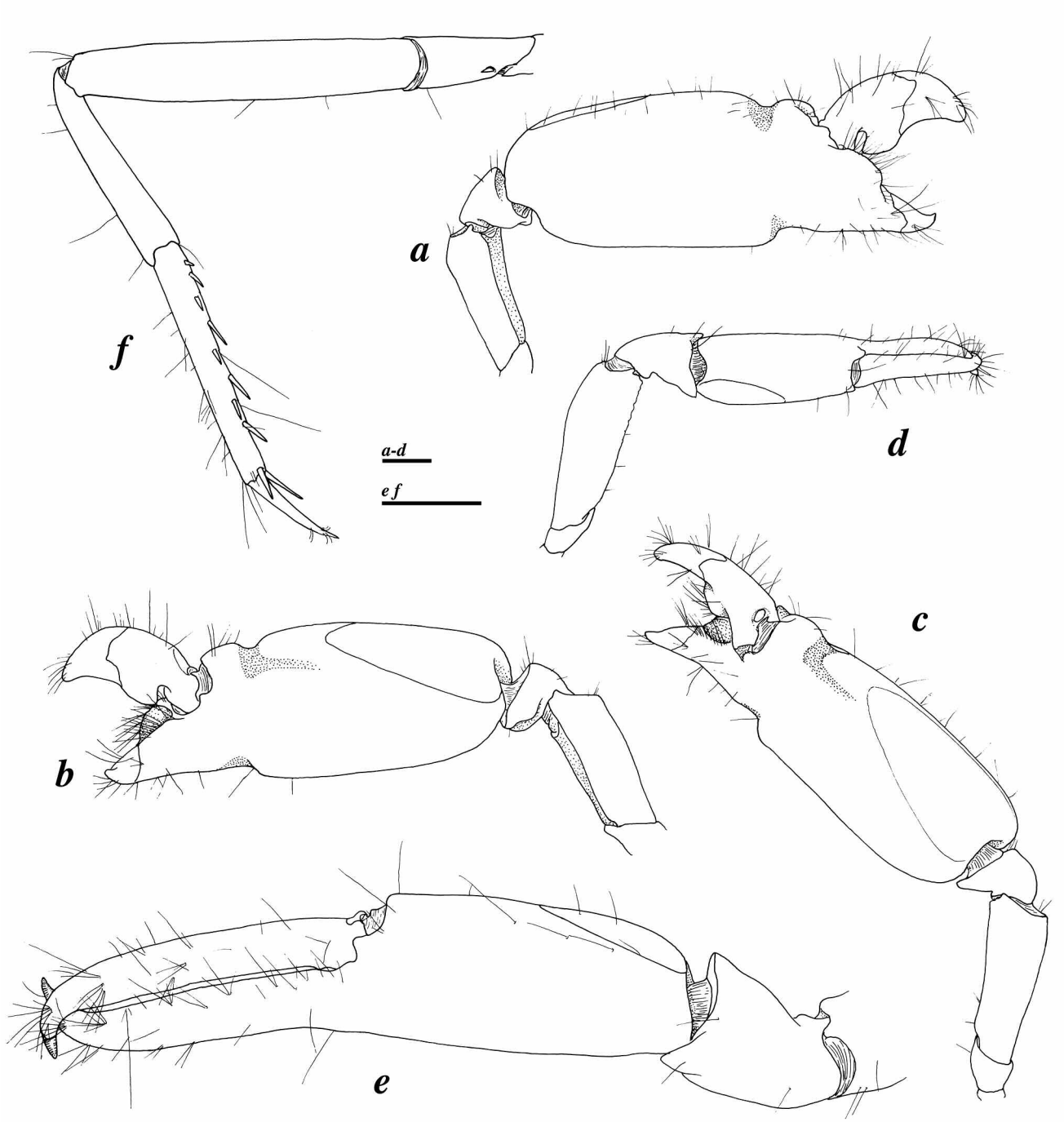

Figure 2. *Alpheus zimmermani* sp. nov. Holotype (LACM 2000-037.1). **a.** Major cheliped, mesial view. **b.** Same, lateral view. **c.** Same, dorsolateral view. **d.** Minor cheliped, lateral view. **e.** Same, chela and carpus, mesial view. **f.** Third pereiopod, lateral view. Scale bars: 1 mm.

Figure 2. *Alpheus zimmermani* sp. nov. Holotype (LACM 2000-037.1). **a.** Grand chélipède, vue médiane. **b.** Le même, vue latérale. **c.** Le même, vue dorso-latérale. **d.** Petit chélipède, vue latérale. **e.** Le même, pince et carpe, vue médiane. **f.** Troisième péréiopode, vue latérale. Echelle : 1 mm.

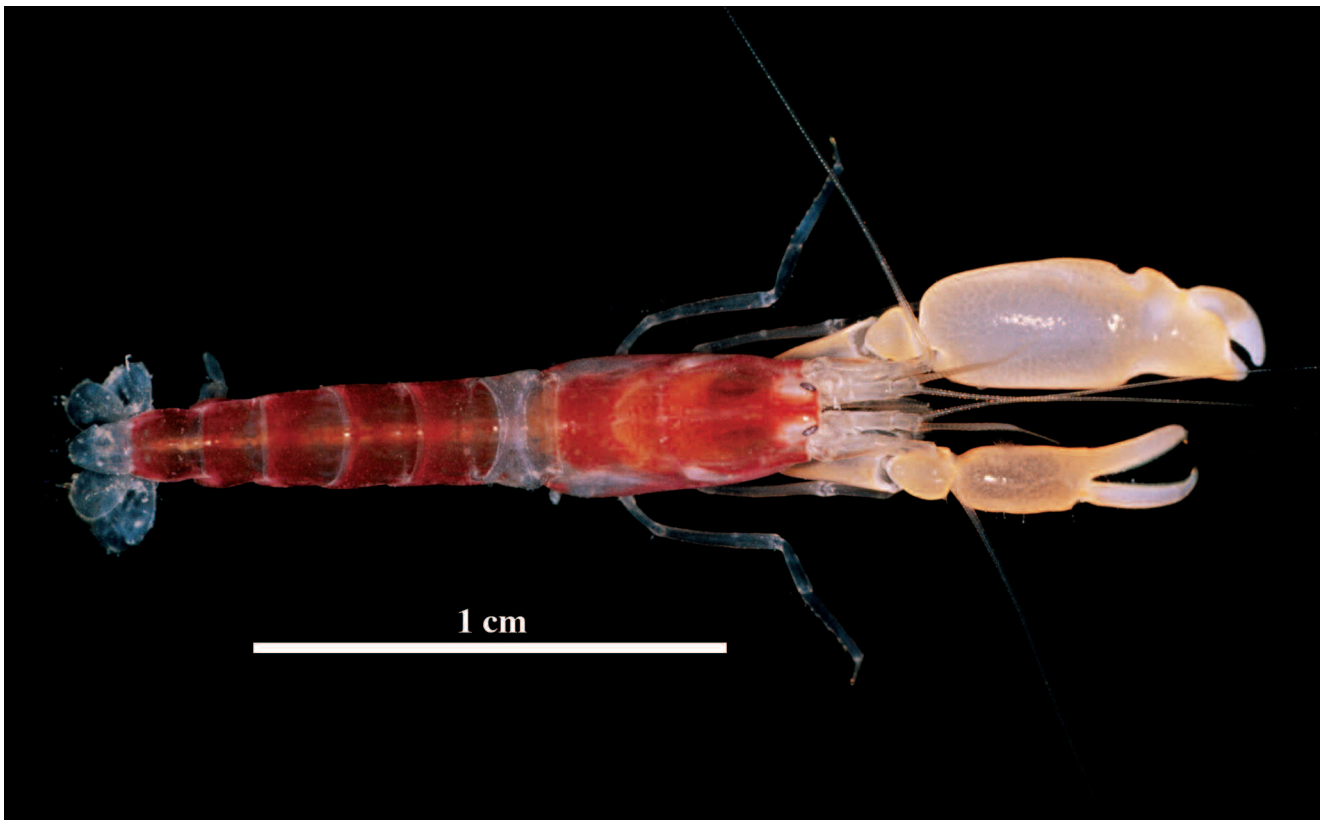

Figure 3. *Alpheus zimmermani* sp. nov. Holotype (LACM 2000-037.1). Habitus and colour pattern. Photograph by Todd L. Zimmerman.

Figure 3. *Alpheus zimmermani* sp. nov. Holotype (LACM 2000-037.1). Habitus et patron de coloration. Photographie de Todd L. Zimmerman.

seta distolaterally; first pleopod with endopod reduced, distally with two setae; second pleopods missing endopods. Uropod (Fig. 1f) with protopod bearing one strong acute lateral tooth and one subacute mesial tooth; exopod with diaeresis almost straight, lateral spine rather small (Fig. 1f); endopod without specific features. Telson slightly less than twice as long as wide at base, with lateral margins slightly convex (Fig. 1f), dorsal surface with shallow medio-longitudinal depression and two pairs of spines inserted first at about half telson length, second at about 3/4 telson length (Fig. 1f); posterior margin broad, convex, with two pairs of slender posterolateral spines, mesial more than twice as long as lateral, margin between spines furnished with numerous setae; anal tubercles well developed. Gill/exopod formula typical for genus, including one arthrobranch above third maxilliped and five mastigobranchs (strap-like epipods) on coxae of third maxilliped to fourth pereiopod.

Size

Medium-sized alpheid shrimp, with CL 5.3 mm and TL approximately 16.2 mm.

Colour pattern

Carapace and abdomen dorsally intense red, except for semitransparent-white first abdominal somite and orbital hoods; carapace flanks also red, except for semitransparent-white posterior portion and whitish longitudinal-oblique band running from pterygostomian region to dorsolateral mid-portion of carapace; antennular and antennal peduncles, walking legs, telson and uropods semitransparent-white; antennular and antennal flagella pale yellowish; antennal basicerite, as well as lateral margin of scaphocerite yellow-brown; chelipeds pale orange-yellow, mesial surface of palm of major cheliped with whitish areas, distal half of dactylus white, most of pollex and dactylus of minor cheliped also whitish; eyes grey-black (Fig. 3).

Habitat

The specimen was collected by hand, most probably under coral rubble or rock, on a coral reef at a depth of 1.5-11 m.

Etymology

This new species is named after Todd L. Zimmerman, who participated in its collection. Todd Zimmerman also photographed a large number of invertebrates, including *A. zimmermani* sp. nov., during the Guana Island Marine Invertebrates Project.

Type locality

Guana Island, British Virgin Islands.

Distribution

Presently known only from the type locality.

Remarks

Alpheus zimmermani sp. nov. belongs to the large, heterogenous and probably polyphyletic "*A. edwardsii* group" (first proposed by Coutière, 1899) that can be roughly characterized by the unarmed orbital hoods and the presence of two notches or transverse grooves on the major chela (see also Banner & Banner, 1982). Within this group, the new species shows some morphological similarities with species characterized by the presence of a more or less developed rostral carina, and shallow, not abruptly delimited adrostal furrows; the merus of the thrid pereiopod without a distal tooth; and the major chela having a smoothly rounded dorsal shoulder, not overhanging the adjacent transverse groove, the latter being rounded and not extending posteriorly on mesial face of the palm, e.g., *Alpheus bouvieri* A. Milne-Edwards, 1878, a species complex known from the eastern Pacific and both sides of the Atlantic Ocean (Kim & Abele, 1988), and *A. leviusculus* Dana, 1852, another species complex from the Indo-West Pacific (Banner & Banner, 1982). Banner & Banner (1982) treated *A. bouvieri* and *A. leviusculus* as subspecies of a single worldwide species, *A. leviusculus*, however, this view is not supported by the recently obtained data from genetics and comparison of colour pattern (A. Anker, pers. obs.).

Alpheus zimmermani sp. nov. differs from both *A. bouvieri* and *A. leviusculus* by the shape of the frontal margin and the presence of a strong mediodorsal carina running from the tip of the rostrum to the posterior region of the carapace (Fig. 1a). To our best knowledge, there are no other species of the "*A. edwardsii* group" in the Atlantic (e.g., Chace, 1972) or eastern Pacific (e.g., Kim & Abele, 1988), with such a marked carina on the carapace. Furthermore, assuming that the holotype of *A. zimmermani* sp. nov. is a male (based on the shape of the abdominal pleurae and absence of long flexible setae on the pleopods), the new species is also distinguishable from *A. leviusculus* and *A. bouvieri* by the absence of balaeniceps setae on the fingers of the minor chela. Another unusual feature of *A. zimmermani* sp. nov. is the relatively small cornea, which is restricted to the lateral margin of the eyestalk (Fig. 1a). Finally, the new species differs from all other Atlantic species of *Alpheus* by its very characteristic and conspicuous red-white colour pattern (Fig. 3).

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