

***Pseudalpheopsis guana* gen. nov., sp. nov. (Crustacea: Decapoda), a New Alpheid Shrimp from the British Virgin Islands, Caribbean Sea**

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Arthur Anker (2007) *Pseudalpheopsis guana* gen. nov. (Crustacea: Decapoda), sp. nov., a new alpheid shrimp from the British Virgin Islands, Caribbean Sea. *Zoological Studies* 46(4): 428-440. *Pseudalpheopsis guana* gen. nov., sp. nov. is described on the basis of a single male specimen collected from an artificial reef matrix structure (ARMS) off Guana I., British Virgin Is., Caribbean Sea. *Pseudalpheopsis*, gen. nov. appears to be most closely related to *Alpheopsis* Coutière, 1896 (*sensu lato*), but differs from all species currently placed in this genus by the unique armature of the chelipeds and the presence of a "pseudo-hepatic tooth" on the anterior margin of the carapace, above the pterygostomial angle. <http://zoolstud.sinica.edu.tw/Journals/46.4/428.pdf>

Key words: Alpheidae, New genus, Western Atlantic, Coral reef, Caridea.

The western Atlantic alpheid shrimp fauna currently comprises over 100 described and undescribed species from 14 genera (Table 1). Most of them occur in the shallow waters of the Caribbean Sea and Gulf of Mexico, in a variety of habitats, such as coral reefs, rocky shores, sand and mudflats, mangroves, sea grass beds, and caves. Reef crevices and coral rubble constitute a perfect habitat for many small-sized non-snapping alpheids, such as species of *Salmoneus* Holthuis, 1955, *Alpheopsis* Coutière, 1896, *Parabetaeus* Coutière, 1897, and *Prionalpheus* Banner and Banner, 1960. Because of their size and highly cryptic lifestyle, these shrimp are rarely collected. For instance, *Prionalpheus gomezi* Martínez-Iglesias and Carvacho, 1991 is presently known from a single incomplete adult male specimen from Cuba (Martínez-Iglesias and Carvacho 1991), and from 1 immature specimen from Guadeloupe, French Antilles (Anker 2001).

During an extensive survey of marine invertebrates of the small island of Guana, British Virgin Is., various collection methods, including artificial reef matrix structures (ARMS), suction pump, intertidal snorkeling and scuba collections, and light and bait traps, were employed (Zimmerman

and Martin 2004), resulting in the collection of numerous undescribed taxa (e.g., Martin 2002, Haney and Martin 2004). During this project, an unusual alpheid specimen was found in a rubble basket of an ARMS placed on coral rock pavement at a depth of about 9 m. This alpheid is characterized by the enlarged and symmetrical chelipeds, bearing a very specialized armature on the claw fingers, and by the anterolateral margin of the carapace having a projecting acute tooth above the pterygostomial angle. Because these 2 features are unique within the family Alpheidae, a new genus is established to accommodate the new species described below.

MATERIAL AND METHODS

The material, actually a single specimen, was collected from a rubble basket of an ARMS placed off Guana I., British Virgin Is. (see Zimmerman and Martin 2004 for a description of the ARMS methodology). The specimen was photographed alive and then preserved in 70% ethanol. All drawings were made under a dissection microscope with the aid of a camera lucida. Carapace

length (CL) and total length (TL) were measured along the mid-dorsal line from the rostrum tip to the posterior margin of the carapace and telson, respectively. While dissecting the specimen, small pieces of muscular tissue were preserved for subsequent DNA analyses. The holotype is deposited in the crustacean collection of the Natural History Museum of Los Angeles County, Los Angeles, USA (LACM).

TAXONOMY

Pseudalpheopsis gen. nov.

Body relatively slender, not compressed laterally. Carapace without sculpturing; cardiac notch deep. Frontal margin with elongate pointed rostrum and acute orbital teeth. Anterolateral margin bearing small acute tooth (“pseudo-hepatic tooth”) above rounded pterygostomial angle. Epistomial sclerite with protruding acute tooth. Eyes mostly concealed in dorsal and lateral views; cornea well-developed. Antennular peduncle with elongate stylocerite and large ventromesial tooth on 1st segment; 2nd segment not elongate; lateral

antennular flagellum with well-developed secondary ramus. Antenna with robust basicerite, armed with strong acute distoventral tooth; caropocerite reaching slightly beyond scaphocerite. Mouthparts typical for family; mandible with bisegmented palp and well-developed molar and incisor processes. Third maxilliped pediform, setose; lateral plate of coxa ear-shaped, with stiff setae; tip of ultimate segment with small subdistal spine. First pereopods (= chelipeds) enlarged, equal, symmetrical, carried extended, with dactylus in lateral position; ischium with spines on dorsodistal margin; merus stout, ventrally flattened; carpus very stout, cup-shaped, transversely constricted, with distoventral lobes, without comb-like setae mesially; chela enlarged, compressed, mesial face flattened; palm smooth, linea impressa and adhesive discs absent; cutting edges of fingers serrated on proximal 2/3, followed by broad hiatus and 1 large subdistal tooth; snapping mechanism absent. Second pereopod with 5-segmented carpus, 1st segment longest. Ischium of 3rd and 4th pereopods bearing 2 spines; merus and carpus unarmed; propodus with slender spines on ventral margin; dactylus simple. Ischium of 5th pereopod bearing 1 spine; propodus with spines on ventral

Table 1. Alpheid genera previously reported from the western Atlantic. The number of species includes both described and undescribed species

Genus	Number of species	References
<i>Alpheopsis</i> Coutière (<i>sensu lato</i>)	6	Chace 1972, Gore 1981, Wicksten 1984, A. Anker pers. obs.
<i>Alpheus</i> Fabricius (synonym: <i>Thunor</i> Banner)	~50	Hendrix 1971, Chace 1972, Hendrix and Gore 1973, Christoffersen 1979 1984, Knowlton and Keller 1983 1985, Abele and Kim 1986, Knowlton and Mills 1992, Knowlton et al. 1993, McClure 1995, Martínez-Iglesias et al. 1997, Wicksten and McClure 2003, A. Anker pers. obs.
<i>Automate</i> De Man	5	Chace 1972, Dworschak and Coelho 1999, A. Anker, pers. obs.
<i>Bermudacaris</i> Anker and Iliffe	1	Anker and Iliffe 2000
<i>Coutieralpheus</i> Anker and Felder	1	Anker and Felder 2005
<i>Fenneralpheus</i> Felder and Manning	2	Felder and Manning 1986, D. Felder pers. comm.
<i>Leptalpheus</i> Williams (<i>sensu lato</i>)	~9	Williams 1965, Dworschak and Coelho 1999, Anker et al. 2006, A. Anker pers. obs.
<i>Metalpheus</i> Coutière	2	Chace 1972, Abele and Kim 1986
<i>Mohocaris</i> Holthuis	1	Holthuis 1973
<i>Parabetaeus</i> Coutière (synonym: <i>Neopalpheopsis</i> Banner)	1	Schmitt 1936, Chace 1972, A. Anker pers. obs.
<i>Prionalpheus</i> Banner and Banner	1	Martínez-Iglesias and Carvacho 1991
<i>Salmonaeus</i> Holthuis (<i>sensu lato</i>)	~15	Chace 1972, Felder and Manning 1986, Holthuis 1990, A. Anker pers. obs.
<i>Synalpheus</i> Bate	~40	Coutière 1909, Chace 1972, Christoffersen 1979, Duffy 1996, Ríos and Duffy 1999
<i>Yagerocaris</i> Kensley	1	Kensley 1988

margin and poorly developed setal brush. Sixth abdominal somite with ventroposterior articulated plate. Protopod of 1st pleopod with slender spines. Second pleopod of male with appendix interna and appendix masculina. Protopod of uropod bearing bifid lateral tooth; diaeresis sinuous, with strong lateral tooth proximal to lateral spine; posterior margin of endopod with spinules. Telson with 2 pairs of dorsal spines and 2 pairs of posterolateral spines, lateral shorter than mesial; posterior margin feebly rounded; anal tubercles absent. Gill formula typical for Alpheidae: 5 pleurobranchs (P1-5); 1 arthrobranch (Mxp3); 0 podobranchs; 2 lobe-shaped epipods (Mxp1 and 2); 5 strap-like epipods = mastigobranchs (Mxp3, P1-4); 5 setobranchs (P1-5); 3 exopods (Mxp1-3).

Type species: Pseudalpheopsis guana sp. nov., by monotypy and present designation.

Number of species included: Only the type species.

Etymology: The genus name is a combination of the Latin *pseudo* (false) and *Alpheopsis*, the morphologically closest alpheid genus. The gender is feminine, following the feminization of *Alpheopsis* (Anker et al. 2005).

Affinities: See under remarks below.

***Pseudalpheopsis guana* sp. nov.**

(Figs. 1-8)

Material examined: Holotype: 1 male (CL 5.2, TL 14.7), LACM CR 2000-038 (BVI-00-097C, VC 1591), Caribbean Sea, British Virgin Is., Guana I., North Bay, North Beach, ARM-08, depth 9 m, scuba and airlift, extracted by hand, coll. T. Zimmerman et al., afternoon dive, 24 July 2000.

Description: Body moderately slender, not compressed laterally (Fig. 1). Carapace smooth,

without sutures, glabrous except for some scarce setae (Figs. 1, 2b); frontal margin with elongate, slender rostrum and acute orbital (extra-corneal) teeth (Figs. 2a, b); rostrum distally acute, ventral margin unarmed, lateral margins with some setae (Figs. 2c); margin between rostrum and orbital teeth broadly concave, with some setae (Figs. 2c); orbital teeth directed anteriorly, tips acute and slightly curved mesially, not reaching 1/2 length of rostrum (Fig. 2a, c); anterolateral margin slightly protruding into rounded lobe below orbital hood (Figs. 1a, b), with acute tooth above pterygostomial angle, reaching far beyond carapace margin (Fig. 2b); pterygostomial angle rounded, not protruding (Figs. 2b); branchiostegial margin without setae; cardiac notch deep (Figs. 2d, e). Eyes mostly concealed, only anterior-most margin visible in dorsal and lateral views (Figs. 2a, b), visible in frontal view; anteromesial margin without tubercle; cornea well-developed (pigments apparently retracted to deeper parts in ethanol-preserved specimen). Ocellar beak low, not protruding. Epistomial sclerite with elongate, curved, distally acute process (Fig. 2j).

Antennular peduncle moderately slender (Fig. 2a); stylocerite almost reaching distal margin of 2nd segment, with acute tip (Figs. 2a, b); ventromesial carina with large acute tooth as illustrated (Fig. 2h); 2nd segment subequal to dorsally visible portion of 1st segment, longer than 3rd segment, about 1.5 times as long as wide (Fig. 2a); lateral flagellum with well-developed secondary ramus, originating from 5th segment and composed of at least 5 partly fused segments bearing tufts of aesthetascs (Fig. 2i). Basicerite of antenna not particularly enlarged, armed with strong, acute ventrolateral tooth (Figs. 2b, j); scaphocerite subrectangular, relatively short, with strong distolateral

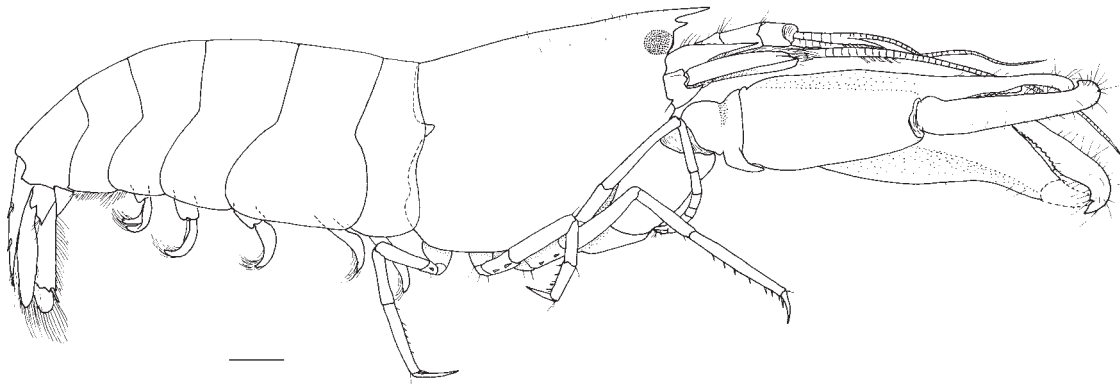


Fig. 1. *Pseudalpheopsis guana* gen. nov., sp. nov., holotype, male (LACM CR 2000-038). Habitus. Scale bar = 1 mm.

tooth, latter almost reaching distal end of antennular peduncle and carpocerite (Fig. 2a), anterior margin of blade somewhat convex, not extending beyond distolateral tooth; lateral margin straight; tubercle of antennal gland conspicuously protruding (Fig. 2j).

Mouthparts typical for family. Mandible with bisegmented palp, distal segment slightly broadened (Fig. 3a); molar process distally with circular rows, patches of setae, and row of small teeth (Fig. 3a); incisor process distally with 10 subtriangular

teeth, 1 much larger than others (Fig. 3a). Maxillule with bilobed palp, dorsal lobe with at least 1 slender seta, ventral lobe with 1 thick, long seta (Fig. 3b); dorsal endite with row of distal spine-like setae; ventral endite distally furnished with stiff setae and spines (Fig. 3b). Maxilla with narrow scaphognathite (Fig. 3c); endopod small, not segmented, without setae (Fig. 3c); dorsal endite deeply notched; ventral endite with elongate setae (Fig. 3c). First maxilliped with indistinctly bilobed epipod; exopod bearing narrow caridean

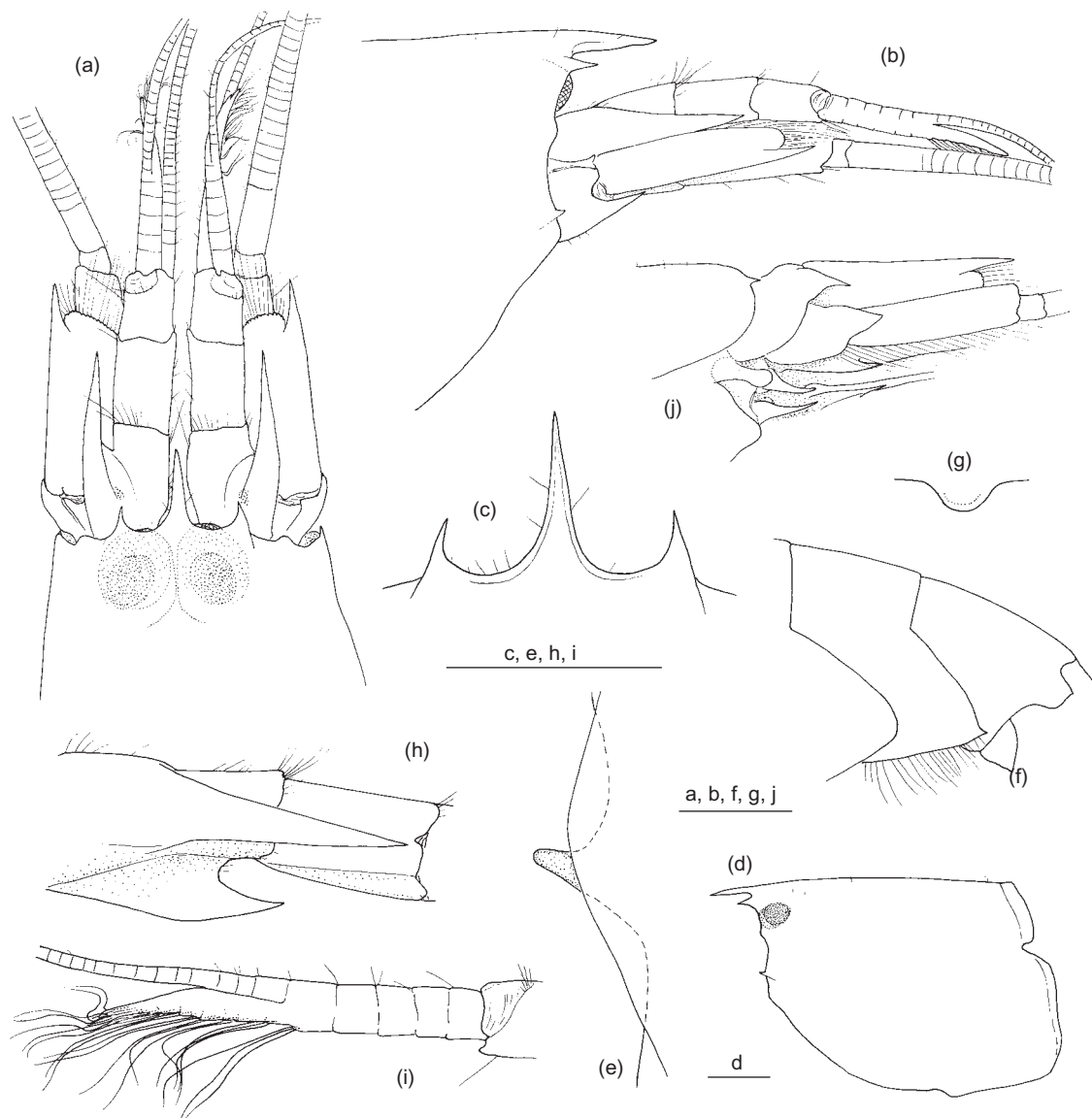


Fig. 2. *Pseudalpheopsis guana* gen. nov., sp. nov., holotype, male (LACM CR 2000-038). (a) Frontal region, dorsal view; (b) same, lateral view; (c) detail of frontal margin, dorsal view; (d) carapace, lateral view; (e) same, detail of cardiac notch; (f) posterior abdominal somites, lateral view; (g) preanal plate of 6th abdominal segment; (h) right antennular peduncle, 1st and 2nd segments, lateral view; (i) left antennular flagellum, lateral view; (j) antennal peduncle and episotomial sclerites, ventrolateral view. Scale bars = 1 mm.

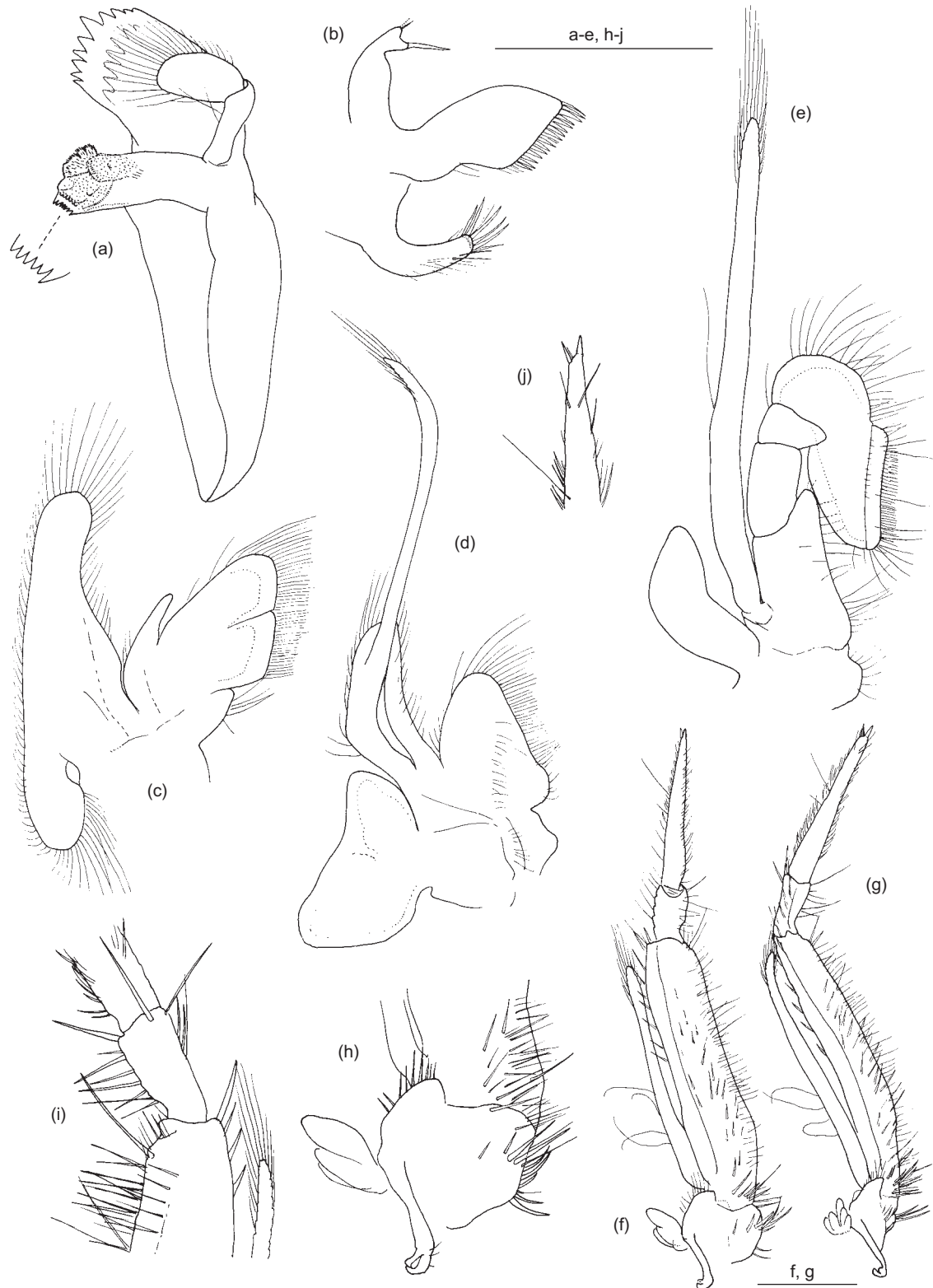


Fig. 3. *Pseudalpheopsis guana* gen. nov., sp. nov., holotype, male (LACM CR 2000-038). (a) Right mandible, ventromesial view; (b) maxillule, lateral view; (c) maxilla, lateral view; (d) 1st maxilliped, lateral view; (e) 2nd maxilliped, lateral view; (f) 3rd maxilliped, lateral view; (g) same, ventrolateral view; (h) same, detail of coxa; (i) same, distal antepenultimate and penultimate segments, mesial view; (j) same, distal ultimate segment, dorsolateral view. Scale bars = 1 mm.

lobe (Fig. 3d); endopod not segmented, furnished with elongate plumose setae on mesial margin and distally (Fig. 3d). Second maxilliped with relatively small, narrow epipod (Fig. 3e); endopod and exopod without specific features. Third maxilliped pediform; coxa stout, ventrolateral and ventromesial margins with numerous stiff setae and slender spines (Fig. 3h); lateral plate feebly projecting, ear-shaped, distal margin with stiff setae (Fig. 3h); mastigobranch very slender; antepenultimate segment somewhat broadened, subtriangular in cross section, ventral margin and lateral surface very setose, including numerous spine-like stiff setae; dorsal margin distally with slender spines (Figs. 3f, g); penultimate segment less than twice as long as wide, distally slightly widening (Figs. 3f, g), with strong, elongate setae on dorsal, ventral, and distal margins (Fig. 3i); ultimate segment tapering distally, with numerous rows of short spiniform setae and 1 short subdistal spine on dorsal margin, tip ending in acute terminal spine (Fig. 3j); exopod not reaching distal margin of antepenultimate segment (Fig. 3f); arthrobranch small (Figs. 3f, h).

First pereiopods (chelipeds) robust, enlarged, equal in size, symmetrical in shape, carried extended, with dactylus in lateral position (Fig. 1);

coxa stout, with elongate stiff setae dorsomesially and ventrally (Fig. 4c); basis very short, with some setae ventrally; ischium stout, dorsal margin armed with 1 slender spine on mid-length and 3 more or less curved, slender spines distally (Figs. 4a-c); merus robust, ventral surface flattened; dorsal margin with 1 slender spine proximally, distally with blunt end (Figs. 4a, c, d); ventromesial margin with blunt distal tooth (Figs. 4b, d); carpus stout, cup-shaped, transversely constricted (Figs. 4a, c, d, 5b); distal margin with rounded lobes, ventral and mesioventral lobes with slender spines (Figs. 4c, d, 5a); mesial surface without comb-like rows of setae; chela greatly enlarged, longer than rest of cheliped (Fig. 4a, b); palm compressed, mesial side flattened, lateral side with shallow proximal depression (Figs. 4a, 5a); linea impressa and adhesive discs absent; fingers about 1.5 times longer than palm, gaping, tips crossing; dactylus gradually curved, cutting edge with elevated ridge of slightly irregular, rounded teeth on proximal 2/3 of finger length, followed by broad hiatus and 1 subdistal tooth near dactylus tip (Figs. 5a-c); pollex with similar cutting edge armature (Figs. 5a-c); both dactylus and pollex furnished with rows of setae along cutting edges, as well as tufts and iso-

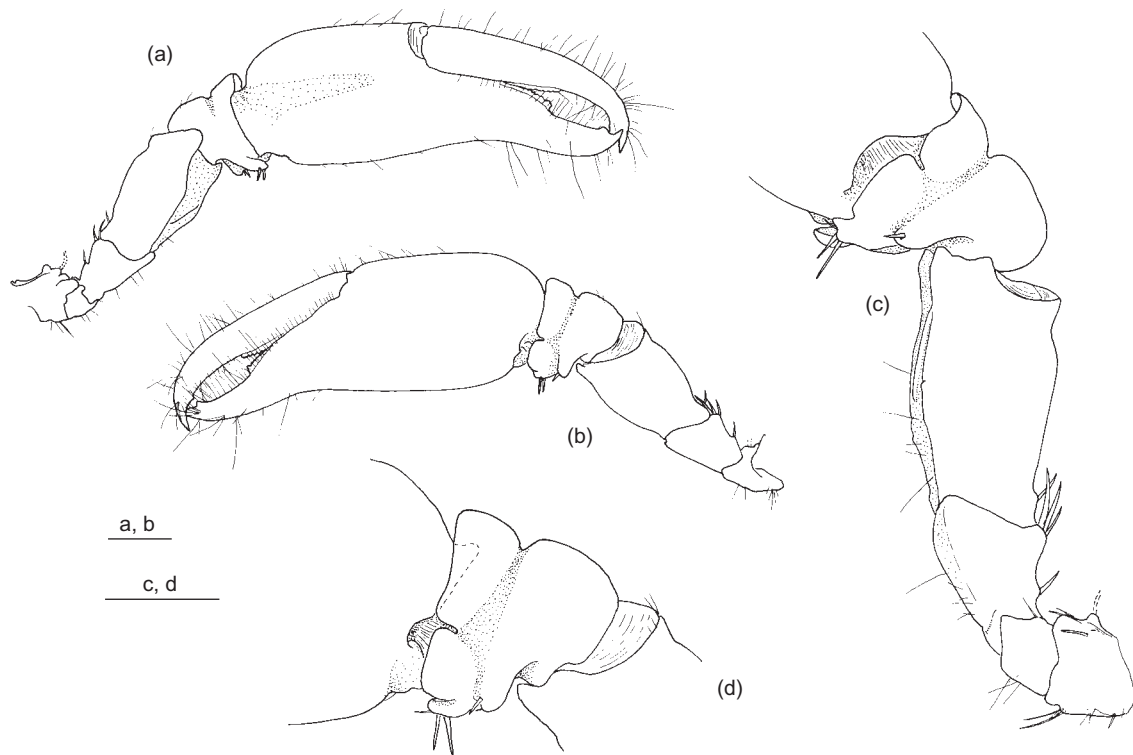


Fig. 4. *Pseudalpheopsis guana* gen. nov., sp. nov., holotype, male (LACM CR 2000-038), right cheliped (1). (a) Lateral view; (b) mesial view; (c) details of coxa, basis, ischium, merus, and carpus, mesial view; (d) detail of carpus, mesial view. Scale bars = 1 mm.

lated setae on ventral (pollex), dorsal (dactylus), lateral, and mesial (pollex and dactylus) margins (Figs. 5a-c); finger armature and setation nearly identical between right and left chelae.

Second pereiopod slender (Fig. 6a); coxa with numerous stiff setae and slender spines, especially on dorsal, ventral, and ventromesial surfaces (Figs. 6a, b); ischium slightly longer than merus; carpus with 5 segments, 1st longest, segment length ratio subequal to 2: 1: 0.8: 1: 1 (Fig. 6a);

chela simple, fingers longer than palm, with tufts of setae, cutting edges unarmed (Fig. 6c). Third pereiopod slender (Fig. 6d), with all endopodal articles slightly compressed; coxa with stiff setae and slender spines ventrally and mesially (Figs. 6d); ischium with 2 spines on ventrolateral margin; merus about 6 times as long as wide, unarmed; carpus slightly more than 1/2 as long as merus, unarmed, except for 1 stiff distal seta (Figs. 3d, e); propodus with 7 spines on ventral margin, distally

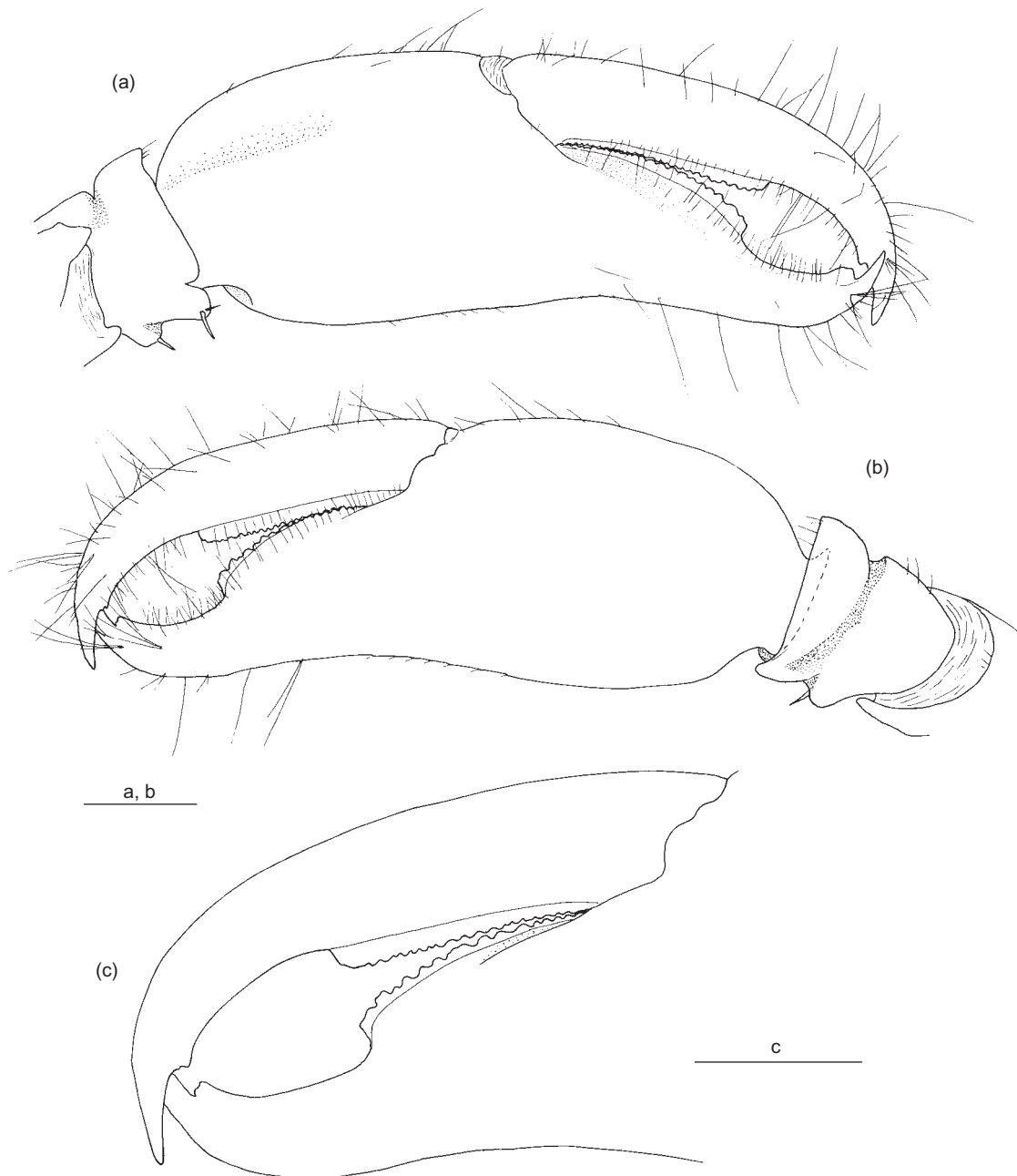


Fig. 5. *Pseudalpheopsis guana* gen. nov., sp. nov., holotype, male (LACM CR 2000-038), right cheliped (2). (a) Carpus and chela, lateral view; (b) same, mesial view; (c) same, detail of finger cutting edges, setae omitted. Scale bars = 1 mm.

with 1 pair of spines and 1 stiff seta (Fig. 3e); dactylus simple, conical, slightly curved, with acute tip, about 1/2 length of propodus, with some sub-distal setae (Fig. 3e). Fourth pereiopod similar to 3rd in proportions and armature, slenderer (Fig. 6f). Fifth pereiopod slenderer than 3rd and 4th pereiopods (Fig. 6g); coxa only with a few stiff setae; ischium with 1 ventrolateral spine (Fig. 6g); merus about 7 times as long as wide, unarmed; carpus about 2/3 length of merus, unarmed; propodus longer than merus, slender, with at least 10 small spines on ventral margin (Fig. 6i) and poorly-developed, short setal brushes on distal 1/2 of ventrolateral margin (Fig. 6h).

Abdominal somites smooth; 1st to 4th somites with rounded posterolateral angles (Fig. 1); 5th

somite with small, acute, ventroposterior tooth (Fig. 2f); 6th somite with large articulated plate at ventroposterior angle (Fig. 2f); preanal plate rounded (Fig. 2g). Protropod of 1st pleopod with stout spines on posterior margin (Fig. 7a); endopod small, distally with plumose setae (Fig. 7a). Male 2nd pleopod with appendix masculina and appendix interna (Figs. 7c, d); appendix masculina slightly exceeding appendix interna, distally with stiff setae (Figs. 7d, c).

Uropods exceeding telson (Fig. 7e); protopod (sympodite) with bifid lateral tooth and stiff setae (Figs. 7f, g); endopod and exopod subequal in length (Fig. 7f); diaeresis of exopod bearing 1 acute tooth near lateral margin, and 2 blunt teeth on medial portion (Fig. 7h); distolateral spine

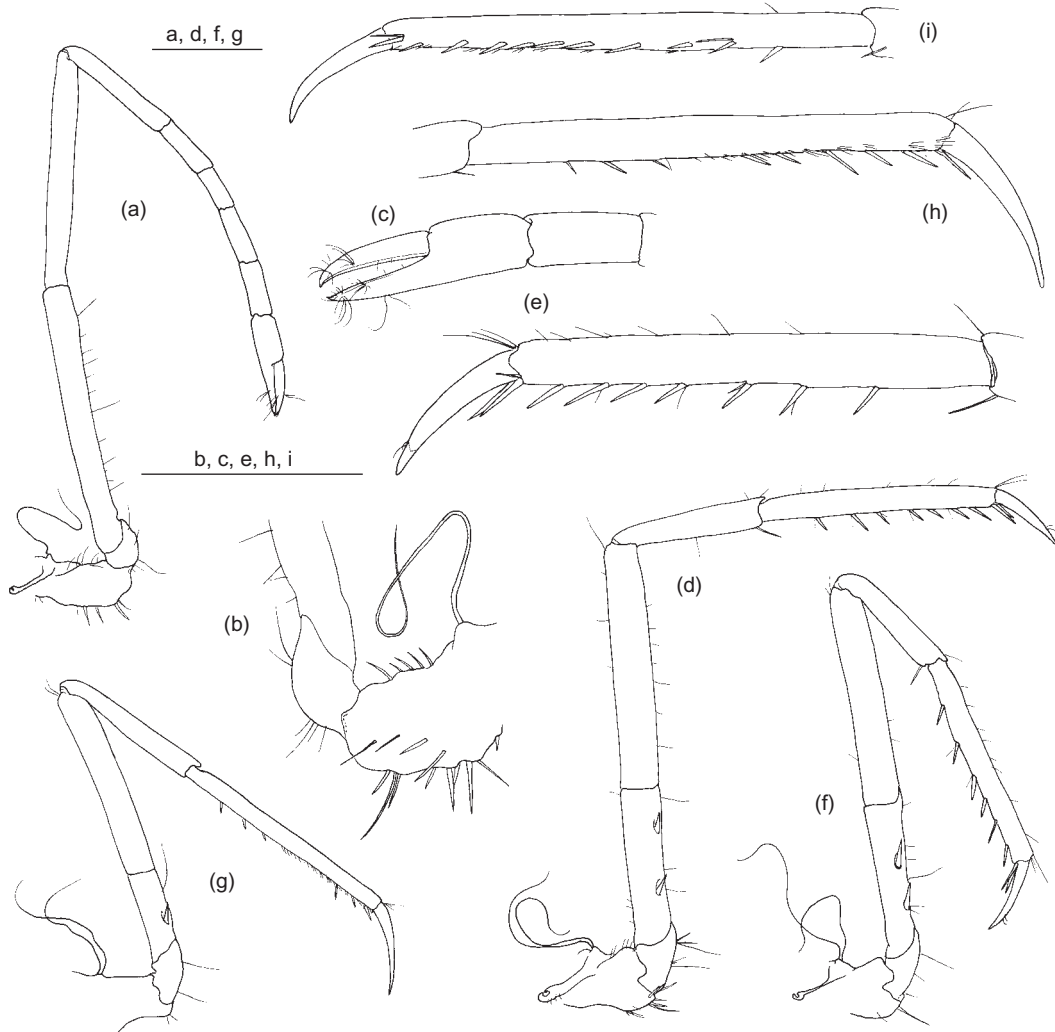


Fig. 6. *Pseudalpheopsis guana* gen. nov., sp. nov., holotype, male (LACM CR 2000-038). (a) Second pereiopod, lateral view; (b) same, detail of coxa, mesial view; (c) same, detail of chela, mesial view; (d) 3rd pereiopod, lateral view; (e) same, details of propodus and dactylus, mesial view; (f) 4th pereiopod, lateral view; (g) 5th pereiopod, lateral view; (h) same, details of carpus and propodus, lateral view; (i) same, ventromesial view. Scale bars = 1 mm.

strong, elongate, not exceeding posterior margin of exopod (Figs. 7f, h); posterior margin of endopod with row of slender spinules (Fig. 7i). Telson moderately broad, tapering distally, less than twice as long as proximally wide, with slightly convex lateral margins (Fig. 7e); proximal width about double width of posterior margin; dorsal surface with 2 pairs of strong spines situated at some distance from lateral margin, 1 pair anterior to mid-length and 1 pair at about distal 1/4 of telson length (Fig. 7e); posterior margin with slightly protruding, broadly rounded median portion; angles subacute or blunt, with 2 pairs of slender posterolateral spines, lateral distinctly shorter than mesial, tip of latter sometimes curved mesially (Fig. 7j); at least 6 thick, elongate, plumose setae inserted between mesial spines, in addition to shorter and slenderer, slightly upwardly directed setae (Fig. 7j); anal tubercles absent. Gill formula as given in generic diagnosis.

Size: Relatively small-sized shrimp, CL of holotype 5.2 mm, TL about 14.7 mm.

Colour: Body semitransparent, with small red chromatophores arranged in broad transverse bands: 1 on each abdominal somite and 1 across

posterior carapace; posterior 1/2 of carapace with sparsely dispersed red chromatophores; postrostral region and anterolateral margins of carapace with small patches of red chromatophores; rostrum pale orange; antennular peduncle, basicerite, and scaphocerite of antenna pale orange, speckled with red chromatophores; antennular and antennal flagella pale orange; chelipeds hyaline-grey, carpus and mesial face of chela with fine reticulations of reddish chromatophores; walking legs semitransparent; eyes grey with golden tinge; dull brownish-green inner organs visible through carapace (Fig. 8).

Etymology: Named after the type locality, Guana I., British Virgin Is.; used as a noun in apposition.

Habitat: The specimen was taken from a rubble basket of an ARMS (mostly pieces of old *Acropora palmata*) placed at a depth of 9 m. The site was a very open flat dominated by soft corals growing on a coralline pavement. Widely scattered medium-sized eroded coral heads were present, but rubble and sand were rare.

Distribution: Presently known only from the type locality in the British Virgin Is.

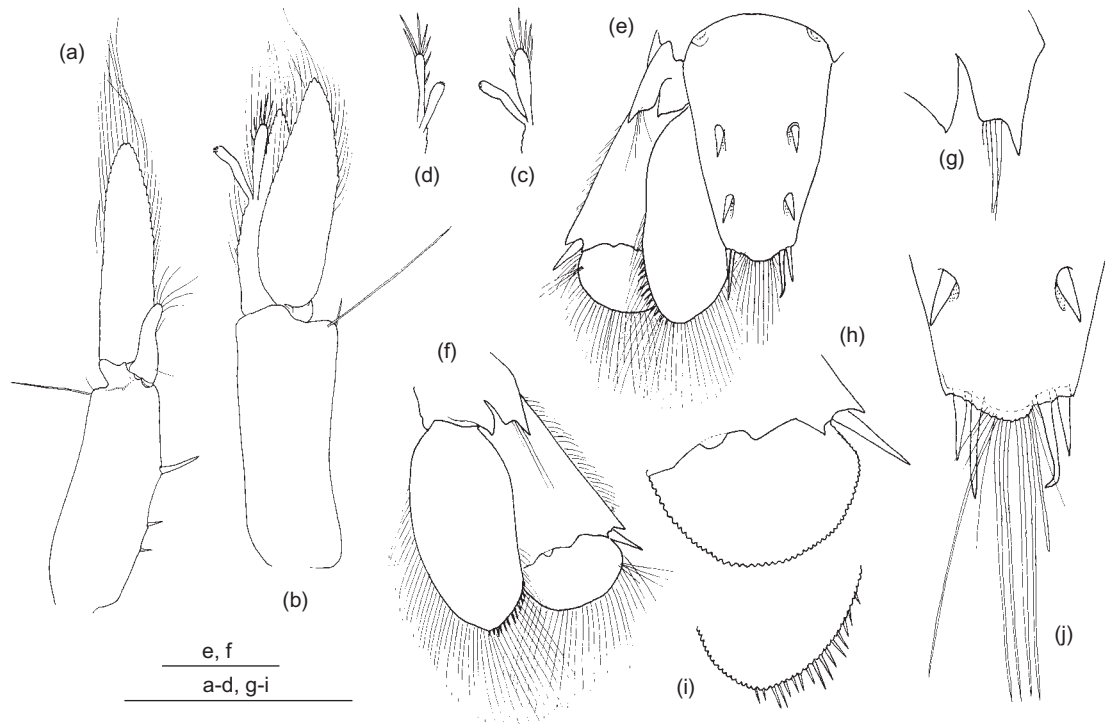


Fig. 7. *Pseudalpheopsis guana* gen. nov., sp. nov., holotype, male (LACM CR 2000-038). (a) First pleopod, mesial view; (b) 2nd pleopod, lateral view; (c) same, appendices masculina and interna; (d) same, mesial view; (e) uropods and telson, dorsal view; (f) right uropod, dorsal view; (g) same, detail of protopod; (h) same, detail of exopod; (i) same, detail of posterior margin of endopod; (j) posterior margin of telson, dorsal view. Scale bars = 1 mm.

Remarks: *Pseudalpheopsis* gen. nov. belongs to a small group of genera, which also includes *Alpheopsis* (at least 15 species), *Parabetaeus* (3 species), and *Prionalpheus* (7 species), all 3 with representatives in the western Atlantic (see Table 1); the monotypic *Notalpheus* Méndez and Wicksten, 1982 from the eastern Pacific; and *Nennalpheus* Banner and Banner, 1981, with 2 species from the Indo-West Pacific. These genera are characterized by (1) the equal or subequal chelipeds, carried extended or folded, without a snapping mechanism on the fingers; (2) a well-developed, acute or subacute rostrum (secondarily reduced in *Parabetaeus culliereti* Coutière, 1897); and (3) the 6th abdominal somite with a subtriangular articulated plate at the posteroventral angle (with the exception of *Nennalpheus inarticulatus* Banner and Banner, 1981, in which this plate is not distinct).

Pseudalpheopsis gen. nov. can be separated from all these genera by the presence of an isolated “pseudo-hepatic tooth” above the pterygostomial angle of the carapace, the unique armature of the chela fingers, and the presence of a row of slender spines on the posterior margin of the uropodal endopod. The new genus differs more specifically from *Parabetaeus* by the absence of a triangular posteromedial projection on the telson, the chelipeds being carried extended not folded (vs. capable of ventral flexion in *Parabetaeus*), and the meri of the 3rd-5th pereopods lacking spines (vs. with spines in *Parabetaeus*) (see Nomura and Anker 2001); from *Prionalpheus* by the presence of orbital teeth and mastigobranchs (absent in *Prionalpheus*) and unspecialized mouthparts (vs. highly specialized in *Prionalpheus*) (see Banner and Banner 1960, Martínez-Iglesias and Carvacho 1991); and from both *Notalpheus* and *Nennalpheus*

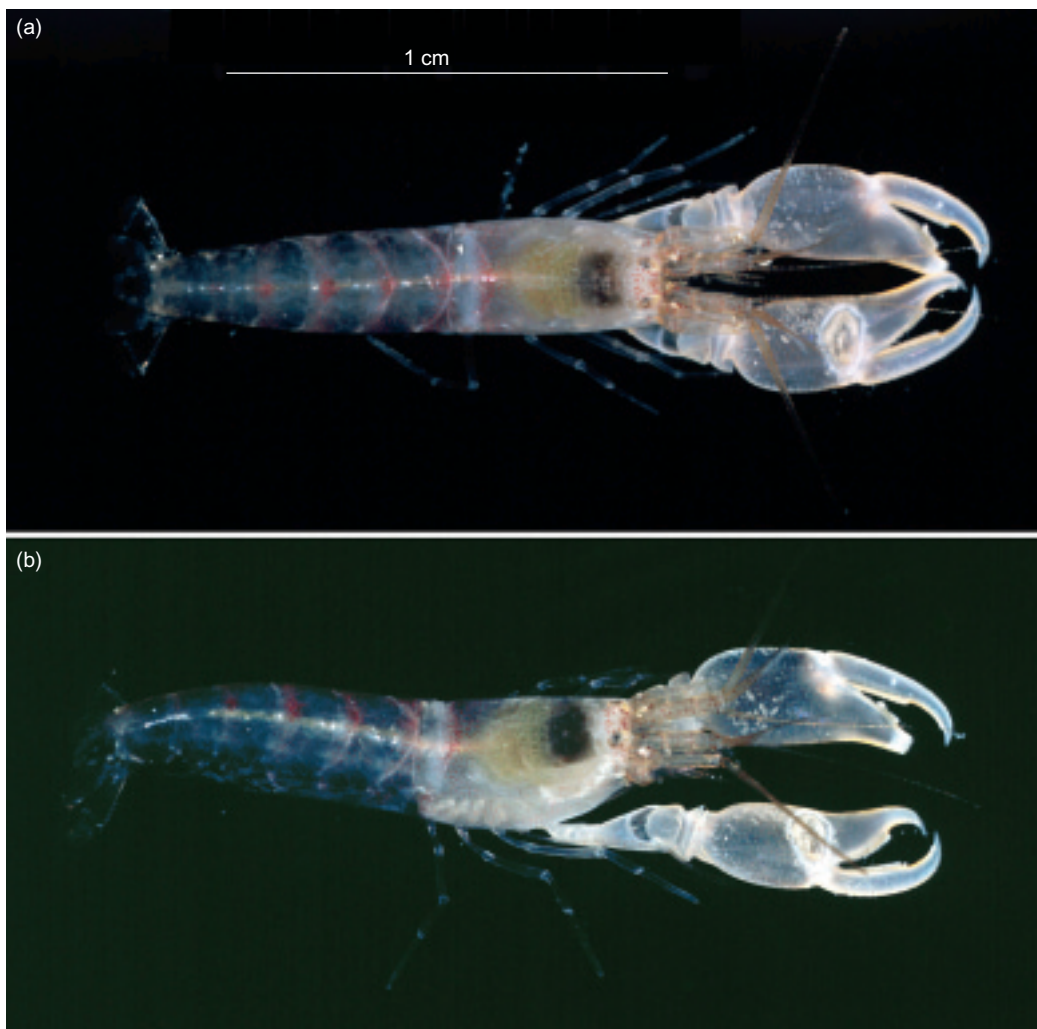


Fig. 8. *Pseudalpheopsis guana* gen. nov., sp. nov. Holotype, male (LACM CR 2000-038), live color pattern. Photograph by Todd L. Zimmerman.

by the very differently shaped and non-inverted chelipeds (vs. inverted, i.e., with the dactylus in the ventral position in *Notalpheus* and *Nennalpheus* (see Banner and Banner 1981, Méndez and Wicksten 1982).

Pseudalpheopsis gen. nov. is morphologically most similar and therefore probably most closely related to *Alpheopsis*, a heterogeneous genus that needs a thorough revision. Anker (2001), based on a phylogenetic analysis of morphological characters, suggested that *Alpheopsis*, as currently defined (*Alpheopsis sensu lato*), might not be monophyletic. Anker et al. (2005) pointed out that since the type species of *Alpheopsis* is *A. trispinosus* (Stimpson, 1860), this genus should be restricted to members of the very distinct *A. trispinosus* group. The morphological diversity within *Alpheopsis* suggests that up to 3 new genera may be needed to accommodate the remaining species of *Alpheopsis* (Anker in prep.). *Pseudalpheopsis* gen. nov. strongly differs from *Alpheopsis sensu stricto* (i.e., the *A. trispinosus* group) by the shape of the chelipeds (see Banner and Banner 1973, Anker et al. 2005), and may actually be more-closely related to some species of the informal *A. aequalis* Coutière, 1896 species group or the *A. trigona* (Rathbun, 1901) species group (Anker 2001). This is indicated by several subtle features shared between *Pseudalpheopsis* gen. nov. and some members of the *A. aequalis* and *A. trigona* groups, such as the presence of particularly strong epistomial processes, the elongate stylocerite, the cheliped ischium armed with dorsal spines, and the uropod with a protopod bearing a bifid lateral tooth and a strong tooth on the diaeresis near the distolateral spine.

The *A. trigona* group, with 2 (1 undescribed) species in the western Atlantic and 1 (probably undescribed) species in the eastern Pacific (*A. Anker pers. obs.*), appears to be particularly close to *Pseudalpheopsis* gen. nov. In *A. trigona*, the cheliped carpus is also robust and transversely constricted, the mesial side of the chela is strongly flattened, and the ischium is armed with dorsal spines (Anker 2001, p. 331, fig. EC1). Even more important is the fact that in *A. trigona*, the carapace also bears a subacute tooth above the pterygostomial angle. However, this tooth is not isolated, as in *Pseudalpheopsis* gen. nov. (Fig. 2b), but actually represents an anterior extension of a strongly marked ridge running above the pterygostomial-branchiostegial margin (Anker 2001, p. 331, fig. EC1, g). On the other hand, the armature of the chela fingers in *A. trigona* (Anker 2001, p. 331,

fig. EC1, m) greatly differs from that of *Pseudalpheopsis* gen. nov. (Fig. 5). Furthermore, the carapace of *Pseudalpheopsis* gen. nov. has no ridges, in marked contrast to 4 strong lateral and 1 mediodorsal ridges in *A. trigona* (Anker 2001, p. 331, fig. EC1e, d). Other differences between *Pseudalpheopsis* gen. nov. and *A. trigona* are the number of ischial spines on the 3rd pereopod (2 in *Pseudalpheopsis* gen. nov. vs. 1 in *A. trigona*), the shape of the orbital teeth (elongate and acute in *Pseudalpheopsis* gen. nov. vs. short and blunt in *A. trigona*), and the degree of asymmetry of the chelipeds (perfectly symmetrical in *Pseudalpheopsis* gen. nov. vs. subsymmetrical to slightly asymmetrical in adult *A. trigona*) (Anker 2001, p. 331, fig. EC1). Therefore, *A. trigona* does not belong to *Pseudalpheopsis* gen. nov., and the pseudo-hepatic teeth of *Pseudalpheopsis* gen. nov. and *A. trigona* appear to have evolved independently. The generic reassignment of species of the *A. trigona* group, as well as other groups of *Alpheopsis*, will be published elsewhere (Anker in prep.).

Although the chelipeds of *Pseudalpheopsis* gen. nov. are superficially similar to the chelipeds of the Indo-West Pacific *Arete* Stimpson, 1860 (Banner and Banner 1973), these 2 genera greatly differ in their gill formulas and frontal regions, and are clearly not closely related. The only other western Atlantic genera characterized by symmetrical chelipeds lacking snapping mechanism are *Mohocaris* Holthuis, 1973 and *Coutieralpheus* Anker and Felder, 2005. However, these two genera lack a posteroventral plate on the 6th segment, and have very different frontal margins and chelipeds (Holthuis 1973, Anker and Felder 2005).

Remarkably, some parts of the body and appendages of *Pseudalpheopsis* gen. nov. are covered with spines or have acute projections. For instance, the above-mentioned epistomial horns appear to be almost hypertrophied in *Pseudalpheopsis* gen. nov. (Fig. 2j). The only other alpheids in which these horns attain the same size are some members of *Alpheopsis*, e.g., *A. aequalis*, and all species of *Prionalpheus* (Banner and Baner 1971, Bruce 1990, Miya 1997). The adjacent ventromesial tooth of the 1st segment of the antennular peduncle is also very large (Fig. 2h, j) compared to that in other alpheids. The 3rd maxilliped, the ischium, merus, and carpus of the chelipeds and coxae of the 2nd-4th pereopods, the protopod of the 1st pleopod, as well as the endopod of the uropod have spines or stiff spine-like setae (Figs. 3h, i, 4c, 6b, 7a).

However, the most remarkable and diagnostic feature of *Pseudalpheopsis* gen. nov. is the unique armature of the cheliped fingers (Fig. 5), suggesting a possible specialization in feeding mode and/or diet, which however, remains unknown.

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REFERENCES

- Abele LG, W Kim. 1986. An illustrated guide to the marine decapod crustaceans of Florida. Tech. Ser. Dept. Environ. Reg. **8**: 1-760.
- Anker A. 2001. Taxonomie et évolution des Alpheidae (Crustacea, Decapoda). PhD dissertation, Muséum national d'Histoire naturelle, Paris, 2 vols: 547 + 331 pp.
- Anker A, C d'Udekem d'Acoz, D Poddoubtchenko. 2005. Description of a new species of *Alpheopsis* from the Azores, with remarks on *A. africana* Holthuis, 1952 and other species of the *A. trispinosa* (Stimpson, 1860) group (Crustacea, Decapoda, Caridea, Alpheidae). Bull. Inst. Roy. Sci. Nat. Belg. Biol. **75**: 97-110.
- Anker A, DL Felder. 2005. Description of *Coutieralpheus setirostris*, new genus, new species, an infaunal alpheid shrimp (Crustacea, Decapoda) from Florida, U.S.A. Crust. Res. **34**: 40-52.
- Anker A, TM Iliffe. 2000. Description of *Bermudacaris harti*, a new genus, and species (Crustacea: Decapoda: Alpheidae) from anchialine caves of Bermuda. Proc. Biol. Soc. Wash. **113**: 761-775.
- Anker A, JA Vera Caripe, C Lira. 2006. Description of a new species of commensal alpheid shrimp (Crustacea: Decapoda) from the southern Caribbean Sea. Zoosystema **28**: 683-702.
- Banner AH, DM Banner. 1960. Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean, part VI: *Prionalpheus*, a new genus of the Alpheidae. Pac. Sci. **14**: 292-298.
- Banner AH, DM Banner. 1971. Contributions to the knowledge of the alpheid shrimp of the Pacific Ocean, part XIV: a review of *Prionalpheus* (Decapoda, Alpheidae) with the description of two new species. Crustaceana **20**: 263-270.
- Banner AH, DM Banner. 1981. Decapod Crustacea: Alpheidae. In Résultats des campagnes MUSORSTOM, I: Philippines (18-28 mars 1976). Mém. ORSTOM **91**: 217-235.
- Banner DM, AH Banner. 1973. The alpheid shrimp of Australia, part I: the lower genera. Rec. Austr. Mus. **28**: 291-382.
- Bruce AJ. 1990. Additions to the marine shrimp fauna of Hong Kong. In Morton B, ed. Proceedings of the Second International Marine Biological Workshop: the marine flora and fauna of Hong Kong and southern China. Hong Kong: Hong Kong Univ. Press. **2**: 611-648.
- Chace FA Jr. 1972. The shrimps of the Smithsonian-Bredin Caribbean expedition with a summary of the West Indian shallow water species (Crustacea Decapoda: Natantia). Smithsonian. Contr. Zool. **98**: i-x + 1-179.
- Christoffersen ML. 1979. Decapod Crustacea: Alpheoidea. Campagnes de la Calypso au large des côtes atlantiques de l'Amérique du Sud (1961-1962). I. Rés. Sci. Camp. Calypso **11**: 297-377.
- Christoffersen ML. 1984. The western Atlantic snapping shrimps related to *Alpheus heterochaelis* Say (Crustacea Caridea), with the description of a new species. Pap. Avul. Zool. São Paulo **35**: 189-208.
- Coutière H. 1909. The American species of snapping shrimps of the genus *Synalpheus*. Proc. US Natl. Mus. **36**: 1-93.
- Duffy JE. 1996. *Synalpheus regalis*, new species, a sponge-dwelling shrimp from the Belize Barrier Reef, with comments on host specificity in *Synalpheus*. J. Crustacean Biol. **16**: 564-573.
- Dworschak PC, VR Coelho. 1999. On two alpheids from Araçá (Sao Paulo, Brazil) with a description of a new species of *Leptalpheus* (Decapoda: Caridea: Alpheidae). Ann. Naturhist. Mus. Wien **101B**: 475-488.
- Felder DL, RB Manning. 1986. A new genus and two new species of Alpheid shrimps (Decapoda: Caridea) from South Florida. J. Crustacean Biol. **6**: 497-508.
- Gore RH. 1981. Three new shrimps, and some interesting new records of decapod Crustacea from a deep-water coral reef in the Florida Keys. Proc. Biol. Soc. Wash. **94**: 135-162.
- Haney TA, JW Martin. 2004. A new genus and species of leptostracan (Crustacea: Malacostraca: Phyllocarida) from Guana Island, British Virgin Islands, and a review of leptostracan genera. J. Nat. Hist. **38**: 447-469.
- Hendrix GY. 1971. A systematic study of the genus *Alpheus* (Crustacea: Decapoda: Alpheidae) in South Florida. PhD dissertation, Univ. of Miami, Coral Gables, Florida, 184 pp., 24 pls.
- Hendrix GY, RH Gore. 1973. Studies on decapod Crustacea from the Indian River Region Florida. I. *Alpheus thomasi*, new species, a new snapping shrimp from the subtropical east coast of Florida (Crustacea: Decapoda: Caridea). Proc. Biol. Soc. Wash. **86**: 413-422.
- Holthuis LB. 1973. *Mohocaris*, a new genus of alpheid shrimps from the Caribbean region (Crustacea, Decapoda, Natantia). Bull. Mar. Sci. **23**: 489-495.
- Holthuis LB. 1990. Notes on *Salmoreus arubae* (Schmitt, 1936) (Crustacea, Decapoda, Caridea). Beaufortia **41**: 109-113.
- Kensley BF. 1988. New species and records of cave shrimps from the Yucatan Peninsula (Decapoda: Agostocarididae and Hippolytidae). J. Crustacean Biol. **8**: 688-699.
- Knowlton N, BD Keller. 1983. A new, sibling species of snapping shrimp associated with the Caribbean sea anemone *Bartholomea annulata*. Bull. Mar. Sci. **33**: 353-362.
- Knowlton N, BD Keller. 1985. Two more sibling species of alpheid shrimp associated with the Caribbean sea anemones *Bartholomea annulata* and *Heteractis lucida*.

- Bull. Mar. Sci. **37**: 893-904.
- Knowlton N, DK Mills. 1992. The systematic importance of color and color pattern: evidence for complexes of sibling species of snapping shrimp (Caridea: Alpheidae: *Alpheus*) from the Caribbean and Pacific coasts of Panama. Proc. San Diego Soc. Nat. Hist. **18**: 1-5.
- Knowlton N, LA Weigt, LA Solorzano, DK Mills, E Bermingham. 1993. Divergence in proteins, mitochondrial DNA, and reproductive compatibility across the isthmus of Panama. Science **260**: 1629-1632.
- Martin JW. 2002. *Microprosthema jareckii*, a new species of stenopodidean shrimp (Crustacea: Decapoda: Stenopodidea: Spongicolidae) from Guana Island, British Virgin Islands. Proc. Biol. Soc. Wash. **115**: 108-117.
- Martínez-Iglesias JC, A Carvacho. 1991. Les crevettes carides de Cuba I. *Prionalpheus gomezi* n. sp. (Decapoda, Alpheidae), premier *Prionalpheus* pour l'Océan Atlantique. Crustaceana **60**: 84-89.
- Martínez-Iglesias, JC, R Ríos, A Carvacho. 1997. Las especies del genero *Alpheus* (Decapoda: Alpheidae) de Cuba. Rev. Biol. Trop. **44/45**: 401-429.
- McClure MR. 1995. *Alpheus angulatus*, a new species of snapping shrimp from the Gulf of Mexico and northwestern Atlantic, with a redescription of *A. heterochaelis* Say, 1818 (Decapoda: Caridea: Alpheidae). Proc. Biol. Soc. Wash. **108**: 84-97.
- Méndez MG, MK Wicksten. 1982. *Notalpheus imarpe*: a new genus and species of snapping shrimp from western South America (Decapoda: Alpheidae). Proc. Biol. Soc. Wash. **95**: 709-713.
- Miya Y. 1997. *Stenalpheops anacanthus*, new genus, new species (Crustacea, Decapoda, Alpheidae) from the Seto Inland Sea and the Sea of Ariake, South Japan. Bull. Fac. Liber. Arts Nagasaki Univ. **38**: 145-161.
- Nomura K, A Anker. 2001. Redescription of *Parabetaeus culiereti* Coutière and status of the genus *Neoalpheopsis* Banner (Decapoda: Caridea: Alpheidae). Crust. Res. **30**: 43-54.
- Ríos R, JE Duffy. 1999. Description of *Synalpheus williamsi*, a new species of sponge-dwelling shrimp (Crustacea: Decapoda: Alpheidae), with remarks on its first larval stage. Proc. Biol. Soc. Wash **112**: 541-552.
- Schmitt WL. 1936. Macruran and Anomuran Crustacea from Bonaire, Curacao and Aruba. In Zoologische Ergebnisse einer Reise nach Bonaire, Curaçao und Aruba im Jahre 1930. No. 16. Zool. Jahrb. Abt. Syst. Oekol. Geogr. Tiere **67**: 363-378, pls. 11-13.
- Wicksten MK. 1984. *Alpheopsis harperi* (Decapoda: Alpheidae): a new species of snapping shrimp from Texas. NE Gulf Sci. **7**: 97-100.
- Wicksten MK, MR McClure. 2003. A new species of *Alpheus* (Decapoda: Caridea: Alpheidae) from the Gulf of Mexico. Crust. Res. **32**: 26-31.
- Williams AB. 1965. A new genus and species of snapping shrimp (Decapoda, Alpheidae) from the southeastern United States. Crustaceana **9**: 192-198.
- Zimmerman TL, JW Martin. 2004. Artificial reef matrix structures (ARMS): an inexpensive and effective method for collecting coral reef-associated invertebrates. Gulf Carib. Res. **16**: 59-64.