

First record of *Alpheus platycheirus* Boone, 1927 (Crustacea, Alpheidae) on the northwest coast of Venezuela

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ABSTRACT

Alpheus platycheirus Boone, 1927 (Decapoda, Alpheidae) is a snapping shrimp widely distributed in the western Atlantic, from the Gulf of Mexico to eastern Brazil. This shrimp usually inhabits muddy marine bottoms; however, here we record for the first time *A. platycheirus* in association with *Thalassia testudinum* and *Halodule wrightii* meadows at an unusually shallow depth in northwest Venezuela. This record extends the known habitat and distribution of *A. platycheirus* in the Caribbean. Moreover, it represents an additional alpheid species for Venezuela, bringing the known total to 34 species.

KEYWORDS

Caridean shrimp, distribution range, new record, Paraguaná Peninsula, shallow seagrass meadows.

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INTRODUCTION

The genus *Alpheus* Fabricius, 1798, is one of the most diverse shrimp taxa worldwide, with 286 described species (De Grave and Fransen, 2011). In the western Atlantic, *Alpheus* is represented by more than 40 species that are associated with a diversity of seabed habitats (Chace, 1972; Christoffersen, 1979; Knowlton and Keller, 1985; Martínez-Iglesias *et al.*, 1996). However, this richness of species may significantly increase because it is likely that many form species complexes (*i.e.*, groups of species that are morphologically similar but genetically different), which require revision (Anker, 2007; Bracken-Grissom *et al.*, 2014).

In Venezuela, 33 species of *Alpheus* have been recorded (Rodríguez, 1980; Marcano, 1997; Hernández-Ávila *et al.*, 2007; Vera-Caripe *et al.*, 2012), including unpublished records from one of the authors. However, it is essential to continue surveying the Venezuelan marine carcinofauna because there are still information gaps in the species diversity. For example, species listed for the Caribbean show a discontinuous distribution, since they have not yet been registered on the Venezuelan coast (Mariño *et al.*, 2018). Here, we report *Alpheus platycheirus* Boone, 1927 for the first time in Venezuelan waters. We also present a morphological description of the coloration, ecology, habitat, and distribution for this species.

MATERIAL AND METHODS

We conducted sampling in the Venezuelan Paraguaná Peninsula on May 19th and 20th, 2013, during the predominant dry season. The sampling site El Supí (12°00'51.2"N 69°49'59.9"W) is located outside of protected areas and close to tourist attractions. El Supí is composed of sandy beaches with a low profile and muddy waters, with intermixed *Thalassia testudinum* Banks ex König 1805 and *Halodule wrightii* Ascherson 1868 seagrass beds (Mariño *et al.*, 2018). We conducted intensive nocturnal samplings using a manual push net with an opening of 1 m (width) x 0.5 m (height), and a mesh size of 1 mm (modified from Manning, 1975). We fixed the collected organisms *in situ* using ethanol (70%) with glycerin (1%) and photographed them (Cannon Power Shot SX20 IS,

zoom lens 20X IS 5.0–100.0 mm 1:2.8–5.7 USM). We measured the specimens (CL = carapace length) and deposited them in the Centro Museo de Biología de la Universidad Central de Venezuela (Centro MBUCV).

TAXONOMY

Phylum Arthropoda von Siebold, 1848

Class Malacostraca Latreille, 1802

Order Decapoda Latreille, 1802

Infraorder Caridea Dana, 1852

Family Alpheidae Rafinesque, 1815

Genus *Alpheus* Fabricius, 1798

Alpheus platycheirus Boone, 1927

(Figs. 1, 2)

Alpheus platycheirus. — Boone, 1927: 131–135, figs. 29, 30. — Bracken-Grissom and Felder, 2014: 474–482, figs. 15–18. — De Grave and Anker, 2017: 8.

Alpheus floridanus. — Chace, 1972: 65 (in part, figs. 20a–f). — Christoffersen, 1979: 312. — Felder *et al.*, 2009: 1057, 1091 (in part).

Material examined. MBUCV-XI-5543 (1 ovigerous female, CL: 7.6 mm; 1 male, CL: 10.0 mm), Venezuela, Falcón State, Paraguaná Peninsula, El Supí beach (12°00'51.2"N 69°49'59.9"W), 19 May 2013.

Diagnosis. Carapace smooth, not setose; rostrum acute, not exceeding first article of antennular peduncle; rostral carina delimited between orbital hoods, extending half of the dorsal surface of the carapace; adrostral furrows deep, reaching posteriorly to base of eyes; ocular hoods inflated, rounded, extending beyond eye, unarmed. Cardiac notch deep.

First article of antennular peduncle with ventromesial carina ending in acute tooth, first article about 1.4 times as long as wide, second article about 3 times as long as wide, third article almost as wide as long. Stylocerite broad, lamellate, with acute tip, not

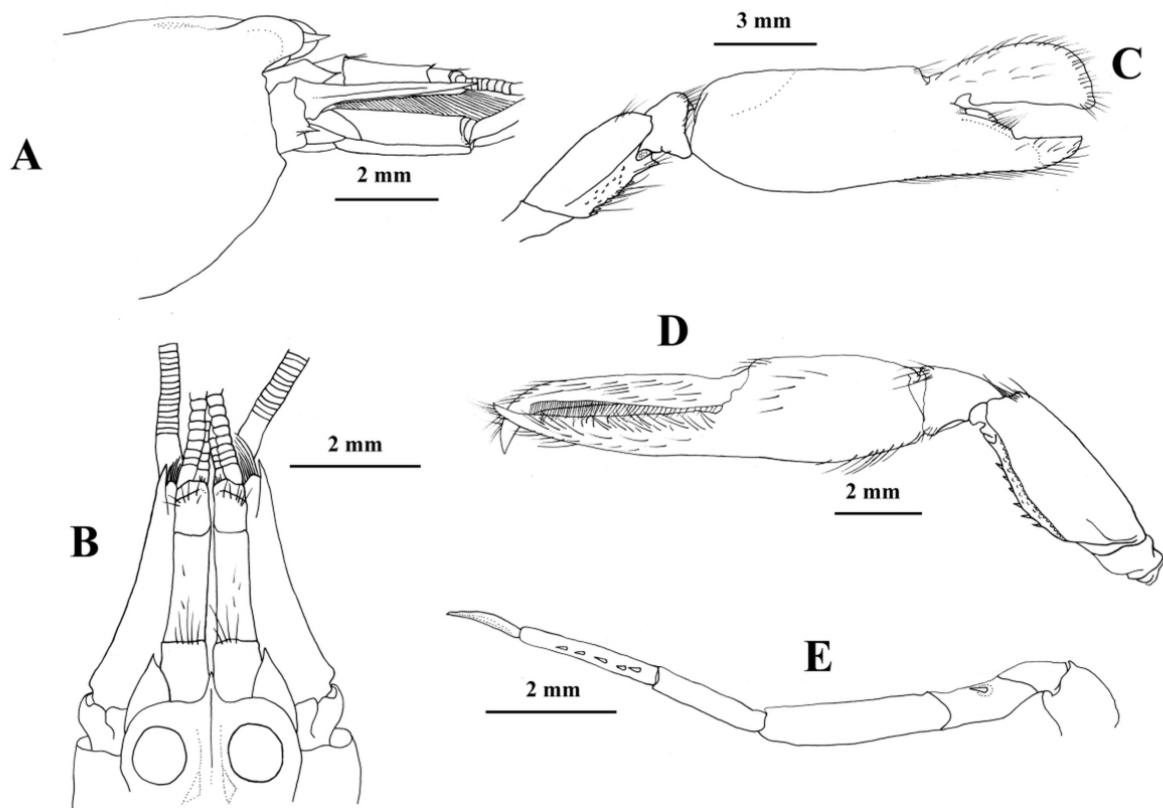


Figure 1. *Alpheus platycheirus* Boone, 1927, female. **A**, Frontal region, lateral; **B**, frontal region, dorsal; **C**, major cheliped, lateral; **D**, minor cheliped, lateral; **E**, fourth pereopod, lateral.

exceeding distal margin of first article. Antenna with a robust and sharp ventrolateral tooth on basicerite; scaphocerite broad, lateral margin slightly concave, reaching distal margin of antennular peduncle.

Mouthparts (mandible, maxillule, maxilla, first and second maxillipeds) typical for genus *Alpheus*. Exopod of third maxilliped long, slender, setose, not extending beyond antepenultimate article of endopod.

Major cheliped of male and female very asymmetrical in shape and unequal in size, massive and large in the male, with ischium short and unarmed (in female weakly serrated on the lateral margin); merus rectangular, with mesial surface with row of 6 teeth (only 4 in the female specimen) and scattered setae, smooth lateral surface (in female, mesiodistal portion armed with a small curved spine); carpus small and cup-shaped, with triangular projection on ventral margin; chela compressed, with abundant and scattered setae; palm without dorsal or ventral notch, 0.5 times (0.6 in female) longer than fingers; $\frac{3}{4}$ of dorsal surface of mobile finger rounded and with line of short setae, cutting edge almost straight, reaching slightly beyond fixed finger; fixed finger with almost

straight cutting edge. Minor cheliped balaeniceps-shaped in male (minor cheliped of female lost), with short ischium; merus subrectangular, ventral surface flattened, with six movable spines and fringe of setae along ventromesial margin; carpus stout, cup-shaped and unarmed; chela slender, compressed, lacking depressions or grooves; fingers elongate, slender, straight, longer than palm, densely setose, with apices crossed.

Second pair of pereopods with ischium and merus elongate and subequal; carpus five-articled, first (proximal) article slightly shorter than second, second almost twice as long as third; third, fourth and fifth, subequal. Third pair of pereopods robust, ischium armed with movable spine on ventrolateral surface; merus about twice as long as carpus; propodus slightly longer than carpus, with four movable spines along ventrolateral surface, dactylus simple, subspatulate, slightly curved. Fourth pair of pereopods similar to third, propodus with five movable spines along ventrolateral surface. Fifth pair of pereopods more slender than third and fourth, ischium lacking movable spine; merus slightly longer than carpus; carpus and

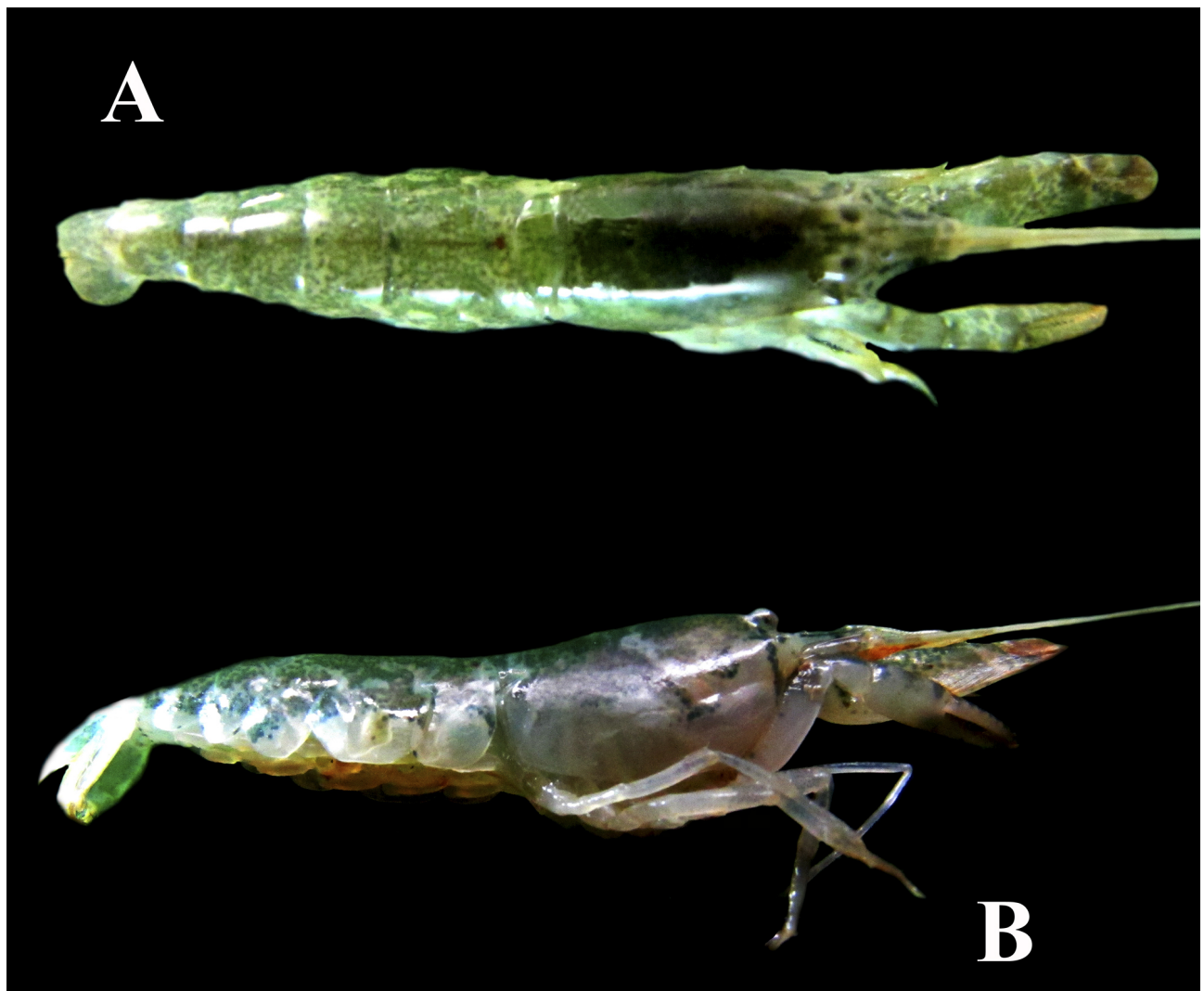


Figure 2. *Alpheus platycheirus* Boone, 1927, ovigerous female. **A**, Dorsal view; **B**, lateral view. CL: 7.6 mm.

propodus similar in length; propodus lacking movable spines, dactylus simple, curved, narrowing to acute tip.

Telson slightly tapering, longer than wide (2 times or more), with two pairs of dorsal movable spines; posterolateral margin broadly rounded, each posterolateral angle with two small movable spines, mesial larger than lateral. Uropodal exopod subequal in length to telson, lateral margin produced with subacute tooth adjacent to strong movable lateral spine; endopod broadly subovate, slightly overreaching length of exopod and telson.

Color. Body greenish, speckled with numerous light yellow and green dots, most of them isolated and not interconnecting. Carapace darker than rest of body. Major and minor chelae mesially without speckled pattern, beige or light brown; major chelae with dark

spots of medium size on dorsal surface of fingers and anterior region of palm; pereopods 3–5 with diffuse reddish band on distal third of merus, and broader, less defined reddish band on carpus, more intense on extensor margin. First and second abdominal somites with minute dark dorsolateral spot (Fig. 2).

Remarks. The color pattern of *A. platycheirus* reported by Bracken-Grissom and Felder (2014) is very different from the two examples collected at the Paraguaná Peninsula, Venezuela. The material described in 2014 exhibits colors such as red, pink, brown, and orange, which differ from the specimens that we collected in Venezuela. Most likely, the shrimps from the study of Bracken-Grissom and Felder (2014) were dying or recently dead, and therefore had lost

their natural pattern of coloration, as is the case with most caridean shrimp and other crustaceans.

According to the description of Bracken-Grissom and Felder (2014), the specimens found in this study coincide with the species *A. platycheirus*. However, in their key and description, they mention that there are 1–4 spines on the propodus of the fourth pair of pereopods, while the specimens in this study have 5 spines on the propodus. Another trait that does not match is the length and width of the first article of the antennular peduncle, which is 2 times longer than wide (Bracken-Grissom and Felder, 2014) while about 1.4 times longer than wide in the material from Venezuela. Additionally, the second article of the antennular peduncle is 4 times as long as wide (Bracken-Grissom and Felder, 2014), while in the specimens collected in Venezuela it is approximately 3 times as long as wide. Nevertheless, these differences are not regarded as

substantial enough to indicate that the specimens correspond to another species.

Geographical distribution. Western Atlantic: Gulf of Mexico (Louisiana/Mississippi, USA?; off Veracruz, Mexico), Caribbean Sea (Cuba, Panama, Haiti, Colombia and Guadeloupe) and Eastern Brazil (Alagoas, Espírito Santo, Rio de Janeiro, São Paulo) (Bracken-Grissom and Felder, 2014; Bracken-Grissom *et al.*, 2014; Almeida *et al.*, 2018) (Fig. 3).

Ecology and habitat. *Alpheus platycheirus* inhabits muddy bottoms at depths between 12 to 122 m (Bracken-Grissom *et al.*, 2014). However, in the Caribbean this species typically inhabits shallow depths: 21.9 m in Cuba (Boone, 1927), from 29 to 40 m in Colombia (Bracken-Grissom *et al.*, 2014), from 0.2 to 1.5 m in Panama (De Grave and Anker, 2017), and between 0.17 and 0.6 m in Venezuela (this

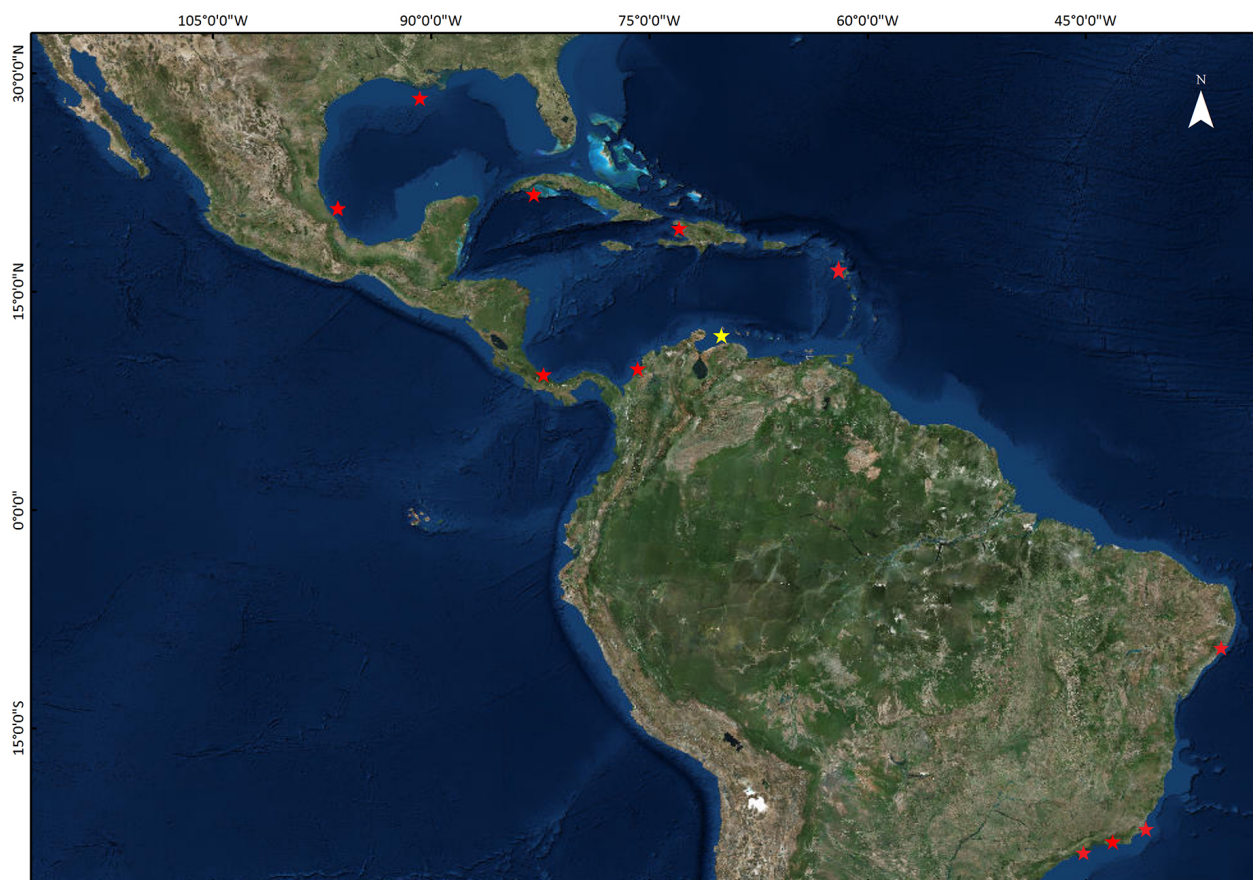


Figure 3. Distribution map of *Alpheus platycheirus* Boone, 1927. The red stars correspond to localities of previous records (Bracken-Grissom and Felder, 2014; Bracken-Grissom *et al.*, 2014; Almeida *et al.*, 2018). The yellow star indicates the new record observed in the Paraguaná Peninsula, Venezuela (this study).

study). In Haiti, a specimen was collected from a fish stomach (Boone, 1930); two specimens were found inside a loggerhead sponge (Boone, 1930), a symbiotic relationship that does not appear to have been recorded since and is considered unusual (Bracken-Grissom *et al.*, 2014). In our study, we found this species associated with *Thalassia testudinum* and *Halodule wrightii* seagrass meadows, which were established on a sandy calcareous substrate with remains of the green algae *Halimeda* sp. (Mariño *et al.*, 2018).

DISCUSSION

Alpheus platycheirus is part of the *A. floridanus* Kingsley, 1878 species complex, which is supported by morphological characters and color patterns. The *A. floridanus* complex consists of five species and one subspecies in the eastern Pacific and tropical Atlantic (Bracken-Grissom and Felder, 2014). The two western Atlantic species, *A. floridanus* s.s. and *A. platycheirus*, were recently redescribed. *Alpheus floridanus* s.s. was redescribed based upon a lectotype selected from the former syntypic pair. The mutilated second specimen of the syntypic pair was identified as *A. platycheirus* (*cf.* Bracken-Grissom and Felder, 2014).

Thirty-three species of *Alpheus* have been previously recorded from the coast of Venezuela, including *A. floridanus* (*cf.* Rodríguez, 1980; Marcano, 1997; Hernández-Ávila *et al.*, 2007; Vera-Caripe *et al.*, 2012; plus unpublished data from one of the authors). We report *A. platycheirus* for the first time in Venezuela, from the Paraguaná Peninsula (Falcón State). In this study, *A. platycheirus* was found at a remarkably shallow depth (between 0.17 and 0.6 m) in association with well-developed seagrass beds that were delimited by fringing coral reefs (Mariño *et al.*, 2018). This shallow habitat is unusual for a species that mainly inhabits muddy bottoms. At least two species of the *A. floridanus* complex occur in Venezuela: *A. floridanus* s.s. and *A. platycheirus* (*cf.* Bracken-Grissom and Felder, 2014). Previous records of *A. floridanus* from the Venezuelan coast may correspond to any of these species and must be treated with caution.

It has been shown that *A. platycheirus* from the Gulf of Mexico, Cuba, Colombia, and Brazil constitute a monophyletic clade (Bracken-Grissom

et al., 2014). Moreover, 16S sequences suggest there is gene flow occurring between these populations (Bracken-Grissom *et al.*, 2014), which is also likely to link populations of this species in northwest Venezuela. Gene flow may be facilitated by the Loop Current (Bracken-Grissom *et al.*, 2014), which plays a significant role in the circulation and transport of water throughout the southeastern Gulf of Mexico and has been suggested to influence the distribution of other species in the region (Williams and Williams, 1981; Bangma and Haedrich, 2008).

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REFERENCES

- Almeida, A.O.; Terossi, M.; Buranelli, R.C.; Castilho, A.L.; Costa, R.C.; Zara, F.J. and Mantelatto, F.L. 2018. Checklist of decapods (Crustacea) from the coast of São Paulo State (Brazil) supported by integrative molecular and morphological data: II. Infraorder Caridea: family Alpheidae. *Zootaxa*, 4450: 331–358.
- Anker, A. 2007. New species and records of alpheid shrimps, genera *Salmonaeus* Holthuis and *Parabetaeus* Coutiere, from the tropical western Atlantic (Decapoda, Caridea). *Zootaxa*, 1653: 21–39.
- Ascherson, P. 1868. Vorarbeiten zu einer Übersicht der phanerogamen Meergewächse. *Linnaea*, 35: 152–208.
- Bangma, J.L. and Haedrich, R.L. 2008. Distinctiveness of the mesopelagic fish fauna in the Gulf of Mexico. *Deep Sea Research Part II: Topical Studies in Oceanography*, 55: 2594–2596.
- Boone, L. 1927. Scientific results of the first oceanographic expedition of the “Pawnee” 1925. Crustacea from tropical east American seas. *Bulletin of the Bingham Oceanographic Collection*, 1: 1–147.
- Boone, L. 1930. New decapod and isopod crustaceans from Gonave Bay, Haiti. *Zoologica*, 12: 4.
- Bracken-Grissom, H.D. and Felder, D.L. 2014. Provisional revision of American snapping shrimp allied to *Alpheus floridanus* Kingsley, 1878 (Crustacea: Decapoda: Alpheidae) with notes on *A. floridanus africanus*. *Zootaxa*, 3895: 451–491.
- Bracken-Grissom, H.D.; Robles, R. and Felder, D.L. 2014. Molecular phylogenetics of American snapping shrimps allied to *Alpheus floridanus* Kingsley, 1878 (Crustacea: Decapoda: Alpheidae). *Zootaxa*, 3895: 492–502.

- Chace, F.A. Jr. 1972. The shrimps of the Smithsonian-Bredin Caribbean Expeditions with a summary of the West Indian shallow water species (Crustacea: Decapoda: Natantia). *Smithsonian Contributions to Zoology*, 98: 1–179.
- Christoffersen, M.L. 1979. Campagne de la Calypso au large des côtes atlantiques de l'Amérique du Sud (1961–1962). 36. Decapod Crustacea: Alpheoidea. *Résultats Scientifiques des Campagnes de la Calypso*, 11: 297–377.
- Dana, J.D. 1852. Conspectus of the Crustacea of the Exploring Expedition under Capt. C. Wilkes, U.S.N. Paguridea, continued, Megalopidea and Macrourea. *The American Journal of Science and Arts, Series 2*, 14: 116–125.
- De Grave, S. and Anker, A. 2017. An annotated checklist of marine caridean and stenopodidean shrimps (Malacostraca: Decapoda) of the Caribbean coast of Panama. *Nauplius*, 25: e2017015.
- De Grave, S. and Fransen, C.H.J.M. 2011. Carideorum catalogus: the recent species of the dendrobranchiate, stenopodidean, procarididean and caridean shrimps (Crustacea: Decapoda). *Zoologische Mededelingen*, 85: 195–589.
- Fabricius, J.C. 1798. Entomologia Systematica emendata et aucta, secundum classes, ordines, genera, species adjectis synonymis locis observationibus descriptionibus. *Hafniae*, I–IV Supplementum Entomologiae Systematicae Copenhagen, p. 1–572.
- Felder, D.L.; Álvarez, F.; Goy, J.W. and Lemaitre, R. 2009. Decapoda (Crustacea) of the Gulf of Mexico, with comments on the Amphionidacea. p. 1019–1104. In: D.L. Felder and D.K. Camp (eds), Gulf of Mexico. Origin, Waters, and Biota. Vol. 1. Biodiversity. College Station, Texas A&M University Press.
- Hernández-Ávila, I.; Gómez, A.; Lira, C. and Galindo, L. 2007. Benthic decapod crustaceans (Crustacea: Decapoda) of Cubagua Island, Venezuela. *Zootaxa*, 1557: 33–45.
- Knowlton, N. and Keller, B.D. 1985. Two more sibling species of alpheid shrimps associated with the Caribbean Sea anemones *Bartholomea annulata* and *Heteractis lucida*. *Bulletin of Marine Science*, 37: 893–904.
- König, C. 1805. Addition to M. Cavolini's these on *Zostera oceanica* L. *Annals of Botany* (König & Sims, London), 2: 91–99.
- Latreille, P.A. 1802. Histoire naturelle générale et particulière des Crustacés et des Insectes. Ouvrage faisant suite à l'histoire naturelle générale et particulière, composée par Leclerc de Buffon, et rédigée par C.S. Sonnini, membre de plusieurs Sociétés savantes, vol. 3. Paris, Dufart, 476p.
- Manning, R.B. 1975. Two methods for collecting decapods in shallow water. *Crustaceana*, 29: 317–319.
- Marcano, J. 1997. Biodiversidad y taxonomía de crustáceos de la Isla de Cubagua, Estado Nueva Esparta. CI-UDO Tecnical Report C.I. 4–0901-0477/91. Universidad de Oriente, Boca del Río, Venezuela. 59p.
- Mariño, J.; Mendoza, M.D. and López-Sánchez, B. 2018. Composition and abundance of decapod crustaceans in mixed seagrass meadows in the Paraguaná Peninsula, Venezuela. *Iheringia, Série Zoologia*, 108: e2018004.
- Martínez-Iglesias, J.C.; Ríos, R. and Carvacho, A. 1996. Las especies del género *Alpheus* (Decapoda: Alpheidae) de Cuba. *Revista de Biología Tropical*, 44/45: 401–429.
- Rafinesque, C.S. 1815. Analyse de la nature, ou tableau de l'univers et des corps organisés. Palerme, aux dépens de l'auteur, 224p.
- Rodríguez, G. 1980. Los crustáceos decápodos de Venezuela. Caracas, Instituto Venezolano de Investigaciones Científicas, 494p.
- Vera-Caripe, J.; Lira, C.; Hernández-Flores, X. and Montoya, H. 2012. Algunas especies del género *Alpheus* Fabricius, 1789 (Crustacea: Decapoda) de la Isla de Coche, con una adición a la carcinofauna venezolana. *Boletín del Instituto Oceanográfico de Venezuela*, 52: 11–18.
- von Siebold, C.T. 1848. Lehrbuch der vergleichenden Anatomie der Wirbellosen Thiere. Erster Theil. In: C.T. von Siebold and H. Stannius (eds), Lehrbuch der vergleichenden Anatomie. Berlin, Verlag von Veit & Comp., 679p.
- Williams, A.B. and Williams, D.M. 1981. Carolinian records for American lobster, *Homarus americanus*, and tropical swimming crab, *Callinectes bocourti* postulated means of dispersal. *Fishery Bulletin*, 79: 192–198.