# A new genus for Pericera septemspinosa Stimpson, 1871 and Pericera heptacantha Bell, 1836 (Crustacea, Brachyura, Majoidea), based on morphology and molecular data 

Jessica Colavite ${ }^{1,2}$, Amanda M. Windsor ${ }^{3}$, William Santana ${ }^{1,2}$<br>1 Departamento de Zoologia, Instituto de Biociências, Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP), Botucatu, SP 18618-970, Brazil<br>2 Laboratory of Systematic Zoology, Centro Universitário Sagrado Coração (UNISAGRADO), Rua Irmã Arminda, 10-50, Jd. Brazil, Bauru, SP 17011-160, Brazil<br>3 Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Museum Support Center, 4210 Silver Hill Road, Suitland, MD 20746-2863, USA

http://zoobank.org/3195954C-4A45-4EC4-AE40-20B158D75C5E
Corresponding author: William Santana (willsantana@gmail.com)

Academic editor: Sammy De Grave • Received 22 January 2020 • Accepted 8 April 2020 • Published 20 May 2020


#### Abstract

A new genus of majoid spider crab, Pohleus gen. nov. is established for Pericera septemspinosa Stimpson, 1871 and Pericera heptacantha Bell, 1836, based on morphology and molecular data from the partial sequences of the 12 S and 16 S mitochondrial genes and the 18 S small subunit rRNA nuclear locus. The species are re-described and illustrated, based on material from several localities of the western Atlantic and eastern Pacific oceans. The carapace, antennal and pterygostomial spines, male thoracic sternum and first gonopods are distinctive characters, distinguishing Pohleus gen. nov. from species assigned to Macrocoeloma Miers, 1879, where $P$. septemspinosus and $P$. heptacanthus are currently included.


## Key Words

Epialtidae, Pisidae, western Atlantic, eastern Pacific, Macrocoeloma heptacanthum, Macrocoeloma septemspinosum

## Introduction

Macrocoeloma heptacanthum (Bell, 1836) and M. septemspinosum (Stimpson, 1871) were originally described as Pericera Latreille, 1825 and transferred by Miers (1886) to Macrocoeloma Miers, 1879 (see Colavite et al. 2016 for review). As part of an ongoing revision of Macrocoeloma, we identified the necessity to establish a new genus for the above two species. The description of Pericera heptacantha was based on two syntypes, one male and one female. This type material was treated as missing in literature for more than 50 years (see Rathbun 1925; Garth 1958) until the female specimen was re-discovered by Di Mauro (1982) in the dry crustacean collection in the University Museum, Oxford (OUM). Pericera septemspinosa, from the western

Atlantic, was described by Stimpson (1871) as a geographical analogue to Pericera heptacantha from the eastern Pacific and, unfortunately, the type material of $P$. septemspinosa was most likely destroyed in the Great Chicago Fire in 1871 (Evans 1967; Deiss and Manning 1981; Manning 1993; Vasile et al. 2005; Manning and Reed 2006).

Pohleus gen. nov., is proposed herein to receive Pericera heptacantha and $P$. septemspinosa and a lectotype and a neotype are designated for each species, respectively. The species are re-described, illustrated and the morphological differences between them are detailed below. A phylogenetic framework for Pohleus gen. nov. and allied genera is proposed, based on partial sequences of the 12 S and 16 S mitochondrial genes and the 18 S small subunit rRNA nuclear locus.

## Material and methods

Specimens examined are deposited in the collections of the Coleção de Invertebrados Aquáticos do Sul da Bahia, Universidade Estadual de Santa Cruz, Brazil (CIASB/ UESC); Grupo de Invetigaciones Carcinologicas, Universidad de Oriente, Venezuela (GIC); Laboratório de Sistemática Zoológica, Universidade do Sagrado Coração, Bauru (LSZ); Muséum National d'Histoire Naturelle, Paris (MNHN); Museum of Comparative Zoology, Harvard University (MCZ); Museu de Zoologia da Universidade de São Paulo (MZUSP); Natural History Museum of Los Angeles County (NHMLA); Zoological collection of the Oxford University Museum of Natural History (OUM); Senckenberg Museum of Natural History, Frankfurt (SMF); University of Louisiana at Lafayette Zoological Collection (ULLZ) and the National Museum of Natural History, Smithsonian Institution (USNM). For comparisons between Pohleus gen. nov. and Macrocoeloma s. str., 11 of the 12 known species of Macrocoeloma were examined, including the type species Macrocoeloma trispinosum Latreille, 1825 (see Comparative material section below). Additionally, the monotypic genus Thersandrus Rathbun, 1897 (type species Thersandrus compressus (Desbonne in Desbonne \& Schramm, 1867) was included in our comparisons.

Abbreviations used are: cl, carapace length (along the dorsal midline, from the base of the rostral sinus to the posterior margin of the carapace); cw, carapace width (taken at the widest point including lateral spines); P2P 5 , pereopods 2 to 5 ( P 1 is the cheliped); G1, first gonopod; G2, second gonopod; ovig., ovigerous; juv., juvenile; RV, research vessel; exped., expedition; stn, station; leg., collector or collected by; det., determined by.

## DNA extraction, PCR , and sequencing

Total genomic DNA was extracted from muscle tissue using either the Qiagen DNeasy Blood and Tissue extraction kit or Omega Bio-tek EZNA Tissue DNA Kit. Partial sequences of the $12 \mathrm{~S}, 16 \mathrm{~S}$ mitochondrial genes were amplified with the following primers, respectively: 12SF (Mokady et al. 1994) and 12S1R (Shull et al. 2005), 16SF/16SR (Hultgren and Stachowicz 2008). The nuclear loci of the small subunit 18 S rRNA were amplified with the primers A and B (Medlin et al. 1988) and C, Y, O and L of Apakupakul et al. (1999) or D18s1R, D18s2F/R, D18s3F/R, D18s4F/R and D18s5F of Bracken et al. (2009). Annealing temperatures for PCRs were $58^{\circ} \mathrm{C}$ and $54^{\circ} \mathrm{C}$ for $12 \mathrm{~S} / 18 \mathrm{~S}$ and 16 S , respectively. Reagent volumes and concentrations followed manufacturer's instructions; primer concentrations were $10 \mu \mathrm{M}$. Sequencing reactions were performed using $1 \mu l$ of purified PCR product in a $10 \mu \mathrm{l}$ reaction containing $0.5 \mu \mathrm{l}$ primer, $1.75 \mu \mathrm{l}$ BigDye buffer and $0.5 \mu \mathrm{l}$ BigDye (Life Technologies). Sequencing reactions were purified using Millipore Sephadex plates (MAHVN-4550), according to the
manufacturer's instructions and sequenced on the ABI 3730XL automated DNA sequencer. Sequences were assembled, trimmed of primers and checked for quality using Geneious 8.0.5 and 9.1.8. DNA extraction and sequencing were carried out at the Smithsonian Institution's Laboratories of Analytical Biology.

## Molecular data analysis

Sequences, generated for this study, were combined with other sequences available from GenBank and previously unpublished sequences generated by AMW, in order to place the target taxa within the context of the superfamily Majoidea. Locality information and GenBank accession numbers for taxa included in the molecular analyses are provided in Suppl. material 1: Table S1. All individual sequences for each species were initially analysed and assembled using the software Geneious 8.0 .5 (http://www. geneious.com; Kearse et al. 2012). The alignment amongst all sequences was generated with the algorithm Muscle (Edgar 2004) under default parameters and the perl script PartitionFinder (Lanfear et al. 2017) on CIPRES Portal (Miller et al. 2010) was run to determine the appropriate model of evolution and partitioning scheme. To determine whether the sequence data was appropriate for phylogenetic studies, the occurrence of substitution saturation was evaluated in the molecular data and identical sequences were excluded, resulting in 23 unique sequences. Numbers of transition and transversions versus ML-CompositeTN93 distance were plotted using the software DAMBE 7.2.7 (Xia 2013, 2017), with the options of pairwise deletion and genetic distance model F84. The individual datasets were concatenated in RAxML, where we used the '-f ae' option with 1000 bootstrap replicates. Likelihood parameters followed the General Time Reversible (GTR) model with a gamma distribution on the partitioned dataset and RAxML estimated all free parameters. The resulting best tree was used to reflect phylogeny (Fig. 1). To establish the phylogenetic context for Pohleus septemspinosus gen. nov. et comb. nov., we followed the previous phylogenies of Majoidea (Hultgren and Stachowicz 2008, 2009; Windsor and Felder 2014) to choose the genera used in this study and rooted the tree with the hymenosomatid crab Elamena producta Kirk, 1879. Only nodes with maximum likelihood bootstrap support greater than $50 \%$ are shown on the maximum likelihood phylogram (Fig. 1). All analyses were run on the Hydra computing cluster at USNM or CIPRES Portal (Miller et al. 2010). Nodes, where maximum likelihood bootstrap support is greater than $50 \%$, are shown on the maximum likelihood phylogram (Fig. 1).

The ongoing revision and phylogenetic study of Macrocoeloma by the authors (unpubl. data), based on both morphological and molecular data, revealed this genus to be a paraphyletic group. Pohleus gen. nov. therefore, needs to be established to accommodate $P$. septemspinosus gen. nov. et comb. nov. and P. heptacanthus gen. nov. et comb. nov.

## Results and discussion

All three genes (12S, 16 S and 18 S ) were successfully amplified and sequenced only for Pohleus septemspinosus gen. nov. et comb. nov. The final alignment for this combined analysis of nuclear and mitochondrial genes included a total of 2659 bp ( $1868 \mathrm{bp} 18 \mathrm{~S}, 417 \mathrm{bp} 16 \mathrm{~S}$ and 372 bp 12 S ). The data were not saturated, considering the $R^{2}$ value for transitions $R^{2}(s)=0.8665$ and $R^{2}(v)=$ 0.9856 transversions, demonstrating that the sequences are appropriate for phylogenetic studies at this level.

Pohleus septemspinosus gen. nov. et comb. nov. has a high support value ( $84 \%$ ) as sister to a clade containing Thersandrus compressus and Macrocoeloma spp. Thersan$d r u s$, presently assigned to the subfamily Majinae sensu Ng et al. (2008), is supported $89 \%$ as basal to Macrocoeloma and nested between Macrocoeloma and Pohleus gen. nov. in all scenarios analysed and with high support (Fig. 1). Thus, we believe that Thersandrus could be better fitted in Pisinae, based on the molecular results. Pohleus gen. nov. nested amongst other Pisinae as expected (Fig. 1).

## Systematics

## Family Epialtidae MacLeay, 1838 <br> Subfamily Pisinae Dana, 1851

## Pohleus gen. nov.

http://zoobank.org/6FB44605-6302-44ED-8667-F4B321C21C11
Type species. Pericera septemspinosa Stimpson, 1871, by present designation.

Included species. Pohleus septemspinosus (Stimpson, 1871) gen. nov. et comb. nov. and Pohleus heptacanthus (Bell, 1836) gen. nov. et comb. nov.

Diagnosis. Carapace subglobose, covered by short velvet pubescence interspaced by dense rows of long, hooked and simple setae in all carapace regions. Carapace armed with strong spines, including seven sharp spines on posterior half: one short mesial metagastric, four long, strong, conical lateral spines (two in each branchial region) aligned with one cardiac spine and one intestinal spine; lateral spines longest, slightly directed upwards. Pterygostomial region with strong spines visible in dorsal view. Rostrum bifurcated, base elongated, fused, diverging abruptly forming a Y-shape, ending in acute tips. Pre-orbital spine strong, acute, directed upwards; post-orbital spine short, acute. Basal article of antenna with three spines, one tubercle, not visible in dorsal view. Cheliped long, merus armed with short spines or tubercles, granulated. P2 shorter than cheliped, dactylus much shorter than propodus. Thoracic sternal somite IV with lateral margins straight. Sternite VIII concealed by pleon in males. Male and female pleon with six somites not fused plus telson. Male telson tight-fitting into sterno-pleonal cavity, distinctly triangular. G1 slender, straight, with bilobed apex. G2 slender, straight, tapering distally, short about one fifth of G1 length.

Comparative material. Libinia spinosa H. Milne Edwards, 1834 - Brazil • 1 male, 1 female; Macaé, near Santana Archipelago, PITA stn 12 III (MZUSP 20271). Macrocoeloma camptocerum (Stimpson ,1871) - USA - 13 males, 7 females, 7 ovig. females; Sanibel Island, 26.440359N, 82.113705W, 0.54-11 m depth; Mar 1938; F A Chace Jr. leg. det. (MCZ 10191). Macrocoeloma concavum Miers, 1886 - Venezuela • 1 female; Costa de Falcon, UTM 378365 and 1358259; 27 Apr 2007 (GIC040). Brazil • 1 male; Paraíba, Projeto Algas, stn 85-B; 04 Jun 1981; Apr 2008, L E A Bezerra det. (MZUSP 5937). Macrocoeloma diplacanthum (Stimpson, 1860) - US Virgin Islands • 1 male; Saint Thom-


Figure 1. Molecular phylogenetic tree represented as maximum likelihood topology of two mitochondrial and one nuclear loci (12S, 16S and 18S) to place Pohleus septemspinosus (Stimpson, 1871) gen. nov. et comb. nov. based on six close genera. Nodal support values represent the frequencies observed, using 1000 bootstrap pseudo-replicates. Values below $50 \%$ are not represented.
as, R/V Albatross; 17-24 Jan 1884 (USNM 16182). Guadeloupe • 1 ovig. female; $16^{\circ} 13^{\prime} 37.3188^{\prime \prime} \mathrm{N}$, $61^{\circ} 32$ '23.0388"W, Karubenthos 2012, stn GD49; 21 May 2012 (MNHN IU-2013-6755). Macrocoeloma eutheca. (Stimpson,1871) - USA • 1 ovig. female; off North Carolina, $33^{\circ} 48^{\prime} 06^{\prime \prime} \mathrm{N}, 76^{\circ} 34^{\prime} 42^{\prime \prime} \mathrm{W}, 77 \mathrm{~m}$ depth; 03 Apr 1981; Duke University for MMS 0S05 exped., 1981, P Krikorian det. (USNM 220812). Macrocoeloma intermedium Rathbun, 1901 - Cuba • male holotype; off Havana, R/V Albatross, stn 2323, $23^{\circ} 10^{\prime} 51^{\prime \prime} \mathrm{N}$, $82^{\circ} 19^{\prime} 03^{\prime \prime} \mathrm{W}, 298 \mathrm{~m}$ depth; 17 Jan 1885; M J Rathbun det. (USNM 9492). Colombia • 1 female; Santa Marta; 29 Jun 1975; M Vélez det. (SMF 9093). Macrocoeloma laevigatum (Stimpson, 1860) - USA • 1 male; Florida, Hawk Channel, R/V Fish Hawk, stn 7429, 4.2 m depth; 27 Jan 1903 (USNM 46933). Bahamas • 1 female; off Whale Cay, 23.7 m depth, 9 Jul 1904, F A Chace Jr. det. (MCZ 8927). Macrocoeloma maccullochae Garth, 1940 - Mexico • 1 male, 1 female; Isabel Island, Allan Hancock Pacific exped., R/V Velero III, stn 747-37, 18-32 m depth; 2 Apr 1937; W Schmitt leg., 1940; J S Garth det. (NHMLAC-AHF 372). Macrocoeloma nodipes (Desbonne in Desbonne \& Schramm, 1867) - USA• 3 males, 2 females; Florida, Off Cape Sable, R/V Fish Hawk, stn $7351,25^{\circ} 09^{\prime} 45^{\prime \prime} \mathrm{N}, 81^{\circ} 18^{\prime} 355^{\prime \prime} \mathrm{W}, 17$ Dec 1902, 5.9 m depth (USNM 46922). Grenada • 1 male; Grand Anse Bay, $12^{\circ} 01^{\prime} 45.19^{\prime \prime} \mathrm{N}, 61^{\circ} 45^{\prime} 21.29^{\prime \prime} \mathrm{W}, 11$ Nov 2012, L R L Simone, A P Dornellas, V S Amaral leg., 27 Nov 2019, J Colavite det. (MZUSP 40162). Macrocoeloma subparallelum (Stimpson, 1860) - US Virgin Islands - male lectotype; soft shell, cl. 13.98 mm , cw. 9.90 mm ; St. Thomas, $18.345591 \mathrm{~N}, 64.923613 \mathrm{~W}$, no date, A H Riise leg., 1860, W Stimpson det. (MCZ 1243). Brazil • 3 females; Porto da Barra, Salvador, left side, 24 Apr 2006, R Bispo, R Jhonsson, W Santana, F Faria leg., Apr 2008, G Melo det. (MZUSP 18626). Macrocoeloma trispinosum (Latreille, 1825) - USA • 1 ovig. female; Kingston Harbour; 1893; R P Bigelow leg., M J Rathbun det. (USNM 17959). Antigua • 1 male; English Harbour, Antigua-Barbados exped., 1918; University of Iowa State exped., M J Rathbun det. (USNM 72956). Macrocoeloma villosum (Bell, 1836) - ECUADOR • 3 males, 1 female; Salinas, Walter Rathbone Bacon travelling Scholarship exped., stn 1, 2, 3; 12-14 Sep 1926; W L Schmitt leg., M J Rathbun det. (USNM 70942). Thersandrus compressus (Desbonne in Desbonne \& Schramm, 1867) - Belize • 1 male; west Bay, 1.3 m depth; 09 Jun 1985 (USNM 1526077).

Remarks. Macrocoeloma Miers, 1879 s. str. is an am-phi-American genus with 12 species. This genus is characterised by the pyriform or triangular carapace, densely covered by short, velvet-like setae; with well-developed bifurcated or parallel rostral spines; the eyes completely protected by the orbits when retracted; orbits composed by the pre-orbital and the post-orbital spines and one or
two projections of the basal article of antenna forming a functional, laterally projected protective hood. Although some of these characters can be observed in Pohleus gen. nov., the new genus can be easily distinguished from Macrocoeloma s. str. by a unique combination of characters, which include: (i) carapace relatively more globose in Pohleus gen. nov. (Figs 2A-C, 3, 4) (vs. carapace subtriangular or pyriform in Macrocoeloma; Fig. 2E, F); (ii) carapace covered by short velvet pubescence interspaced by dense rows of long hooked and simple setae in all carapace regions in Pohleus gen. nov. (Fig. 2C) (vs. carapace densely covered by velvet pubescence with hooked setae in specific regions of the carapace in Macrocoeloma); (iii) basal article of antenna with small spines ventrally directed, not visible in dorsal view in Pohleus gen. nov. (Fig. 2B) (vs. with a long laterally-directed spine, between the rostral and pre-orbital spine, visible in dorsal view of Macrocoeloma, except in Macrocoeloma diplacanthum; Fig. 2F); (iv) pterygostomial region with a strong spine, laterally projected, visible in dorsal view in Pohleus gen. nov. (Fig. 2B) (vs. pterygostomial spines short, reduced or not visible in dorsal view in Macrocoeloma; Fig. 2F); (v) male sterno-pleonal cavity with no crest anteriorly in Pohleus gen. nov. (Fig. 2B); (vs. male sterno-pleonal cavity with a distinct crest anteriorly on thoracic sternite IV in Macrocoeloma; Fig. 2E); (vi) male sternite IV almost straight laterally in Pohleus gen. nov. (Fig. 2B) (vs. sternite IV deeply concave laterally in Macrocoeloma; Fig. 2E); (vii) episternites IV and V forming a continuous line with the sternite, slightly downward directed in Pohleus gen. nov. (Fig. 2B) (vs. episternites IV, V and VI upward directed in Macrocoeloma; Fig. 2F); and (viii) sternal sutures shallow in Pohleus gen. nov. (Fig. 2B) (vs. sternal sutures deep sculpted in Macrocoeloma; Fig. 2F).

In Macrocoeloma, the gonopods are highly variable amongst species, but it is possible to recognise a general pattern with G1 being longer than the thoracic sternal suture IV/V, parallel and usually with a bilobed apex (except in M. concavum, M. intermedium and M. laevigatum that have a unilobed apex). Although Pohleus septemspinosus gen. nov. et comb. nov. (G1 of Pohleus heptacanthus gen. nov. et comb. nov. not examined) can be fitted in this general pattern, the G1 apex is notably more similar to the G1 apex of Libinia Leach, 1815 (Fig. 2D and see Tavares and Santana 2011: 63, fig. 2D for Libinia spinosa).

Thersandrus Rathbun, 1897, is a monotypic genus exhibiting extremely efficient camouflage behaviour as Macrocoeloma and Pohleus gen. nov. However, Thersandrus does not actively decorate itself, presenting crypsis behaviour consisting of matching the body to the environment in shape and colour, being morphologically adapted to live on green algae fronds. For instance: (i) Thersandrus has a carapace covered by long setae giving a felt-like texture (vs. velvet-like and hooked setae in Macrocoeloma and Pohleus gen. nov.); (ii) the carapace


Figure 2. Pohleus septemspinosus (Stimpson, 1871) gen. nov. et comb. nov. A, B. male, (USNM 1256361); C. male (USNM 241030); D. sterno-pleonal cavity with first (G1) and second (G2) gonopods in place (USNM 1256361). Macrocoeloma trispinosum (Latreille, 1825); E, F. male (USNM 17959). A, E. habitus; B, F. ventral view; C. frontal view; D. pleonal view in detail. Note the spine of the basal article of antenna (white arrow); pterygostomial spine (grey arrow); margin of the IV sternite thoracic (black arrow). Scale bars: 10 mm .
and pereopods are flattened in Thersandrus (vs. carapace subtriangular or piriform, not flattened and with cylindrical pereopods in Macrocoeloma and subglobose carapace and cylindrical pereopods in Pohleus gen. nov.); (iii) the orbital spines are reduced, not forming a hood in Thersandrus (vs. orbital spines long, blunt, forming a hood in Macrocoeloma and long, acute and forming a hood in Pohleus gen. nov.); all characters that prevented us from synonymising Thersandrus to Macrocoeloma. However, it is important to note that, based on the molecular results, Thersandrus should be transferred from Majidae to Pisinae as mentioned above.

Etymology. Generic name in honour of the renowned marine biologist and carcinologist Gerhard Werner Pohle (Atlantic Reference Centre, Huntsman Marine Science Centre). Gender masculine.

Pohleus septemspinosus (Stimpson, 1871) gen. nov. et comb. nov.
Figs 2A-D, 3, 5A, B

Pericera septemspinosa Stimpson, 1870 (1871): 113 [type locality: West of Tortugas; 65 m depth, type material: non-extant]. - A. Milne-Edwards 1873: 59, 200, pl. 15A, fig. 2; Gundlach and Torralbas 1900: 365, fig. 366G.
Macrocoeloma septemspinosa - Miers, 1886: 80; Rathbun, 1892: 250; 1898b: 257; 1899: 576.
Macrocoeloma septemspinosum - Moreira 1901: 64, 136; Rathbun 1925: 477, pl. 173, figs 2, 3; Coelho 1971:142; Coelho and Ramos 1972: 218; Soto 1980 (digital document); Powers 1977: 52; Takeda and Okutani 1983: 141; Abele and Kim 1986: 45, fig. 521A; Melo 1996: 219, fig. 1; 1998: 464; Coelho-Filho 2006: 19; Almeida et al. 2007: 15; Alves et al. 2008: 58; Ng et al. 2008: 119; Alves et al. 2012: 54.

## Neotype (Here designated).

USA • male neotype, cl 31 mm , cw 35 mm ; Florida, West of Sarasota, R/V Oregon, stn $4088,27^{\circ} 44^{\prime} \mathrm{N}, 83^{\circ} 45^{\prime} \mathrm{W} ; 04$ Dec 1962, National Marine Fisheries Service exped.; 27 Oct 2014, W Santana det. (USNM 1256361) (Fig. 2A, B, D).

Material examined. USA - 1 male; North Carolina, $33^{\circ} 48^{\prime} 06^{\prime \prime} \mathrm{N}, 76^{\circ} 34^{\prime} 42^{\prime \prime} \mathrm{W}, 77 \mathrm{~m}$ depth; 03 Apr 1981, Duke Univ. for MMS leg.; 1981, P Krikorian det. (USNM 220811). - 1 male, 1 juv. female; South Carolina, East of Cape Romain, R/V Albatross, stn 2311, $32^{\circ} 55^{\prime} 00^{\prime \prime} \mathrm{N}$, $77^{\circ} 54^{\prime} 00^{\prime \prime} \mathrm{W}, 59.1^{\circ} \mathrm{F}, 114.4 \mathrm{~m}$ depth; 05 Jan 1885, U.S. fish commission leg. (USNM 15127). $\cdot 1$ juv.; Florida, between Cedar Keys and Delta of Mississippi, R/ V Albatross, stn 2369-2374, 46-48 m depth; Feb 1885 (USNM 46957). - 1 juv. female; Gulf of Mexico, Southwest of Cape San Blas, R/V Albatross, stn $2373,29^{\circ} 14^{\prime} 00 " \mathrm{~N}, 85^{\circ} 29^{\prime} 15^{\prime \prime} \mathrm{W}$, 45.7 m depth; 07 Feb 1886 (USNM 15132). • 1 juv. female, 1 male; same collection data as preceding (USNM 15130). - 2 females; same collection data as preceding (USNM 15131). • 1 male; Suez of Mexico, R/V Oregon, $\operatorname{stn} 892,28^{\circ} 55^{\prime} \mathrm{N}, 85^{\circ} 07^{\prime} \mathrm{W}, 53 \mathrm{~m}$ depth; 07 Mar 1954, Fish and Wildlife leg.; 21 Apr 1954, F A Chace Jr det. (USNM
96389). • 1 male; off Apalachicola Bay, R/V Indian Seal, $28^{\circ} 49^{\prime} 59^{\prime \prime} \mathrm{N}, 85^{\circ} 37^{\prime} 02^{\prime \prime} \mathrm{W}, 177 \mathrm{~m}$ depth; 31 Jan 1978; R Lemaitre det. (USNM 1085620). • 1 male; South of Dog Island, R/V Albatross, stn $2407,28^{\circ} 47^{\prime} 30^{\prime \prime} \mathrm{N}, 84^{\circ} 37^{\prime} 00^{\prime \prime} \mathrm{W}$, 43.8 m depth; 07 Feb 1886, U.S. fish commission exped.; M J Rathbun det. (USNM 15135). • 3 juv. females; South of stn George Island, R/V Albatross, $\operatorname{stn} 2406,28^{\circ} 46^{\prime} 00^{\prime \prime} \mathrm{N}$, $84^{\circ} 49^{\prime} 00^{\prime \prime} \mathrm{W}, 47.5 \mathrm{~m}$ depth; 15 Mar 1885 (USNM 15134). - 1 female; $26^{\circ} 45^{\prime} 52^{\prime \prime} \mathrm{N}, 83^{\circ} 21^{\prime} 26^{\prime \prime} \mathrm{W}, 50.2 \mathrm{~m}$ depth; 18 Jul 1981, Continental Shelf Associates exped.; R Lemaitre det. (USNM 273379). • 1 male; same collection data as preceding (USNM 241027). •1 juv. female; same collection data as preceding (USNM 236995). • 1 male; $26^{\circ} 16^{\prime} 50 " \mathrm{~N}$, $83^{\circ} 23^{\prime} 49^{\prime \prime} \mathrm{W}, 55.5 \mathrm{~m}$ depth; 05 Feb 1982, Continental Shelf Associates exped.; R Lemaitre det., (USNM 241026). • 1 male, 2 females; same collection data as preceding (USNM 273381). 1 female, 1 male; same collection data as preceding (USNM 241024). • 1 male, 1 ovig. female; same collection data as preceding (USNM 229838). • 1 male; $26^{\circ} 16^{\prime} 44^{\prime \prime} \mathrm{N}, 83^{\circ} 42^{\prime} 49^{\prime \prime} \mathrm{W}, 71.3 \mathrm{~m}$ depth; 03 Nov 1980, Continental Shelf Associates exped.; R Lemaitre det. (USNM 236994). • 1 juv. female; same collection data as preceding (USNM 241007). 1 male; same collection data as preceding (USNM 236987). 2 males; same collection data as preceding (USNM 236986). • 1 male; $26^{\circ} 16^{\prime} 43$ " N , 83046'49"W, 77 m depth; 24 Jun 1981, Continental Shelf Associates exped.; R Lemaitre det. (USNM 241029). - 1 female; same collection data as preceding (USNM 273382). • 1 male; $25^{\circ} 45^{\prime} 355^{\prime \prime} \mathrm{N}, 83^{\circ} 20^{\prime} 14^{\prime \prime} \mathrm{W}, 58.5 \mathrm{~m}$ depth; 24 Apr 1981, Continental Shelf Associates exped.; R Lemaitre det. (USNM 242947). - 1 male; R/V Silver Bay, $25^{\circ} 32^{\prime} \mathrm{N}, 80^{\circ} 04^{\prime} \mathrm{W}, 65.8 \mathrm{~m}$ depth; 24 Oct 1960; Oct.1970, D J G Griffin det. (USNM 1278767). • 1 female; off Dry Tortugas, $24^{\circ} 34^{\prime} \mathrm{N}, 83^{\circ} 16^{\prime} \mathrm{W}, 65.8 \mathrm{~m}$ depth; Dec 1877- Jan 1878, USCSS Blake exped.; A. Milne-Edwards det. (MCZ 8206). - 1 male, 1 female; off Key West, R/V Albatross, $24^{\circ} 25^{\prime} 45^{\prime \prime} \mathrm{N}, 81^{\circ} 46^{\prime} 45^{\prime \prime} \mathrm{W}$, stn $2317,75^{\circ} \mathrm{F}, 82.3 \mathrm{~m}$ depth; 15 Jan 1885, U.S. fish commission exped. (USNM 15128). - 1 male, 1 female; same collection data as preceding (USNM 15129). • 1 male; Off Key West, Sand key Light bearing West Northwest, Key West Light bearing North, State Univ. Iowa exped., stn 24, 109.7 m depth; 19 Jun 1893, M J Rathbun det. (USNM 75724). • 1 male; same collection data as preceding (USNM 72863). • 1 male, 1 juv. female; Sand Key Light bearing Northwest by North, Key West Light North 0.5 mile East, $91.4-109.7$ m depth (USNM 68913). • 1 male; Florida, Pompano; 23 May 1949 (AMNH 10961). BAHAMAS • 1 juv. female; Bahamas Bank; 18 May 1893, State Univ. Iowa Bahamas exped. (USNM 72862). Colombia, • 1 male; 2 miles Southwest of Cape La Vela; 8 Apr 1939, J Garth leg.; 17 Jan 2018, J Colavite det. (AHF 39295). • 1 juv. female; 2 miles off Bahia Honda, R/V Velero III, stn A15-39, 9-18.28 m depth; 08 Apr 1939, J Garth det. (AHF 39292). Venezuela • 1 juv. male; 7 miles of Tortugas Island, R/V Velero III, stn A43-39, 7375 m depth; 21 Apr 1939, J Garth det. (AHF 39293). • 1 male; 125 miles northeast of Macaibo, $12^{\circ} 37^{\prime} \mathrm{N}, 70^{\circ} 45^{\prime} \mathrm{W}$, R/V Oregon, stn 4400, 97 m depth; 26 Sep 1963; 27 Oct 2014, W Santana det. (USNM 1256370). 1 male; 50 miles
northeast of Caracas, $10^{\circ} 44^{\prime} \mathrm{N}, 66^{\circ} 09^{\prime} \mathrm{W}, \mathrm{R} / \mathrm{V}$ Oregon, stn 4466, 73 m depth; 17 Oct 1963; 23 Oct 2014, W Santana det. (USNM 1256347). French Guiana • 1 ovig. female; Guiana 2014 exped., R/V Hermano Gines, $6^{\circ} 17^{\prime} 58.2^{\prime \prime} \mathrm{N}$, $52^{\circ} 13^{\prime} 18.5952^{\prime \prime} \mathrm{W}, 95-97 \mathrm{~m}$ depth; 08 Aug 2014 (MNHN IU 2013-2682). Brazil • 1 ovig. female; Recife, dredge 2; J Colavite det. (R2 unnumbered). • 1 ovig. female; Bahia, Ilhéus, Costa de Ilhéus, $14^{\circ} 43^{\prime} 33^{\prime \prime} \mathrm{S}, 38^{\circ} 57^{\prime} 20^{\prime \prime} \mathrm{W}, 41-42 \mathrm{~m}$ depth; 28 Nov 2004, A O Almeida det.; old number MZUESC 406 (CIASB M. 2017.0084. UESC).

Diagnosis. Rostrum width half of interorbital length bifurcated, base elongated, fused, diverging abruptly forming a Y-shape. Pleonal somite II smooth; merus of second pereopod armed with a spine.

Description. Cephalothorax and appendages sparsely covered with short, velvet-like pubescence. Carapace subglobose wider than long, convex, with long lines of hooked and simple setae in all carapace regions, denser in rostral and lateral spines. Rostrum width half of interorbital length bifurcated, base elongated and fused, abruptly diverging forming a Y-shape, ending in acute tips. Interorbital region slightly depressed medially. Hepatic region broad. One metagastric spine. Four long, strong, conical lateral spines (two in each branchial region), in line with the cardiac spine. One short intestinal spine. Orbital region very prominent, eyes completely protected in orbit when retracted, ocular peduncle visible when not retracted. Pre-orbital spine acute, directed upwards, tip curved, longer than post-orbital spine, ventral margin of pre-orbital spine with a small crenulation; post-orbital spine curved upwards.

Antennular fossae wider than long, margins smooth. Interantennular septum elongated, compressed laterally, forming distinct, ventrally-directed lobe. First and second antennal articles fused to epistome, suture between an-
tenna and epistome visible, antennal gland opening near suture line. Basal article of antenna with three spines, one tubercle, not visible in dorsal view. Antennal flagella longer than rostral spines, behind rostrum in dorsal view.

Epistome anterior margin narrower than antennular fossae, smooth. Buccal field sub-quadrate, narrower at posterior edge with acute spine at anterolateral angle in line with antennal spines. Third maxillipeds completely covering buccal field. Exopod long, nearly reaching distal margin of merus. Pterygostomial region subtriangular, slightly inflated, separated from subhepatic region by marked groove, one long, strong spine slightly curved upwards on medial margin, visible in dorsal view.

Chelipeds equal, longer than pereopods in adults, more robust in adult males; females chelipeds shorter than males, slender. In males, ischium, merus, carpus and propodus segments granulate. Ischium with one prominent tubercle laterodistally. Merus with one spine on proximal half, one on distal margin. Carpus with four tubercles sparsely distributed. Dactylus arched in adult males, a small gap between fingers, distinctly shorter than palm. Cutting edges with sub-equal teeth in distal half, one distinct proximal tooth in larger males; distal half with dark brown colour in fixed specimens. Female ischium, merus, carpus and propodus with smaller tubercles than males, dactylus slightly arched, without gap between fingers.

Pereopods short, slender, cylindrical. P2 longest, P3P5 progressively decreasing in length. P2 merus with distinct spine in distolateral margin. Dactylus slightly curved, shorter than propodus, smooth ventrally, with corneous tip.

Male thoracic sternites I-IV fused, broadly triangular, smooth, anterior half declivous in ventral view, forming a carina along the sterno-pleonal cavity margin. Thoracic sternal somite IV with lateral margins straight. Telson fully fitted to cavity, anterior margin smooth. Sternite VIII


Figure 3. A. Habitus, dorsal view and B. ventral view of Pohleus septemspinosus (Stimpson, 1871) gen. nov. et comb. nov., female (R2 unnumbered). Colour in life with debris and algae for camouflage. Scale bars: 10 mm
concealed by pleon. Episternites IV and V forming a continuous line with the sternite, slightly downward directed.

Pleonal somites I-VI, telson free in males and females, slightly raised medially forming low longitudinal ridge. Male telson sub-triangular, apex rounded. Female pleon markedly arched, with row of setae marginally. Female telson transversally ovate.

G1 longer than thoracic sternal suture IV-V, stout, straight, parallel, with torsion in distal half, apex bilobed; mesial lobe short, with tip curved upwards; lateral lobe long, slightly arched, ending in an acute tip; lateral margin smooth. G2 slender, straight, very short (one fifth of G1 length), with disto-medial process.

Colour in life. Carapace light brown; cephalothorax ventral, pleon and pereopods pinkish to purple (Fig. 3).

Neotype locality. USA, Florida, west of Sarasota, $27^{\circ} 44^{\prime} \mathrm{N}, 83^{\circ} 45^{\prime} \mathrm{W}$.

Geographic distribution. Western Atlantic: USA (from North Carolina); Gulf of Mexico; Bahamas; Venezuela and Brazil (from Ceará to Bahia) (Fig. 4).

Remarks. The type material of Pericera septemspinosa was probably lost in the Great Chicago Fire in 1871 (see Evans 1967; Deiss and Manning 1981; Manning 1993; Vasile et al. 2005; Manning and Reed 2006). The male (USNM 1256361) is here designated as neotype of Pericera septemspinosa Stimpson, 1871 due to the close morphological similarity to the original description. The neotype is from a region close to the type locality. The specimen chosen here is from west of Sarasota, $27^{\circ} 44^{\prime} \mathrm{N}$, $83^{\circ} 45^{\prime}$ W (cf. ICZN art. 75 and 76).

Pohleus septemspinosus gen. nov. et comb. nov. can be distinguished from its Pacific congener, Pohleus heptacanthus gen. nov. et comb. nov., by the following characters: (i) rostrum width half of the interorbital length in P. septemspinosus gen. nov. et comb. nov. (vs. rostrum with one-third or less of the interorbital length in $P$. heptacanthus gen. nov. et comb. nov.; Fig. 5C, D); (ii) pleonal somite II smooth in P. septemspinosus gen. nov. et comb. nov. (vs. pleonal somite II with one spine or tubercle in $P$. heptacanthus gen. nov. et comb. nov.; Fig. 5C, D); (iii) merus of the second pereopod armed with a spine in P. septemspinosus gen. nov. et comb. nov. (vs. merus of second pereopod unarmed in $P$. heptacanthus gen. nov. et comb. nov.; Fig. 5C, D). Unfortunately, no male specimens of Pohleus heptacanthus gen. nov. et comb. nov. were available for study, thus, the gonopodal differences cannot be ascertained.

The southeast record of this species as Espírito Santo State, in Brazil (Serejo et al. 2006: fig. 8C) is not valid, since the specimen (MNRJ 17062) was re-identified as Macrocoeloma concavum. Therefore, the distribution of to Pohleus septemspinosus gen. nov. et comb. nov. is corrected to the Brazilian coast, from Ceará to Bahia.

Pohleus heptacanthus (Bell, 1836) gen. nov. et comb. nov.
Fig. 5C, D
Pericera heptacantha Bell, 1836: 173 [type locality: Puerto Potrero, Central America, 23.7 m depth; type material: syntypes, 1 male (non-extant), 1 female (OUM 13764)] - Bell 1836b: 61, pl. 12, fig. 6 and 6r-u; White 1847: 10; A. Milne-Edwards 1873: 55.
Macrocoeloma heptacantha - Miers 1886: 79, 81.
Macrocoeloma heptacanthum - Rathbun 1898a: 576; 1925: 473, pl.
173, fig. 1; pl. 269, fig. 8-11, text-figs 133, 134; Garth 1958: 415; Di Mauro 1982: 170; Ng et al. 2008: 119.

Lectotype (Here designated).
Costa Rica • 1 female, cl: 35 mm , cw: 43 mm ; Central America, Puerto Potrero, 23.7 m depth; H Cumming leg. (OUM 13764) (Fig. 5C, D).

Material examined. Mexico - 1 juv. female; Off Cape San Lucas, R/V Albatross, stn 2829, $22^{\circ} 52^{\prime} 00^{\prime \prime} \mathrm{N}$, $109^{\circ} 55^{\prime} 00^{\prime \prime} \mathrm{W}$, RKY leg., 56.6 m depth, $74.1^{\circ} \mathrm{F}$; 01 May 1888, M J Rathbun det. (USNM 21933 illustrated). PanAMA • 1 juv. female; Panama Bay, R/V Albatross, stn 2798, $8^{\circ} 10^{\prime} 30^{\prime \prime} \mathrm{N}, 78^{\circ} 50^{\prime} 30^{\prime \prime} \mathrm{W}, 114.6 \mathrm{~m}$ depth; 05 Mar1888, M J Rathbun det. (USNM 21932).

Diagnosis. Rostrum width less than one-third of interorbital length, bifurcated, base elongated, fused, diverging abruptly forming a Y-shape, ending in acute tip. Pleonal somite II with one spine or tubercle. Merus of second pereopod smooth.

Description based on female lectotype (male characters modified from Bell 1836b). Cephalothorax and appendages slightly covered with short, velvet-like pubescence. Carapace subglobose wider than long, convex, with long lines of hooked and simple setae in all regions. Rostrum short, less than one-third of interorbital length, bifurcated, base elongated, fused, diverging abruptly forming a Y-shape, ending in acute tips. Interorbital region slightly depressed medially. Hepatic region broad. One metagastric spine. Four long, strong, conical lateral spines (two in each branchial region), in line with cardiac spine. One short intestinal spine. Orbital region very prominent, eyes completely protected when retracted, ocular peduncle visible when not retracted. Pre-orbital spine directed upwards, slightly curved on tip, longer than post-orbital spine, ventral margin of pre-orbital spine with small crenulation; post-orbital spine curved upwards.

Antennular fossae wider than long, margins smooth. Interantennular septum elongate, laterally compressed, forming distinct ventrally-directed lobe. First and second antennal articles fused to epistome, with suture between antenna and epistome visible, antennal gland opening near suture line. Basal article of antenna with two spines, not visible in dorsal view: proximal spine smallest. An-


Figure 4. Geographic distribution Pohleus heptacanthus (Bell, 1836) gen. nov. et comb. nov.; orange circles = distribution based on examined material; green star = type locality and Pohleus septemspinosus (Stimpson, 1871) gen. nov. et comb. nov.; red circles $=$ distribution based on examined material; yellow star $=$ neotype locality.
tennal flagella longer than rostral spines, behind rostrum in dorsal view.

Epistome anterior margin narrower than antennular fossae, smooth, posterior margin slightly depressed. Buccal field sub-rectangular, narrower at posterior edge with one acute spine in anterolateral angle aligned with antennal spines. Third maxillipeds covering buccal frame when closed, leaving a small gap between ischia. Exopod long, nearly reaching distal margin of merus. Pterygostomial region subtriangular, slightly inflated, separated from subhepatic region by marked groove, with one long, strong spine slightly curved upwards on medial margin, visible in dorsal view.

Male chelipeds equal, longer than pereopods; covered with sparse granulation, unarmed. Dactylus arched in adult males, leaving small gap between fingers, distinctly shorter than palm. Cutting edges with sub-equal teeth in distal half, one distinct proximal tooth in larger males; distal half with light brown colour in fixed specimens. Pereopods short, slender, cylindrical. P2 longest; P3-P5 progressively decreasing in length. Dactylus slightly curved, covered with short setae.

Female chelipeds equal, longer than pereopods, slender and smooth. Dactylus arched in adult, shorter than palm, sub-equal teeth in distal half. Pereopods, slender, cylindrical. P2 longest, P3-P5 progressively decreasing in length. Dactylus slightly curved, shorter than propodus, smooth ventrally, with corneous tips.

Male thoracic sternites I-IV fused, broadly triangular, smooth, anterior half declivous in ventral view. Telson fully fitted to cavity, anterior margin smooth.

Female pleonal somites I-VI markedly arched, telson free, transversally oval, with a row of setae on margin and one small spine in first somite. Male pleon rather prominent, pleonal somites I-VI, telson free, somite II with a mesial tubercle. Somite III with slight elevations. Somite VI longest, with a mesial tubercle and a small projection each side.

Colour in life. Light brown, covered with darker hair, first pair of pereopods reddish (Bell 1936b).


Figure 5. Pohleus septemspinosus (Stimpson, 1871) gen. nov. et comb. nov. A, B. female (MNHN IU 2013-32682). Pohleus heptacanthus (Bell, 1836) gen. nov. et comb. nov.; C, D. female lectotype (OUM 13764). A, C. habitus; B, D. ventral view. Note the spine on merus of the second pereopod (white arrow). Scale bars: 10 mm .

Type locality. Costa Rica, Central America, Puerto Potrero, in sand at a depth of 23.7 m .

Geographic distribution. Eastern Pacific: Mexico (Cape San Lucas), Costa Rica (Guanacaste) and Panamá (Panama Bay) (Fig. 4).

Remarks. Bell (1836) described Pericera heptacantha, based on two specimens as syntypes, one male and one female. The male syntype is considered lost and the female is deposited in the dry crustacean collection of the Oxford University Museum (OUM 13764) (Di Mauro 1982). Thus, the female syntype (OUM 13764) is here designated as the lectotype of Pericera heptacantha since it is the only specimen from the type series remaining (Fig. 5C, D). The locality Puerto Potrero in Central America probably refers to the Puerto Potrero, Guanacaste, in Costa Rica. Rathbun (1937: 136) examining Lithadia cumingii Bell, 1855, a species described from the same locality by Bell (1855), referred to the type locality as from Potrero, Costa Rica, the same case as for Pohleus heptacanthus gen. nov. et comb. nov.

## Acknowledgements

We are grateful to Rafael Lemaitre and Karen Reed (USNM) for facilitating access to materials and information from the USNM collections and to Marcos Tavares (MZUSP) and Alexandre Almeida for access to the comparative material and all visited institutions for access to materials and information. Thanks to the Laboratory of Analytical Biology at Smithsonian Institute and Laboratory of Molecular Biology at MZUSP for allowing the use of their facilities during the analyses. Thanks to Patricia Souza and Andressa Cunha for the photos of the fresh specimen arranged in this paper. This work was supported by the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) [2013/01201-0 and 2014/15549-0]. JC thanks FAPESP [2016/02775-8] for supporting her doctorate fellowship at UNESP. We also thank Darryl Felder at the University of Louisiana at Lafayette for use of DNA sequences generated by AMW under the USA National Science Foundation grant NSF/AToL EF-0531603 to DF. WS thanks Gerhard W. Pohle for his friendship and support over the years, looking forward to our further fruitful cooperation. This work greatly benefited from
the comments of Peter Ng (National University of Singapore), Ngan Kee Ng (National University of Singapore) and Paul Clark (Natural History Museum, UK).

## References

Abele LG, Kim W (1986) An illustrated guide to the marine decapod crustaceans of Florida (Vol. 8). State of Florida Department of Environmental Regulation Technical Series, 760 pp .
Almeida AO, Guerrazzi MC, Coelho PA (2007) Stomatopod and decapod crustaceans from Camamu Bay, state of Bahia, Brazil. Zootaxa (1553): 1-45. https://doi.org/10.11646/zootaxa.1553.1.1

Alves MDL, Ramos-Porto M, Viana GF (2008) Checklist of the decapods (Crustacea) from the Fernando de Noronha Archipelago, Brazil. Zootaxa (1881): 43-68. https://doi.org/10.11646/zootaxa.1881.1.2
Apakupakul K, Siddall ME, Burreson EM (1999) Higher level relationships of leeches (Annelida: Clitellata: Euhirudinea) based on morphology and gene sequences. Molecular Phylogenetics and Evolution 12(3): 350-359. https://doi.org/10.1006/mpev.1999.0639
Bell T (1836a) Some account of the Crustacea of the coasts of South America, with descriptions of new genera and species: founded principally on the collections obtained by Mr. Cuming and Mr. Miller. (Tribus 1, Oxyrhynchi). In November 10, 1835, Thomas Bell, Esq., in the Chair. Proceedings of the Zoological Society of London 3: 169173. Date of publication, 24 February 1836 [see Duncan FM (1937)]

Bell T (1836b) IV. Some account of the Crustacea of the coasts of South America, with descriptions of new genera and species: founded principally on the collections obtained by Mr. Cuming and Mr. Miller. Transactions of the Zoological Society of London (Zoology) 2(1): 39-66. [pls 8-13]. Date of publication, November 1836 from note inside NHM volume. https://doi.org/10.1111/j.1469-7998.1839. tb00007.x
Bell T (1855) XXXI. Horae carcinologicae, or notices of crustacea. I. A monograph of the Leucosiidae, with observations on the relations, structure, habits and distribution of the family; a revision of the generic characters; and descriptions of new genera and species. Transactions of the Linnean Society of London 21(3): 277-314. [pls 30-34] https://doi.org/10.1111/j.1096-3642.1852.tb00464.x
Bracken HD, Toon A, Felder DL, Martin JW, Finley M, Rasmussen J, Palero F, Crandall KA (2009) The decapod tree of life: compiling the data and moving toward a consensus of decapod evolution. Arthropod Systematics \& Phylogeny 67(1): 99-116. http://www.senckenberg.de/fles/content/forschung/publikationen/arthropodsystematics/ asp_67_1/asp_67_1_bracken_99-116.pdf
Coelho PA (1971) Nota prévia sobre os Majidae do norte e nordeste do Brasil. Arquivos do Museu Nacional 54: 137-143.
Coelho PA, Ramos MA (1972) A constituição e a distribuição da fauna de decápodos do litoral leste da América do Sul entre as latitudes de $5^{\circ} \mathrm{N}$ e $39^{\circ} \mathrm{S}$. Trabalhos Oceanográficos da Universidade Federal de Pernambuco, Recife 13: 133-236. https://doi.org/10.5914/tropocean.v13i1.2555
Coelho-Filho PA (2006) Checklist of the Decapods (Crustacea) from the outer continental shelf and seamounts from Northeast of Bra-zil-REVIZEE Program (NE III). Zootaxa (1184): 1-27. https://doi. org/10.11646/zootaxa.1184.1.1
Colavite J, Santana W, Tavares M (2016) Morphological differences between Stenocionops furcatus (Olivier, 1791) and S. coelatus (A.

Milne-Edwards, 1878) (Crustacea, Decapoda, Brachyura, Majoidea). Zootaxa 4184(3): 517-528. https://doi.org/10.11646/zootaxa.4184.3.6 Colavite J, Windsor AM, Santana W (2019) Three new species and a new genus of majoid crabs from the eastern Pacific (Decapoda, Brachyura). ZooKeys 825: 1-24. https://doi.org/10.3897/zookeys.825.32271
Duncan FM (1937) On the dates of publication of the Society's Proceedings, 1859-1926. Proceedings of the Zoological Society of London A107: 71-84. https://doi.org/10.1111/j.1469-7998.1937.tb08500.x
Deiss WA, Manning RB (1981) The fate of the invertebrate collections of the North Pacific Exploring Expedition, 1853-1856. In: Wheeler A, Price JH (Eds) History in the Service of Systematics. Society for the Bibliography of Natural History, London, 79-85. https://doi. org/10.3366/anh. 1981.012
Di Mauro Jr AA (1982) Rediscovery of Professor Thomas Bell's type Crustacea (Brachyura) in the dry crustacean collection of the Zoological Collections, University Museum, Oxford. Zoological Journal of the Linnean Society 76(2): 155-182. https://doi. org/10.1111/j.1096-3642.1982.tb01499.x
Evans AC (1967) Syntypes of Decapoda described by William Stimpson and James Dana in the collections of the British Museum (Natural History). Journal of Natural History 1: 399-411. https://doi. org/10.1080/00222936700770391
Garth JS (1958) Brachyura of the Pacific coast of America. Oxyrhyncha. Tables and Plates. Allan Hancock Pacific Expeditions 21(2): 501-854.
Gundlach J, Torralbas JI (1900) Contribución al estudio de los Crustáceos de Cuba, Notas cumplidas y completadas por el Dr. J. I. Torralbas. Anales de la Academia de Ciencias Médicas, Físicas y Naturales de la Habana (1899) 36: $292-305$.
Hultgren KM, Stachowicz JJ (2008) Molecular phylogeny of the brachyuran crab superfamily Majoidea indicates close congruence with trees based on larval morphology. Molecular Phylogenetics and Evolution 48(3): 986-996. https://doi.org/10.1016/j.ympev.2008.05.004
Hultgren KM, Guerao G, Marques FPL, Palero FP (2009) Assessing the contribution of molecular and larval morphological characters in a combined phylogenetic analysis of the superfamily Majoidea. In: Martin JW, Crandall KA, Felder DL (Eds) Decapod Crustacean Phylogenetics. CRC Press, Boca Raton, 437-455. https://doi. org/10.1201/9781420092592-c22
Katoh K, Kuma KI, Toh H, Miyata T (2005) MAFFT version 5: improvement in accuracy of multiple sequence alignment. Nucleic Acids Research 33(2): 511-518. https://doi.org/10.1093/nar/gki198
Lanfear R, Frandsen PB, Wright AM, Senfeld T, Calcott B (2017) PartitionFinder 2: New methods for selecting partitioned models of evolution for molecular and morphological phylogenetic analyses. Molecular Biology and Evolution 34(3): 772-773. https://doi. org/10.1093/molbev/msw260
Manning RB (1993) The scientific contributions of William Stimpson, an early American naturalist and taxonomist. Crustacean Issues 8 : 109-117.
Manning RB, Reed KJ (2006) Decapod crustaceans deposited in the Zoological Museum of Copenhagen by William Stimpson in 1859. The Raffles Bulletin of Zoology 54: 283-293.
Medlin L, Elwood HJ, Stickel S, Sogin ML (1988) The characterization of enzymatically amplifed eukaryotic 16S-like rRNA-coding regions. Gene 71(2): 491-499. https://doi.org/10.1016/0378-1119(88)90066-2
Melo GAS (1996) Manual de identificação dos Brachyura (caranguejos e siris) do litoral brasileiro. Plêiade/FAPESP, São Paulo, 603 pp .

Miers EJ (1879) III. On the classification of the maioid Crustacea or Oxyrhyncha, with a synopsis of the families, subfamilies, and genera. Journal of the Linnean Society (Zoology) 14 (79) 626-673. [pls 12-13] https://doi.org/10.1111/j.1096-3642.1879.tb02457.x
Miers EJ (1886) Miers, E. J., 1886. Part II. - Report on the Brachyura collected by H.M.S. Challenger during the years 1873-76. Report on the Scientific Results of the Voyage of HMS Challenger during the years 1873-1876 under the command of Captain George S Nares, RN, FRS and the late Captain Frank Tourle Thomson, RN prepared under the Superintendence of the late Sir C Wyville Thomson, Knt, FRS \&c Regius Professor of Natural History in the University of Edinburgh Director of the civilian scientific staff on board and now of John Murray, LLD, PhD, \&c one of the naturalists of the Expedition Zoology, Published by Order of Her Majesty's Government (Vol 17). Her Majesty Stationery Office, London, Edinburgh and Dublin, 362 pp. [pls I-XXIX]
Miller MA, Pfeiffer W, Schwartz T (2010) "Creating the CIPRES Science Gateway for inference of large phylogenetic trees" in Proceedings of the Gateway Computing Environments Workshop (GCE), 14 Nov. 2010, New Orleans, 8 pp. https://doi.org/10.1109/GCE.2010.5676129
Milne-Edwards A (1873) Études sur les xiphosures et les crustacés de la région mexicaine. Mission scientifique au Mexique et dans l'Amérique centrale, ouvrage publié par ordre du Ministre de l'Instruction publique. Recherches zoologiques pour servir à l'histoire de la faune de l'Amérique central et du Mexique, publiées sous la direction de M.H. Milne Edwards, membre de l'Institut. Cinquième partie. Tome premier. Paris: Imprimerie Nationale. 8 [unnumbered], 368 pp. [pls 63]
Mokady O, Rozenblatt S, Graur D, Loya Y (1994) Coral-host specificity of red sea lithophaga bivalves: interspecific and intraspecific variation in 12S mitochondrial ribosomal RNA. Molecula Marine Biology Biotechnology 3: 158-164.
Moreira C (1901) Contribuições para o conhecimento da fauna Brasileira: Crustáceos do Brasil. Archivos do Museu Nacional do Rio De Janeiro 11: 1-151. https://doi.org/10.5962/bhl.title. 46376
Ng PKL, Guinot D, Davie PJF (2008) Systema Brachyurorum: Part I. An annotated checklist of extant brachyuran crabs of the world. Raffles Bulletin of Zoology, Supplement 17: 1-286.
Powers LW (1977) A catalogue and bibliography to the crabs (Brachyura) of the Gulf of Mexico. Contributions in Marine Science 20: 1-190.
Rathbun MJ (1892) Catalogue of the crabs of the family Periceridae in the U. S. National Museum. Proceedings of the United States National Museum 15: 231-277. https://doi.org/10.5479/si.00963801.15-901.231
Rathbun MJ (1898a) The Brachyura collected by the U.S. Fish Commission steamer Albatross on the voyage from Norfolk, Virginia, to San Francisco, California, 1887-1888. Proceedings of the United States National Museum 21: 567-616. [plates 41-44] https://doi. org/10.5479/si.00963801.21-1162.567
Rathbun MJ (1898b) The Brachyura of the biological expedition to the Florida Keys and the Bahamas in 1893. Bulletin from the Laboratories of Natural History, State University of Iowa 4(3): 250-294. [pls I-IX]
Rathbun MJ (1899) The Brachyura collected by the U. S. Fish Commission Steamer Albatross on the voyage from Norfolk, Virginia, to San Francisco, California, 1887-1888. Proceedings of the United States

National Museum 21:567-616. [pls 41-44] https://doi.org/10.5479/ si.00963801.21-1162.567
Rathbun MJ (1925) The spider crabs of America. Bulletin of the United States National Museum 129: 1-613. https://doi.org/10.5479/ si.03629236.129.i
Rathbun MJ (1937) The oxystomatous and allied crabs of America. Bulletin of the United States National Museum 166: 1-278. https://doi. org/10.5479/si.03629236.166.i
Shull HC, Pérez-Losada M, Blair D, Sewell K, Sinclair EA, Lawler S, Ponniah M, Crandall KA (2005) Phylogeny and biogeography of the freshwater crayfish Euastacus (Decapoda: Parastacidae) based on nuclear and mitochondrial DNA. Molecular Phylogenetics and Evolution 37(1):249-263. https://doi.org/10.1016/j. ympev.2005.04.034
Soto LA (1980) Decapod Crustacea shelf-fauna of the northeastern Gulf of Mexico. Anales Centro de Ciencias del Mar y Limnologia 7(2): 70-110.
Stimpson W (1870-1871) Preliminary report on the Crustacea dredged in the Gulf Stream in the Straits of Florida by L.F. de Pourtales, Assistn U. S. Coast Survey. Part I. Brachyura. Bulletin of the Museum of Comparative Zoology at Harvard College 2: 109-160.
Takeda M (1983) Crustaceans. In: Takeda M, Okutani T (Eds) Crustaceans and Mollusks Trawled off Suriname and French Guiana. Japan Marine Fishery Resource Research Center, Tokyo, 19-180.
Vasile RS, Manning RB, Lemaitre R (2005) William Stimpson's journal from the North Pacific Exploration Expedition, 1853-1856. Crustacean Research, Special Number 5: 1-220. https://doi.org/10.18353/ crustacea.Special2005.5_1
White A (1847) List of the Specimens in the Collection of the British Museum (Vol. 8). British Museum, London, 143 pp.
Windsor AM, Felder DL (2014) Molecular phylogenetics and taxonomic reanalysis of the family Mithracidae Macleay (Decapoda: Brachyura: Majoidea). Invertebrate Systematics 28: 145-173. https://doi.org/10.1071/IS13011

## Supplementary material 1

## Table S1

Authors: Jessica Colavite, Amanda M. Windsor, William Santana
Data type: Species data
Explanation note: Taxa included in the molecular phylogenetic analyses to place the newly described taxa within the context of the family Pisidae.
Copyright notice: This dataset is made available under the Open Database License (http://opendatacommons. org/licenses/odbl/1.0/). The Open Database License (ODbL) is a license agreement intended to allow users to freely share, modify, and use this Dataset while maintaining this same freedom for others, provided that the original source and author(s) are credited.
Link: https://doi.org/10.3897/zse.96.50360.suppl1

## ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database
Digitale Literatur/Digital Literature
Zeitschrift/Journal: Zoosystematics and Evolution
Jahr/Year: 2020
Band/Volume: 96
Autor(en)/Author(s): Colavite Jessica, Windsor Amanda M., Santana William
Artikel/Article: A new genus for Pericera septemspinosa Stimpson, 1871 and Pericera heptacantha Bell, 1836 (Crustacea, Brachyura, Majoidea), based on morphology and molecular data 205-216

