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A second discovery of *Diapontonia maranulus* Bruce, 1986 (Crustacea: Decapoda: Palaemonidae) in the Caribbean

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Abstract

A second discovery of the echinoid associated shrimp species *Diapontonia maranulus* Bruce, 1986 is recorded from deep water off Curaçao, Leeward Islands of the Dutch Caribbean. The material is compared with the type description and paratypic material as well as with material of closely related species. A mtDNA COI barcode was obtained from the material. The systematic position of the genus is discussed.

Key words: Crustacea, Decapoda, Palaemonidae, *Diapontonia maranulus*, taxonomy, range extension, DNA barcode

Introduction

A new genus and species of pontoniine shrimp, *Diapontonia maranulus* Bruce, 1986, was described on the basis of 11 specimens found in association with an asterostomatoid echinoid host, *Paleopneustes tholoformis* Chesher, 1968, in the Bahamian region, at a depth of 240–309 m. Thus far this is the only record for the species.

During two surveys of pontoniine shrimp diversity on Curaçao (November 2013 and March 2014), deep dives were made with the Curasub submersible along the SE coast of the island. Specimens of *Diapontonia maranulus* were collected at depths of 220 m and 214 m respectively from the same host species on which the type specimens were found. The current records constitute a considerable range extension of the species to the south.

The specimens are deposited in Naturalis Biodiversity Center (formerly Rijksmuseum van Natuurlijke Historie (RMNH)). Post-orbital carapace length (pocl) is used as the standard measurement of size and indicated in mm. A mtDNA COI barcode was obtained using the protocol described by Fransen & Reijnen (2012).

Palaemonidae Rafinesque, 1815

Pontoniinae Kingsley, 1879

Diapontonia Bruce, 1986

Diapontonia maranulus Bruce, 1986
(Figs. 1, 2A, 3)

Diapontonia maranulus Bruce, 1986: 57–68, figs 1–7.

Material examined. 2 ovigerous females (pocl 1.8 and 2.1 (GenBank acc. nr. KM921671)) RMNH.CRUS.D.56690; stn COA.24, Curaçao Substation, Curaçao, Netherlands Antilles, 12.084542ºN 68.898222ºW, 220 m, 8 November 2013, Curasub submersible, on *Paleopneustes tholoformis*, collected by Adriaan (Dutch) Schrier, Bruce Brandt, Charles H.J.M. Fransen, Sancia E.T. van der Meij and Bastian T.

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Reijnen.— 6 ovigerous females (pocl. 1.75–2.30), 4 males (pocl. 1.50–1.75), 1 juvenile (pocl. 1.43) RMNH.CRUS.D.56691; Curaçao Substation, Curaçao, Netherlands Antilles, 12.084542ºN 68.898222ºW, 214 m, 31 March 2014, Curasub submersible, on *Paleopneustes tholoformis*, collected by Adriaan (Dutch) Schrier, Cessa Rauch, Bert W. Hoeksema and Kaj van Tienderen.—1 non-ovigerous female paratype (pocl 3.5) RMNH.CRUS.D.36341; off Wood Cay, West End, Grand Bahama Island, 26º42.55'N, 79º01.72'W, 244–309 m, 14 June 1983, Johnson Sea Link Dive JSL-I-1357, on *Paleopneustes tholoformis* (as *Palaeopneustes tholoformis*), collected by Miller, Askew, Hendler, and Chulamanis.

Material for comparison. *Periclimenes ingressicolumbi* Berggren & Svane, 1989: 1 male (pocl 2.4) and 1 ovigerous female (pocl 2.3) paratypes RMNH.CRUS.D.37738; off San Salvador Island, 24º02.91'N 74º32.7'W, 579 m, l May 1987, Johnson Sea Link Dive no. 2039, on *Paleopneustes tholoformis* (as *Palaeopneustes tholoformis*) and *Heterobrissus hystrix* (A. Agassiz, 1880) (as *Archaeopneustes hystrix* Agassiz, 1880).— *Periclimenes milleri* Bruce, 1986: 1 female paratype (pocl 2.8) RMNH.CRUS.D.36342; off San Salvador Island, Bahama Islands, 24º02.75'N, 74º32.53'W, 527 m, 22 October 1983, Stn Johnson Sea Link SL-1500, on *Heterobrissus hystrix* (A. Agassiz, 1880), collected by Askew, Kier, Hall and Miller, bottom temp 17.9°C.— *Altopontonia disparostris* Bruce, 1990: 1 ovigerous female paratype (pocl 3.1) RMNH.CRUS.D.37690; Station CP/45 (Biocal), New Caledonia, 22°47'S 167°15'E, 430–485 m depth, 30.viii.1985, collected by Richer de Forges, donated by the Museum National d'Histoire Naturelle, Paris through Alain Crosnier.— 1 ovigerous female (pocl 2.8 (GenBank acc. nr. KM921672)) RMNH.CRUS.D.51028; NORFANZ stn. 20/60 or 69, North Norfolk Ridge, 29°41.84'S 168°02.61'E; 322–337 m depth, beam trawl, 14.v.2003, NMNZ CR. 9991; don. A.J. Bruce.

Comparison with type-material. Specimens (pocl 1.4–2.3) from Curaçao are somewhat smaller than the four females of the type-series (pocl 3.5–5.1).

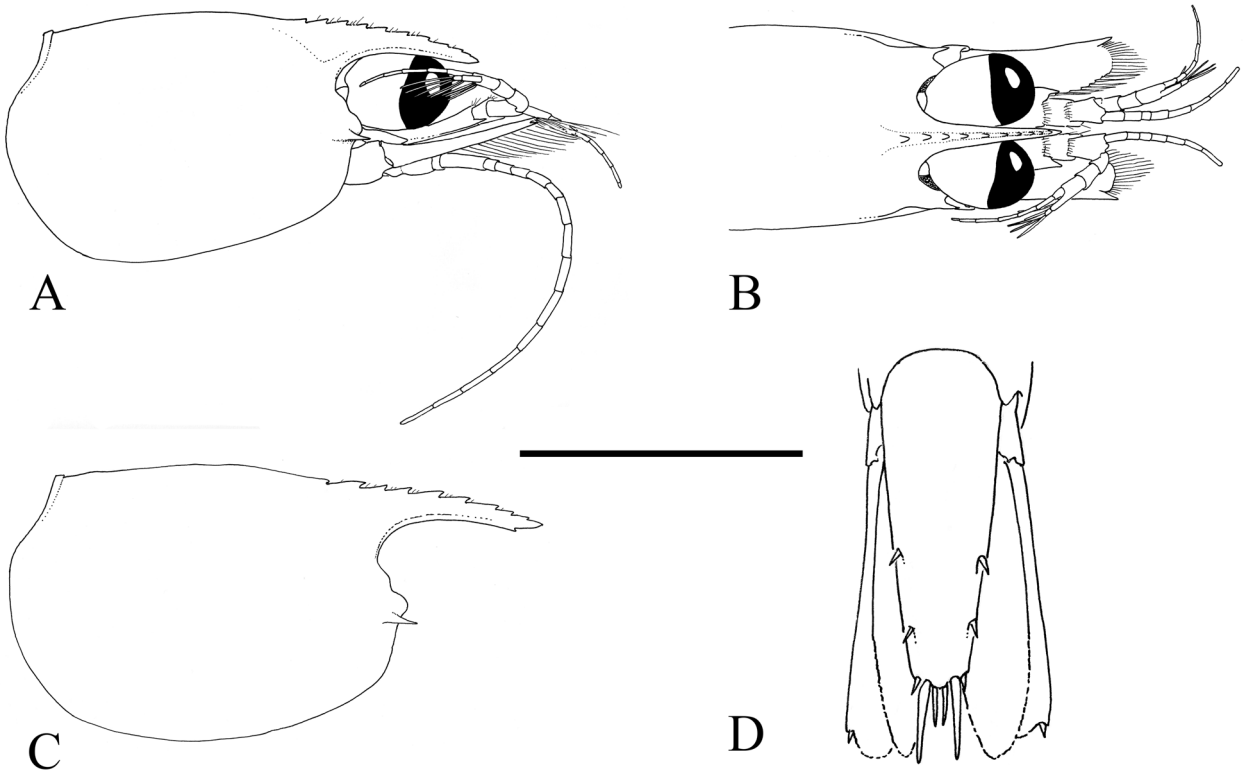

FIGURE 1. *Diapontonia maranulus* Bruce, 1986, RMNH.CRUS.D.566905. A, carapace and anterior appendages, lateral view; B, anterior appendages, dorsal view; C, carapace, lateral view; D, tailfan, dorsal view, setae omitted. A,B, D, ovigerous female, pocl. 1.8; C, ovigerous female, pocl. 2.1. Scale bar A–C = 2 ; D = 1 mm.

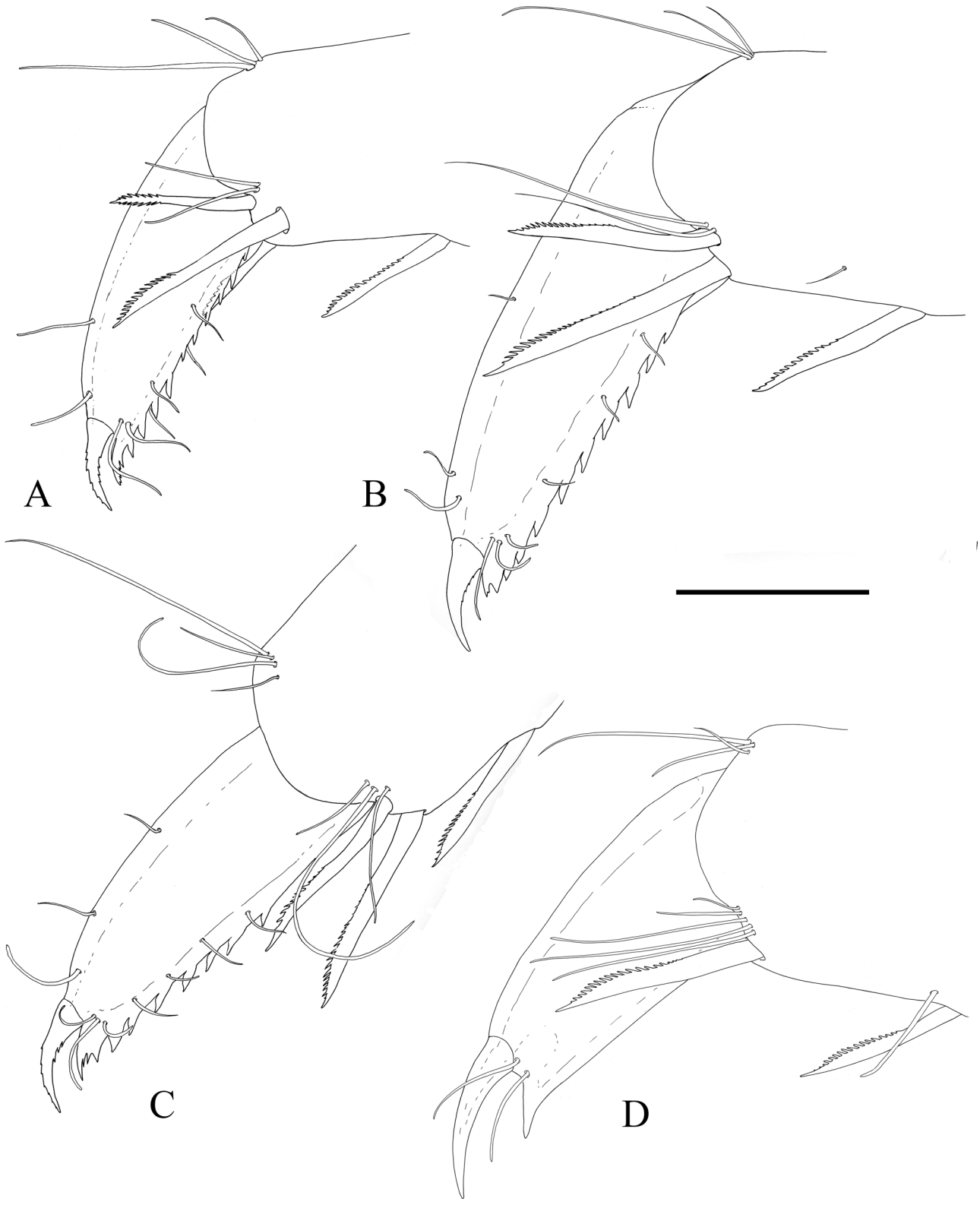

FIGURE 2. Dactylus right third pereiopod, median aspect. A, *Diapontonia maranulus* Bruce, 1986, ovigerous female pocl. 1.8, RMNH.CRUS.D. 566905; B, *Periclimenes milleri* Bruce, 1986, female pocl. 2.8, RMNH.CRUS.D.36342; C, *Periclimenes ingressicolumbi* Berggren & Svane, 1989, ovigerous female, pocl. 2.3, RMNH.CRUS.D.37738; D, *Altopontonia disparostris* Bruce, 1990, ovigerous female paratype, pocl. 3.1, RMNH.CRUS.D.37690. Scale bar = 0.5 mm.

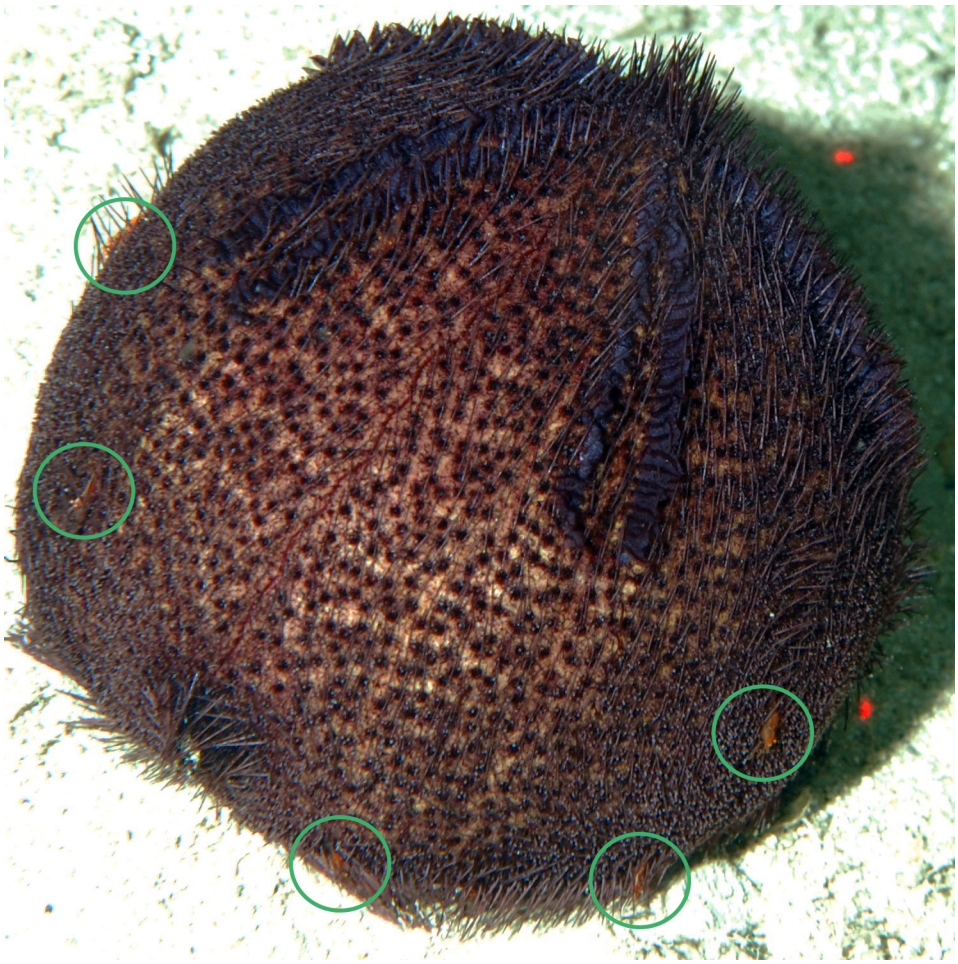

FIGURE 3. Host echinoid *Paleopneustes tholoformis* Chesher, 1968, with *Diapontonia maranulus* Bruce, 1986 shrimps (indicated by circles) photographed with Curasub at 220 m depth off the SE coast of Curaçao. Photo by Adriaan (Dutch) Schrier.

The specimens from Curaçao have 7–10 (usually 8 or 9) small teeth on the dorsal margin of the rostrum (Fig. 1A, B) of which 2 or 3 are situated postorbitally; the ventral margin of the rostrum has 1 or 2 subdistal teeth. The smaller female (pocl 1.8) of RMNH.CRUS.D.56690 has the ventral margin devoid of teeth (Fig. 1B). The paratypes have 7–9 teeth on the dorsal margin of the rostrum of which 0–3 are situated postorbitally; the ventral margin of these specimens always has a subdistal tooth although minute in the small males. Carapace and anterior appendages (Fig. 1B, C) are as described for the type-specimens.

Abdomen, caudal fan (Fig. 1D) and pereiopods are as described for the type specimens. The configuration and ornamentation of the teeth on the flexor margin of the dactylus as well as the unguis and ventral and distoventral spines of the propodus of the third pereiopod (Fig. 2A) is as in the female paratype figured by Bruce (1986: Fig. 5A). Both third and fourth pereiopods with one distoventral spine on lateral surface and two on medial surface as figured by Bruce (1986: Fig. 5D).

Coloration. Uniform brown (Fig. 3).

Host. *Paleopneustes tholoformis* Chesher, 1968 (Echinodermata: Echinoidea: Asterostomatidae) (Fig. 3). It was observed that one echinoid could host up to 10 specimens of the shrimp species.

Systematic position. At present three species of deep water echinoid associated pontoniine shrimps have been described from the tropical West Atlantic: *Diapontonia maranulus*, *Periclimenes milleri* Bruce, 1986, and *Periclimenes ingressicolumbi* Berggren & Svane, 1989. These three species were until now only known from a few records in the vicinity of the Bahama Islands (Bruce, 1986a,b; Berggren & Svane, 1989). The recently described deep water species *Periclimenes bathyalis* Anker, Pachelle & Tavares, 2014, collected off Espírito Santo, Brazil, at a depth of 360 m, is morphologically similar to *P. milleri* and *P. ingressicolumbi*. It is only known from the holotype male specimen and its host is unknown.

Diapontonia maranulus differs from the three *Periclimenes* species in the absence of a hepatic tooth, an important character often used in the delimitation of genera in Pontoniinae. Morphological differences between the three species of *Periclimenes* are mainly found in the ventral rostral dentition, antennular peduncle, scaphocerite, major second pereiopod, size and position of the hepatic tooth, propodi and dactyli of the third to fifth pereiopods, telson, number of setae and spines on the endopod of the first pleopod, and the size and number of spines on the appendix masculina (Berggren & Svane, 1989; Anker et al., 2014)

It is interesting to note that Berggren & Svane (1989) collected seven specimens from the echinoid *Paleopneustes tholoformis*, identified by them as belonging to *P. milleri*, of which two were lacking the hepatic tooth and in one specimen a very small hepatic tooth was present.

The three Caribbean species are very similar and share several apomorphic characters, most conspicuous in the armature of the ambulatory propodi and dactyli (Fig. 2A–C) like (1) the distally strongly serrulate ventral and distoventral spines of the propodi, (2) the presence of three distoventral spines on the propodi of the third and fourth pereiopods of which one situated laterally and two medially, (3) the presence of a series of 8–10 acute ventral teeth on the flexor margin of the dactylus, and (4) with the ventral border of the unguis minutely crenulate or denticulate. The presence of minute crenulation on the ventral margin of the unguis in *P. milleri* was not described by Bruce (1986b) nor by Berggren & Svane (1989) but observed in the paratype female (RMNH.CRUS.D.36342) as is shown in figure 2C. These characters have not been described for *P. bathyalis*.

The most closely related species from the Indo-West Pacific seems *Altopontonia disparostris* Bruce, 1990. Specimens of this species have been collected from depths of 322–503 m off New Caledonia, the Loyalty Islands and the North Norfolk Ridge (Bruce, 1990, 1991, 1996, 2005). Its host is unknown, although its resemblance to *Diapontonia* suggests it might be associated with echinoids (Bruce, 1990). The species is generally similar to the three Atlantic species mentioned above. It shares the presence of the strongly serrulate ventral and distoventral spines on the propodi (Fig. 2D) of the ambulatory pereiopods with the three Atlantic species. It has the absence of a hepatic tooth in common with *Diapontonia maranulus*. It differs from the three Atlantic species principally in the form of the major chela and in having the flexor margin of the dactyli of the ambulatory pereiopods devoid of teeth.

Species of the recently described Indo-West Pacific deep-water, possibly echinoid associated genus *Echinopericlimenes* (Marin & Chan, 2014) share several characters in the rostrum, chelae and dactyli of the ambulatory pereiopods with *Diapontonia* and *Altopontonia,* though differ in having a distinct hepatic tooth like *Periclimenes milleri* and *P. ingressicolumbi* have. With *Diapontonia* they share the denticulation of the flexor margin of the unguis of the ambulatory dactyli and the irregular dentition of the dactylar accessory tooth. They differ in having the flexor margin of the dactyli entire while it is denticulate in *Diapontonia*. With *Altopontonia* they share the entire flexor margin of the dactyli of the ambulatory pereiopods. However. *Altopontonia* does not show the denticulate accessory tooth nor a denticulate flexor margin of the unguis.

Mitochondrial DNA COI barcodes were obtained for the species of *Diapontonia* and *Altopontonia.* Unfortunately, DNA extraction of paratype specimens of *Periclimenes milleri* (RMNH.CRUS.D.36342) and *P. ingressicolumbi* (RMNH.CRUS.D.37738) failed. The genetic distance between *Diapontonia* and *Altopontonia* is 0.25, which is substantial. COI barcodes of the four *Echinopericlimenes* species were used by Marin & Chan (2014) to show the molecular distinction between these species. Unfortunately these COI barcodes are not yet available on GenBank for comparison with the present material.

Discussion

The synapomorphies in the ambulatory dactyli and propodi of the Caribbean species *D. maranulus*, *P. milleri* and *P. ingressicolumbi,* indicate that these species might form a monophyletic group and these *Periclimenes* species should be transferred to *Diapontonia*. The observed variation among the specimens of the Atlantic species raises the question if these species are really distinct or belong to one species varying in several characters. In none of the specimens from Curaçao however a hepatic tooth was present. More specimens of the Caribbean *Periclimenes* species are needed to study the morphological variation combined with a molecular analysis in order to resolve the issue raised here.

Although generally similar to the four Atlantic species, the Indo-West Pacific *Altopontonia disparostris* only shares the strongly serrated spines on the ambulatory pereiopods as a synapomorphy with the Atlantic species. Its

inclusion with the Atlantic species in a monophyletic group seems less obvious, moreover as the genetic distance in the mtDNA COI gene is substantial. Species of *Echinopericlimenes* do not share the apomorphies in the ambulatory dactyli and propodi and seem even less related.

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