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New records of *Pegantha* spp. (Hydrozoa: Narcomedusae) off Northern Brazil

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Abstract. Specimens of *Pegantha laevis* H.B. Bigelow, 1909 and *Pegantha triloba* Haeckel, 1879 were found in oceanic waters off the northern Brazilian coast. The former species is clearly distinct due to the thickness and shape of peripheral channels, while the latter is recognized mainly due to the exumbrellar furrows and long otoporpae. This study represents the first actual record of *P. laevis* inside the Brazilian Economic Exclusive zone, since previous reports were far away from the coast, and clarifies the presence of *P. triloba* off Brazil.

Key-Words. Jellyfish; Cnidaria; Hydrozoa; Taxonomy; Biodiversity; South Atlantic.

INTRODUCTION

Holoplanktonic hydromedusae of the family Solmarisidae Haeckel, 1879 is distinguished from other Narcomedusae mainly by the absence of manubrial pouches, thus the periphery of manubrium is circular and unbroken at the same level as the tentacles rise. Two genera are recognized in the family: i) *Pegantha* Haeckel, 1879, with a peripheral canal system and otoporpae, and gonads forming lobes on the margin of manubrium wall; and ii) *Solmaris* Haeckel, 1879, without peripheral canal system and otoporpae and with simple annular gonads (Bouillon & Boero, 2000; Bouillon, *et al.* 2004, 2006).

Currently there are five valid species of *Pegantha,* in addition to many doubtful names regarded as *"taxon inquirendum"* or possible synonymies (Schuchert, 2015). All valid species are widely distributed, mostly in epipelagic oceanic waters (Kramp, 1957, 1961; Bouillon, 1999). At southwestern Atlantic all the five species have been found (Bouillon, 1999), among which *Pegantha laevis* H.B. Bigelow, 1909 was recorded off Argentina and in oceanic waters > 1,300 km offshore the Brazilian coast (Kramp, 1957; Genzano *et al.,* 2008). *Pegantha triloba* Haeckel, 1879 was recorded at Fernando de Noronha archipelago (Vanhöffen, 1913) and offshore North of Brazil (Ranson, 1949; Kramp, 1959b), but its occurrence has been overlooked by Oliveira *et al.* (2016) in the census of Cnidaria from South America, and thus its distribution became uncertain. Hydromedusae are important predators in marine zooplankton and information on its distribution is essential for understanding species diversity, biogeographic patterns and marine ecosystem functioning. In this study, we report the occurrence of both species on North Brazilian shelf and offshore waters, extending northwards the known distribution of *P. laevis* in the western Atlantic and clarifying the presence of *P. triloba* in Brazilian waters.

MATERIALS AND METHODS

One specimen of *Pegantha laevis* and eight specimens of *Pegantha triloba* were found in superficial plankton samples collected in oceanic waters off the northern coast of Brazil (Table 1) with a David-Hempel catamaran (Hydro-Bios, Kiel, Germany) equipped with two superposed nets, each with a rectangular mouth and 500 µm mesh size. Sub-superficial temperature and salinity was measured with a Seabird SBE 25 Sealogger CTD profiler. Specimens were depos-

Table 1. *Pegantha laevis* and *Pegantha triloba* occurrences off northern Brazil. T = temperature; S = salinity.

	Location	Number of specimens	T(°C)	S	Bottom depth (m)
P. laevis	0.0013°N, 38.0073°W	1	27.9	36.2	4,426
P. triloba	3.9963°N, 38.0042°W	7	28.1	36	4,208
	5.9126°N, 49.7035°W	1	27.6	36.2	3,592

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ited in the *Museu de Oceanografia Prof. Petrônio Alves Coelho* from *Universidade Federal de Pernambuco.* All applicable international, national, and/or institutional guidelines for the care and use of animals were followed by the authors.

RESULTS AND DISCUSSION

The single *Pegantha laevis* medusa found was 9 mm in bell diameter. Umbrella flattened with completely smooth surface (Fig. 1A). The specimen was damaged

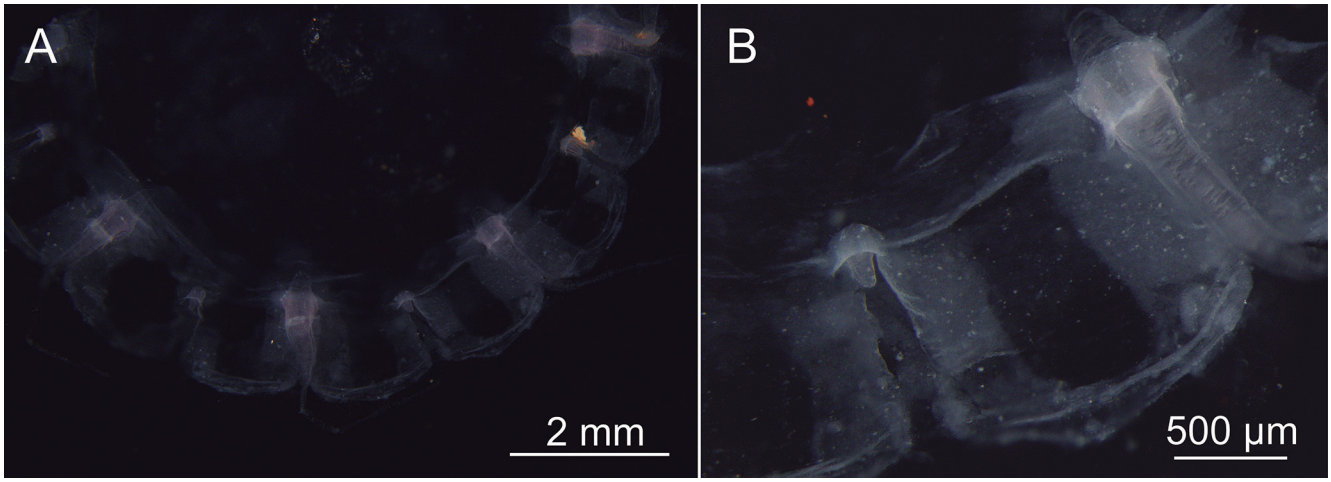

Figure 1. *Pegantha laevis* medusa from North Brazil. (A) Aboral view. (B) Detail of marginal lappet and peripheral channel.

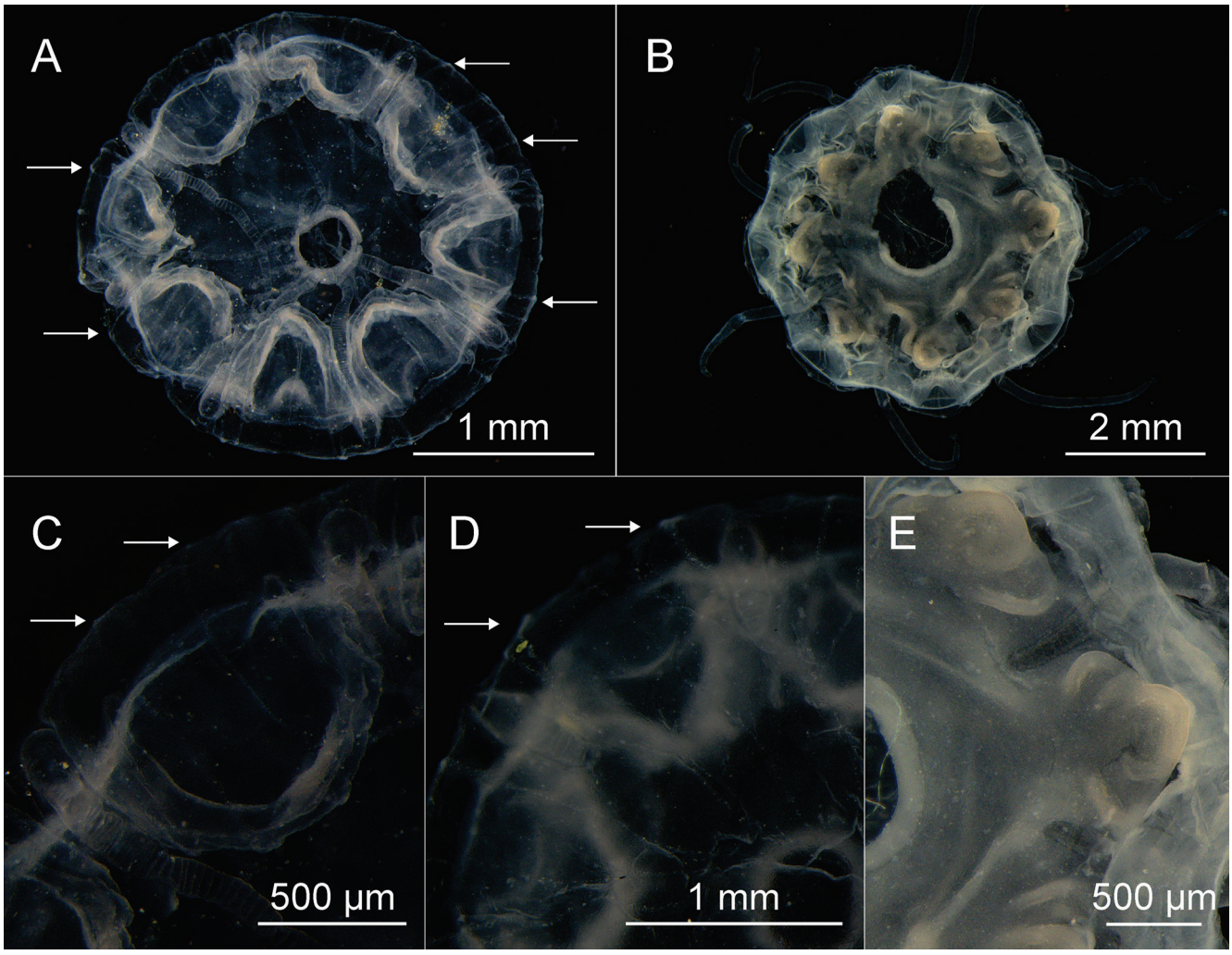

Figure 2. *Pegantha triloba* medusae from North Brazil. (A and B) Oral view. (C) Detail of marginal lappet and otoporpae. (D) Aboral view showing furrows and ridges on exumbrella. (E) Detail of tri-lobed gonads. Arrows indicate some otoporpae.

and *ca.* 1/5 of the margin was missing, and about 16 square marginal lappets were estimated. Peripheral canals quadrate, very broad mainly in the sides which represent 1/3-1/4 of the total lappet width and do not tapering (Fig. 1B). Only remnants of short otoporpae present, with nearly the same length of the peripheral canal width. Gonads absent.

A total of eight individuals of *Pegantha triloba* were analyzed, ranging from 1.5 to 4.6 mm in bell diameter (Fig. 2A). Seven medusae presented eight marginal lappets and one medusa had nine lappets. Peripheral canals thin, more or less triangular with rounded or pointed margins (Fig. 2B). Typically, three long otoporpae in the smaller medusae and five in the two larger ones, reaching almost the middle of the central disk and tapering upwards; exumbrella with furrows from the base of the tentacles to almost the apex, leaving the central disk smooth (Figs. 2A, B). The largest specimen presented gonads with three lobes (Figs. 2B, D), except one of the gonads with a single lobe.

Species of the genus *Pegantha* are mostly characterized by the width and/or shape of the peripheral canals, the size of the otoporpae and the presence/absence of exumbrellar furrows (Kramp, 1957, 1959b, 1961, 1965, 1968; Pagès *et al.,* 1992; Bouillon, 1999; Bouillon *et al.,* 2004). The number of gonadal lobes has also been used by earlier researchers (*e.g.,* Haeckel 1879), but this has been long shown to be highly variable and not accurate to distinguish species (*e.g.,* Bigelow, 1909; Kramp, 1961).

Pegantha triloba is easily distinguished from the remaining species by the exumbrella with furrows. This character, along with the long otoporpae and relatively thin peripheral canal system (Fig. 2B), confirm the present identification (*e.g.,* Bigelow, 1909; Kramp, 1957, 1959b, 1961; Bouillon, 1999). Bigelow (1909) described the otoporpae reaching the level of the base of the tentacles, however latter authors indicate the otoporpae may be considerably longer than the lappet, reaching the apex of the exumbrella (Kramp, 1957) likewise the present material (Fig. 2D). The observed medusae have 8-9 marginal lappets and tentacles, less than the 12-16 typically reported for this species. This may be attributed to the small size of our specimens (Xu & Wu, 1998), in spite the fact that one of them already had gonads. Although medusae as small as 5-7 mm have 12-14 lappets (Kramp, 1957), our specimens are smaller (1.5 to 4.6 mm) and in accordance with the medusa reported by Bigelow (1909) (with 2.5 mm in diameter and 7 lappets). The smaller number of otoporpae (3-5 per lappet) observed in the present specimens is also probably related to the small size of the medusae sampled here (see Bigelow, 1909: 88).

Among *Pegantha* species with smooth exumbrella, *P. laevis* differs from *Pegantha clara* R.P. Bigelow, 1909 and *Pegantha rubiginosa* (Kölliker, 1853) in the thickness of the peripheral canals. *Pegantha martagon* Haeckel, 1879 has also thick peripheral canals, however those from *P. laevis* are even thicker, being almost as wide as the space between them (Kramp, 1957; Fig. 1B). Also, the peripheral canals of *P. martagon* taper towards the margin (Bigelow, 1909; Kramp, 1957, 1961), while the same is not true for *P. laevis* (Fig. 1B). These differences in the

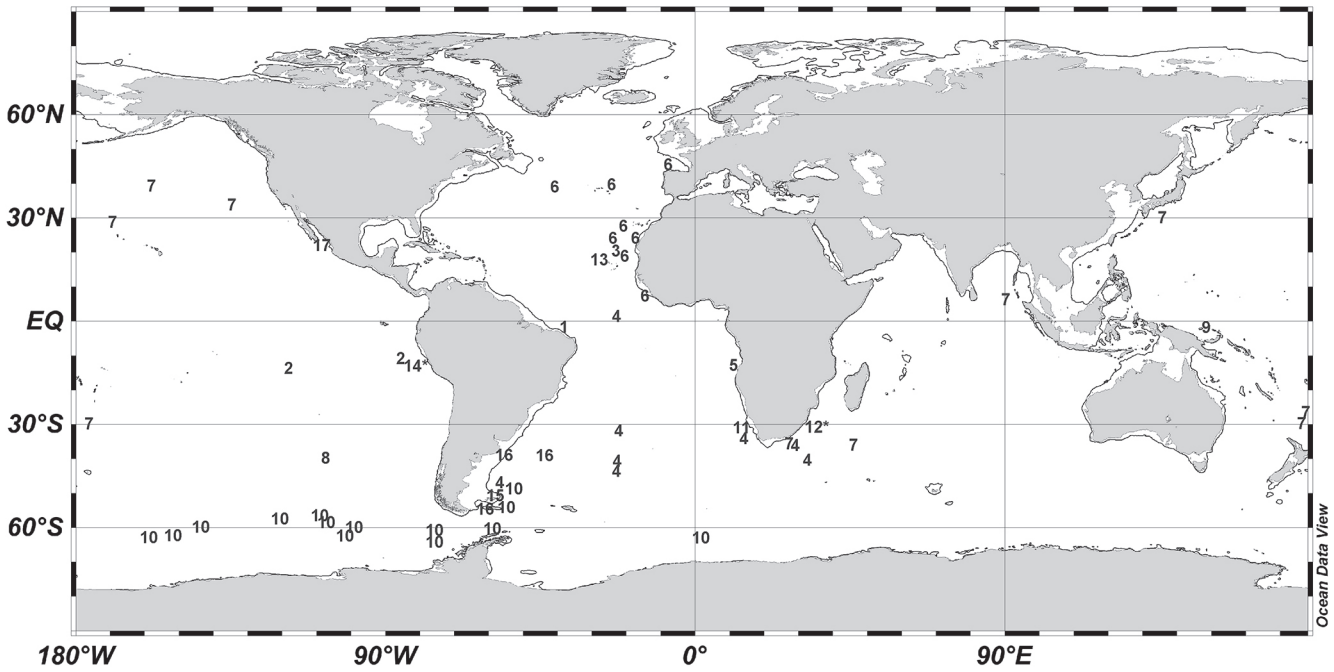

Figure 3. Global distribution of the narcomedusa *Pegantha laevis* based on this study and literature records. The dashed line shows the 250 m isobath, roughly corresponding to the shelf break (generated using Ocean Data View software; Schlitzer, 2007). Data Source: 1 = this study; 2 = Bigelow, 1909; 3 = Kramp, 1955; 4 = Kramp, 1957; 5 = Kramp, 1959a; 6 = Kramp, 1959b; 7 = Kramp, 1965; 8 = Fagetti, 1973; 9 = Bouillon *et al.,* 1986; Bouillon, 1978; 10 = Navas-Pereira & Vannucci, 1990; 11 = Pagès *et al.,* 1992; 12 = Buecher *et al.,* 2005; 13 = León *et al.,* 2005; 14 = Ayón *et al.,* 2008; 15 = Genzano *et al.,* 2008; 16 = Rodriguez, 2012; 17 = Gasca & Browne, 2017.

peripheral canal system are robust and may help even the identification of badly preserved specimens (Kramp, 1957). In addition, *P. martagon* has a vaulted umbrella, while in *P. laevis* the umbrella is flatter and lenticular (Bouillon, 1999).

Although *P. laevis* is not a common species (Kramp, 1959b, 1968), it is widely distributed in tropical, temperate and even Antarctic (temperatures down to 0.2°C; Navas-Pereira & Vannucci, 1990) regions of the three large oceans, but mostly in the Atlantic and Pacific (Fig. 3). Its known distribution is somewhat skewed southwards, with current records not surpassing 50°N, but reaching nearly 70°S (Fig. 3). In South Atlantic waters, the occurrence of this species was recorded off the African and Argentinean coast and in the center of the Atlantic at tropical, temperate and polar latitudes (Fig. 3). Recently, Oliveira *et al.* (2016) considered this medusa as integrating the Brazilian fauna based on Kramp's (1957) record at 31.27°S, 29.94°W (number 4 in Fig. 3). However, this location is > 1,300 km offshore, in the center of Atlantic Ocean (Fig. 3), and far outside the economic exclusive zone and Brazilian waters. Thus, the present study represents the first actual record of this species off Brazil.

Pegantha triloba is widely distributed in oceanic waters of the Atlantic, Indian and Pacific Oceans, mainly in warm latitudes between *ca.* 30°N and 30°S (Fig. 4). Outside this latitudinal range, *P. triloba* has been recorded at northwest of South Georgia (48°S), in the Mediterranean and in the Southern Ocean, a single record on each locality (respectively numbers 5, 4 and 35 in Fig. 4). The two latter records may be misidentifications (Kramp, 1959b, 1965). In the South Atlantic, the species was recorded off the African coast and in several oceanic localities between Africa and South America (Fig. 4). Although there were some previous records of this species on Brazilian waters (Ranson, 1949; Kramp, 1959b), these occurrences were overlooked in a recent review (Oliveira *et al.,* 2016), perhaps because they were reported only as "Atlantic" or "Equatorial Atlantic". Thus, this study highlights the presence of *P. triloba* in oceanic waters offshore northern Brazilian coast. While specimens collected in this study were in the subsurface, this species has extensive vertical distribution from surface to strata as deep as 5,000 m (Bigelow, 1909; Kramp, 1959b, 1965).

Holoplanktonic animals such as *Pegantha* species usually present a wide distribution in the oceans, being dispersed by large-scale processes such as global circulation (Boltovskoy *et al.,* 2003). Furthermore, many Narcomedusae early life stages are parasitic (Xu & Wu, 1998; Osborn, 2000), and movement and migration of their hosts can also contribute to the wide distribution of *P. laevis* and *P. triloba* (Figs. 3, 4).

The waters off the northern Brazilian coast are amongst the least studied regarding zooplankton in general (Lopes, 2007) and medusae in particular (Oliveira *et al.,* 2016), leaving a gap in the understanding of spe-

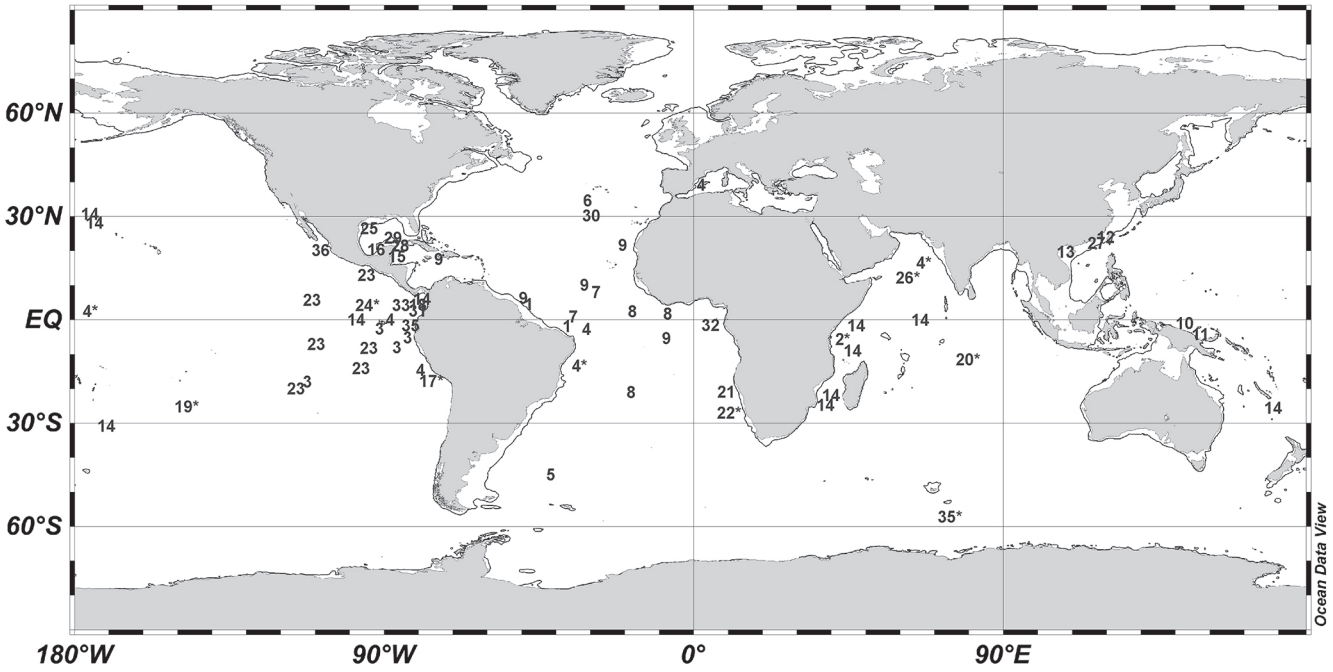

Figure 4. Global distribution of the narcomedusa *Pegantha triloba* based on this study and literature records. The dashed line shows the 250 m isobath, roughly corresponding to the shelf break (generated using Ocean Data View software; Schlitzer, 2007). Data Source: 1 = this study; 2 = Haeckel, 1879; 3 = Bigelow, 1909; 4 = Vanhöffen, 1913; 5 = Kramp, 1948a; 6 = Kramp, 1948b *apud* Kramp, 1961; 7 = Ranson, 1949; 8 = Kramp, 1957; 9 = Kramp, 1959b; 10 = Bouillon *et al.,* 1988; 11 = Bouillon *et al.,* 1986; 12 = Chang, 2008; 13 = Du *et al.,* 2012; 14 = Kramp, 1965; 15 = Larson, 1982; 16 = Loman-Ramos *et al.,* 2007; 17 = Ayón *et al.,* 2008; 18 = Baldrich & López, 2010; 19 = Navas-Pereira & Vannucci, 1990; 20 = Navas-Pereira & Vannucci, 1991; 21 = Pagès, 1992; 22 = Pagès *et al.,* 1992; 23 = Segura-Puertas, 1984; 24 = Segura-Puertas, 1991; 25 = Suárez-Morales *et al.,* 2002; 26 = Vannucci & Navas, 1973; 27 = Xu & Wu, 1998; 28 = Suárez-Morales *et al.,* 1999; 29 = Segura-Puertas, 1992; 30 = Bleeker & Van Der Spoel, 1988; 31 = Chaparro & Peralta, 2013; 32 = Repelin, 1965; 33 = Chaparro, 2007; 34 = Muñoz-Pozo, 2015; 35 = Vanhöffen, 1912 *apud* Kramp, 1961; 36 = Fernández-Álamo, 2002.

cies diversity and biogeographical patterns. Particularly considering the Amazon River plume as a potential barrier for marine organisms (*e.g.,* Rocha, 2003), and the potential high diversity of this understudied tropical and highly productive ecosystem. These aspects emphasize the need of comprehensive surveys in the area and faunistic studies such as the present one.

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Conflict of Interest: The authors declare that they have no conflict of interest.

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