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ECOSYSTEMS

***Teissiera polypofera*: first record of the genus *Teissiera* (Hydrozoa: Anthoathecata) in the Atlantic Ocean**

EVERTON G. TOSETTO, SIGRID NEUMANN-LEITÃO, ARNAUD BERTRAND & MIODELI NOGUEIRA-JÚNIOR

Abstract: Specimens of *Teissiera polypofera* Xu, Huang & Chen, 1991 were found in waters off the northeast Brazilian coast between 8.858°S, 34.809°W and 9.005°S, 34.805°W and 56 to 717 m depth. The genus can be distinguished from other anthomedusae by the two opposite tentacles with cnidophores and four exumbrellar cnidocyst pouches with ocelli. Specimens were assigned to *Teissiera polypofera* due to the long and narrow manubrium transposing bell opening and polyp buds with medusoid buds on it, issuing from the base of manubrium. This study represents the first record of the genus in the Atlantic Ocean.

Key words: Jellyfish, cnidaria, taxonomy, biodiversity.

INTRODUCTION

The presence of stinging pedicellate and contractile cnidocysts buttons on marginal tentacles, named cnidophores, is a distinctive character among Anthoathecata hydromedusae (Bouillon et al. 2006). They occur only on three families of the suborder Capitata, Cladocorynidae Allman, 1872, Teissieridae Bouillon, 1978 and Zancleidae Russell, 1953. These families used to be included in the extinguished superfamily Zancleida (along with Porpitidae Goldfuss, 1818). Another synapomorphy in these three families is the presence of exumbrellar cnidocyst pouches on perradial bulbs (Bouillon 1974, Boero et al. 2000, Bouillon et al. 2006). Cladocorynidae has two opposite marginal tentacles and exumbrellar pouches only on non-tentaculate bulbs. Teissieridae also has two opposite marginal tentacles but with pouches in the four perradial quadrants. Zancleidae may have either

four or none pouches and two, four or none marginal tentacles (Bouillon et al. 2004, 2006).

Distinction between Teissieridae and Zancleidae was primarily based on morphology of the clearly distinct hydroid stages. The former with polymorphic colony and incrusting hydrorhiza forming a crust-like stolonial plate and the later with the hydrorhiza formed by creeping stolon tubes covered by perisarc (Petersen 1990, Boero et al. 1996, Bouillon et al. 2006). Medusae from both families have an almost identical body plan and the only recognizable difference is the ocelli that is present only in Teissieridae (Boero et al. 1996, Bouillon et al. 2006). This is not an easy assignment, some Zancleidae species have a dark spot on nematocyst pouches base that may be interpreted as ocellus (Bouillon 1978, Boero et al. 2000). Another problem is the fixation of material in formalin, which may lose these small delicate structures (Bouillon 1978). These factors have led to known misidentifications and genera changes (Bouillon 1978, Bouillon &

Boero 2000, Boero et al. 2000, Xu & Huang 2004, Schuchert 2019).

The genus *Teissiera* Bouillon, 1974 used to be the unique representative of Teissieridae, presenting characteristics of the family (Bouillon et al. 2006). However, the genus *Pseudosolanderia* Bouillon & Gravier-Bonnet, 1988, which produces eumedusoids, were recently included in the taxon (Schuchert 2019). *Teissiera* was previously described as *Teissiera milleporoides* Bouillon, 1974 from the Indian Ocean (Bouillon 1974). Three additional species were described from the Pacific (Schuchert 2019), where the genus was exclusively found since then (Bouillon 1978, Xu & Huang 2004, Kubota 2006, Kubota & Gravili 2007, Du et al. 2012). In the present paper, we describe specimens assigned to *Teissiera*, which were recently found at an oceanographic expedition (Bertrand 2015) achieved off Northeast Brazil, representing the first reported occurrence of the genus in Atlantic Ocean waters, and discuss its taxonomy and global distribution.

MATERIALS AND METHODS

Specimens were obtained during the “Acoustics along the Brazilian coast” survey (ABRACOS 1), carried out on October 20015, on board the French R/V ANTEA off Northeast Brazil (Table I). Samples were collected in oblique hauls, using a bongo plankton net with 300 µm mesh and 0.6 m opening, from near bottom to surface over the continental shelf, and 200 m depth to surface in open waters. Surface temperature and salinity was observed using a Seabird 911 CTD profiler. Material was fixed with 4% formaldehyde buffered with sodium tetraborate (0.5 g.l-1). Specimens were deposited in the Museu de Invertebrados Paulo Young from Universidade Federal da Paraíba (CIPY1123). All procedures performed in this research were in accordance

Table I. *Teissiera polypofera* occurrences off northeast Brazil.

Number of specimens	Location	SST (°C)	SSS	Bottom depth (m)
4	8.858°S, 34.809°W	26.65	36.62	56
1	9.005°S, 34.805°W	26.76	36.79	717

SST = sea surface temperature; SSS = sea surface salinity.

with the ethical standards of the Universidade Federal de Pernambuco. All necessary permits for sampling and observational field studies have been obtained by the authors from the competent authority (SISBIO 47270-4).

RESULTS AND DISCUSSION

Specimens presented a bell-shaped umbrella almost spherical, with the mesoglea thicker in the apical region (Figure 1a, b). Umbrella height ranged from 0.7 to 1.2 mm and width from 0.5 to 1 mm. All five specimens analyzed presented umbrella margin with two perradial opposite marginal bulbs bearing tentacles with cnidophores. All preserved specimens had four oval perradial exumbrellar cnidocyst pouches connected to the ring canal by a slender peduncle (Figure 1a, c). A small reddish-brown ocellus was observed in the central portion of some cnidocyst pouches (arrow in Figure 1c). Manubrium narrow and long, exceeding bell opening in larger specimens (Figure 1b). Four out of five specimens presented many capitate polyp buds issuing from the upper portion of manubrium (Figure 1d, e). Several medusoid buds were also observed issuing from these hydrants (Figure 1d, e).

The combination of two opposite tentacles with cnidophores and four exumbrellar cnidocyst pouches each with an ocellus assigned the

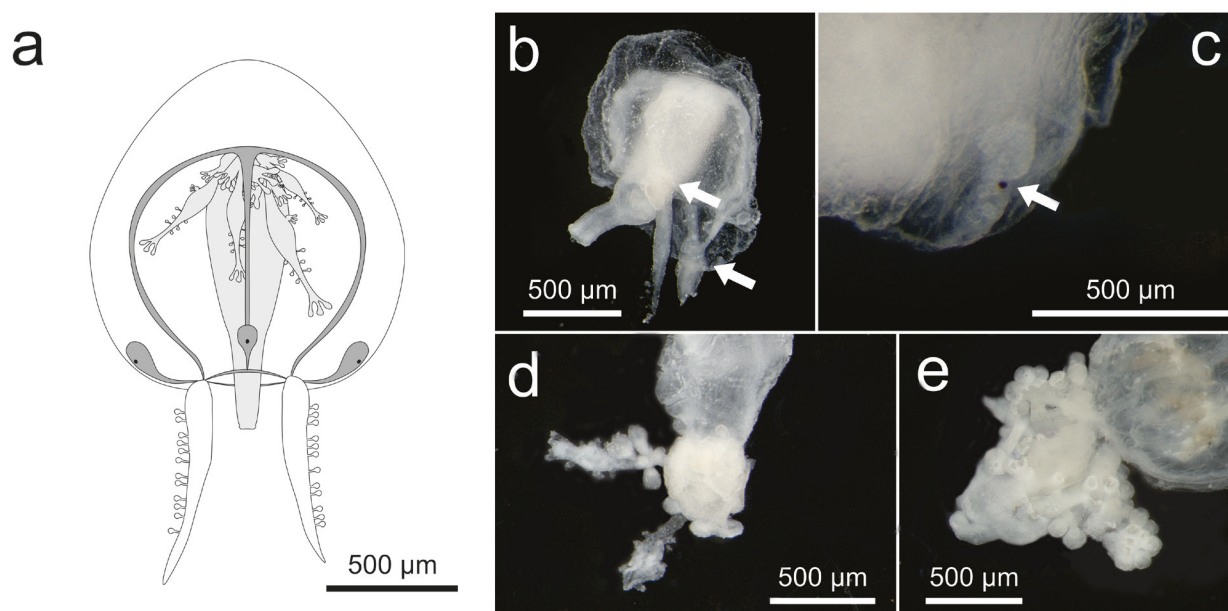


Figure 1. *Teissiera polypofera* from Western Atlantic Ocean. (a) Schematic representation of full specimen. (b) full view (arrows indicating tentacle bulbs). (c) detail on exumbrellar cnidocyst pouch with red-brown ocelli (indicated by the arrow). (d and e) detail on manubrium and several polyp buds and medusoid buds in it.

specimens to the genus *Teissiera* (Bouillon 1974, Bouillon et al. 2006). Even though ocelli were not present in some specimens, which would assign them to *Zanclaea* Gegenbaur, 1856, these structures may disappear easily due to formalin fixation through time (Bouillon 1978), and we assumed that was the case herein since most specimens had ocelli only in some pouches and those with no ocelli were found in the same sample.

Teissiera medusae species are mainly distinguished based on the position and shape of gonads, length of manubrium and presence of polypoid or medusoid buds issuing from the manubrium (Table II, Bouillon 1978, Xu & Huang 2004). Although cnidocysts scattered or in ridges on the exumbrella have also been used to distinguish species (e.g. Xu & Huang 2004), these structures are common on newly released Capitata medusae (Bouillon et al. 2006) and were disregarded herein. Currently, four species were described in *Teissiera* (Schuchert 2019). *Teissiera milleporoides* Bouillon, 1974

and *Teissiera australe* Bouillon, 1978 do not produce buds and have a short manubrium never reaching the bell margin (Table II, Bouillon 1974, 1978). Thus, they clearly do not match with the present specimens. Polypoid buds have been observed in the two remaining species, *Teissiera medusifera* Bouillon, 1978 and *Teissiera polypofera* Xu, Huang & Chen, 1991, both distinguished mainly based on the relative manubrium length; the former with a shorter manubrium never exceeding bell opening and the latter the opposite (Table II, Bouillon 1978, Xu & Huang 2004). Therefore, despite small differences such as the presence of cnidocysts in the exumbrella, our specimens match to *T. polypofera* diagnosis.

Geographic distribution of *Teissiera* species were until now restricted to the Indian and Western Pacific Ocean, mainly in tropical and subtropical areas (Figure 2). The genus was first described from hydroids and its released medusae of *T. milleporoides* found in the Seychelles islands, Western Indian Ocean

Table II. Comparison of main characters of the valid medusae species of the genus *Teissiera*.

Species	Height (mm)	Width (mm)	Umbrella	Manubrium	Gonads	Ocellus	Reference
Present specimens of <i>Teissiera polypofera</i>	1.2	1	Bell shaped; mesoglea thicker in the apical region	Narrow and long; exceeding bell opening; with polyp buds and medusa buds on it	Not observed	Red-brown	This study
<i>Teissiera australe</i>	3.5	3	Mesoglea thicker in the apical region	Up to 2/3 of subumbrellar cavity	Interradial; covering up to 2/3 of manubrium	Bright red	Bouillon 1978
<i>Teissiera medusifera</i>	1.3	1	Thick conical mesoglea in the apical region	Short; with medusa buds; one specimen with a polyp bud	interradial in the upper half of manubrium, eggs in the apical mesoglea	Red-brown	Bouillon 1978
<i>Teissiera milleporoides</i>	0.5	0.6	Mesoglea thicker near cnidocyst pouches; exumbrella with cnidocysts	Half of subumbrellar cavity	Not observed	Red-brown with a yellow central spot	Bouillon 1974
<i>Teissiera polypofera</i>	1.3	0.5	Spherical; exumbrella many cnidocysts	Narrow and long; exceeding bell opening; with polyp buds and medusa buds on it	Not observed	Present	Xu & Huang 2004

(Bouillon 1974), later it was reported in Japanese waters (Kubota & Gravili 2007). *T. australe* and *T. medusifera* were first described off Papua New Guinea, and later found off China (Bouillon 1978, Xu et al. 1991, Du et al. 2012). *T. polypofera* were described and found only off China as well (Xu et al. 1991, Xu & Huang 2004, Li et al. 2006). Moreover, two unidentified species of the genus were found in the Japanese Nansei Islands (Kubota 2006).

In this study *T. polypofera*, was observed in tropical Brazilian waters in the Western Atlantic Ocean with surface temperature and salinity around 26.7°C and 36.7 respectively (Table I). This disjunct distribution of *T. polypofera* is worthy of attention (Figure 2). Given the fragility of the ocelli used to distinguish *Teissiera* species from *Zanclea* (see above), many previous occurrences of *Teissiera* may have been erroneously classified as the later due to absence of ocelli.

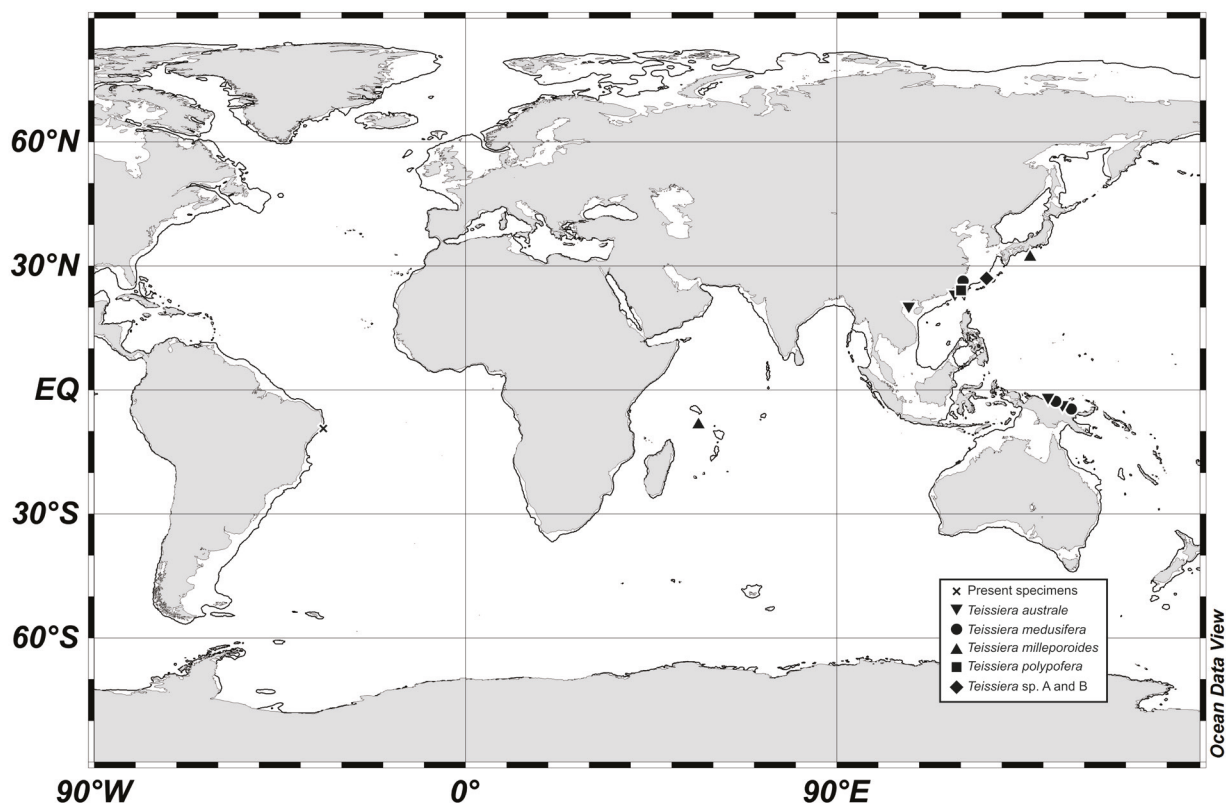


Figure 2. Global distribution of *Teissiera* species based on this study and literature records (Bouillon 1974, 1978, Xu et al. 1991, Xu & Huang 2004, Kubota 2006, Li et al. 2006, Kubota & Gravili 2007, Du et al. 2012). The dashed line shows the 250 m isobath, roughly corresponding to the shelf break. Generated using Ocean Data View software (Schlitzer 2019).

This is particularly true when considering *Zanclaea medusopolypata* Boero, Bouillon & Gravili, 2000, which is morphologically similar to *T. polypofera* and both species have even been erroneously argued to be the same (Boero et al. 2000, Xu & Huang 2004). Thus, previous occurrences of *Zanclaea costata* and *Zanclaea* sp. medusae off the Brazilian coast could have been misidentifications of *Teissiera* species (Navas Pereira, 1984, Gusmão et al. 2014). Furthermore, cnidarian biodiversity of South Atlantic Ocean is still poorly known when compared to other oceanic basins, mainly considering North and Northeast Brazil (Oliveira et al. 2016, Toso et al. 2018). The lack of knowledge associated

with taxonomic problems may be covering up a widespread distribution of *Teissiera* species.

A less plausible hypothesis could be *T. polypofera* being an invasive species in Brazilian waters transported by ballast water in transoceanic ships. In fact, in the last few decades, a large harbor was installed at Pernambuco state in Brazil (Silva et al. 2004). However, it is about 65 km away from the spot specimens were collected and it would be unlikely the species reach this far. It is important to note that the species or genus was never reported as invasive elsewhere in the world. Anyway, further studies should be aware to the presence of *T. polypofera* in the area and the development of its populations, aiming to

understand its global biodiversity patterns and invasive potential as well.

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