

# First report of the box jellyfish *Tripedalia cystophora* (Cubozoa: Tripedaliidae) in the continental USA, from Lake Wyman, Boca Raton, Florida

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*A male specimen of Tripedalia cystophora (Cubozoa: Tripedaliidae) was collected from Lake Wyman, Boca Raton, Florida, USA. This is the first report of this species from the continental United States and brings the total known number of cubozoan species living in this region to four. Lake Wyman is a natural lagoon/estuary ecosystem which is part of the Atlantic Intracoastal Waterway. The box jellyfish was found in shallow water around the roots of the red mangrove, Rhizophora mangle, where it was observed feeding on copepods attracted to light. This finding may indicate a local population in the waters of south Florida, USA, but an isolated occurrence cannot be ruled out.*

**Keywords:** Cubomedusae

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## INTRODUCTION

*Tripedalia cystophora* Conant, 1897 is a box jellyfish in the family Tripedaliidae of the order Carybdeida. Carybdeids are easily identified by the presence of only one tentacle on each pedalius. Most species of this order possess four interradial pedalia, each with a single tentacle. However, species of the genus *Tripedalia* have two or three pedalia with single tentacles at each interradial corner of the bell (not to be confused with members of the order Chirodropida, which have several tentacles per pedalius) (Daly *et al.*, 2007). *Tripedalia cystophora* has been the focus of many studies on feeding behaviour, and vision capabilities (e.g. Nilsson *et al.*, 2005). Little is known about interactions between this animal and humans. In particular, there do not appear to be any studies about the effects of *T. cystophora* envenomations.

*Tripedalia cystophora* was originally described from Jamaica (Conant, 1897). Collections at the Smithsonian National Museum of Natural History contain exemplars from Indian, Pacific and Atlantic localities suggesting that the species is distributed around the globe along tropical/sub-tropical mangrove coastlines. Nevertheless, there are relatively few published records of *T. cystophora* in the Caribbean and surrounding waters. Observations in the Atlantic include mangrove coastal localities of Brazil (Migotto *et al.*, 2002), Jamaica, and Puerto Rico (Coates, 2003).

## MATERIALS AND METHODS

*Tripedalia cystophora* was collected in Lake Wyman, Boca Raton, Florida, on 27 September 2009 (26°21'59.26"N 80°04'16.66"W). Lake Wyman is a small lagoon system created along with the formation of the barrier islands and part of the Atlantic Intracoastal Waterway (ICW) since its dredging in the early 19th Century. There are no previously documented reports of *T. cystophora* in Florida or elsewhere in the continental United States to date. Another specimen was caught and released during a seine in the same area earlier in the year.

The specimen was brought to the Gumbo Limbo Nature Centre in a plastic cup containing natural seawater from Lake Wyman. *Tripedalia cystophora* was relaxed with 5% ethanol and fixed in 10% formalin/seawater for 4–6 hours. The specimen was then dipped lightly in seawater to remove precipitate and stored in a 50% glycerin solution. A tentacle was excised post-fixation and mounted with glycerin for light microscopy (LM) examination.

## SYSTEMATICS

Phylum CNIDARIA Verrill, 1865  
Class CUBOZOA Werner, 1973  
Order CARYBDEIDA Gegenbaur, 1909  
Family TRIPEDALIIDAE Conant, 1897  
Genus *Tripedalia* Conant, 1897  
*Tripedalia cystophora* Conant, 1897

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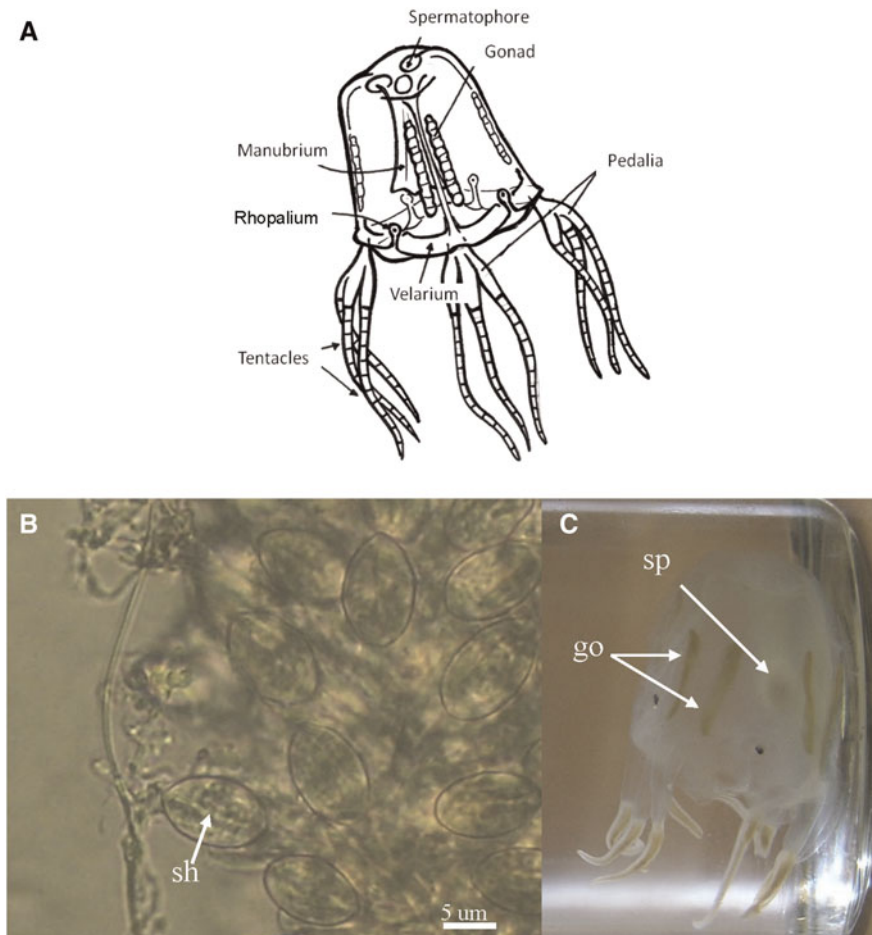
## DISCUSSION

Compared with the notoriety of Pacific cubomedusae, particularly *Chironex fleckeri* and *Carukia barnesi*, box jellies in the Atlantic go relatively unnoticed. Several species have been recorded in the eastern Atlantic, particularly in the Caribbean and surrounding waters. Two species of carybdeid *Alatina alata* (Reynaud, 1830), *Tamoya* sp. (Collins *et al.*, 2011), and the chirodroid *Chiropsalmus quadrumanus* (F. Müller, 1859) are known to be distributed along the southeast United States coast from the Gulf of Mexico to waters of Cape Hatteras (Calder, 2009). This report brings the number of box jellyfish species known from this region to four.

General anatomical features of the specimen collected were recorded post-fixation for species identification (Figure 1). In addition to the presence of multiple pedalia/tentacles at each interradial corner of the bell, species of this family are unique within Cubozoa in being sexually dimorphic and in possessing spermatophores, which apparently evolutionarily arose in tandem (Bentlage *et al.*, 2010). Since the specimen was already fixed discharged nematocysts could not be examined. Two main types of nematocyst were observed under LM, using an Olympus BX50 under 40 $\times$  magnification, in the tentacle tissue. The predominant type has a visible shaft inside the capsule, identifying them as heteronemes (Figure 1B) (Östman, 2000) with an average size (length  $\times$  width) of

14  $\times$  10  $\mu\text{m}$ , N = 16. The other nematocysts observed were classified as round/oval haplonemes, as no visible shaft was present in the undischarged capsule (Östman, 2000). Sizes of the haplonemes varied, 5–10  $\mu\text{m}$   $\times$  6–12  $\mu\text{m}$ , N = 8. These observations of nematocyst types correspond to what Gershwin (2005) identified as microbasic euryteles and small oval isorhizas in a specimen from Puerto Rico.

The specimen appears to be a breeding male due to the presence of three large spermatophores located at the base of the manubrium in the gastric cavity, as well as a set of paired gonads midway on the bell along each interradial axis (Figure 1; Werner, 1973; Stewart, 1996). Noted was the absence of a single spermatophore; breeding males normally have a total of four. This can be explained in one of three ways. First, the spermatophore may have been ejected, unnoticed, during initial collection. However, the remaining three spermatophores were initially observed in a relaxed state in the gastric cavity, making this explanation unlikely. Second, this specimen may be aberrant in having developed just three spermatophores. Finally, the absence could indicate that a single spermatophore had been transferred to a female during mating (Werner, 1973; Stewart, 1996). If the third possibility is correct, it would imply that a breeding population exists in the mangrove lined waters of Lake Wyman and the Florida ICW. Additional specimens should be captured for further assessment of this population.



**Fig. 1.** (A) Drawing of *Tripedalia cystophora* based on initial and light microscopy examination; (B) undischarged heteronemes from an excised tentacle at 100 $\times$ , with visible shaft (sh); (C) specimen post-fixation with gonads (go) and spermatophores (sp) characteristic of breeding males.

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