

# Bristle worms attack: benthic jellyfish are not trophic dead ends

Pelagic (open-ocean) jellyfish have often been considered trophic “dead ends” (Hansson and Norrman 1995; Lynam *et al.* 2006). However, various studies have indicated that some terrestrial and aquatic species do frequently consume jellyfish, despite their low nutritional quality (Doyle *et al.* 2007, 2014). Much less is known about the role of benthic (bottom-dwelling) jellyfish in marine and estuarine food webs, a topic that is increasingly relevant as human disturbances can stimulate benthic jellyfish blooms (Stoner *et al.* 2011, 2014). Such blooms could potentially be controlled by top-down predation pressure, but little information is available on the possible predators of these animals. So it was with great interest that we recently observed and recorded a benthic jellyfish, *Cassiopea* spp (hereafter *Cassiopea*), being preyed upon by bristle worms (*Hermodice carunculata*).

*Cassiopea* are semi-sessile, benthic jellyfish found all over the world in a range of coastal habitat types, including seagrass beds, coral reefs, mangrove forests, and canals. They are commonly referred to as “upside-down jellyfish”, because as medusae (the free-swimming adult life stage of jellyfish) they rest on the substrate with their oral arms extending upward. *Cassiopea* use this orientation to acquire light, because, like certain corals, their tissues contain photosynthetic algae that provide them with carbohydrates. When disturbed, *Cassiopea* release mucus filled with nematocysts (stinging cells), presumably as a defense against predators. Where abundant, these jellyfish have been found to alter the structure and function of nearshore ecosystems (Stoner *et al.* 2014). For instance, they were shown to reduce seagrass shoot densities in a

turtle grass (*Thalassia testudinum*) bed in The Bahamas, leading to a decline in the densities of other benthic fauna (Stoner *et al.* 2014). To date, the only documented predator of *Cassiopea* is a nudibranch – *Dondice parguerensis* – that occurs around Puerto Rico; this animal consumes only the oral arms, which can subsequently regenerate (Brandon and Cutress 1985).

Our observations were made in a tidal creek on Abaco Island, part of the Bahamian Archipelago in the western North Atlantic Ocean. The dominant emergent vegetation in the area is red mangrove (*Rhizophora mangle*), with a heterogeneous substrate of seagrass (primarily *T. testudinum*), hard bottom, and sand flats. *Cassiopea* are predominantly found in seagrass beds but often float into hard bottom areas on strong tidal currents. In April 2014, we documented the bristle worm *H. carunculata*, an amphinomid polychaete, consuming a *Cassiopea* jellyfish. *H. carunculata*, commonly called the bearded fireworm due to its venomous setae (bristles), is a well-known predator of anemones and coral polyps in reef ecosystems (Lizama and Blanquet 1975; Witman 1988). After a jellyfish had settled on the sediment surface, the bristle worms began preying on it, everting their buccal mass, a muscular area on the head containing the pharynx and esophagus (Figure 1). On several occasions, we observed multiple worms feeding on a single jellyfish at the same time, wrapping their bodies either partially or completely around it (Figure 2). Notably, all of the worms we saw feeding on *Cassiopea* were fairly large (> 30 cm long), whereas *H. carunculata* in shallow marine ecosystems around Abaco Island are typically just a few centimeters long.

In April and August of 2014, we used video cameras to record predation events. For each underwater trial, we selected one *Cassiopea* medusa from adjacent seagrass beds and placed it in front of the camera; we did not see any worms in the area when the trials were initiated. We ran trials on separate days during high tide in different parts of the creek. In one of these trials, we placed a dead fish (ballyhoo, *Hemiramphus brasiliensis*) next to the *Cassiopea* to test whether *H. carunculata* would prefer an alternative, readily available prey item. We also conducted one nighttime feeding trial using infrared lighting with the video setup.

In five of the six daytime trials, *H. carunculata* moved toward the



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**Figure 1.** Close-up of a bearded fireworm (*Hermodice carunculata*) preying on a *Cassiopea* jellyfish.

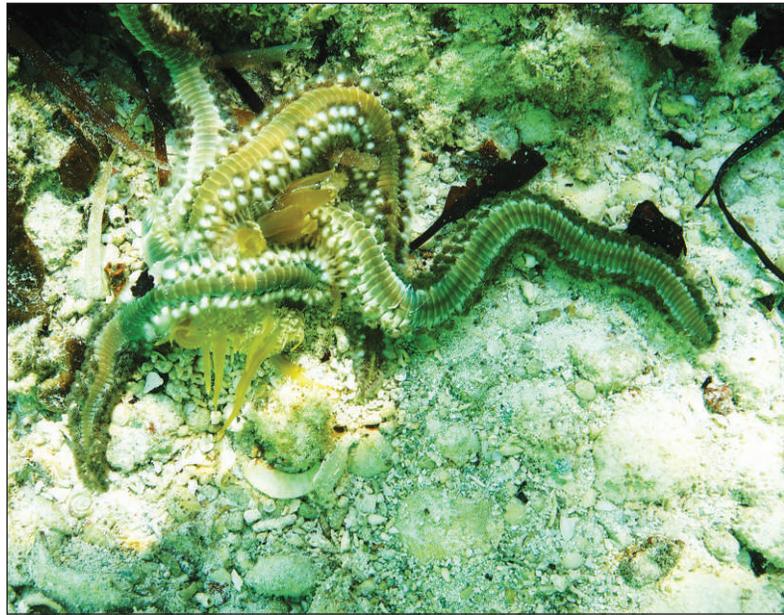
*Cassiopea* and consumed them. Most of the worms emerged out of crevices in the rocky creek bottom. Previous studies suggest that *H carunculata* may randomly encounter sea anemone and hydrozoan prey (Lizama and Blanquet 1975; Witman 1988), but our observations suggested that the worms were actively searching for *Cassiopea*. Interestingly, in a few of the videos, worms appeared to whip their heads back and forth, perhaps in an attempt to identify jellyfish chemical cues using their olfactory organs, termed caruncles (Witman 1988). The bristle worms appeared in the camera field between 3 and 15 minutes after trial initiation, and feeding events lasted no longer than 30 minutes. Three or more worms fed on the jellyfish during each of the trials. In every case, once predation began, *Cassiopea* excreted substantial amounts of mucus and exhibited faster bell pulsation rates. No worms fed on the ballyhoo, which was unexpected given that *H carunculata* have previously been shown to prefer dead fish over live coral prey (Wolf *et al.* 2014). We also observed predation in the night trial; one bristle worm began consuming the *Cassiopea* within the first few minutes of the trial, and another followed soon after.

In addition to the fact that *Cassiopea* are an abundant prey source for *H carunculata*, a possible explanation for the consumption of the jellyfish may be the sequestration of venom from *Cassiopea* nematocysts. Several invertebrate marine taxa, including nudibranchs, use nematocysts from cnidarians as antipredator defense mechanisms, although there is some debate as to whether it is the chemical or physical properties of the nematocysts that cause these animals to be distasteful to predators (Edmunds 2009). For instance, the nudibranch mentioned previously, *D parguerensis*, uses stored nematocysts from *Cassiopea* to make itself unpalatable to fish predators (Brandon and Cutress 1985). While the relationship between *Cassiopea* venom and *H carunculata* venom is speculative at this point, the possibility that *H carunculata* relies on jellyfish as a source of venom may influence which species of marine and estuarine organisms can consume *H carunculata*.

Because jellyfish populations are increasing in many ecosystems globally (Condon *et al.* 2013), there is a growing need to understand the biotic interactions between jellyfish and other organisms. Recognizing the importance of benthic jellyfish in marine food webs will allow for better management of human-affected ecosystems in which they are common.

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**Figure 2.** Four bearded fireworms (*Hermodice carunculata*) consuming a single *Cassiopea* jellyfish (yellow appendages on jellyfish oral arms are just visible).

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