



A Review of Research Pertaining to Gorgonian Octocorals off the Gulf of Mexico

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Abstract

The Gulf of Mexico is made up of primarily limestone reefs, where gorgonian octocorals are one of the most prominent organisms that contribute to habitat formation. Gorgonian octocorals make up highly diverse communities, yet it is evident that few ecological studies have been conducted on their species in the Gulf of Mexico. This gap in research is predominantly due to the difficulty of species identification in the field, causing a lack of monitoring efforts pertaining to this group of organisms. Despite this, there is an increasing effort to understand this diverse and widely distributed taxon due to their role as habit-forming organisms and potential reliance under global change. Within this literature review, we delve into an array of ecological, morphological, distributional, and taxonomical research pertaining to gorgonian octocorals throughout the Gulf of Mexico. This comprehensive review will conceivably be used by researchers and scientists to communicate knowledge, provide suggestions for prospective work, and advocate for future imperative studies.

Biological Overview

Gorgonian corals are some of the most disparate and prominent octocoral growth forms that can be found at depths and locations spanning the Gulf of Mexico and coral reefs globally (Corra 2013). This growth form is part of the Subclass Octocorallia and Order Alcyonacea and are characterized by their central proteinaceous axis (Cairns and Bayer 2009). This taxon includes sea whips, sea feathers, and sea pens, among others (Cairns and Bayer 2009). Gorgonian corals are imperative members of reef ecosystems, as they are essential to increasing biodiversity and habitat complexity (Corra 2013). Gorgonian octocorals' branching structure serves as a habitat, a source of nutrition, and as protection for an array of essential marine species (Etnoyer et al. 2009). Gorgonian corals also provide vital dictates for reef growth and overall health (Corra 2013). Research has shown that with depth, biodiversity in gorgonian octocorals increases – this concept is seen in the progression from shallow reefs to mesophotic reefs (Etnoyer et al. 2009). These gorgonian ecosystems are observed from locations at only a few meters to thousands of meters (Cairns & Bayer 2009).

Morphology, Growth, and Structure

Gorgonian octocorals are sedentary colonial polypoid Anthozoa (Carins & Bayer 2009). The tissue of gorgonians is made up of calcium carbonate structures known as sclerites (Carins & Bayer 2009). Gorgonian octocorals have a proteinaceous skeleton, which essentially contributes to the axial support of the colony (Wicksten & Cox 2011). Gorgonian octocorals have feeding polyps with eight pinnate tentacles and eight gastric mesenteries (Etnoyer et al. 2009).

Distribution, Diversity, and Habitat

There are a reported two-thousand nine-hundred species of gorgonian octocorals (Cairns & Bayer 2009). Of this number, there are one-hundred and sixty-two species reported to occur in the Gulf of Mexico (Cairns & Bayer 2009). Most gorgonians exist in shallow environments. However, forty-eight percent of Gulf of Mexico species live in the deep ocean below 200m (Cairns & Bayer 2009). Cairn and Bayer (2009) found that gorgonian octocorals are most common and diverse in southeastern Gulf of Mexico (seventy-one percent of the species). Areas such as the coast of Cuba and the Florida Keys maintain an array of both deep-water and shallow-water ecosystems (Cairns & Bayer 2009). In the Gulf of Mexico, Eighty-two species can be found within the northeast, fifty-eight reside in the northwest, and fifteen can be observed within the southwest. It has been recorded that only three of these two-hundred and seventy-eight species can be observed in all of the Gulf of Mexico, these being *Chrysogorgia elegans*, *Chrysogorgia spiculosa*, and *Callogorgia americana* – all deep-water species. Less than ten percent of all gorgonian octocorals are known to only reside within the Gulf of Mexico, likely due to poor data collection.

Literature Cited

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Anthropogenic Effects

Anthropogenic effects have been shown to be large contributing factors that lead to the demise of gorgonian octocorals in the Gulf of Mexico. Etnoyer et al. (2009) investigated an array of possible origins of injury to mesophotic gorgonian octocoral reefs. They hypothesized that that non-anthropogenic effects such as hurricanes could have been a more prominent potential cause of the degradation of gorgonian coral colonies than that of anthropogenic inputs (Etnoyer et al. 2009). However, it was determined that the injury was 10.8 times greater after anthropogenic effects, such as the Deepwater Horizon Oil spill, and was present prior to hurricane activity surrounding the colonies in the Gulf of Mexico (Etnoyer et al. 2009). Due to this spill, recovery of these injured colonies is improbable, though a few colonies are estimated to continue to thrive so long as supplemental irritants do not arise (Etnoyer et al. 2009). Ultimately, there is clear evidence leading to anthropogenic effects such as the Deepwater Horizon oil spill contributing to the decline of gorgonian octocorals.

Community Interactions

There is an array of invertebrate species linked to gorgonian octocorals, as they provide services to other species and communities. Wicksten & Cox (2011) found that Caridean shrimps are associated with gorgonian corals. Species of spider crabs were also found at the base of gorgonian corals and on surrounding surfaces of the coral reefs (Wicksten & Cox 2011). Chace's sea whip shrimp, *Neopontonides chacei*, was observed parallel to the axis of gorgonian corals (Wicksten & Cox 2011). Barnacle species *Conopea galeata* could be found on gorgonian corals attached to the axial rod, often covered by living tissue (Wicksten & Cox 2011). Species of mollusks have been observed living in sea whip, sea rod, and sea pansy gorgonian corals (Wicksten & Cox 2011). West Indian siminia gastropods, *Cymbovula aciclaris*, were also found residing on and eating gorgonian sea whips (Wicksten & Cox 2011). Gorgonian corals are ultimately important organisms that form habit for other species in the Gulf of Mexico.

Future Recommendations

It is ultimately essential that distributional data collecting efforts on the grounds of gorgonian octocorals residing in the Gulf of Mexico, progress forward with further comprehensive detail and a more in-depth compilation of data.