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Populations of the Gorgonian Genus *Leptogorgia* at Two Jetties in the Northwestern Gulf of Mexico

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SHORT PAPERS AND NOTES

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POPULATIONS OF THE GORGONIAN GENUS *LEPTOGORGIA* AT TWO JETTIES IN THE NORTHWESTERN GULF OF MEXICO.—Gorgonian coral distributions are poorly known in the subtropical northwestern coast of the Gulf of Mexico (the area from Corpus Christi, TX to Tamaulipas, Mexico). Strip transect surveys were performed in July 2008 at the Aransas Pass and Brazos–Santiago Pass jetties in south Texas to determine distribution and community composition of gorgonian species present. In excess of 600 *Leptogorgia* colonies were recorded consisting of *Leptogorgia hebes*, *Leptogorgia setacea*, and *Leptogorgia virgulata*. At Aransas Pass, *L. virgulata* was dominant, followed by *L. setacea*, and *L. hebes*. Overall density at the Aransas Pass north jetty was 0.0239 colonies m^{-2}, 0.0286 colonies m^{-2} at the Aransas Pass south jetty, and 0.0026 colonies m^{-2} at the Brazos–Santiago Pass north jetty. During surveys, animals observed in association with *Leptogorgia* colonies included juvenile fish, *Simnialena uniplacata*, *Pteria colymbus*, *Neopontonides beaufortensis*, *Cyphoma gibbosum*, and *Conopea galeata*. Morphological adaptations and tolerance to variances in water conditions allow *Leptogorgia* to be successful in jetty environments, providing important habitat for many organisms.

Introduction.—Shallow hard-bottom substrate suitable for coral settlement is relatively uncommon in the northern Gulf of Mexico (Bayer, 1961; Phillips et al., 1990). For this reason, corals often are studied in three locations, the subtropical coral reefs of the Flower Garden Banks 192 km southeast of Galveston, TX, the Florida Middle Grounds 137 km south of Apalachicola, FL, and deep-water coral banks scattered along the Louisiana–Alabama–Mississippi–Florida shelf (Rezak et al., 1985; Jordán-Dahlgren, 2002; Tunnell, 2007). The azooxanthellate gorgonian genus *Leptogorgia* (Octocorallia: Gorgonacea: Gorgoniidae) can occupy many diverse habitats, from deep offshore hard or soft substrates, oil and gas platform structures, artificial reefs, to nearshore (<20 km) shallow hard bottoms and jettied inlets (Shirley, 1974; Leversee, 1976; Adams, 1980; Gotelli, 1988; Kingsley et al., 1990; Gotelli, 1991; Bull and Kendall, 1994; Lucas and Knapp, 1997; Shapo and Galloway, 2006; Craft et al., 2008; Texas Cooperative Wildlife Collection, 2011). Although similar to natural hard-bottom environments such as coral reefs or offshore banks, jetties in temperate or subtropical areas are subjected to substantially more variable environmental conditions. Texas jetty environments consist of periodic swift channelized currents, terrestrial runoff, maintenance dredging conditions, fluctuating temperatures, and swells from ship and recreational boat traffic.

Many studies have been undertaken with *Leptogorgia* on the Atlantic and northeastern Gulf of Mexico coasts (Patton, 1972; Leversee, 1976; Adams, 1980; Gotelli, 1988; Kingsley et al., 1990; Gotelli, 1991; Mitchell et al., 1993; Beasley et al., 2003) but few have focused on the northwestern Gulf of Mexico. Nine species of *Leptogorgia* have been documented in the Gulf of Mexico, in waters from 2 to 309 m, with the majority located in the northeastern area (Cairns and Bayer, 2009). *Leptogorgia hebes*, *L. setacea*, and *L. virgulata* appear to be the only shallow-water gorgonians that have been found on the northern Gulf coast (Bayer, 1961; Fotheringham and Brunenmeister, 1975; Mitchell et al., 1993; Texas Cooperative Wildlife Collection, 2011). Growth forms of *Leptogorgia* can vary from elongate and arborescent, as in *L. virgulata*; whiplike with only one or two branches, as in *L. setacea*; or highly branched and fanlike, as in *L. hebes* (Bayer, 1961).

Gorgonians provide a unique and sheltered habitat that many other organisms use to maximize their protection and seclusion within colonies. Along the northern Gulf of Mexico, gorgonians provide some of the only physical relief and cover for many benthic invertebrates and fishes (Beasley et al., 2003). *Neopontonides beaufortensis* (sea whip shrimp), *Simnialena uniplacata* (one-toothed simnialena snail), *Tritonia wellsi* (nudibranch), *Conopea galeata* (brown sea whip barnacle), and *Pteria colymbus* (Atlantic wing oyster) are common commensal species on *Leptogorgia* (Patton, 1972; Britton and Morton, 1989; Tunnell et al., 2010). *Neopontonides beaufortensis* and *S. uniplacata* have similar pigmentation as their host gorgonian. Nearshore coral habitat often is inhabited by jetty fish species such as *Hypleurochilus geminatus* (crested blenny), *Abudefduf saxatilis* (sergeant major), and *Chaetodipterus faber* (Atlantic spadefish). Such habitat also may be important for many estuarine and coastal fishery species, linking estuarine intertidal communities and offshore adult habitat (Tunnell, 2002; G. Stunz, pers. comm.).

Gorgonian species on jetty habitat along the coast of the Gulf of Mexico coast from Corpus Christi, TX to Tamaulipas, Mexico have been documented, however, *Leptogorgia* sp. abundance and distribution has not been studied in detail (Bayer, 1961; Tunnell, 2002; Texas Cooperative Wildlife Collection, 2011). This location is of particular interest also due to the lack of nearshore hard bottom structure, proximity to shipping traffic and threats of pollution, the connection between estuarine and gulf habitats, and the confluence of temperate and tropical influences. These surveys were performed to provide estimates of *Leptogorgia* densities, species present, and associated organisms along the South Texas coast, at the Aransas Pass and Brazos–Santiago Pass jetties in South Texas.

Materials and methods. Study area.—Surveys were conducted in July 2008 on jetties at Aransas Pass and Brazos–Santiago Pass, approximately 160 km apart. The jetties extend perpendicular to the shoreline and were built to maintain navigable ship channels into nearby ports. The Aransas Pass jetties (27°50′13″N, 97°02′41″W) were originally constructed in 1899 and provide access to the Port of Corpus Christi. The channel is ~15 m deep, 160 m wide, and the north and south jetties are ~3,000 m and ~2,600 m long, respectively (Sargent and Bottin, 1989). For Aransas Pass, surveys were conducted from east to west toward the shore. A total of 548 m was surveyed on the north jetty and 442 m on the south jetty. The Brazos–Santiago Pass jetties (26°03′57″N, 97°09′04″W) were constructed in 1935 and provide access to Port Isabel and Brownsville. The channel is ~12 m deep, 120 m wide, and the north and south jetties are ~1,600 m and ~1,500 m long, respectively (Sargent and Bottin, 1989). At Brazos–Santiago Pass, surveys were conducted ~770 m (26°04′03.7″N, 97°09′17.0″W to 26° 04′03.5″N, 97°08′49.5″W) from west to east towards the Gulf. Because of lack of accessibility to the south jetty, only the north jetty at Brazos–Santiago Pass was surveyed.

Benthic intertidal habitats are dominated by *Balanus* and *Chthamalus* (barnacles), *Nodilittorina* and *Stramonita haemostoma* (snails), *Gracilaria* and *Ulva* (macroalgae), and *Clibanarius vittatus* (hermit crabs). Subtidal habitat is dominated by *Bunodosoma cavernata* (rock anemones), *Rhodymenia* and *Padina* (macroalgae), *Tubularia* (hydroid), *Cliona* (boring sponges), and *Oculina*, *Astrangia*, and *Leptogorgia* (hard and soft corals) (Britton and Morton, 1989).

Population surveys.—The strip-transect method of determining animal density was used according to the methods of Buckland et al. (1993). One transect was made on each jetty and transect locations were selected randomly within the central section on the channel side of both passes. Transects were 548 m on the Aransas Pass north jetty, 442 m on the Aransas Pass south jetty, and 770 m on the Brazos–Santiago Pass north jetty. Data were collected by divers with the use of SCUBA and swimming parallel to the jetty ~0.5 m above the substrate while maintaining depths between 2 and 10 m. Divers remained within sight distance of each other based on water clarity at the time of surveys resulting in overall transect width. Each colony was initially identified to species, and colony depth, height, number of branches, and color were measured. Any associated organisms seen on or around the colony were also noted. Representative samples 14 cm long were removed from random colony branch tips. Both dried samples and those preserved in 95% ethanol were sent to Dr. Howard Lasker, Graduate Program in Evolution, Ecology, and Behavior in the Department of Geology at the University at Buffalo in New York for species confirmation.

Results.—Three species of *Leptogorgia* were found during surveys (Table 1). At Aransas Pass, *L. virgulata* was dominant, followed by *L. setacea* and *L. hebes.* Overall density at the Aransas Pass north jetty was 0.0239 colonies m^{-2}, 0.0286 colonies m^{-2} at the Aransas Pass south jetty, and 0.0026 colonies m^{-2} at the Brazos–Santiago Pass north jetty. Only two colonies of *Leptogorgia* were found at Brazos–Santiago Pass, one *L. virgulata* and one *L. hebes.* Personal observations of a slight gradient in densities along the transects were made, where higher colony densities were seen toward the open Gulf and lower densities further inland, however, the location of each colony along the transect was not recorded. Only seven colonies of *L. setacea* were found, and were much shorter (15 cm) than those that commonly wash ashore, with very small holdfasts, no branches, and yellow in color. The average height of *L. virgulata* colonies was 70 cm with more than three branches, a large holdfast, and orange in color. *Leptogorgia hebes* colonies were shorter (30 cm), highly branched (≥100), fan-shaped, with a medium-sized holdfast, and were burgundy in color.

During surveys, organisms observed in association with *Leptogorgia* colonies included juvenile fish, *S. uniplacata*, *P. colymbus*, *N. beaufortensis*, *Cyphoma gibbosum*, and *Conopea galeata* (Fig. 1; Table 1). The most commonly observed organ-

Table 1. Characteristics of each *Leptogorgia* species encountered at each jetty including number of colonies, densities (colonies m^{-2}), average depth (m), average height (cm), and average number of branches (mean ± SE).

Species	Number	Density (colonies m^{-2})	Average depth (m)	Average height (cm)	Average branches
Aransas Pass north jetty					
Leptogorgia hebes	1	0.00008	4.27	30.48	100+
Leptogorgia setacea	5	0.00037	3.11 ± 0.06	12.70 ± 1.61	0
Leptogorgia virgulata	314	0.02348	4.10 ± 0.04	55.66 ± 1.40	12 ± 0.44
Aransas Pass south jetty					
L. setacea	2	0.00019	0.91 ± 0.00	17.78 ± 0.00	0
L. virgulata	306	0.02837	4.14 ± 0.07	68.90 ± 1.81	11 ± 0.39
Brazos–Santiago north jetty					
L. hebes	1	0.0013	3.05	30.48	100+
L. virgulata	1	0.0013	2.13	82.55	7

isms overall were *S. uniplacata* and *C. galeata*. A total of 2.72% of all colonies recorded at Aransas Pass had at least one associated organism. *Simnialena uniplacata* and *N. beaufortensis* were associated with both *L. virgulata* and *L. hebes* and all individuals seen on the colonies were pigmented or camouflaged to match the colony, whether it was orange (*L. virgulata*) or burgundy (*L. hebes*). One *C. gibbosum* was recorded on an *L. virgulata* colony at the Aransas Pass south jetty. Both specimens of *L. hebes* found in this study were collected with *S. uniplacata* and *N. beaufortensis* attached. No *L. setacea* colonies in this study had any associated organisms. Fish in association with *Leptogorgia* colonies were only seen in Aransas Pass. In addition, personal observations along the Aransas Pass jetties indicated the presence of small brittle stars, bryozoans, and copepods on colonies as well as higher abundances of *S. uniplacata*, *N. beaufortensis*, *P. colymbus*, *C. gibbosum*, and *C. galeata* than at Brazos–Santiago Pass.

Discussion.—The three species of *Leptogorgia* identified during the surveys conducted for this study correspond to those of Bayer (1961). Along the eastern U.S. coast, shallow water gorgonian communities were almost completely limited to *L. virgulata*, *L. setacea*, and *Lophogorgia hebes* (now *Leptogorgia hebes*, Bayer, 1961). The two *L. hebes* colonies recorded in this study add to the four specimens previously documented on the south Texas coast, both in Bayer (1961) and in the Texas Cooperative Wildlife Collection at Texas

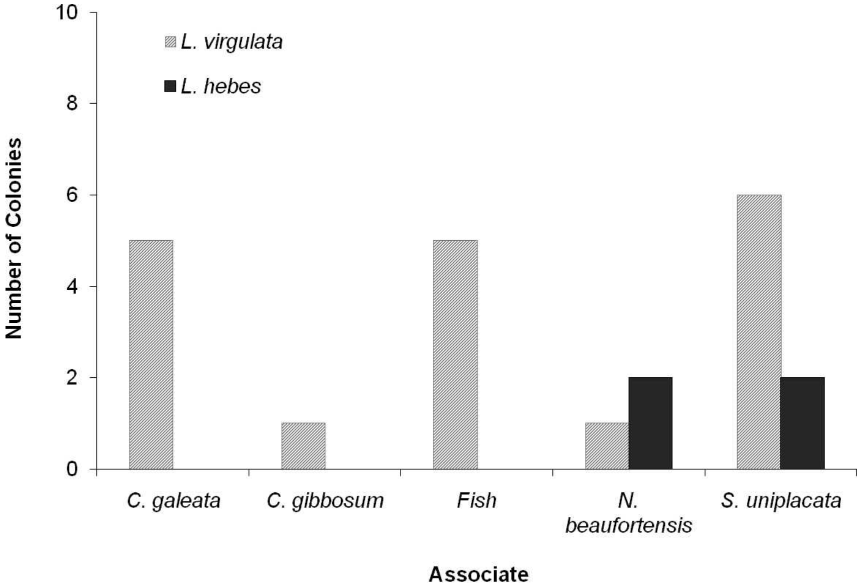

Fig. 1. Number of associated organisms per *Leptogorgia* species found in field surveys.

A&M University (Port Aransas jetties, 3 m, 1974, No. 5-1183; Port Mansfield jetties, 3–5 m, 1984, No. 5-1179; Seven and One-Half Fathom Reef, 23 m, 2006, No. 5-1683). More research is needed to determine if this is a rare species, a case of range extension, or if it is less successful at colonizing jetties than *L. virgulata* (Bayer, 1961). The species found in this study correspond to results from previous coastal studies in this region. *Leptogorgia virgulata* and *L. setacea* were occasionally found on the Aransas Pass jetties in studies reported by Alvarado (1996) and *L. setacea* was reported in Aransas Bay and Aransas Pass as well as Mesquite Bay (Schultz, 1962). *Leptogorgia setacea* was found during a yearlong survey performed by Parker (1955) in the Gulf Intracoastal Waterway and northern Aransas Bay near Rockport, TX although it was not noted if colonies were attached to substrate or washed in unattached. Colonies of *L. setacea* observed by Parker (1955) were smaller than those in nearby Gulf waters, as seen in surveys for this study. In personal observations, large masses of *L. setacea* commonly wash ashore on beaches in the study area and have been observed on offshore oil and gas platforms, however, very few colonies were found in these jetty surveys; therefore, this species is more likely located in deeper, less turbulent, offshore locations.

Adaptations such as strong holdfasts and rigid but flexible skeletons allow *L. hebes* and *L. virgulata* to colonize jetty substrate successfully and withstand swift currents and wave action typical of jetty habitats, whereas *L. setacea* has a very small holdfast and a thin, highly flexible, unbranched skeleton that would preclude it from colonizing jetties. In these surveys, all *Leptogorgia* colonies were found at depths below 0.9 m and were the only large benthic organisms. This depth is below the subtidal algal zone, which is light limited because of frequent turbid water, resulting in less competition with other organisms for settlement space. At these depths, ambient conditions, such as wave action, are also less extreme than closer to the surface, reducing the chance of physical damage or displacement. Bayer (1961) found that other gorgonians such as *Anthopodium rubens*, *Muricea pendula* (one specimen reported from Padre Island, TX), *L. medusa*, *Leptogorgia stheno*, and *Leptogorgia euryale* are also present in the northern Gulf of Mexico; however, no specimens were found in this study. Although this study provided contributions of *Leptogorgia* distribution along the south Texas coast, overall *Leptogorgia* distribution remains poorly studied along much of the western Gulf of Mexico.

Various gradients in abiotic factors (e.g., temperature, salinity, and depth) determine distribution of organisms throughout the Gulf of Mexico (Withers and Tunnell, 2007). Reduced precipitation and freshwater input in South Texas, compared with the remainder of the coast, results in higher annual salinities in the bays adjacent to the inlets. Brazos–Santiago Pass receives more tropical species whereas Aransas Pass, further north, receives more temperate species (Tunnell, 2002). Individual species of *Leptogorgia* may be distributed according to climatological gradients along the Texas coast, as well as throughout the Gulf of Mexico (Douglas, 1996).

Leptogorgia colonies provide benthic structure and habitat for many organisms and are able to withstand the harsh variable conditions of Texas jetties. Anthropogenic activities such as fishing, maritime traffic, and dredging pose an array of other direct and indirect dangers to *Leptogorgia* colonies including dislodgment, physical damage, and chemical pollution. Six colonies of *L. virgulata* recorded in the Aransas Pass surveys were found dislodged and laying on the substrate. Every colony collected for analysis in the course of this study was entangled in fishing line that had embedded in the tissue, causing scarring or adjacent tissue loss. Research, continued monitoring, and increased public awareness of the presence and need for healthy populations of *Leptogorgia* at all coastal inlets would promote conservation of this unique inlet habitat, and potentially reflect its importance as habitat to many marine organisms.

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