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William W. Schroeder
Dauphin Island Sea Lab

Thomas S. Hopkins
University of Alabama

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NORTHERN RECORD FOR THE ZOOXANTHELLATE SCLERACTINIAN CORAL *SIDERASTREA SIDEREA* (ELLIS AND SOLANDER) FROM THE GULF OF MEXICO

William W. Schroeder[1] and Thomas S. Hopkins[2]
[1]*Marine Science Program, The University of Alabama, Dauphin Island Sea Lab, Box 369, Dauphin Island, Alabama 36528, USA*
[2]*Department of Biological Sciences, The University of Alabama, Box 870344, Tuscaloosa, Alabama 35487-0344, USA*

ABSTRACT We report a northward range extension of the zooxanthellate scleractinian coral *Siderastrea siderea* (Ellis and Solander) in the Gulf of Mexico. Several small, living colonies of *S. siderea* have been obtained in dredge samples from a site located at 29° 55.5' N, 087° 28.4' W in the northeastern Gulf of Mexico. Prior to these collections the northernmost occurrence of *S. siderea* in the Gulf of Mexico was reported as 27° 54.5' N, 093° 35.8' W, on the East Flower Garden Bank, in the western Gulf of Mexico. In the eastern Gulf of Mexico, *S. siderea* is not reported occurring on the west Florida shelf north of the Florida Keys-Dry Tortugas or approximately 24° 55' N.

Introduction

In 1986 and 1988, during three oceanographic cruises surveying hardbottom habitats on the continental shelf off Alabama and northwestern Florida, seven living colonies of *S. siderea* (Ellis and Solander) were obtained on three separate slabs of hard substrate, brought up in Capetown dredge samples, from a site located at 29° 55.5' N, 087° 28.4' W (Figure 1). The colonies are all small, ranging in size from 1.8 x 1.5 x ~0.2 cm up to 6.1 x 5.1 x ~0.3 cm (Table 1) and are an encrusting form with a flattened, dome-like skeletal morphology.

The location where the specimens were collected is in an area called the Trysler Grounds and is locally known as Big Rock. Hardbottom substrates in the Trysler Grounds are primarily constructed from bioclastic limestones. They are present as scattered clusters of low relief (up to 1.5 m) outcrops. These outcrops tend to occupy the slope portions or bathymetric lows associated with the hummocky relief of extensive sand patches or large, low-amplitude sand waves. The Big Rock site is in 34 - 35 m of water approximately half way down the northwestern slope of a substantial bathymetric low. A set of tabular outcrops, some partially covered with sand, have been observed at this site during both remotely operated vehicle and manned submersible surveys. Individual outcrops, up to 5 m across and with 1 m of vertical relief, appear to be aligned in two or more parallel, discontinuous rows 2 - 3 m apart. Some of the outcrops are jointed along two or perhaps three nearly vertical planes, giving them a blocky, fractured appearance. Surface sediments in this mid-shelf region are principally composed of medium to fine, well sorted sands mixed with various sized areas of coarse sands and shell gravels and make up part of the MAFLA sand sheet (Doyle and Sparks 1980).

Monthly average bottom water temperature and salinity values in this region of the northern Gulf of Mexico range from 23 - 27° C in the summer to 16 - 19° C in the winter (Thompson and Leming, 1978; U.S. Department of Commerce, 1985; Brooks 1991) and 34.0 - 36.5 ppt year round (Darnell and Kleypas 1987; Brooks 1991), respectively. Extreme bottom water conditions in the vicinity of Big Rock, obtained over the period 1974 to 1990 from CTD vertical profiles taken during periodic cruises (unpublished data) and a moored instrument array (Brooks, 1991) , range from 13.1° C in December, 1989 to 29.4° C in September, 1989 and 30.2 ppt in June, 1979 to 36.7 ppt on a number of occasions. Water clarity is generally high but intervals of poor light penetration do occur (Manheim et al. 1972; Steward 1981). Turbid conditions have been observed to develop in the upper water column during periods of both high runoff from the Mississippi River or regional watersheds and high biological productivity and in the lower water column during synoptic scale, wind-wave resuspension events (e.g. tropical cyclones or cold-air outbreaks) or from the importation of a nepheloid layer formed in an adjacent shelf area.

Discussion

Prior to these collections the northernmost occurrence of *S. siderea* in the Gulf of Mexico was reported as 27° 54.5' N, 093° 35.8' W, on the East Flower

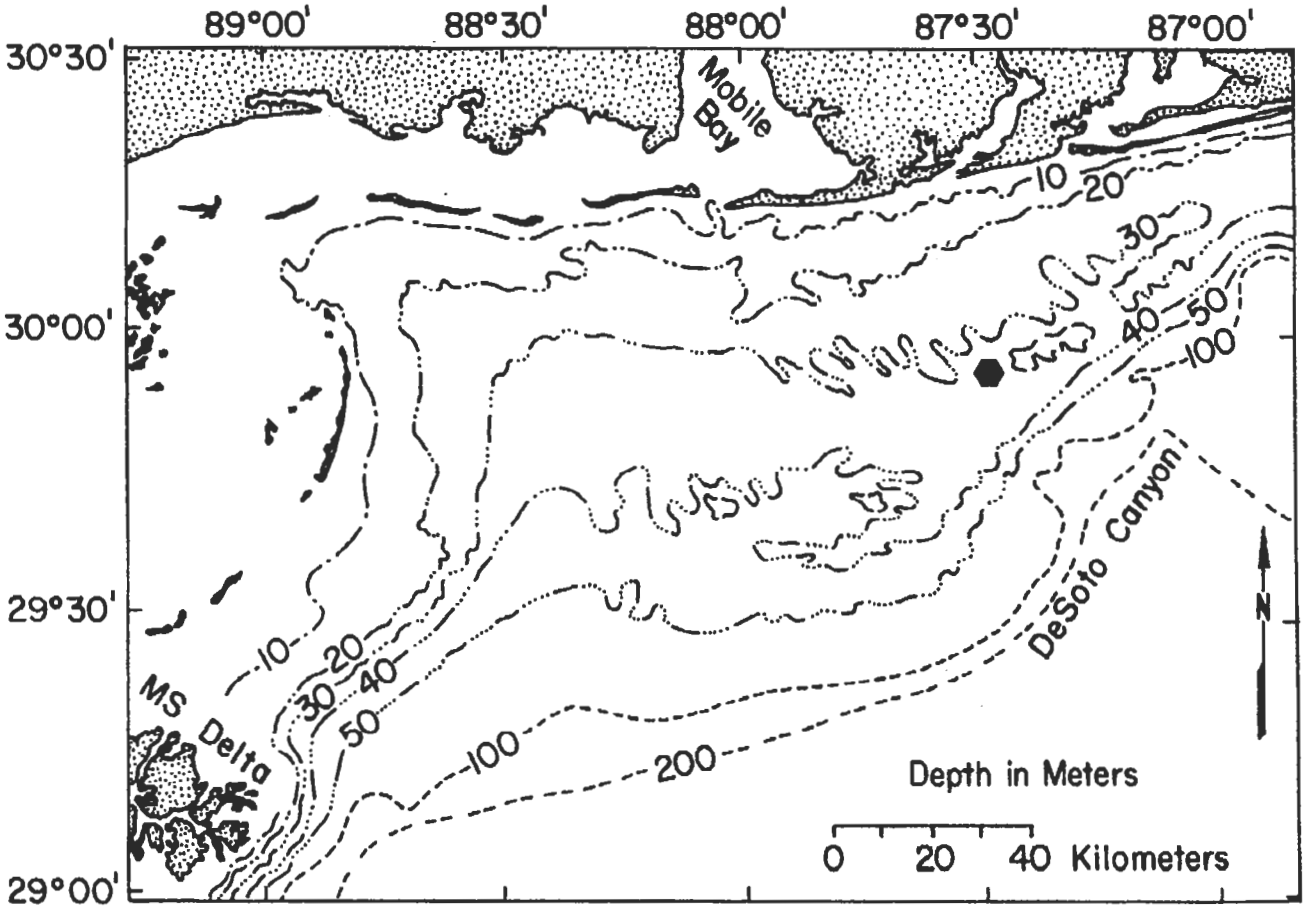

Figure 1. Location of Big Rock on the Alabama-northwest Florida continental shelf, northeastern Gulf of Mexico.

TABLE 1

Sampling dates and dimensions of *Siderastrea siderea* colonies collected at Big Rock (29° 55.5' N, 087° 28.4' W; water depth 34 to 35 m) on the Alabama-northwestern Florida continental shelf. * - archived as specimen No. 3766-1904 in the Marine Environmental Sciences Consortium Reference Coral Collection.

Colony	Date	Cruise	Dimensions
1	July 13, 1986	RSC-14	4.5 x 3.4 x ~0.3 cm
2	July 13, 1986	RSC-14	3.3 x 2.8 x ~0.2 cm
3	July 13, 1986	RSC-14	2.8 x 2.5 x ~0.2 cm
4	July 13, 1986	RSC-14	1.2 x 0.9 x ~0.2 cm
5	August 14, 1988	RSC-22	6.1 x 5.1 x ~0.3 cm*
6	August 14, 1988	RSC-22	1.8 x 1.5 x ~0.2 cm
7	October 11, 1988	ACSESS I-88	4.8 x 3.6 x ~0.3 cm

Garden Bank (EFGB), at the shelf break off the Texas-Louisiana coast in the western Gulf of Mexico (Bright et al. 1984; Rezak et al. 1985). Colonies can exceed 5 m in diameter (Gittings personal communication) and have been collected and/or observed at water depths from 21 - 50 m (Bright et al. 1984). Water temperatures measured at the EFGB from 1990 to 1995, at 19 m on the high diversity portion of the reef, ranged from 18.5 - 30.2° C (Gittings personal communication). These observations are consistent with the annual range of near-surface water temperatures (18 - 32° C) reported for this region by Etter and Cochrane (1975). In the eastern Gulf of Mexico *S. siderea* is not reported occurring on the west Florida shelf north of the Florida Keys-Dry Tortugas (FK-DT) or approximately 24° 55' N (Jaap and Wheaton 1975; Wheaton and Jaap 1988; Jaap et al. 1989; Chiappone and Sullivan, 1994). Colonies up to 1 m in diameter have been observed in the Florida Keys (Aronson personal communication). Water temperature extremes at the FK-DT range from 14 - 38° C while monthly mean values are between 18 - 30° C (Jaap 1984; Porter 1987).

Although the generally accepted lower temperature range for coral reef development is 16° - 18° C (Vaughan and Wells 1943; Levinton 1992) some hermatypic coral species, in non-reef building environments, have thermal threshold tolerances considerably lower (e.g. Wells 1955; Squires 1966; McCloskey 1970; Veron 1995). *S. siderea* is included among these species. For example, Macintyre and Pilkey (1969) and Macintyre (1970) report *S. siderea* in water depths of 20 - 40 m in Onslow Bay off North Carolina (approximately 34° 28' N) where winter bottom water temperatures can remain below 16° C for up to three months and values as low 10.6° C have been recorded. Therefore, the presence of *S. siderea* in the cooler waters of the continental shelf off Alabama and northwestern Florida, is not surprising. In addition, since *S. siderea* is a gonochoristic broadcasting species (Szmant 1986), transport of competent larvae, produced from colonies in reefs of the Yucatan Peninsula shelf, the Caribbean Sea and even the FK-DT area to this region of the Gulf of Mexico, can readily be accomplished during favorable northward intrusions of the Gulf Loop Current.

However, no living colonies or skeletal remains of *S. siderea*, or any other zooxanthellate scleractinian corals, have been found or observed on hard substrate during dredging, trawling, manned submersible or Scuba diving operations at numerous other inner and mid-shelf sites in this region of the Gulf of Mexico. We speculate that for the sites shallower than 34 - 35 m colder winter water temperatures, longer intervals of decreased water clarity, frequent periods of sediment abrasion associated with high wind-wave events and storm-driven sediment burial-exhumation cycles combine to prevent successful recruitment and/or survival. As for the sites at depths greater than 34 - 35 m the dominant factor is likely insufficient light intensity. The absence of *S. siderea* from the Florida Middle Ground (28° 35' N, 084° 16' W) (Grimm and Hopkins 1977), as well as other sites located on the West Florida shelf, has yet to be explained.

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