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OCCURRENCE OF MICROALGAE IN SOUTHWESTERN LOUISIANA COASTAL SALT FLATS[1]

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ABSTRACT A descriptive analysis of the edaphic algal flora in salt flats along the coastline of southwestern Louisiana is provided. Six salt flats containing the angiosperm *Salicornia* were surveyed in November 1978, and April 1979, for microalgae. Seven genera of Chrysophycophyta, eleven genera of Cyanochloronta, and eighteen genera of the Chlorophycophyta were found. The most abundant alga was *Oscillatoria* (sensu Drouet). The most common green alga was *Chlorosarcinopsis*.

INTRODUCTION

There have been few studies of edaphic microalgae along the coast of the Gulf of Mexico. The most notable reports are those of Sorensen and Conover (1962), Dykstra et al. (1975), Sage and Sullivan (1978) and Sullivan (1978). Other reports on the algal flora of inland saline soils include those of Nordin and Blinn (1972) and MacEntee and Bold (1978). Such studies typically report the presence of numerous genera of green and blue-green algae as well as diatoms and dinoflagellates (Round 1965).

The purpose of this study was to provide a descriptive analysis of the edaphic algae found in salt flats along the coast of Louisiana. Six salt flats located in the coastal salt marshes of southwestern Louisiana between the Mermentau and Sabine rivers were surveyed (Table 1). All of the sites are located above mean high tide and are irregularly flooded by fresh water from precipitation. The soil sediment (upper 2 cm) is composed primarily of clays and fine silt with no significant amounts of organic debris. Each of the edaphic habitats was devoid of spermatophytes. The prevalent angiosperm species bordering these sites were *Distichlis spicata* (L.) Greene, *Salicornia bigelovii* Torr. and *Suaeda linearis* (Ell.) Moq.

MATERIALS AND METHODS

Four soil samples to a depth of 2 cm were collected at each site on November 14, 1978, and April 10, 1979. These samples were analyzed for pH using a 1:1 water-soil slurry with a Markson Model 90 meter. Salinity was measured using a 2:1 water-soil slurry with a YSI Conductivity Bridge Model 31. Rainfall data were obtained from the National Oceanic and Atmospheric Administration (NOAA) Climatological Station at Rockefeller Wildlife Refuge. The soil samples were assayed for the presence of algae by the technique of enrichment culture as described by Brown and Bold (1964).

TABLE 1.

Location of study sites along the coast of southwestern Louisiana, arranged from east to west.

Site No.	Area	Parish	Latitude/Longitude
I	Rutherford Beach	Cameron	29° 45.2′ N 93° 05.9′ W
II	Cameron Jetties	Cameron	29° 45.1′ N 93° 20.1′ W
III	Cameron Jetties	Cameron	29° 45.2′ N 93° 20.1′ W
IV	Louisiana Helicopter Heliport	Cameron	29° 45.5′ N 93° 20.1′ W
V	Holly Beach	Cameron	29° 45.2′ N 93° 25.4′ W
VI	Johnson's Bayou	Cameron	29° 45.1′ N 93° 35.9′ W

RESULTS

The pH of the soil samples ranged from 8.07 to 8.95 and showed no seasonal fluctuation. Salinity varied from a low of 8 ppt at site III in the fall to 38 ppt at site IV in the spring. The mean salinity for all sites was 18 ppt. The total precipitation for November 1978 was 7.14 inches and 4.55 inches for April 1979.

Examination of the enrichment cultures after a 2-week incubation period revealed a rich microalgal flora (Table 2). Seven genera of the Chrysophycophyta were identified and diatoms were predominant. The most common diatoms belonged to the genera *Navicula*, *Nitzschia*, and *Amphora*. Eleven genera of the Cyanochloronta were found and the most frequent were *Anabaena*, *Oscillatoria* (sensu Drouet, 1968), and *Schizothrix*. Eighteen genera of the Chlorophycophyta were found. Some of these had to be isolated and subcultured to facilitate identification, and the most common genera were *Chlorococcum*, *Chlorosarcinopsis*, and *Tetracystis*. Several genera of diatoms and one dinoflagellate were observed only once and, in the absence of sufficient material, remained unidentified. Of all the algae reported in Table 2, *Oscillatoria* was the most abundant.

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TABLE 2.

Distribution of microalgae found in six salt flats along the coast of southwestern Louisiana.

	November 1978						April 1979					
	Site No.						Site No.					
Classification:	I	II	III	IV	V	VI	I	II	III	IV	V	VI
Chlorophycophyta												
Ankistrodesmus							+		+	+	+	
Bracteococcus			+		+							
Chlamydomonas	+	+	+			+	+	+				+
Chlorella		+						+				
Chlorococcum	+	+	+		+	+	+	+	+	+	+	+
Chlorosarcina						+						
Chlorosarcinopsis	+		+	+	+	+	+	+	+	+	+	+
Gleocystis												+
Klebsormidium		+	+									+
Microspora											+	
Pedimonas		+										
Pleuastrum		+	+					+				
Radiosphaera											+	
Rhizoclonium					+	+						+
Spongiochloris											+	
Stigeoclonium						+		+				+
Tetracystis	+	+	+	+			+		+	+		
Ulothrix						+						
Chrysophycophyta												
Amphora		+		+				+		+		
Botrydiopsis			+									
Chrysosarcinia				+								
Fragilaria		+				+		+				+
Navicula	+	+	+	+	+	+	+	+	+	+	+	+
Nitzschia	+					+	+					+
Ochromonas				+			+		+			+
Cyanochloronta												
Anabaena	+	+	+	+	+		+	+		+	+	
Aphanotheca	+			+			+					
Calothrix			+						+			+
Chroococcus	+		+				+				+	
Microcoleus					+							
Microcystis			+	+								+
Nodularia			+	+							+	
Nostoc			+						+			+
Oscillatoria	+	+	+	+	+	+	+	+	+	+	+	+
Schizothrix	+	+	+	+	+	+	+		+	+	+	+
Spirulina	+	+	+				+	+	+			
Totals	12	13	19	12	9	12	14	12	11	9	12	16

DISCUSSION

Differences in the total number of genera between the fall and spring flora were probably due to the decreased precipitation in the spring of 1979; this is particularly true of site III which drains a freshwater ditch. The high ratio of blue-green to green algae in this study may be due to the alkaline nature of the soils. The Cyanophyceae and Bacillariophyceae have been previously described as growing best in alkaline conditions (Lund 1946, Baker and Bold 1970, MacEntee et al. 1972, and Brock 1973). The diversity of blue-green algae in this study compares favorably with that reported by Sage and Sullivan (1978) for a Mississippi salt marsh. Although there were fewer genera of diatoms found in our study than reported for a coastal salt marsh by Sullivan (1978), the diatom flora of the salt flats compared favorably with that found in saline prairie soils by Nordin and Blinn (1972).

Brock (1973) stated that the green algae are the least sensitive to pH and are almost universal in occurrence in soils. However, one genus, which is reported to be sensitive to pH, is *Chlorosarcinopsis* (McComb and Maples 1979). Olson (1961) reported this genus to be characteristic of Wisconsin pine forests and their acidic soils. McComb and Maples (1979) reported *Chlorosarcinopsis* as rare in the acid soils (pH 4.6 to 5.2) beneath a slash pine canopy. Chantanchat and Bold (1962) found *Chlorosarcinopsis* to be a prevalent genus in arid alkaline soils. Dykstra et al. (1975) reported that *Chlorosarcinopsis* was the most abundant alga in the coastal soils of Texas (pH 6.2 to 6.7). In this study, we found *Chlorosarcinopsis* to be the most common green alga in the alkaline coastal soils of Louisiana.

A number of environmental parameters have been suggested as important factors affecting the distribution of soil algae. These include moisture, light, organic matter and phytotoxins. We believe that soil pH is one of the most important factors affecting the frequency and occurrence of soil algae, particularly in view of the known sensitivities of blue-green algae to low pH values. Further studies are needed concerning the effect pH has on the distribution of edaphic green algae. Such studies should consider sensitivities to pH values and distribution patterns at the species level.

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