THE ECOLOGY OF THE LITTORAL MARINE POLYCHAETES OF TIMBALIER BAY

by Philip L. Lewis and A. Geoffrey Fish

ABSTRACT

The marine polychaetes were studied for community structure, diversity, biomass, and abundance, and to determine the relationship of chemical and physical factors with their distribution in beaches located near petroleum production and control areas in Timbalier Bay, Louisiana.

Two northern mud beaches and two southern sand beaches were studied during July and October 1973 and January 1974. At each locality one beach was close to an oil production site; the control beach was remote from such activities. At the high-, mid-, and low-tide region of each beach, biological, chemical, and physical samples were collected. Total numbers and wet-weight biomass were determined and the biological data were analyzed by the Shannon and Weaver Diversity Index, Morisita-Ono Index of Faunal Affinity, and Analysis of Variance.

Twenty-one species were identified. Average numbers increased from July to January. The sand control beach was the richest area, followed by the mud production beach. The sand production beach was the poorest. Wet-weight biomasses were greatest in mud beaches and least in sand beaches. Faunal resemblances were greatest between the two mud beaches, the two sand beaches, and between the mud and sand production beaches. Sand beaches had higher diversities than mud beaches in July; the reverse was true in October. In January, production

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beaches had lower diversities than control beaches. The analysis of variance demonstrated that there were three distinct species-substrate associations. Some species were found only in mud beaches, a second group in sand beaches, and a third group in both mud and sand beaches. The mud production beach with an absence of petroleum had a larger population than its control; therefore, other factors seem to influence polychaete abundance in this beach. The sand production beach with visible hydrocarbons had lower numbers than its control. Other parameters were similar. Hydrocarbons may be associated with distribution in this beach, or other factors may have been responsible.

INTRODUCTION

In 1972, the Gulf Universities Research Consortium, in conjunction with affiliates from the petroleum industry, established the Offshore Ecology Investigation (OEI). The purpose was to determine whether petroleum production and related activities had any effects on marine organisms over an extended period of time.

The objectives of our research were to (1) evaluate the polychaete community structure, (2) compare the diversity, biomass, and abundance of polychaetes, and (3) determine the chemical and physical factors most important to the distribution of polychaetes in beaches located near petroleum-producing activities and control areas in Timbalier Bay, Louisiana.

Polychaetes are one of the most abundant groups of metazoans in marine sediments (Day 1967). Wass (1967) cited several studies of polychaetes known to tolerate oil pollution. Gilet (1960) reported that the polychaete *Capitella capitata* is one of the few animals to occur in large numbers on the bottom of the heavily oil-polluted port of Marseilles, and Reish (1960) cited *C. capitata* as an indicator of pollution in Japan and California. Nelson-Smith (1973) cited other studies of polychaetes in polluted areas. Orton (1925) observed large numbers of polychaetes burrowing in a lump of weathered oil, and George (1971) reported that a fresh fuel-oil spill at Southampton had no detectable effects on the mortality, growth, or reproduction of *Cirriformia tentaculata* or *Cirratulus cirratus*.

The Louisiana coastal area is well known for sustained long-term petroleum production and its associated activities. Special efforts have been made to study the role of marine organisms in this area in relation to petroleum-producing activities (Galtsoff et al. 1935; Mackin and Hopkins 1961; St. Amant 1971, 1972). These studies were directed toward selected communities, primarily oyster biocoenoses. Little attention has been given to the marine polychaetes of the coastal waters of Louisiana. Warren (1942) surveyed the marine annelids of Grand Isle and Hartman (1951) later described several littoral marine annelids collected by Dr. E. H. Behre and Dr. J. H. Roberts from the same locality.

MATERIALS AND METHODS

Description of the study area and station sites

Timbalier Bay is a segment of the system of large, shallow bays that are typical of the Louisiana coast. The bay area extends from latitudes 29°03′ to 29°19′ N and longitudes 90°13′ to 90°29′ W and is bounded on the east by the Lafourche Bayou region and on the west by Terrebonne Bay (figure 1). The maximum width is approximately 23.2 km and the length is 27.2 km. The total surface area is approximately 362.6 square km. The bay averages 1.8 m in depth. Access to the bay is through Grand Pass Timbalier, which connects the bay to the Gulf of Mexico. There is one tidal cycle each twenty-four hours with an average tidal range of about 0.3 m (Waldron 1963). Many of the islands within the bay are remnants of natural levees and consist of low-lying areas and marshes of muddy-sand sediments. The southern boundary of the bay is composed of natural sand barrier islands (Waldron 1963).

Four stations were established within the bay: two from the mud bottomed north-central region and two from the sand bottomed southern region. At both of these localities one station was located in major petroleum producing areas and designated the experimental station and the other was located at some distance from oil industry related activities and designated the control station. Descriptions of the stations are as follows: Station 1 (MES-1, figure 1) was located on the southeastern tip of Northwest Island at latitude 29°11.73′ N and longitude 90°20.93′ W. The island is located in the north central portion of Timbalier Bay. The study area was a narrow beach characterized by sediments containing a high silt-clay content and a high organic carbon content, which was sporadically covered with crushed shell material. This site was located within an oil producing area.

Station 2 (SES-2) was located on the northern side of East Timbalier Island, approximately 100 m northwest of a Gulf Oil Company installation at latitude 29°04.8′ N and longitude 90°17.20′ W. Sediments at this station had a low silt-clay content and a low organic carbon content.

Station 3 (MCS-3) was situated on the southwestern tip of a small, low-lying island located in the northeastern central portion of Timbalier

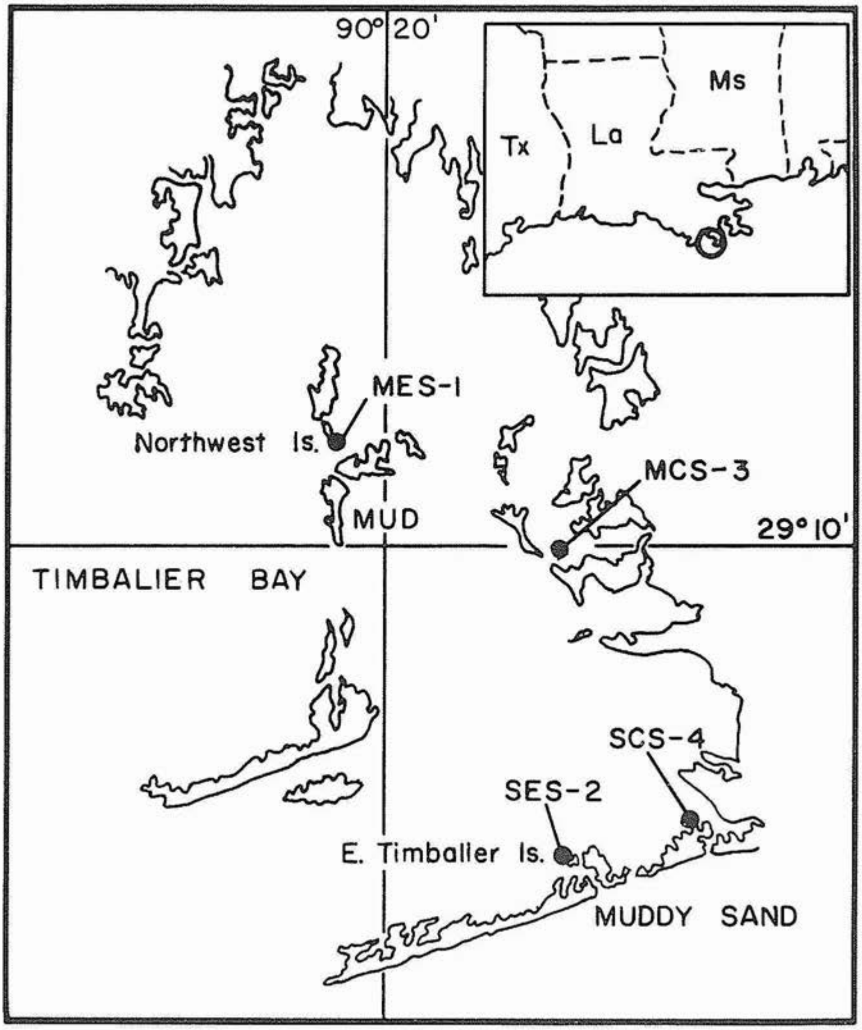

FIG. 1. LOCATION OF SAMPLING STATIONS WITHIN TIMBALIER BAY, LA.

Bay at latitude 29°09.80′ N and longitude 90°17.18′ W. The sample site was an isolated beach bound on both sides by *Spartina* and having sediments with a high silt-clay content and a high organic carbon content. This site was situated a suitable distance from oil producing areas and separated from these areas by small islands.

Station 4 (SCS-4) was established on a narrow sand island in the southeastern corner of Timbalier Bay at latitude 29°05.65′ N and longitude 90°14.59′ W. The beach was characterized by sediments with a low silt-clay and organic carbon content. This station was also located as far as possible from oil production activities and was designated the control station for Station 2.

Sampling techniques

A transect of the littoral region was established at the four selected sites in order to assess the variability of the polychaete community. A stratified sampling design was used (Hulings and Gray 1971). The beaches were divided according to tidal level into three sampling areas along the transect. Three replicate samples were obtained from each tidal zone with a hand operated corer, which was inserted to 10 cm in the substrate and circumscribed an area of 14 cm^2. The core was removed, stored in a glass jar, and preserved in 10% formalin. The number of replicates was increased to five following analyses of the July samples. Sediment samples for total organic and inorganic carbon analysis, hydrocarbon analysis, salinity, and pH were taken at each tide region at each station. Methods for the analysis of these factors followed the procedures in Standard Methods (1971) and Hulings and Gray. Hydrocarbons were determined by Dr. J. L. Laseter, University of New Orleans.

In the laboratory the faunal samples were washed through a set of two sieves (McIntyre 1964). The top sieve had a mesh opening of 2.0 mm and the bottom sieve had a mesh opening of 0.3 mm. Material in the top sieve was examined for polychaetes; material in the bottom sieve was washed into a vial and stained with a mixture of rose Bengal and 70% isopropyl alcohol. The polychaetes were removed from the stain after 24 hours, sorted, identified, and stored.

The Morisita-Ono Index of Faunal Affinity (Morisita 1959; Ono 1961) was used to determine similarity between stations. The diversity index as defined by Shannon and Weaver (1963) was used to measure the faunal similarity between the production and control station sites.

RESULTS

Environmental

The data collected from the physical and chemical measurements made during the survey are summarized in tables 1-4.

A comparison of sediment temperatures (table 1) indicated only slight variations between tide levels for all stations. Temperatures at stations SES-2 and SCS-4, in the southern bay region, were found to be higher than those at stations MES-1 and MCS-3 in the northern bay region. The variation may be attributed to differences in the slope and exposure of the beaches.

Table 1

Temperature (°C) observed at the high, mid, and low-tide regions in Timbalier Bay, from July 1973 to January 1974.

Station Number	Tidal Zone	Temperature °C		
		July 1972	October 1972	January 1973
MES-1				
Sediment	H	27	22	17
	M	27	22	17
	L	27	22	17
Water		27	22	17
SES-2				
Sediment	H	31	24	16
	M	31	23	16
	L	31	23	16
Water		31	24	16
MCS-3				
Sediment	H	27	23	16
	M	27	23	16
	L	27	23	17
Water		28	22	16
SCS-4				
Sediment	H	30	24	16
	M	29	24	16
	L	29	24	16
Water		30	25	16

Interstitial water was found to have a greater salinity range, 17 ppt to 34 ppt, than the adjacent seawater with a range 15 ppt to 27 ppt (table 2). The salinities at stations SES-2 and SCS-4 were, in general, higher and had a greater range, 21 ppt to 34 ppt, than those at stations MES-1 and MCS-3 with a range of 17 ppt to 27 ppt. The higher values at stations SES-2 and SCS-4, in the southern bay region, were probably due to the proximity of those stations to high salinity waters of the Gulf of Mexico.

A comparison of the organic content between stations (table 3) indicated similarity of readings between the two northern mud stations, MES-1 and MCS-3, and between the two southern sand stations, SES-2 and SCS-4, but little similarity between northern and southern stations. The higher organic content of MES-1 and MCS-3 was probably the result of dense aquatic vegetation, which extended to the water's edge. Aquatic

Table 2

The salinity (^{o}/oo) of the interstitial water and adjacent sea water of Timbalier Bay from July 1973 to January 1974.

Station Number	July 1973	October 1973	January 1974
MES-1	17	27	22
sea	15	27	19
SES-2	30	34	26
sea	21	25	21
MCS-3	19	22	23
sea	17	19	19
SCS-4	30	23	21
sea	21	23	20

Table 3

Organic carbon content (^{o}/oo) at the high, mid, and low-tide regions in Timbalier Bay from July 1973 to January 1974.

Station Number	Tidal Region	July 1973	October 1973	January 1974
MES-1	H	13.52	13.34	14.63
	M	14.35	10.91	24.49
	L	35.66	9.69	28.15
SES-2	H	8.00	3.20	3.93
	M	0.83	1.66	1.72
	L	3.12	2.63	2.57
MCS-3	H	12.19	11.00	16.39
	M	13.45	40.17	36.27
	L	9.44	22.39	27.31
SCS-4	H	1.25	6.31	8.16
	M	3.29	1.16	3.26
	L	1.49	3.92	4.89

Table 4

Sediment Analysis of samples taken at the high, mid, and low-tide regions in Timbalier Bay, October 1973

Station Number	Tidal Region	Percent Mud	Percent Sand and Gravel	Sorting Coefficient	Mean Grain Size (mm)
MES-1	H	85.14	14.86	-	-
	M	87.26	12.74	-	-
	L	93.26	6.74	-	-
SES-2	H	4.39	95.61	0.42	0.12
	M	4.39	95.37	0.37	0.11
	L	1.74	98.26	0.35	0.12
MCS-3	H	89.20	10.80	-	-
	M	94.10	5.89	-	-
	L	86.92	13.08	-	-
SCS-4	H	37.60	62.40	0.55	0.12
	M	21.38	78.62	0.56	0.13
	L	61.93	38.07	0.53	0.11

vegetation was lacking at SES-2 and SCS-4. The organic carbon content in general was higher in January than in July, perhaps because of the incorporation of dead material from salt marsh and terrestrial vegetation into the sediments from the past season. Considerable variation was encountered between levels within a beach and no level was consistently higher in organic carbon than another. Measurements tended to be higher in the northern mud beaches than in the southern sand beaches. The results may indicate the effects of particle size upon the distribution of organic carbon within a beach. Fine-grained particles retain organic carbon particles, and because of poor percolation along the beach, greater variation can be expected. In beaches with better drainage, SES-2 and SCS-4, the variation between beach levels was somewhat reduced.

A mechanical analysis was carried out on sediment samples collected on the October 1973 survey (table 4). The highest values for percentage of silt-clay (mud) were recorded for MES-1 and MCS-3. Sand fractions were small, and the mean grain size and sorting coefficients could not be determined. A high percentage of the particles in the sand fractions at MES-1 and MCS-3 was shell fragments. The sediments at SES-2 consisted of very fine sand, which was well sorted. Sediments at SCS-4 were also composed of very fine sand, but the sorting was not as well defined.

Biological

Twenty-one species of polychaetes were collected from the littoral region of four selected beaches in Timbalier Bay. The species composition, total numbers, and mean number of polychaetes per core are shown in table 5 (pp. 520-521). Of the 21 species collected, six were common to MES-1 and MCS-3 but absent at SES-2 and SCS-4. Many species collected in the study area were rare. Their absence in some samples may be due to inherent error associated with random sampling.

The seasonal change in abundance indicates that polychaetes are generally more abundant in January than in October (figure 2, p. 522). The lowest number of polychaetes was recorded for July.

There was little consistency to the pattern of distribution of organisms with respect to tidal level at MES-1 and MCS-3. During October at MES-1, mean numbers for all tide levels were greater than at MCS-3 and the reverse was somewhat true in July and January. A clearer distribution occurred at SES-2 and SCS-4. The mean numbers of organisms per tidal level were always greater at SCS-4 than at SES-2, with the exception of July for the high- and mid-tide levels. A mean was calculated for the three tide levels per collection to reduce variation with respect to tide level. These data indicate that mean numbers of organisms were greater at the control stations (MCS-3 and SCS-4) than at the experimental stations (MES-1 and SES-2) with an exception during October at MES-1. The two southern stations also showed the greatest fluctuation in mean numbers. The richest area quantitatively was SCS-4, whereas SES-2 had the lowest mean numbers. The two northern bay stations (MES-1 and MCS-3) showed more uniformity in means. At all stations mean numbers tended to rise from July to January with maximum means in January.

The wet-weight biomass of the polychaetes is shown in table 6. In general, the highest values were reported in January at all stations. Biomass means at MES-1 and MCS-3 were higher than those at SES-2 and SCS-4. The higher values at MES-1 and MCS-3 may be attributed to the large populations of *Neanthes succinea* at these stations (table 5).

The Morisita-Ono Index of Faunal Affinity between stations is shown in table 7. A $C\lambda$ value of 1.0 indicates complete faunal similarity and a $C\lambda$ value of 0 indicates no faunal similarity. The faunal resemblance was greatest between MES-1 and MCS-3 in the northern bay region. The second highest faunal resemblance was between SES-2 and SCS-4 in the southern bay region. Faunal resemblances were least between northern and southern bay stations; the faunal resemblance was greater between production stations (MES-1 and SES-2) than between control stations (MCS-3 and SCS-4).

The Shannon-Weaver species diversity index (H') was calculated for each station to determine the community diversity (table 8). Diversities at SES-2 and SCS-4 were found to be higher than those at MES-1 and MCS-3 for July. In October, only slight variations between stations occurred; however, the values were higher at MES-1 and MCS-3.

TABLE 5

THE SPECIES COMPOSITION OF POLYCHAETES, TOTAL NUMBERS PER TIDE LEVEL, MEAN NUMBER OF ORGANISMS PER CORE, AND MEAN OF THREE TIDE LEVELS PER MONTH FOR JULY, OCTOBER, AND JANUARY 1973-74

STATION NUMBER	MES-1									SES-2								
DATE	JULY			OCT			JAN			JULY			OCT			JAN		
TIDAL LEVEL	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
SPECIES COMPOSITION																		
Etenoe heteropoda	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Loandalia americana	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
Streblospio benedicti	0	0	0	2	2	0	0	1	2	2	0	0	1	3	3	0	3	9
Polydora socialis	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1
Notomastus hemipodus	0	0	1	0	6	1	0	0	0	0	0	0	0	6	1	0	0	0
Heteromastus filiformis	0	0	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Capitella capitata	0	0	0	2	35	22	11	33	55	2	2	0	0	0	9	4	19	3
Malanid sp.	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Hesionid sp.	0	0	0	0	1	4	0	0	2	0	0	0	0	0	0	0	0	0
Neanthes succinea	13	4	9	110	56	27	46	46	135	1	0	0	0	0	2	0	4	0
Spiochaetopterus oculatus	0	0	0	0	0	11	0	0	0	0	0	0	0	1	0	0	0	0
Paraeurythoe americana	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Megalomma bioculatum	0	0	0	3	17	6	2	0	9	0	0	0	0	0	0	0	0	0
Dorvillea rudolphi	0	0	0	0	0	1	1	4	0	0	0	0	0	0	0	0	0	0
Sphaerosyllis sp. a	0	0	0	5	26	12	1	2	1	0	0	0	0	0	0	0	0	0
Sphaerosyllis sp. b	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Autolytus fasciatus	0	0	0	0	8	1	0	2	6	0	0	0	0	0	0	0	0	0
Exogone dispar	0	0	0	0	0	0	0	1	12	0	0	0	0	0	0	0	0	0
Tharyx monilaris	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Sthenelais boa	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Paranoid sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MEAN NO. ORGANISMS PER CORE	4.3	1.3	3.3	25.6	30.8	17.6	12.6	17.8	44.4	1.6	0.6	1.0	0.6	2.2	3.0	0.8	5.2	2.6
MEAN OF 3 TIDE LEVELS PER MONTH	3.0			24.7			24.9			1.1			1.9			2.9		

MCS-3									SCS-4								
JULY			OCT			JAN			JULY			OCT			JAN		
H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L
0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	4	2	4	0	0	45	16	58	6	9	238	167
0	0	0	0	0	0	3	10	6	0	0	0	0	0	0	0	32	1
0	0	1	0	0	0	101	30	5	0	0	4	0	2	3	0	0	0
0	0	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
5	1	0	5	5	3	19	8	11	0	0	0	18	4	6	16	7	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0
6	51	9	36	8	0	47	51	47	0	0	4	2	2	3	0	4	0
0	0	0	0	15	12	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	1	13	0	0	0	0	0	20
0	0	1	7	4	2	10	22	14	0	0	0	0	0	2	0	1	1
0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
0	0	0	7	18	4	1	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	14	9	0	0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	19	9	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	0	0	5	5	3	0	0	0	23
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	5	6	0	0	0	0	0
	17.3		11.2		4.2		30.0			0.3		9.4		4.0		56.3	
3.6		4.0		10.8		40.8		19.4	0.0		27.3		13.8		5.0		53.2
	8.3			8.7			30.1			9.2			9.1			38.2	

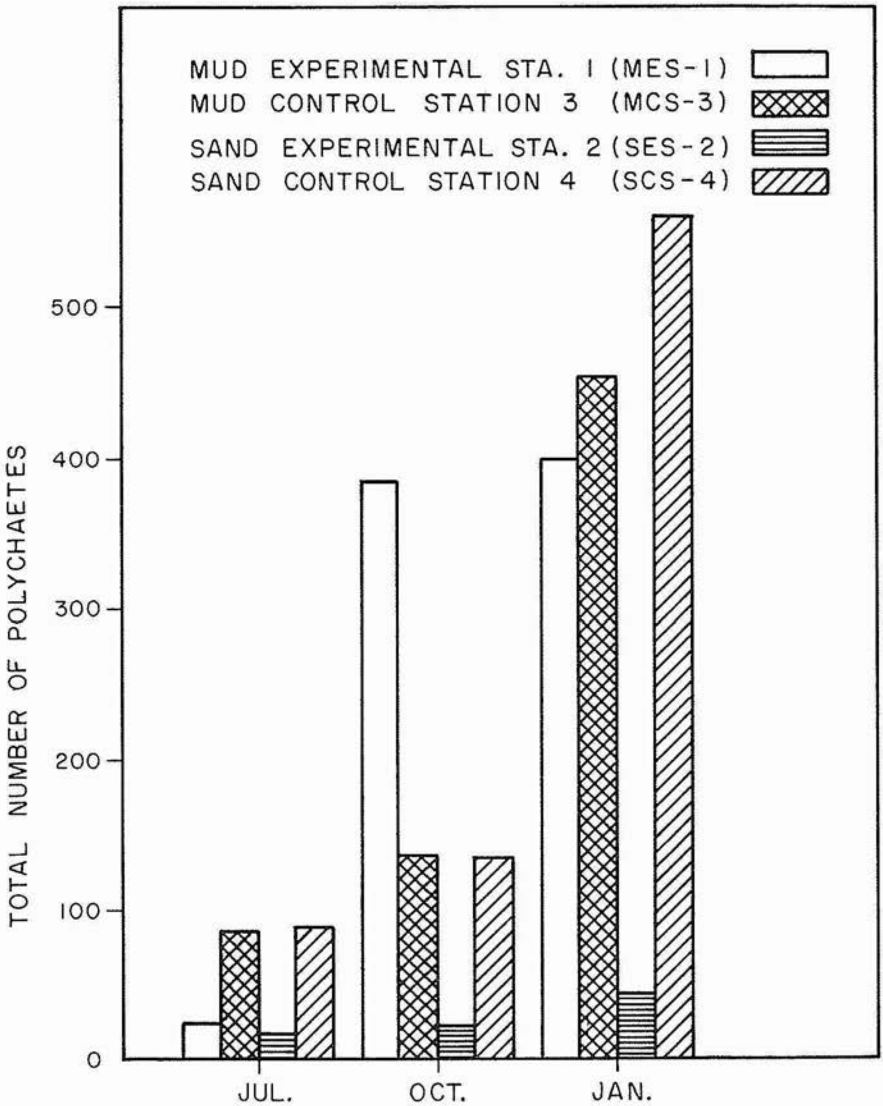

FIG. 2. TOTAL NUMBER OF POLYCHAETES COLLECTED from MES-1, MCS-3, SES-2, and SCS-4 during July, October, and January.

Table 6

The mean biomass per core (mg/cm^3) for each tide region at each station site from July 1973 to January 1974.

Station Number	Tidal Region	July 1973	October 1973	January 1974
MES-1	H	0.010	0.159	0.102
	M	0.001	0.153	0.816
	L	0.005	0.081	1.370
	Mean	0.005	0.131	0.763
SES-2	H	0.011	0.001	0.007
	M	0.005	0.022	0.022
	L	0.013	0.021	0.018
	Mean	0.009	0.015	0.016
MCS-3	H	0.006	0.123	0.821
	M	0.202	0.036	0.827
	L	0.214	0.004	1.060
	Mean	0.140	0.057	0.902
SCS-4	H	0.001	0.104	0.013
	M	0.001	0.102	0.158
	L	0.438	0.059	0.978
	Mean	0.146	0.088	0.383

Table 7

The Morisita-Ono Index of Faunal Affinity between Stations of Timbalier Bay from July 1973 to January 1974.

	MES-1	SES-2	MCS-3	SCS-4
MES-1	+	0.44	0.84	0.10
SES-2		+	0.37	0.61
MCS-3			+	0.08
SCS-4				+

Table 8

The number of species, number of individuals, and species diversity for all stations from July 1973 to January 1974.

Station Number	Date	Number of Species	Number of Individuals	Species Diversity Index (H')
MES-1	July	2	27	0.23
	October	16	370	2.35
	January	11	374	1.67
SES-2	July	5	10	2.12
	October	7	28	2.13
	January	4	43	1.39
MCS-3	July	5	75	0.69
	October	9	132	2.43
	January	13	451	2.74
SCS-4	July	8	83	1.73
	October	8	137	2.11
	January	9	572	1.48

Diversity indices at MES-1 and SES-2 were noticeably lower than those at MCS-3 and SCS-4 in January.

DISCUSSION

Three analytical methods were used in this study to establish whether or not changes in the polychaete community were associated with petroleum producing activities. Several physical and chemical measurements were also taken in order to determine which environmental factors influenced the distribution of organisms.

It has been previously emphasized that biological samples were taken from petroleum production areas and control areas located maximum distances from petroleum producing activities. Although the control areas were not isolated from potential petroleum pollutants, we assumed that they were not affected by petroleum producing activities.

McIntyre (1969) suggested that temperature and salinity operating directly, and grain size operating indirectly, control the distribution of benthic organisms. Pettibone (1967) indicated that polychaetes are highly euryhaline organisms adapted to living in varying salinities. In the present study the northern stations had salinities similar to those of the southern stations, but the polychaete composition was different. Thus, there appears little evidence to indicate that salinity was an important factor in the distribution of polychaetes in Timbalier Bay.

McIntyre reported that the polychaetes were fewer in the spring and more numerous in late autumn and winter. A similar seasonal cycle was found in the present study. Pettibone indicated that sexually mature polychaetes may be found swimming at the surface during the spawning season between early spring and late summer. Therefore, fewer polychaetes are found in the benthic environment in July, the time at which the higher water temperatures occurred.

The abundance of polychaetes in the present study increased in October and January. Tietjen (1969) also found significant peaks in total numbers of polychaetes during late summer and early fall. The increase in total numbers might be due to settlement of the metamorphosed larvae.

The effects of grain size are of fundamental importance in the ecology of benthic invertebrates. Larger grain sizes allow more percolation of tidal waters, which removes trapped organic material. Sandy beaches are characteristically low in organic detritus. In sediments containing a large percentage of clay, the percolation of tidal waters is decreased and the organic material is not readily removed; therefore, mud beaches are characteristically higher in organic detritus.

In the present study the data indicate significant differences in polychaete abundances throughout Timbalier Bay, suggesting the occurrence of two distinct biofacies. There are those primarily found in the northern mud beaches, and those predominantly found in the southern sand beaches. A third group of species occurred in both mud and sand beaches.

The mud biofacies was characterized by the occurrence of *Neanthes succinea*, *Megalomma bioculatum*, *Exogone dispar*, *Sphaerosyllis* species *a*, and *Sphaerosyllis* species *b*.

All samples of polychaetes from MES-1 and MCS-3 were dominated by *Neanthes succinea* and *Megalomma bioculatum*. *Sphaerosyllis* species *a* was prominent in October, but decreased in January; the reverse relationship was true for *Sphaerosyllis* species *b*. *Exogone dispar* was not found in samples collected in October, but was common in most samples collected in January. The northern stations (MES-1 and MCS-3) had a high silt-clay content and were rich in organic detritus. These stations supported large populations of deposit feeders such as *Neanthes succinea* and *Exogone dispar*.

The sand biofacies was characterized by the dominance of *Streblospio benedicti*, *Polydora socialis*, and *Tharyx monilaris*.

Streblospio benedicti was the dominant species found in samples collected at SES-2 and SCS-4. *Polydora socialis* and *Tharyx monilaris* were negligible in October, but prominent in January. The southern stations (SES-2 and SCS-4) were composed of a very fine sand and little organic detritus was present. Here suspension feeders, such as *Streblospio benedicti*, replaced the deposit feeders, a replacement expected in view of the lack of detritus.

Notomastus hemipodus and *Capitella capitata* occurred at all stations and were generally abundant in Timbalier Bay.

Dr. J. L. Laseter (personal communication) was not able to support or disprove the hypothesis that petroleum hydrocarbons exist at any station because hydrocarbon samples taken during the present study produced insufficient results. He did comment that the hydrocarbons present seem to be in an advanced state of degradation.

The results (table 5) indicate that MES-1, in a production area, supported larger populations of *Neanthes succinea*, *Capitella capitata*, and *Sphaerosyllis* species *a* than its control MCS-3. Four other species, *Heteromastus filiformis, Hesionid* sp., *Dorvillea rudolphi,* and *Autolytus fasciatus,* although present in very small numbers, also occurred in greater numbers at MES-1 than at MCS-3. Four other species, *Eteone heteropoda, Loandalia americana, Malanid* sp., and *Paraeurythoe americana* were represented only at MES-1.

Spiochaetopterus oculatus, *Megalomma bioculatum*, *Streblospio benedicti*, *Polydora socialis*, *Notomastus hemipodus*, *Sphaerosyllis* species *b*, and *Exogone dispar* were more common at MCS-3 than at MES-1, but only one species, *Tharyx monilaris*, was found at MCS-3 and not at MES-1.

The faunal affinity between MES-1 and MCS-3 (table 8) was greater than between any other combination of two stations, and the physical and chemical parameters at both MES-1 and MCS-3 were quite similar (tables 1-4). There was also no indication of the physical presence of petroleum at either station. It is concluded that factors other than oil pollution were controlling the abundance of these polychaetes at MES-1.

The lowest number of polychaetes was always recorded from SES-2 (table 5). This station was located close to workover rigs and just northwest of the channel leading to a Gulf Oil Company installation. Although hydrocarbons from petroleum could not be identified by Dr. J. L. Laseter, tarry balls were found in sediment samples taken in October and January, and an oil film was always present in the holes dug for the collection of interstitial water at all tide levels. On the other hand, SCS-4, which had similar physical and chemical parameters and no indication of petroleum hydrocarbons, supported large populations of polychaetes, in particular *Streblospio benedicti* and *Capitella capitata, Eteone heteropoda*, *Polydora socialis*, *Notomastus hemipodus*, *Neanthes succinea, Paraeurythoe americana, Tharyx monilaris,* and *Paranoid* sp. Only one species, *Loandalia americana*, represented by one specimen, was collected at SES-2 and not at SCS-4. The faunal affinity index (table 8) was also relatively low between these stations. The sparsity of polychaetes at SES-2 may bear some relationship to such factors as boat traffic in and out of the Gulf Oil Company installation, the presence of petroleum hydrocarbons present within the substrate, or some other unknown factor.

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