

# PELAGIC, EPIBENTHIC, AND INFAUNAL INVERTEBRATES OF TIMBALIER BAY AND OFFSHORE ENVIRONMENT

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## ABSTRACT

Offshore and Timbalier Bay, Louisiana, sites were sampled with trawls and benthic grabs to determine if there have been any effects of petroleum drilling and production activities on the invertebrate fauna of the area. Collections were made at a drilling site, a production platform, and a control site at both in-shore and offshore localities. The dominant invertebrate fauna was similar at all stations within a locality. The catch per unit effort was highest at the control station in two instances and at the upstream drilling station in two sampling series. The biomass was highest at the control sites for both benthic grab series of samplings. On the basis of these data no major differences were noted between the petroleum activity sites and control area.

## INTRODUCTION

The "Oil Patch" around the Grand Isle, Louisiana, area has long been regarded as a highly productive fisheries area particularly with reference to the shrimp, blue crab, and oyster fisheries.

Some insight into the biological nature of this area has been provided, but years after petroleum production was initiated. Perret et al. (1971) noted that only 13 invertebrate species were taken from the Terrebonne-Timbalier Bay area in 168 seine and trawl samples. Adkins (1972) sampled this same area for blue crabs parasitized by the barnacle *Loxothylacus*

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*texanus* and reported only on the catch of blue crabs. Gaidry and White (1973) reported on brown and white shrimp taken from five trawl stations. St. Amant et al. (1965) worked on brown shrimp in Barataria Bay and Perret (1966, 1967) studied the fauna of Vermilion Bay. Gunter (1952) reported on the changes in the salinity regime of the general southwestern area of Louisiana due to leveeing of the Mississippi River and its tributaries. Behre (1950) and Dawson (1966) provided checklists of the fauna of the Grand Isle area. Felder (1973) presented a key to the reptantian decapods of the northwestern Gulf of Mexico. Comprehensive biological surveys of this area of the continental shelf along the Louisiana coast were not made prior to oil exploration and development. In the absence of previous data it is difficult to ascertain whether or not 35 years of oil production activities have led to any adverse effect on this bay and offshore environment. This study was conducted to determine what effects these activities may have had on the benthic invertebrate populations in Timbalier Bay and the adjacent offshore area.

#### MATERIALS AND METHODS

Samples were collected from the offshore sites for epifauna with a 9.4 m trawl provided with 3 cm mesh and for infauna with a 0.2 m<sup>2</sup> Van Veen type bottom grab. Surface trawls were taken for pelagic species with a 1.2 × 2.4 m opening and 0.6 cm mesh webbing along the sides and 0.3 cm mesh webbing at the end.

Samples in Timbalier Bay were collected with a 4.9 m trawl provided with 1.9 cm mesh netting along the sides and 0.3 cm mesh in the end. Benthic grabs were taken with a 0.1 m<sup>2</sup> Petersen-type sampler. Surface plankton tows were taken with a 0.9 × 1.2 m framed mouth and 0.6 cm mesh webbing in the body and 0.3 cm mesh webbing in the end.

All nets were towed 20 minutes. Samples were fixed in 10% formalin on the boat and transported to the Gulf Coast Research Laboratory for analysis. Samples were sorted to lowest taxa possible and aliquot samples of up to 100 individuals from each group were taken, weighed to the nearest 0.1 g, and the length measured to the nearest mm. All specimens were counted and weighed.

Bottom grab samples were washed through a 0.5 mm sieve and fixed in 5% buffered formalin for transfer to GCRL. The material was identified to the lowest taxon possible. Total count and weights were made for each group and species.

Species diversity values were computed using the equation of Wilhm (1968), where species diversity  $H' = \sum_{i=1}^S pi \log 2pi$ ; with  $pi = ni/N$ ,  $ni$  = number of species, and  $N$  = total number of organisms.

Samples were taken upstream and downstream from an active drilling rig and an active production rig, and at a control site that was located as far as possible from any petroleum production activities. The offshore drilling sites were occupied only twice because drilling ceased. Production and control sites were visited on each cruise.

## RESULTS

The data for the offshore and Timbalier Bay trawls and grabs are summarized in tables 1-4. Comparisons of data for the most part cannot be made because of the different number of samples taken at the four sites. However, some comparisons can be made by comparing catch per unit effort between stations and for the dominant species. The catch per unit effort was highest at the control site for the offshore trawling samples and the Timbalier Bay grab samples. The upstream drilling site had the highest values for the offshore grab samples and Timbalier Bay trawling samples. The dominant species at the offshore drilling sites were *Calliactis tricolor*, *Trachypeneus similis*, *Pagurus pollicaris*, and *Lolliguncula brevis*, with the greatest number of specimens per unit effort taken from the control site (table 1). The dominant species from the offshore benthic grabs were counted but not identified; the highest number per sample were taken from the upstream drilling site (table 2). The dominant species encountered in the Timbalier Bay trawling samples were *Penaeus aztecus*, *P. setiferus*, *Callinectes sapidus*, *C. similis*, and *Lolliguncula brevis*, with the greatest number of specimens per unit effort taken from the downstream drilling site (table 3). The polychaete *Spiochaetopterus costarum* was the dominant species taken in the benthic grabs in Timbalier Bay, but the number of specimens collected was not determined (table 4).

The biomass per sample was calculated for the benthic grabs for offshore and Timbalier Bay. In both instances the biomass was considerably higher in the control than those values for the remaining three samples within a series.

## DISCUSSION

On the basis of these data it is impossible to state whether or not there is any statistically significant difference in the biota of one site over the others. The number of samples, which were as few as one in some instances, varied from site to site, and not all the specimens were identified from the benthic samples. On the qualitative comparison of the dominant species present, the four stations within a site were similar. The

Table 1  
Number of Species and Specimens  
Collected in Offshore Trawls

Species	Number of Specimens			
	Upstream Drilling	Downstream Drilling	Production	Control
<b>Coelenterata</b>				
<i>Chrysaora quinquecirtha</i>			1	
<i>Pelagia noctiluca</i>		abundant		common
Anthozoa			1	
<i>Calliactis tricolor</i>	87	98	53	347
<b>Crustacea</b>				
<i>Lironeca texana</i>		1		
<i>Neroclia lanceolata</i>	1			
Hyperiididae			1	
Decapoda				2
<i>Penaeus aztecus</i>			10	29
<i>P. setiferus</i>	12	27	1	14
<i>Trachypeneus similis</i>	12	18	14	199
<i>Sicyonia dorsalis</i>		1		5
<i>Aetes americanus</i>			1	
<i>Latreutes fucorum</i>				6
<i>Leander tenuicornis</i>				2
<i>Calappa sulcata</i>		3	2	2
<i>Hepatus epheliticus</i>	2	2		1
<i>Persephonia crinita</i>	2			2
<i>Libinia dubia</i>	2			1
<i>Callinectes sapidus</i>	2	1	2	
<i>C. similis</i>	4	4		13
<i>Metoporphaphis calcarata</i>				1
<i>Portunus gibbesii</i>	2	1		24
<i>P. spinimanus</i>	4	6	2	7
<i>Albunea paretii</i>				6
<i>Paqurus pollicaris</i>	36	42	22	253
<i>Petrochirus diogenes</i>	3	8		2
<i>Porcellana sayana</i>	2	9	1	16
Porcellanidae				1
<i>Squilla empusa</i>				12
Stomatopoda	7	3	1	12
<b>Mollusca</b>				
<i>Loligo peali</i>			10	5
<i>Lolliguncula brevis</i>	18	24	44	229
<i>Octopus vulgaris</i>		1		
<i>Busycon contrarium</i>	1			
<i>Cantharus cancellarius</i>	1	1		14
<i>Crepidula fornicata</i>	1	3		15
<i>Murex fulvescens</i>			1	
<i>Sinum perspectivum</i>			1	
<i>Noetia ponderosa</i>				2
Nudibranchia	3			1
Total Number of Species	20	20	18	30
Total Number of Specimens	202	253+	167	1223+
Species Diversity	4.3	5.0	5.1	5.4
Catch/Unit Effort	101	125.5	23.9	152.9
Number of Trawls	2	2	7	8

Table 2  
 Number of Specimens of Infaunal Species  
 Collected in Offshore Grab Samples

Species	Number of Specimens			
	Upstream Drilling	Downstream Drilling	Production	Control
Coelenterata				
Actiniaria			1	
Nemertea				
<i>Cerebratulus lacteus</i>				1
Polychaeta				
<i>Spiochaetopterus costarum</i> unidentified	38	17	41	abundant 411
Crustacea				
Amphipoda	1		3	10
Mysidacea	1	1		1
<i>Oxyurostylis smithi</i>	1		1	
<i>Leptocheila serratorbita</i>				1
<i>Ambidexter symmetricus</i>				1
<i>Calappa</i> sp.				1
<i>Squilla empusa</i>				1
Mollusca				
<i>Cantharus cancellarius</i>	1		1	
<i>Corbula krebiana</i>	20		9	
<i>C.</i> sp.	17	2	6	
<i>Abra aequalis</i>	2	2		2
<i>Nucula concentrica</i>	2		3	7
<i>N. acuta</i>			5	
<i>N. proxima</i>	2			2
<i>Solen veridis</i>			1	
<i>Lucina amianthus</i>			2	
<i>Tellina iris</i>				3
<i>T.</i> sp.	2		1	
<i>Cumingia tellionides</i>				3
<i>Callocardia texastana</i>				1
<i>Chione latilirata</i>				1
<i>Phacoides filiosus</i>				2
<i>Mercenaria campechiensis</i>				1
Vitrinellidae				2
pelecypods, unidentified		1	1	
<i>Oliva sayana</i>			1	
Ophiuroidea, unidentified	10	5	4	40
unidentified specimens	12	14	35	34
Total Number of Species	13	7	16	21
Total Number of Specimens	109	42	110	232+
Biomass (g)/Sample	3.9	0.9	6.2	15.8+
Number of Samples	1	1	4	4
Catch/Unit Effort	109	42	28	58+

Table 3  
Number of Species and Specimens Collected  
in Timbalier Bay Trawls

Species	Number of Specimens			
	Upstream Drilling	Downstream Drilling	Production	Control
Polychaeta, unidentified			1	
Crustacea				
<i>Aegathoa oculata</i>	1		1	
<i>Cymothoa excisa</i>	3	7		
<i>Lironeca ovalis</i>			1	
<i>Penaeus aztecus</i>	102	34	81	109
<i>P. setiferus</i>	29	43	112	175
<i>P. duorarum</i>				4
<i>Trachypenaeus similis</i>			14	4
<i>Palaemonetes vulgaris</i>				2
<i>Xiphopeneus kroyeri</i>			1	
<i>Callinectes sapidus</i>	32	8	31	46
<i>C. similis</i>	7	7	43	26
<i>Portunus gibbesii</i>				1
Xanthidae	2		1	1
<i>Clibanarius vittatus</i>	1		1	3
<i>Panopeus herbstii</i>				1
<i>Pagurus annulipes</i>				1
<i>P. longicarpus</i>	1	1	7	9
<i>P. polltcaris</i>	5	1	2	8
<i>Squilla empusa</i>	1	1	10	44
Mollusca				
<i>Lolliguncula brevis</i>	108	147	83	57
<i>Nassarius vibex</i>	1		1	1
<i>Anchis avara</i>				1
<i>Polinices duplicatus</i>			1	
<i>Thais laemastoma</i>	2		1	5
<i>Crepidula fornicata</i>				1
<i>Chione cancellata</i>			1	
<i>Mulinia lateralis</i>			2	6
<i>Nuculana concentrica</i>				1
Ectoprocta				
<i>Bugula neritina</i>	present		common	abundant
Number of Species	15	9	21	23
Number of Specimens	375+	249	395+	507+
Species Diversity	3.0	2.5	5.5	5.1
Catch/Unit Effort	46.9	35.8	35.9	46.1
Number of Trawls	6	5	9	9

sediment characteristics were more closely compacted around the drilling and production platforms, possibly as a result of the discharge of drilling mud, which may account for the higher biomass values measured from the benthic grab samples at the control site.

Trawls were taken out from two production rigs to determine whether or not any difference in number of species and species diversity occurred. No relationship was found to exist between the species composition or species diversity with respect to distance from the rig.

Table 4  
 Number of Specimens of Infaunal Species  
 Collected in Timbalier Bay Grab Samples

Species	Number of Specimens			
	Upstream Drilling	Downstream Drilling	Production	Control
<b>Polychaeta</b>				
<i>Spiochaetopterus costarum</i>	+	+	+	abundant
<i>Lepidonotus</i> sp.				7
Amphinomidae				1
<i>Drilonereis</i> sp.				4
<i>Lumbrineris</i> sp.				3
<i>Branchioasychis americana</i>				4
<i>Magelona</i> sp.				1
Onuphidae				1
unidentified	8	4	40	115
<b>Crustacea</b>				
Amphipoda		1		2
<i>Ogyrides limicola</i>	4		7	
<i>Pagurus annulipes</i>				1
<i>P.</i> sp.				2
<i>Callinectes</i> sp.				1
<b>Mollusca</b>				
<i>Mulinia lateralis</i>		2	8	7
<i>Nuculana concentrica</i>			1	6
<i>Tellina versicolor</i>				2
<i>Corbula contracta</i>				4
<i>Tagelus divinus</i>				1
<i>Ensis minor</i>				8
<i>Anachis avara</i>				4
<i>Nassarius acutus</i>			1	10
Ophiuroidea, unidentified			23	75
<b>Pisces</b>				
<i>Anchoa mitchilli</i>	3			1
<i>Myrophis punctatus</i>				2
<i>Ophidion welshi</i>	1			
unidentified specimens	5	5	9	21
Number of Species	6	5	8	25
Number of Specimens	21+	12+	89+	283+
Biomass (g)/Sample	0.4+	0.1+	1.3+	5.3+
Number of Samples	2	2	4	4
Catch/Unit Effort	10.5+	6+	22.3+	71

### CONCLUSIONS

Any definitive conclusions concerning the impact of oil production activities on the macroinvertebrate fauna in this area are difficult to draw primarily because of the small number of samples collected and the lack of historical data. Higher biomass values at the control site may be accounted for by the presence of compact drilling muds at the drilling and production sites.

## ACKNOWLEDGMENT

This research was supported by contract number OB-74-HJM to the Gulf Coast Research Laboratory.

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