

## Job Report

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### A Summary of Oyster Studies Along the Texas Coast

Abstract: The intensity of the 1963 oyster (Crassostrea virginica) spat set was generally less than that observed in 1962. The set appeared to be more abundant along the lower coast than on the upper coast.

A decline in apparent abundance of year-old seed stock was noted, beginning in late spring. Unlike 1962, little increase in the abundance of seed oysters occurred during the fall.

Market oyster stocks increased in Galveston Bay but declined in other bay areas. Extensive losses among market oysters in Aransas, San Antonio and Lavaca Bays occurred during the summer and fall. These mortalities were not associated with Dermocystidium marinum. Another organism, possibly "Malpeque Bay disease", was believed to be responsible.

In spite of heavy mortalities along the middle coast, a record oyster harvest was obtained during the 1963-64 season. Most of the harvest (85%) was reported from Galveston Bay. Increased fishing pressure, reduction of the legal size limit to three inches, and an increase in the abundance of market oysters were factors responsible for increased production in Galveston Bay.

Objectives: To summarize data obtained from studies of oyster populations in several bay areas along the Texas Coast.

Procedures: Nineteen oyster reefs (six in Galveston Bay, three in Matagorda Bay, four in San Antonio Bay, five in Aransas Bay, and one in South Bay) were sampled at intervals (generally monthly) by dredging, tonging or collecting by hand. A standard sample consisting of one bushel (2150 cubic inches) of uncultured oysters was collected at each station visit. All live oysters collected in the sample were measured to the nearest millimeter along the right valve from the tip of the beak to the tip of the bill. In certain instances, additional bushel samples were collected to provide supplementary information on market oyster stocks. In such samples, only market oysters, over 75 millimeters in length, were measured.

Ten market oysters from each of the population samples were selected for determination of the infection incidence of the parasite, Dermocystidium marinum. Sections of rectal tissue from each oyster were cultured in fluid

thioglycollate medium containing Mycostatin and Chloromycetin. Analyses of the cultures, following Ray's techniques (1952) were made at the Rockport and Seabrook laboratories. The weighted incidence of infection was determined using the numerical system described by Mackin (1961).

Oyster platforms supporting two thousand or more oysters in trays were employed in Aransas and Galveston Bays for special mortality studies. Oysters were examined at weekly or bi-weekly intervals and dead oysters were removed and measured. Gaper tissues were cultured in thioglycollate-antibiotic medium to determine the presence of Dermocystidium marinum. The gapers were then fixed in Zenker-acetic fixative, washed in tap water, and preserved in iso-propyl alcohol. Live oyster samples were also collected and treated in a similar manner. Preserved oysters were sent to Dr. J. G. Mackin at Texas A & M University for sectioning and analysis. A report covering data obtained from the mortality studies will be presented by Dr. J. G. Mackin at a later date.

#### Findings and

#### Discussion:

Galveston Bay stations included Hanna Reef, Red Fish Reef, Todd's Dump, Bart's Pass, Scott's Reef and Beasley's Reef. These stations were unchanged from the previous year. In Matagorda Bay, Middle Ground Reef, Sand Point Reef and Gadwall Reef (artificial) were sampled. Three other stations sampled in 1962 (Oliver Point, Dressing Point and Raymond Shoal) were dropped. The San Antonio Bay stations (Mosquito Point Reef, Josephine Reef, Panther Point Reef and Chicken Foot Reef) remained unchanged from the previous year. Stations sampled in Aransas Bay; Bray's Cove, Lap Reef, Long Reef, Half Moon Reef and Pintail Reef (artificial); also remained unchanged from 1962. Because oysters were scarce on the public grounds in South Bay, sampling was confined to a private oyster lease. Furthermore, South Bay samples were collected by hand, and represent culled, rather than uncultured, oysters per bushel. For these reasons, South Bay data are not entirely comparable to those obtained in other areas.

#### Oyster Population Trends

To determine general oyster population trends within each bay system, the number of oysters collected at all stations each month were averaged as "monthly bay indices". Three size (length) categories were used: Spat (25 millimeters or less); Seed (26-75 millimeters); and Market (76 millimeters and over). Data obtained in 1962 were treated in a similar manner for comparison between years. Indices of spat, seed and market oyster stocks within the bay systems are presented in Tables 1-5 and shown graphically in Figures 1-5.

The Matagorda Bay indices (Table 2, Figure 2) were based upon samples from two natural reefs (Middle Ground and Sand Point) which were sampled both in 1962 and 1963. The artificial reef (Gadwall) was also sampled both years but was not used in preparing the bay indices because the young (less than one-year old) oysters sampled in 1962 could not be compared to the community present in 1963. Data for only two reefs, one in Lavaca Bay and one in Matagorda Bay, cannot be considered entirely representative of the Matagorda Bay system.

South Bay indices (Table 5, Figure 5) have been included, primarily to compare trends in spat and seed stock during 1963 with other bay areas. Data from 1962 have not been used.

The indices for Galveston Bay (Table 1, Figure 1), San Antonio Bay (Table 3, Figure 3), and Aransas Bay (Table 4, Figure 4) are based upon six, four and five stations, respectively and are more reliable indicators of population trends than are indices from the other two bay systems.

### Spat Stock

A peak setting period for oyster spat occurred in all bay areas sampled during late May or early June. Substantial, secondary, setting peaks were also noted in the Matagorda Bay system during September and October, but such fall sets were not significant in other areas.

In South Bay, large numbers of spat were found in January, indicating that significant sets occurred during the winter months. Smaller numbers of spat in Aransas Bay during March also indicated that winter spawning and setting had taken place.

Spat stocks were most abundant during June in South Bay and Aransas Bay, July in San Antonio Bay and Galveston Bay, and August in Matagorda Bay. Spat appeared to be most abundant in South Bay and least abundant in Galveston Bay. There was a general pattern of decreasing abundance of spat from the lower coast to the upper coast.

The abundance of spat in Aransas Bay and Matagorda Bay was influenced by large populations of the Gulf oyster, Ostrea equestris, (Heffernan, 1963a; King, 1963). Approximately 10 per cent to 70 per cent of the spat in Matagorda Bay and approximately 90 per cent of the spat in Aransas Bay were found to be O. equestris. The Gulf oyster was not reported from San Antonio Bay or South Bay (although it had been found in the lower Laguna Madre). It was present, but rare, in Galveston Bay.

In general, the peak abundance of spat appeared to be greater in 1962 than in 1963. Survival of the 1963 set in the Galveston, San Antonio and Aransas Bay systems appeared to be less than the 1962 set. In Matagorda Bay, however, 1963 set apparently suffered less mortality than did the 1962 set.

### Seed Oyster Stock

Seed oyster stocks, which had been abundant in all bay systems at the beginning of the year, began to decline during the spring and early summer months, indicating poor survival of the 1962 set. The decline began in April in Galveston and Aransas Bays, May in South Bay, and July in San Antonio Bay.

In Matagorda Bay, an initial loss in seed stock occurred in February, followed by an increase during March and April. The spring-summer pattern, as found in other bay systems, began in May.

In all bay systems, increases in seed oyster stock occurred during late summer or early fall as the 1963 set attained seed size. However, survival of this set appeared to be poor and, in most instances, the set did not produce any substantial increase in seed stock. Only in Matagorda Bay did the seed stock show an appreciable increase through recruitment of the 1963 set. This was halted in October, chiefly through seed losses in Lavaca Bay.

Comparisons of seed stock during 1962 and 1963 show marked differences. In 1962, seed stock, which was low during the first part of the year (probably due to poor survival of the 1961 set), increased in abundance, reaching a peak in the fall as the 1962 set reached seed size.

#### Market Oyster Stock

The number of market oysters collected in samples increased in Galveston Bay, declined slightly in Matagorda Bay and South Bay, and decreased markedly in San Antonio Bay and Aransas Bay during 1963. Losses among market oysters were first noted during April in Aransas Bay and July in San Antonio Bay. Although somewhat obscure in the bays indices, a decline in market oyster stock occurred in Lavaca Bay in October, but was offset by an increase in market oysters on Middle Ground Reef. Only in Galveston Bay was there an increase in market oyster stocks throughout the year.

During 1962, market oyster stocks in Galveston Bay and San Antonio Bay tended to increase in abundance. In Aransas Bay, market oysters showed an increase until July when substantial mortalities occurred. Market stocks appeared to be less abundant during the fall and winter than during the summer in Matagorda Bay.

With the exception of Galveston Bay, market oyster stocks at the end of 1963 were lower than those found at the end of 1962. In Galveston Bay, the pattern of increasing abundance was similar during both years but market oysters were consistently more abundant in 1963 than in 1962.

#### Oyster Mortality

With the exception of South Bay, the oyster parasite (Dermocystidium marinum) was found in all bay areas sampled. The incidence of infection increased in Galveston Bay (as compared to 1962) but decreased in the mid-coastal areas (Heffernan, 1963b). It could not be associated with the high oyster mortalities in Aransas, San Antonio and Lavaca Bays.

In Aransas Bay mortalities occurred during March-May, 1963 and again during October-December, 1963. In San Antonio Bay, mortalities were first noted



among oysters in the upper bay area during July. By the end of the year, most of the seed and market oysters in this portion of the bay had been killed. No unusual mortality was noted in lower San Antonio Bay or in Espiritu Santo Bay. Mortalities among seed and market oysters were found on Sand Point Reef in Lavaca Bay during the fall and, by the end of the year, only spat survived. Such mortalities were widespread throughout Lavaca Bay.

The organism responsible for the Aransas Bay mortalities has been tentatively identified as the "Malpeque Bay Disease" organism (Mackin et al, 1964). Unlike Dermocystidium marinum, which affects only the older oysters, Malpeque Bay disease affects the young as well as the older oysters. Because of the nature of the mortalities in San Antonio Bay and Lavaca Bay, it is probable that this organism was also responsible for oyster losses in these two areas.

### Oyster Production

In February, 1963 the legal size limit of oysters harvested from Galveston Bay was reduced from three and one-half inches to three inches (from hinge to bill) by proclamation of the Texas Game and Fish Commission. Effective August 1, 1963, the legal size of three inches was established by proclamation for the entire Texas Coast.

The size reduction was designed to prevent waste of oysters between three inches and three and one-half inches which were subject to considerable mortality (caused by Dermocystidium marinum) before they could normally be harvested. Because of the extensive mortalities among seed stock, as well as market oysters, in Aransas, San Antonio and Lavaca Bays, the reduced size limit provided only slight benefit to the harvest from those areas. It was, however, beneficial in Galveston Bay where abundant market stocks were exposed to an increasing incidence of the parasite.

During the 1963-64 season, 2,404,143 pounds of oyster meat were harvested from Texas waters as compared to 1,732,019 pounds of oyster meat harvested during the previous season. This was an increase of approximately 39 per cent over the 1962-63 harvest.

Most of the harvest (2,043,351 pounds, or approximately 85 per cent) came from Galveston Bay. Increased fishing pressure, especially during the early months of the season, the reduction in size limit, and an apparent increase in market oyster stocks, were factors contributing to the record harvest in Galveston Bay.

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TABLE 1: Comparison of the average number of spat, seed and market oysters per bushel sample collected at monthly intervals at six reefs in Galveston Bay during 1962 and 1963.

MONTH	SPAT		SEED		MARKET	
	1962	1963	1962	1963	1962	1963
1	-	-	-	-	-	-
2	80*	32	153*	245	29*	41
3	34*	39	159*	257	28*	45
4	32*	27	150*	229	27*	40
5	11*	90	138*	202	25*	37
6	342	127	136	194	26	48
7	216	288	141	166	29	46
8	193	107	184	178	39	45
9	163	70	290	151	30	45
10	110	96	318	194	40	55
11	74	33	313	118	55	61
12	52	28	269	129	48	59

\* In January - May, 1962 only three of the six reefs were sampled each month. Bi-monthly averages of Jan.-Feb., Feb.-March, March-April, and April-May were used to represent these months.

TABLE 2: Comparison of the average number of spat, seed and market oysters per bushel sample collected at monthly intervals from two reefs in Matagorda Bay during 1962 and 1963.

MONTH	SPAT		SEED		MARKET	
	1962	1963	1962	1963	1962	1963
1	-	118	-	610	-	40
2	-	46	-	322	-	18
3	-	48	-	369	-	38
4	-	40	-	444	-	34
5	-	56	-	404	-	26
6	642	106	95	354	38	44
7	318	306	144	316	28	32
8	663	577	156	331	36	42
9	254	567	201	404	26	24
10	476	524	368	246	28	9
11	-	521	-	242	-	30
12	104	267	350	186	28	16

TABLE 5:      Number of spat, seed and market oysters per culled bushel sample collected at monthly intervals from a private oyster lease in South Bay during 1963.

MONTH	SPAT	SEED	MARKET
1	2160	676	27
2	1204	708	84
3	872	700	104
4	604	896	56
5	1652	488	116
6	2968	415	82
7	1481	487	38
8	1249	544	65
9	1158	364	40
10	682	320	52
11	596	338	62
12	262	464	54



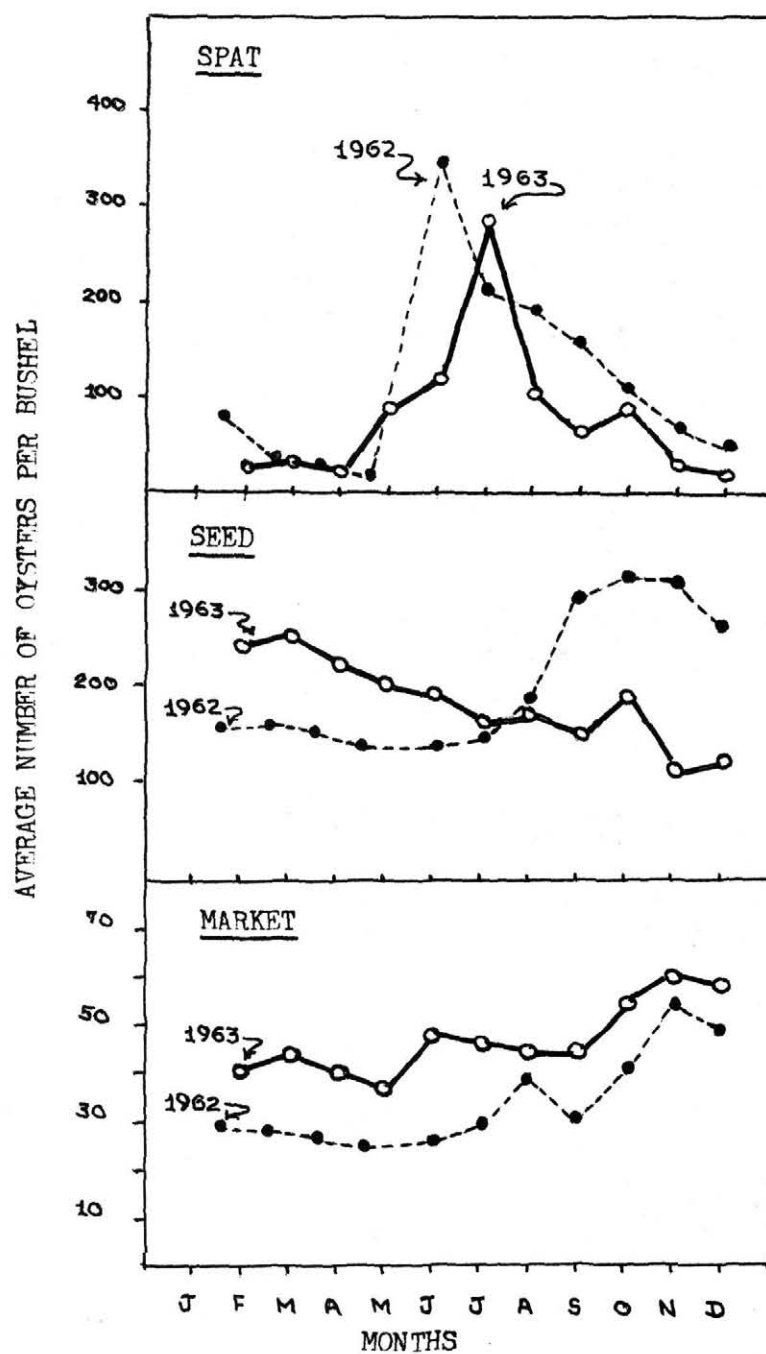
TABLE 3: Comparison of the average number of spat, seed and market oysters per bushel sample collected at monthly intervals from four reefs in San Antonio Bay during 1962 and 1963.

MONTH	SPAT		SEED		MARKET	
	1962	1963	1962	1963	1962	1963
1	32	-	146	-	20	-
2	-	-	-	-	-	-
3	19	79	245	339	24	48
4	3	150	140	345	26	42
5	3	-	146	-	29	-
6	110	298	234	349	22	40
7	694	639	240	282	27	22
8	438	332	279	181	23	18
9	282	324	300	238	28	11
10	221	-	394	-	22	-
11	234	260	301	210	32	14
12	270	239	293	157	48	11

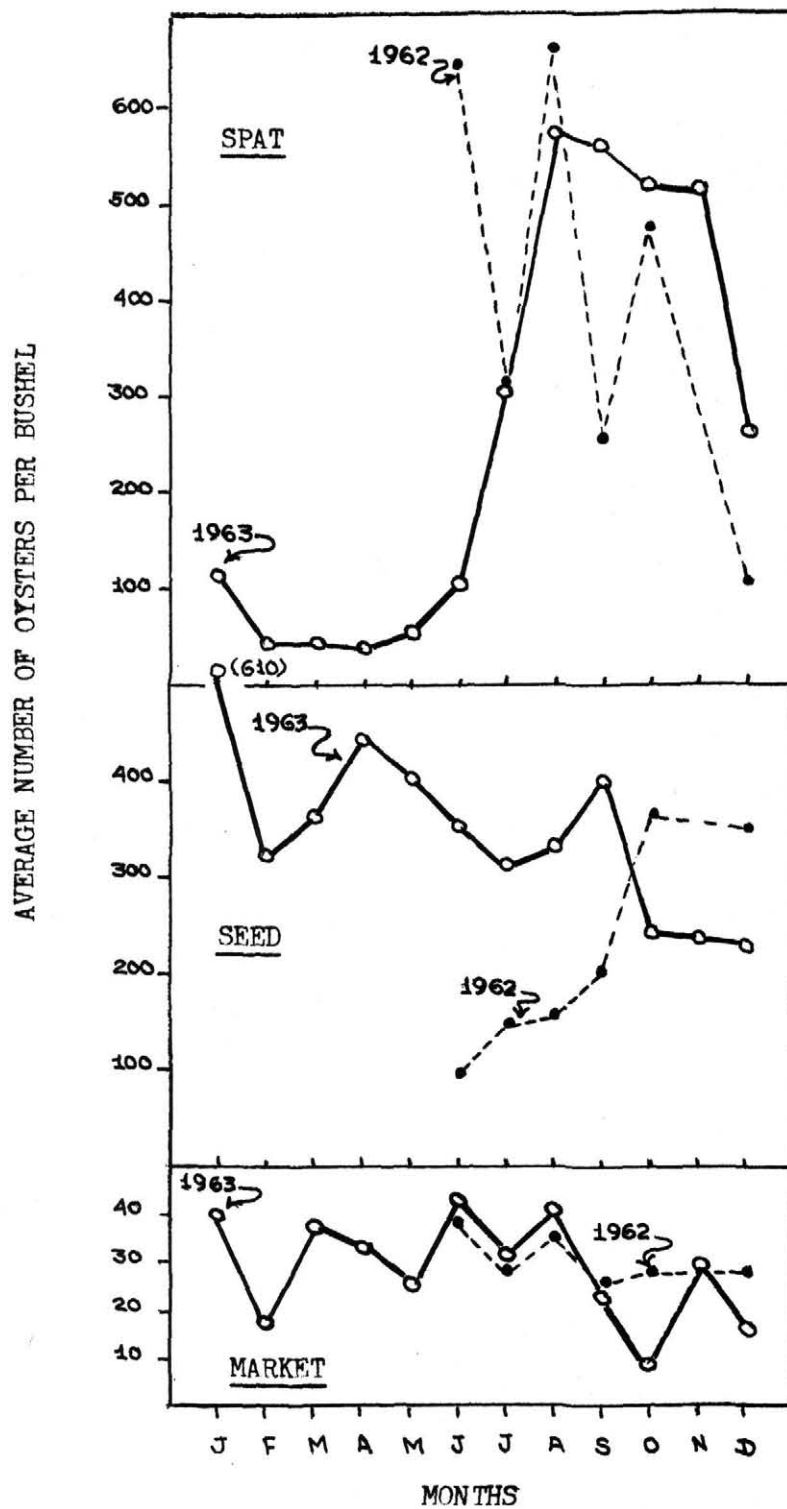
TABLE 4: Comparison of the average number of spat, seed and market oysters per bushel sample collected from five reefs at monthly intervals in Aransas Bay during 1962 and 1963.

MONTH	SPAT		SEED		MARKET	
	1962	1963	1962	1963	1962	1963
1	12	210	172	375	18	41
2	22	270	139	440	24	34
3	10	391	159	492	28	39
4	49	44	193	223	21	30
5	27	12	180	182	22	8
6	2491	1414	250	156	40	10
7	1658	613	280	116	45	3
8	245	-	188	84	20	5
9	164	-	446	-	33	-
10	306	114	583	164	19	4
11	-	120	-	226	-	5
12	26	45	260	186	24	11

**FIGURE 1 :** Average number of spat, seed and market oysters per bushel sample collected at monthly intervals from six reefs in Galveston Bay - 1962, 1963.



**FIGURE 2 :** Average number of spat, seed and market oysters per bushel sample collected at monthly intervals from two reefs in Matagorda Bay - 1962, 1963.



**FIGURE 3 :** Average number of spat, seed and market oysters per bushel sample collected at monthly intervals from four reefs in San Antonio Bay - 1962, 1963.

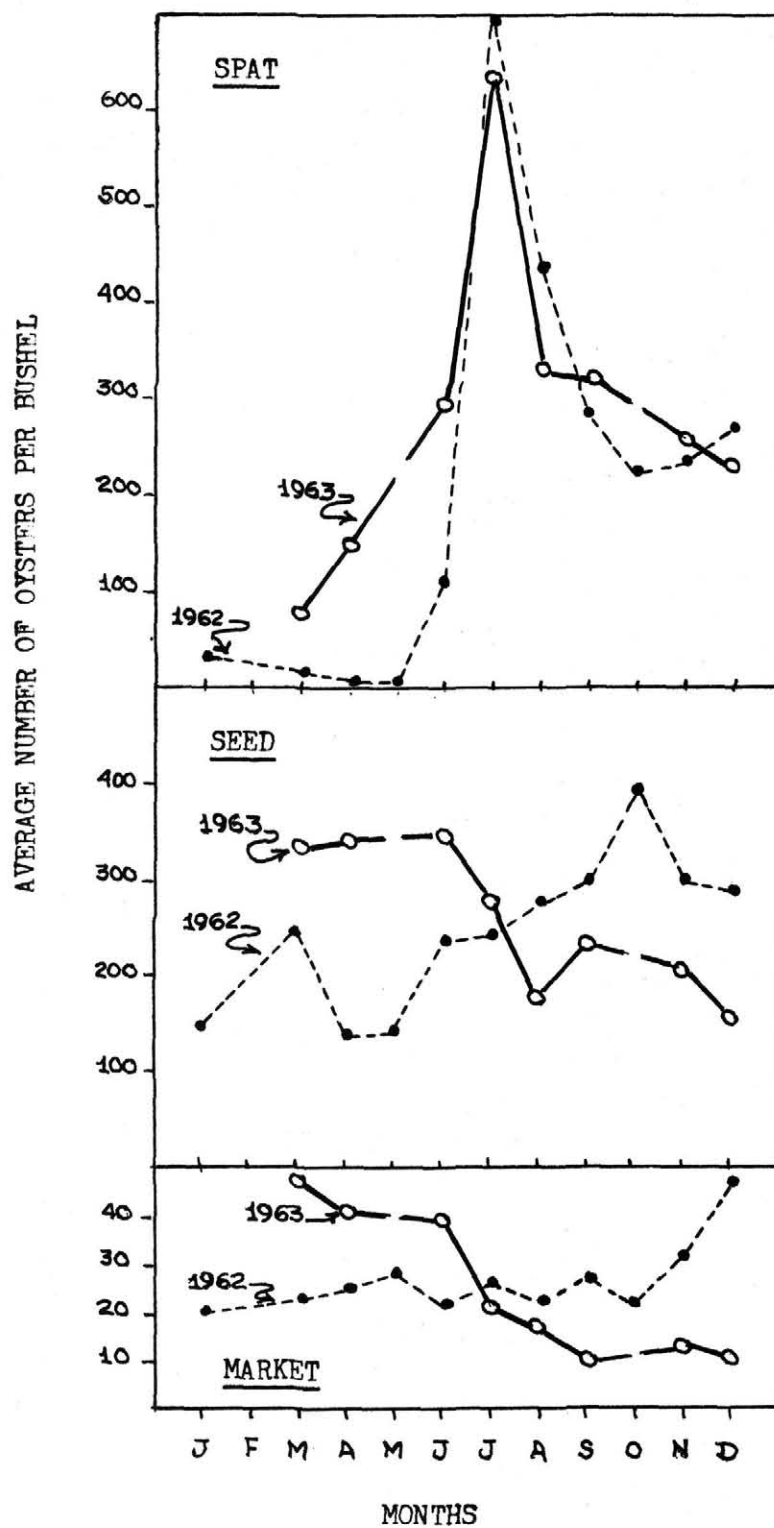
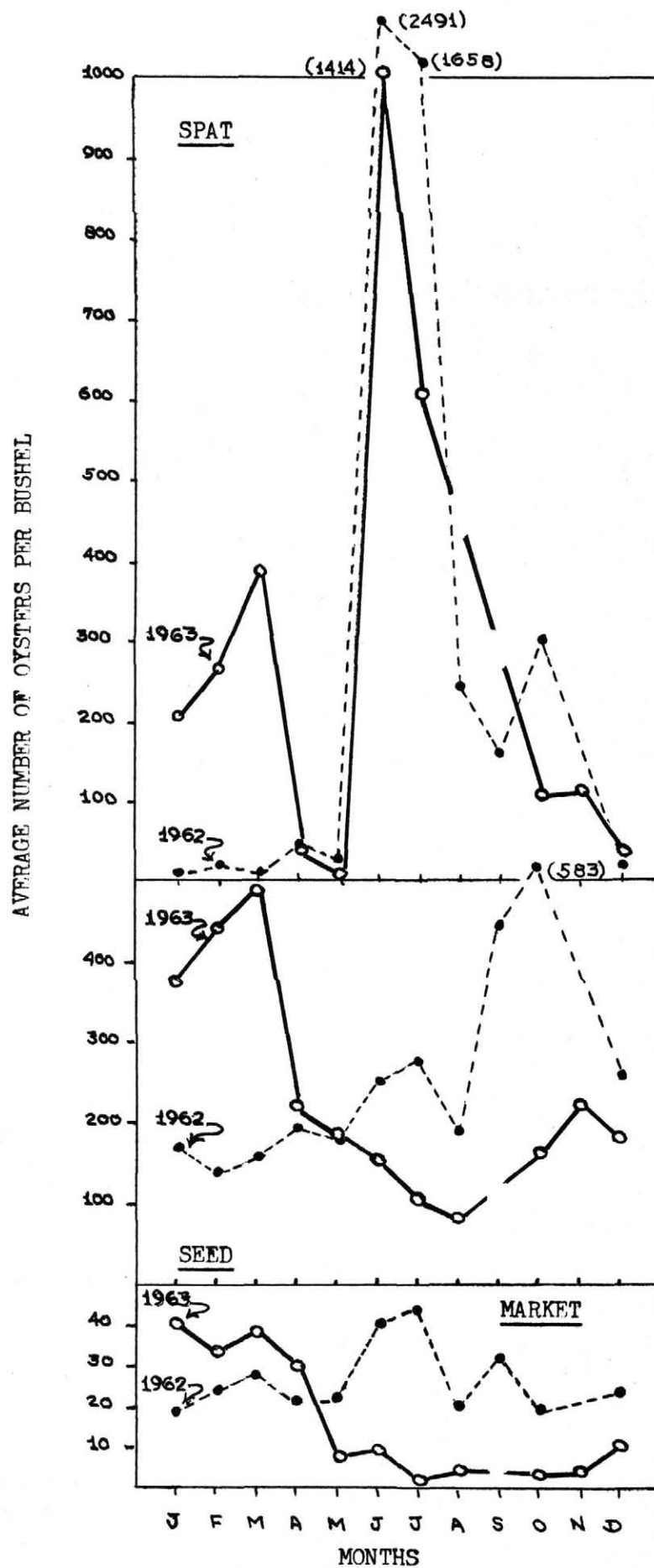


FIGURE 4: Average number of spat, seed and market oysters per bushel sample collected at monthly intervals from five reefs in Arkansas Bay - 1962, 1963.



**FIGURE 5 :** Number of spat, seed and market oysters per culled bushel sample collected at monthly intervals from a private oyster lease in South Bay, 1963.

