

JOB REPORT

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Study of the Oyster (Crassostrea virginica) Population in
the Galveston Bay Area

Abstract: The sample abundance of oyster (Crassostrea virginica) spat decreased in 1963 as compared to 1962, and a further decline occurred in 1964. Seed oysters also declined in sample abundance during 1963 as a result of poor survival among the 1963 (and possibly 1962) oyster spat sets. The seed stock increased slightly during the fall 1964, indicating better survival of the 1964 oyster spat set. Market oysters were abundant in the samples during 1963 but decreased considerably in 1964.

The incidence of Dermocystidium marinum infection among market oysters increased in 1964 as compared to 1963. Infections among Trinity Bay oysters (Beasley's Reef and Bart's Pass) were negative to very light until fall 1963 when the incidence rose to epidemic level. During the fall 1964, the highest infection incidences were found among Trinity Bay oysters.

The oyster harvest during the 1963-64 season (November through March) was the best in many years. The harvest during the 1964-65 season (incomplete) was expected to be even larger. The increase was believed due to heavier fishing pressure rather than an increase in oyster abundance.

Objectives: To study factors influencing the oyster (Crassostrea virginica) population on public reefs in the Galveston Bay area, and to determine the effect of such factors upon the commercial oyster harvest.

Procedures: Six public oyster reefs were sampled at monthly intervals with a small oyster dredge. A standard sample consisting of one bushel (2150 cubic inches) of uncultured oysters was collected at each station visit. All live oysters were measured to the nearest millimeter along the right valve. Additional bushel samples were collected when necessary.

Ten market oysters from each sample 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 the anti-biotics Mycostatin and Chloromycetin. The cultures were analysed following procedures described by Ray (1952) and the incidence of D. marinum infection was determined using the numerical system described by Mackin (1961).

Bottom water samples were collected during station visits and salinity and temperature were determined. Associated organisms collected in the samples were recorded.

Findings and Discussion: The six stations (Figure 1) included: Hanna Reef, a

large, commercially important, barrier-type reef at the mouth of East Bay; Red Fish Reef, an extensive, commercial reef forming the central portion of old Red Fish Bar between the Houston Ship Channel and Smith Point; Todd's Dump, a commercially valuable, barrier-type reef forming the western portion of Red Fish Bar between Eagle Point and the Houston Ship Channel; Bart's Pass, a commercial reef forming the eastern end of old Red Fish Bar off Smith Point in lower Trinity Bay; Scott's Reef, a non-commercial reef (closed to oystering by the State Health Department) in upper Galveston Bay off the Seabrook shoreline; and Beasley's Reef, a non-commercial reef in closed waters in Trinity Bay near Houston Point.

Salinity

Salinities at all stations increased in 1963 as compared to 1962 (Table 1), with increases most noticeable in late summer and early fall. During both years, low salinities prevailed in late spring or early summer (usually June) and highest salinities occurred in late summer (August and September). A similar cycle was found in 1964 (Table 1) with salinities slightly lower than recorded in 1963 but higher than those recorded in 1962.

Oyster Population Trends

Oyster length-frequencies, obtained from monthly reef samples, were grouped into three size categories: Spat, those oysters less than 26 mm long; Seed, oysters 26-75 mm long; and Market, oysters 76 mm or longer, corresponding to the legal size limit of three inches and over.

Oyster Spat Stock

Hanna Reef:

Peak abundance of spat was found in samples taken in June, 1962, August, 1963 and October, 1964 (Table 2). Lesser peaks were also found in September, 1962 and July, 1964. Spat appeared to be less abundant in 1963 and 1964 than in 1962, but were more abundant in 1964 than in 1963.

Red Fish Reef:

Spat were most abundant in samples collected in June, 1962, June, 1963 and July-August, 1964 (Table 3). Minor peaks in abundance were found in August-September, 1962 and July, 1964. The abundance of spat in samples collected in 1963 was considerably less than that in 1962 but slightly more than that in 1964.

Todd's Dump:

Peak sample abundance of spat occurred in June in all three years (Table 4). Spat were more abundant in samples during 1962; little differences were found between the abundance peaks in 1963 and 1964 although spat were more numerous in 1964.

Bart's Pass:

Spat were most abundant in samples collected in August, 1962; July, 1963; and September, 1964 (Table 5). Lesser peaks also occurred in October, 1962 and in May and October, 1963. Peak abundance in 1963 was almost equal to that in 1962. Peak abundance in 1964 was slightly greater than the secondary peak in May, 1963 but was considerably less than the major peaks in 1962 and 1963.

Scott's Reef:

Peak spat abundance was found in samples collected in June, 1962 and June, 1963 (Table 6). No peak period could be detected in 1964 when spat were scarce. Spat abundance during all three years was less than that on any other reef sampled. A continual decline in abundance took place from 1963 through 1964.

Beasley's Reef:

Peak spat abundance was found in samples collected in June, 1962, June, 1963 and September, 1964 (Table 7). Sample abundance was less in 1963 than in 1962. Abundance increased in 1964 but did not approach the level of 1962. Spat sets were poor in all three years.

Spat appeared to be most abundant along the eastern side of the bay (as represented by Hanna Reef and Bart's Pass) and least abundant in the upper bay (Scott's Reef and Beasley's Reef). Ranking of the reefs in order of decreasing spat abundance during the three year period is as follows:

<u>1962</u>	<u>1963</u>	<u>1964</u>
Hanna	Bart's Pass	Hanna
Bart's Pass	Hanna	Bart's Pass
Red Fish	Todd's Dump	Todd's Dump
Todd's Dump	Red Fish	Red Fish
Scott's	Beasley's	Beasley's
Beasley's	Scott's	Scott's

Sample abundance of spat was generally highest in 1962, decreased considerably in 1963, and continued to decline in 1964. Peak abundance was most commonly found in June samples in 1962 and 1963, but occurred later in 1964. Secondary peaks, due to smaller groups of spat setting before or after the major set, were more common in 1962 than in 1963 and 1964.

Growth of the 1962-64 Oyster Year Classes

Growth of the year classes was estimated by following the progression in modal sizes of the peak spat set in each year. Modal sizes of the 1962 set could be followed for a year; those of the 1963 set became obscure after six or seven months. Growth curves for each of the three year classes, prepared by plotting the monthly modes and fitting the lines by inspection, are shown in Figure 2.

The 1962 set grew approximately 4 mm to 6 mm per month to a modal size of 30-43 mm in December. After one year (June, 1963) the modal size ranged from 48 to 60 mm. Growth appeared to be most rapid among oysters on Beasley's Reef and slowest among Hanna Reef oysters.

The growth rate of the 1963 set appeared to be slightly faster than that of the 1962 set among oysters on Bart's Pass but was similar to that of the 1962 set among oysters at other reefs. Modal sizes of Beasley's Reef oysters could not be determined in samples after July but initial growth of the 1963 set appeared to be more rapid than that in 1962. Since setting occurred earlier in 1963 than in 1962 (May, rather than June) a longer growing period resulted and modal sizes in December, 1963 were larger than the December, 1962 modes.

Peak setting in 1964 occurred later in the year at all reefs except Todd's Dump and Red Fish Reef. No peak set was found among the Scott's Reef samples. The growth rate of the early set at Todd's Dump appeared to be more rapid than that of the 1962 or 1963 sets. Initial growth at Red Fish Reef also appeared

to be rapid but, by December, was similar to that of the 1962 set. Growth rate of the late set at Bart's Pass and Beasley's Reef was faster than that of the 1962 set but similar to that of the 1963 set.

Oyster Seed Stock

Hanna Reef:

Seed oyster stock increased rapidly in September, 1962, remained high through early spring, 1963 but began to decline in May to a low level in July (Table 2). A slight increase occurred in August (as the 1963 spat attained seed size) but sample abundance was less than that found in the fall, 1962. Seed oyster abundance in 1964 samples was well below that found in 1963. After a low in August and September, abundance increased in October as the 1964 spat (the early set) moved into the seed category. The major spat group (October) did not attain seed size during the year.

Red Fish Reef:

Seed oysters increased in the September (1962) sample, reflecting the advance of the 1962 spat into the seed category (with a modal size of 28 mm). The number of seed declined through May, 1963, rose in June and gradually declined to a low in December (Table 3). There was no increase in September when the 1963 spat reached seed size. Seed oyster abundance was low in April and May, 1964; increased in June to a peak in October (when the 1964 spat were 35 mm, modal size). The seed stock declined after October but did not drop to the low levels found in spring.

Todd's Dump:

Seed oyster abundance increased in September, 1962 to a peak in October, as the 1962 spat entered the seed category (Table 4). Numbers dropped rapidly in November, however, to a level only slightly above that found at the beginning of the year. Peak abundance in 1963 was found in the March sample, possibly as late 1962 spat groups attained seed size. Seed oyster numbers declined in April to a low in May. A slight increase occurred in June and numbers remained fairly constant through September, even though the 1963 early set had entered seed size. A sharp decrease occurred after September to a low in November and December. The decline apparently continued during early spring, 1964 with a low recorded in April. The stock increased in July to a peak in August (when the 1964 spat reached a modal size of 30 mm). By December, sample seed abundance was similar to that found in December, 1963.

Bart's Pass:

Seed oyster abundance, which had been very low through June, 1962, increased in July to a peak in November when the modal size of the 1962 spat was 30 millimeters (Table 5). Sample numbers of seed decreased to a low of February, 1963 then increased to a peak in May, possibly due to growth of late-setting 1962 spat. A summer peak in July and August (less than the spring peak) occurred when the 1963 spat attained a modal length of 28 mm. During 1964 seed numbers were low in May but rose continually to a peak in November when the 1964 spat reached seed size.

Scott's Reef:

Sample seed oyster abundance began to increase in August, 1962 and continued to increase until February, 1963 (Table 6). Seed numbers dropped to a low in June, 1963 but increased in July as the 1963 spat reached seed size. A sharp decline began in September and continued through 1964. By December, 1964, few seed oysters could be found.

Beasley's Reef:

The abundance of seed oysters increased from a low in the June, 1962 sample to a peak in November as the 1962 spat grew to seed size (Table 7). Even though the spat set was the least abundant of any reef sampled (except Scott's), it contributed substantially to the seed stock. During 1963 the number of seed oysters declined from a peak in February until August, when the 1963 spat probably reached seed size (the modal length could not be determined). A decline in number began in September, 1963 and continued throughout 1964.

Seed stock generally increased in abundance during the late summer and early fall, 1962, indicating good survival of the 1962 spat set. Even though mortality among the spat may have been high, survivors were sufficient to increase the seed stock above the levels found earlier in the year. Both Scott's Reef and Beasley's Reef, which received lesser spat sets than any of the other reefs, showed an increase in seed oyster abundance, indicating good survival among a smaller number of spat.

During 1963 seed oyster stocks decreased on all reefs sampled, irrespective of the relative abundance of the 1963 spat set. This indicated that the 1963 spat set, which was generally smaller than the 1962 set, suffered mortality prior to, or shortly after, attaining seed size so that it contributed little to the seed stock. The low abundance of seed oysters during spring and early summer, 1963 was a possible indication of mortality among the 1962 spat set.

The 1964 spat set, which was less abundant than either the 1962 or 1963 set, survived better than the 1963 set resulting in a general increase in seed oysters by the end of the year. On Scott's Reef, where the set was scarce, no increase in seed oyster abundance was found; only slight increases occurred on Beasley's Reef where the set was light and late.

Seed stocks appeared to have seasonal cycles with periods of low abundance in late spring or early summer. These periods occurred when most of the spat which set in the previous year had grown to seed size but before many (if any) of this group had reached market size. This may be an indication of seasonal mortality among the young seed oysters.

The peak abundance period generally occurred in the fall when the spat which set in early summer grew to seed size. The fall abundance peak was slight in 1963 because of poor survival of the 1963 spat.

Market Oyster Stocks

Hanna Reef:

During 1962 and 1963, market oyster abundance decreased in the spring samples (April-May) and increased in samples collected in the fall and winter (Table 2). There were no substantial differences in abundance between the 1962 and 1963 samples. In 1964, however, market oysters were more abundant in spring samples and, by the end of the year were few in number.

Red Fish Reef:

Market oysters were less abundant in spring samples than in winter samples during 1962 and 1963 (Table 3). Except in December, 1963 when large numbers of market oysters were collected, levels of abundance were approximately the same in 1962 and 1963. Market oyster stocks remained fairly constant in 1964 and substantially the same as in the previous years.

Todd's Dump:

Market oysters increased in sample abundance in November-December, 1962, remained at fairly high levels through September, 1963 and began a gradual decline in November, 1963 (Table 4). Sample numbers of market oysters were similar from November, 1963 to October, 1964 when another decline began.

Bart's Pass:

Market oysters were more abundant in the fall and winter samples than in the spring samples during 1962 and 1963 (Table 5). Generally, market oysters were more numerous in 1963 than in 1962. During 1964, market stocks were fairly constant throughout the year but were less abundant than in 1962 and 1963.

Scott's Reef:

The abundance of market oysters in the fall 1962 samples was less than that in the spring (April) sample (Table 6). During 1963 a similar pattern was found but the abundance increased in December from a low in September. In 1964 market oysters were also more numerous in the spring samples, gradually declining to a low in December.

Beasley's Reef:

In 1962 and 1963 market oysters were generally less abundant in the spring samples than in the late fall and winter samples (Table 7). The abundance of market oysters throughout 1963 was greater than that in 1962. In 1964, however, spring samples contained more market oysters than did the fall and winter samples. The abundance of market oysters during the fall, 1964 was similar to the fall abundance in 1962 and less than that in 1963.

In general, market oyster stocks increased during the fall and winter, 1962, continued at high levels during 1963, reaching a peak in abundance during the fall and winter. In 1964, however, the abundance of market oysters declined in summer to a low in August or September. An increase occurred in the fall and winter but the level of abundance did not approach that of 1963.

The cycle in market oyster stocks found in 1962 was similar to the seed oyster cycle with low abundance occurring in the spring and greatest abundance in fall and winter. The period of greatest abundance also occurred during the fall and winter, 1963, but the low abundance period ranged from April through September among the reefs sampled. In 1964 the period of greatest abundance occurred in the spring with low abundance during the summer.

Incidence of *Dermocystidium marinum*

The incidence of *Dermocystidium marinum* infection was generally low during spring and early summer, 1962, increased sharply to epidemic level (2.0) in late summer and early fall, and did not drop appreciably in early winter (Table 8, Figure 3). The incidence was highest in the central and upper bay (Red Fish Reef, Todd's Dump and Scott's Reef) and lowest in Trinity Bay (Beasley's Reef and Bart's Pass).

During 1963 the incidence increased sharply in April and May, dropped in June or July, and rose to epidemic level in September (Table 8, Figures 3 & 4). The fall infection incidence was usually higher than the spring incidence (however, the spring infection incidence was higher in the Scott's Reef samples). Infections among oysters on Bart's Pass and Beasley's Reef, which had been light during 1962, increased above epidemic level late in 1963. Epidemic levels of

infection were found on all reefs in December.

Infection incidences in 1964 generally followed the cycle in 1963 with light infections in late spring or early summer and highest infections in the fall (Table 8, Figure 4). However, fall infections at Scott's Reef were not much higher than those found in the spring. On Bart's Pass and Beasley's Reef, infection incidences increased rapidly and remained above epidemic level from June to December. Peak infection incidences (3.8) were higher on these reefs than on any of the others.

During July and August, 1964, seed oysters from Bart's Pass and Todd's Dump were cultured for D. marinum. Seed oysters from Bart's Pass in July (average size 70 mm) had a weighted infection incidence of 3.5 compared to a weighted incidence of 2.2 among market oysters (average size 106 mm). In August seed oysters with an average size of 61 mm had a weighted incidence of 2.7 compared to a weighted incidence of 2.5 among market oysters (average size 93 mm). Todd's Dump seed oysters in August (average size 56 mm) had a weighted incidence of 1.6 compared to market oysters (average size 95 mm) with a weighted incidence of 2.8.

Associated Reef Organisms

In 1962 and 1963 the conch (Thais haemastoma) was common on Hanna Reef but was not collected at other regular sample stations (however, oyster fishermen had reported conchs at Todd's Dump and Red Fish Reef in 1962). Conchs were again common on Hanna Reef in 1964 and appeared to be increasing in the central bay area. They became common on Red Fish Reef and along the Houston Ship Channel spoil bank north of Red Fish Island (collected among oysters from spoil bank reefs off Beacons 59-63 and Beacon 71). Conchs were very common throughout the Middle Ground area below Todd's Dump but were scarce on Todd's Dump. During the spring, conchs appeared in the boat basin at the Seabrook Laboratory and were found laying egg capsules on oyster holding trays. These conchs presumably were introduced into the boat basin from Hanna Reef oyster samples collected in 1963. Small conchs were very common in oyster trays at platforms on Hanna Reef and Switchover Reef (adjacent to Todd's Dump) during the fall; a possible indication of a successful spawn. Such small conchs were not observed at the platforms in 1963.

The boring clam (Diplothyra) increased in numbers at Hanna Reef, Red Fish Reef, Todd's Dump and Bart's Pass during 1964. Shells of the Hanna Reef oysters became badly eroded due to boring clam holes. The boring sponge (Cliona) also increased in abundance at Hanna Reef, and Red Fish Reef during 1964. It was also present on Todd's Dump and on Beasley's Reef.

Large clusters of mussels (Brachidontes recurvus), which had been common on Bart's Pass, Beasley's Reef and Scott's Reef in previous years, were less abundant in 1964. Mud mats formed by nereid worms and tube-building amphipods were very common on Scott's Reef but were not found on the other reefs.

Small stone crabs (Menippe mercensaria) were common on reefs in the lower and central bay but scarce on reefs in Trinity Bay. The anomuran Petrolisthes armatus was also common on all reefs except those in Trinity Bay.

Oyster Production

During the 1962-63 oyster season (November through March) a total of 1,314,167 pounds of oyster meat was reported from Galveston Bay. This was approximately 76 per cent of the total production reported along the Texas Coast. The harvest was concentrated at Todd's Dump and the Middle Ground area south of Todd's Dump. Bart's Pass and Red Fish Reef were also heavily fished. Hanna

Reef contributed less to the harvest than in previous years.

A record total of 2,043,351 pounds of oyster meat was reported from Galveston Bay during the 1963-64 season, representing approximately 35 per cent of the total Texas Harvest. Much of the harvest came from Red Fish Reef with substantial contributions from Todd's Dump and the Middle Ground area. Bart's Pass and Hanna Reef were fished less frequently than in past years.

In view of the decrease in market oysters during 1964, as indicated by reef sampling, it was predicted that the 1964-65 harvest would be less than that of the previous season. However, it is now anticipated that a new record will be established by the end of the season. As in the past season, the majority of the harvest came from Red Fish Reef. Todd's Dump and the Middle Ground area were fished less than in past years. Hanna Reef produced very few market oysters but reefs in middle East Bay began to receive increased fishing pressure late in the season.

Comments:

Spat sets in 1963 and 1964 appeared to be less abundant than the set in 1962 resulting in a decline in seed stock and, ultimately, a decline in market oyster stock. The peak abundance of market oysters, as indicated by reef sampling, occurred during the 1963-64 season. The decline in abundance began in 1964 and should continue through 1965. The record harvest anticipated for the 1964-65 season appears to be the result of heavy fishing pressure (and perhaps a better yield in gallons of oysters per barrel) rather than an increase in the supply of market oysters.

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Table 1: Bottom water salinities taken at monthly intervals at six stations in Galveston Bay during 1962-64

YEAR	MONTH	SALINITY 0/00					
		STATION					
		1	2	3	4	5	6
1962	1	16.6	17.7	-	-	-	12.8
	2	-	-	16.9	11.6	16.3	-
	3	17.3	15.2	-	-	-	7.7
	4	-	-	18.3	17.3	16.6	-
	5	17.6	18.8	-	-	-	15.0
	6	18.1	14.8	13.3	11.1	12.1	8.3
	7	14.1	17.4	14.1	12.8	12.2	8.3
	8	22.8	23.1	21.1	20.2	20.4	13.3
	9	20.0	18.2	20.6	15.5	18.2	14.4
	10	16.0	17.7	17.5	11.0	16.7	12.1
	11	18.8	19.6	20.4	19.0	20.4	15.1
	12	19.7	17.9	17.6	12.0	15.0	13.3
1963	1	-	-	-	-	-	-
	2	15.0	17.5	19.3	12.8	20.8	15.5
	3	25.6	15.9	16.0	17.8	15.1	9.8
	4	25.3	24.0	20.4	24.5	18.4	16.1
	5	21.8	20.9	19.0	19.1	18.2	10.9
	6	21.3	19.3	18.5	18.7	18.5	15.6
	7	21.7	21.5	20.0	18.7	18.7	14.6
	8	23.0	28.8	25.9	23.5	23.4	20.9
	9	21.4	25.8	25.4	25.1	25.0	18.6
	10	-	-	-	21.0	-	-
	11	22.1	-	-	23.1	23.8	20.6
	12	20.2	27.8	26.7	20.5	26.0	26.0
1964	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	3	-	-	-	-	-	-
	4	-	-	19.0	-	15.7	10.5
	5	19.7	16.3	17.7	11.4	14.0	13.4
	6	18.7	21.7	19.9	16.1	15.0	12.9
	7	24.8	24.0	23.8	17.2	20.5	17.8
	8	23.4	25.7	23.0	23.5	20.6	17.2
	9	24.1	23.0	24.5	21.9	22.0	19.3
	10	21.7	24.4	24.1	18.2	23.5	14.8
	11	24.9	23.0	23.0	20.0	20.7	10.8
	12	22.6	18.0	17.0	14.5	18.0	9.4

Stations: (1) Hanna Reef; (2) Red Fish Reef; (3) Todd's Dump; (4) Bart's Pass;
(5) Scott's Reef; (6) Beasley's Reef

Table 2: Number of spat, seed and market oysters collected in monthly samples from Hanna Reef during 1962, 1963 and 1964.

SIZE GROUP	MONTH	NUMBER OF OYSTERS/BUSHEL SAMPLE		
		1962	1963	1964
SPAT	1	351	-	-
	2	-	59	-
	3	131	146	-
	4	-	90	-
	5	11	91	20
	6	754	127	136
	7	660	224	211
	8	46	299	160
	9	548	221	189
	10	143	151	335
	11	125	70	230
	12	133	86	264
SEED	1	284	-	-
	2	-	226	-
	3	309	<u>301</u>	-
	4	-	342	-
	5	175	261	109
	6	203	<u>195</u>	<u>81</u>
	7	196	<u>107</u>	46
	8	191	165	34
	9	404	<u>141</u>	<u>35</u>
	10	380	<u>199</u>	64
	11	320	143	63
	12	288	<u>199</u>	<u>79</u>
MARKET	1	34	-	-
	2	-	44	-
	3	31	<u>46</u>	-
	4	-	<u>27</u>	-
	5	22	31	19
	6	24	<u>38</u>	<u>18</u>
	7	34	<u>29</u>	<u>13</u>
	8	61	42	7
	9	36	<u>26</u>	<u>11</u>
	10	52	<u>40</u>	<u>12</u>
	11	39	63	5
	12	48	<u>51</u>	<u>9</u>

Table 3: Number of spat, seed and market oysters collected in monthly samples from Red Fish Reef during 1962, 1963 and 1964.

SIZE GROUP	MONTH	NUMBER OF OYSTERS/BUSHEL SAMPLE		
		1962	1963	1964
SPAT	1	28	-	-
	2	-	55	-
	3	36	28	-
	4	-	30	-
	5	42	90	8
	6	551	150	69
	7	142	120	109
	8	231	63	108
	9	73	56	73
	10	130	34	67
	11	81	-	29
	12	37	24	34
SEED	1	131	-	-
	2	-	285	-
	3	180	247	-
	4	-	240	-
	5	256	209	65
	6	195	293	64
	7	157	223	86
	8	185	247	115
	9	335	204	116
	10	264	199	163
	11	365	-	143
	12	285	161	101
MARKET	1	25	-	-
	2	-	29	-
	3	20	43	-
	4	-	35	-
	5	17	25	49
	6	18	19	41
	7	29	26	49
	8	38	44	48
	9	46	29	35
	10	13	47	41
	11	59	-	41
	12	42	93	44

Table 4: Number of spat, seed and market oysters collected in monthly samples from Todd's Dump during 1962, 1963 and 1964

SIZE GROUP	MONTH	NUMBER OF OYSTERS/BUSHEL SAMPLE		
		1962	1963	1964
SPAT	1	-	-	-
	2	16	10	-
	3	-	17	-
	4	6	16	3
	5	-	43	179
	6	364	211	225
	7	89	157	122
	8	93	77	77
	9	135	57	70
	10	143	-	31
	11	33	53	29
	12	32	16	14
SEED	1	-	-	-
	2	185	183	-
	3	-	<u>283</u>	-
	4	152	183	48
	5	-	133	76
	6	183	<u>177</u>	<u>77</u>
	7	229	171	118
	8	222	182	182
	9	277	<u>153</u>	<u>148</u>
	10	379	-	124
	11	231	96	124
	12	208	<u>97</u>	<u>100</u>
MARKET	1	-	-	-
	2	33	40	-
	3	-	<u>68</u>	-
	4	32	52	37
	5	-	38	37
	6	42	<u>59</u>	<u>35</u>
	7	48	62	40
	8	43	46	36
	9	14	<u>53</u>	<u>35</u>
	10	48	-	19
	11	79	38	25
	12	56	33	<u>28</u>

Table 5: Number of spat, seed and market oysters collected in monthly samples from Bart's Pass during 1962, 1963 and 1964

SIZE GROUP	MONTH	NUMBER OF OYSTERS/BUSHEL SAMPLE		
		1962	1963	1964
SPAT	1	-	-	-
	2	26	51	-
	3	-	26	-
	4	0	21	-
	5	-	279	7
	6	78	218	40
	7	222	604	61
	8	664	196	196
	9	179	80	320
	10	216	102	201
	11	191	37	107
	12	76	38	51
SEED	1	-	-	-
	2	41	185	-
	3	-	214	-
	4	16	256	-
	5	-	276	58
	6	15	253	78
	7	62	173	80
	8	165	221	101
	9	289	221	120
	10	390	185	141
	11	492	189	185
	12	301	196	135
MARKET	1	-	-	-
	2	26	67	-
	3	-	35	-
	4	9	35	-
	5	-	53	38
	6	16	52	41
	7	25	60	30
	8	28	56	27
	9	25	72	28
	10	52	78	47
	11	72	93	43
	12	64	62	41

Table 6: Number of spat, seed and market oysters collected in monthly samples from Scott's Reef during 1962, 1963 and 1964

SIZE GROUP	MONTH	NUMBER OF OYSTERS/BUSHEL SAMPLE		
		1962	1963	1964
SPAT	1	-	-	-
	2	7	9	-
	3	-	7	-
	4	1	0	0
	5	-	15	0
	6	154	30	2
	7	108	6	1
	8	50	2	2
	9	22	1	0
	10	15	-	0
	11	3	0	0
	12	21	1	0
SEED	1	-	-	-
	2	61	280	-
	3	-	155	-
	4	64	119	40
	5	-	139	19
	6	68	110	25
	7	42	213	14
	8	154	126	9
	9	191	68	12
	10	195	-	7
	11	149	71	8
	12	259	50	5
MARKET	1	-	-	-
	2	34	22	-
	3	-	32	-
	4	42	42	39
	5	-	29	32
	6	32	45	56
	7	29	31	39
	8	39	21	34
	9	13	10	34
	10	26	-	30
	11	33	33	30
	12	23	44	28

Table 7: Number of spat, seed and market oysters collected in monthly samples from Beasley's Reef during 1962, 1963 and 1964.

SIZE GROUP	MONTH	NUMBER OF OYSTERS/BUSHEL SAMPLE		
		1962	1963	1964
SPAT	1	52	-	-
	2	-	7	-
	3	21	8	-
	4	-	2	1
	5	7	21	1
	6	148	28	0
	7	73	14	1
	8	73	2	5
	9	18	6	59
	10	14	-	13
	11	13	4	8
	12	11	4	1
SEED	1	218	-	-
	2	-	331	-
	3	179	340	-
	4	-	231	92
	5	161	196	34
	6	150	137	44
	7	158	111	36
	8	187	124	32
	9	246	119	25
	10	300	-	27
	11	318	89	46
	12	273	69	28
MARKET	1	23	-	-
	2	-	44	-
	3	27	48	-
	4	-	50	67
	5	27	45	74
	6	21	77	64
	7	11	66	58
	8	29	59	29
	9	49	79	41
	10	48	-	44
	11	46	76	48
	12	66	73	47

Table 8: Weighted incidence of Dermocystidium marinum infection in market oyster samples collected at monthly intervals from six reefs in Galveston Bay during 1962-64

YEAR	MONTH	WEIGHTED INCIDENCE OF INFECTION					
		STATIONS					
		1	2	3	4	5	6
1962	1	-	-	-	-	-	-
(THESE ARE BASED ON 3=HEAVY SCALE INSTEAD OF 5)	2	-	-	-	-	-	-
	3	0.5 0.8	0.9 1.5	-	-	-	0
	4	-	-	1.4 2.3	0.8 1.3	1.2 2.0	-
	5	1.5 2.5	0.8 1.3	-	-	-	0.6 1.0
P/S	6	0.7 1.2	1.8 3.0	1.3 2.2	0.2 0.3	1.6 2.7	-
M/C in JUNE	7	0.6 1.0	1.9 3.2	1.5 2.2	0.2 0.2	1.6 2.7	0
	8	1.4 2.3	2.2 3.7	2.3 3.8	0.7 1.2	1.6 2.7	1.2 2.0
	9	2.4	4.2	3.4	0.4	3.3	0
	10	2.1	2.8	3.0	0.5	4.0	0.5
	11	-	-	-	1.6	-	0.4
	12	1.6	3.0	3.0	0.5	3.2	0.1
1963	1	-	-	-	-	-	-
	2	0.2	1.4	0.3	0.4	1.6	0.05
	3	0.2	0.4	0.6	0.2	1.2	0.05
	4	1.3	1.6	2.4	0.1	3.5	0.2
	5	1.2	2.2	0.8	1.0	3.0	0.4
	6	0.7	1.6	0.8	0	2.9	0
	7	0.6	0.5	1.4	-	1.9	-
	8	0.9	1.5	0.6	0.4	2.0	0.5
	9	3.4	3.5	2.8	2.7	3.0	0.9
	10	-	-	-	-	-	-
	11	-	-	-	-	-	-
	12	2.6	2.0	2.6	2.4	2.2	2.4
1964	1	-	-	-	-	-	-
	2	-	-	-	-	-	-
	3	-	-	-	-	-	-
	4	-	-	2.2	-	1.8	0.7
	5	0.8	0.2	1.4	1.1	3.0	1.8
	6	0.8	1.2	1.2	3.2	2.8	2.5
	7	2.2	1.9	1.8	2.2	1.8	3.6
	8	3.4	3.4	2.8	2.6	3.0	3.9
	9	3.0	3.0	3.3	2.4	3.3	2.8
	10	3.2	2.4	2.7	3.8	3.2	3.8
	11	2.5	2.0	3.3	3.7	2.8	3.1
	12	1.0	2.9	1.9	1.8	1.9	2.3

Stations: (1) Hanna Reef; (2) Red Fish Reef; (3) Todd's Dump; (4) Bart's Pass; (5) Scott's Reef; (6) Beasley's Reef.

Figure 1: Location of reef sample stations in Galveston Bay during 1962-64

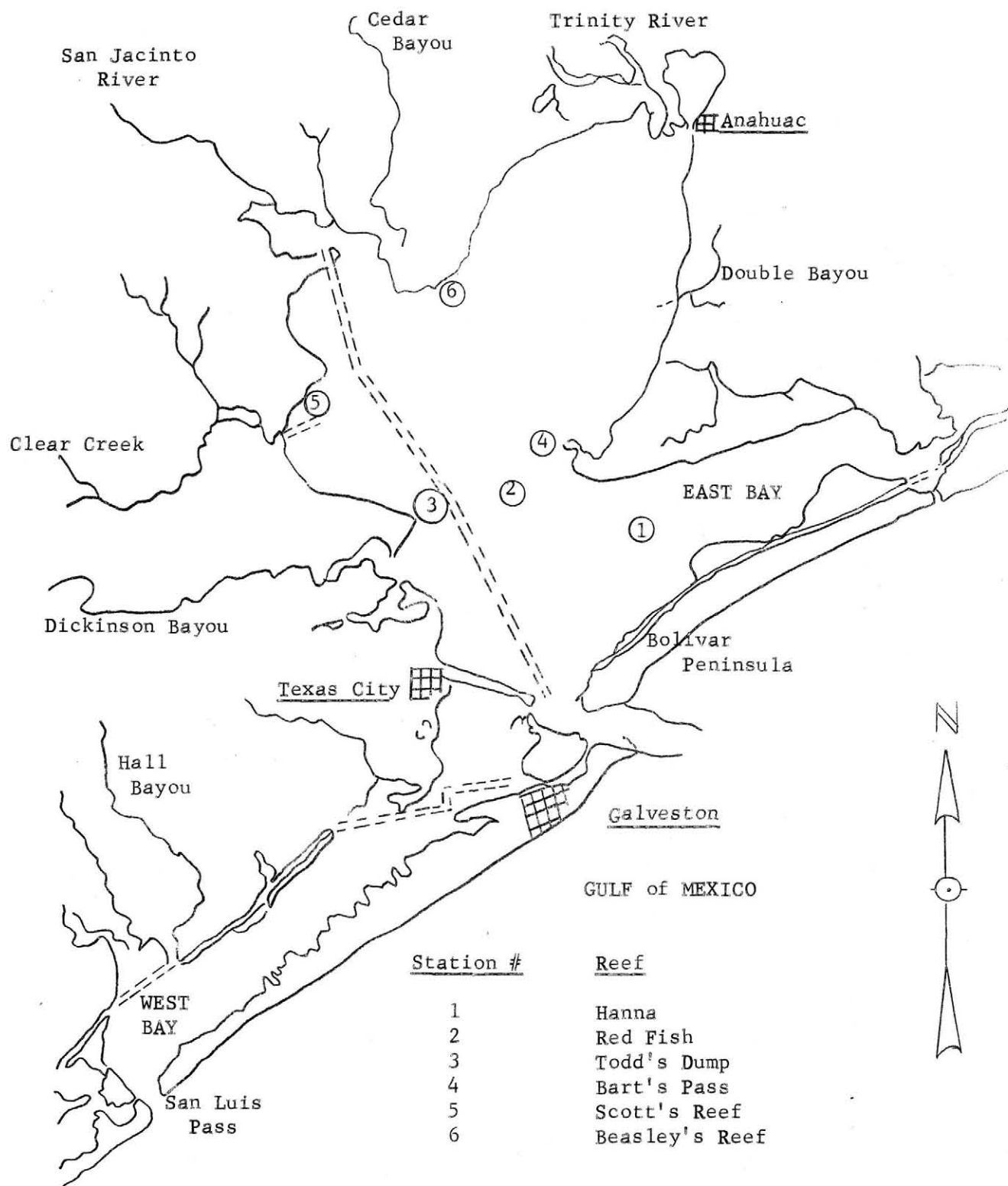


Figure 2: Comparison of growth of the 1962; 1963 and 1964 spat growth of the 1962 set followed for one year, growth of the 1963-64 set followed for 6 - 7 months.

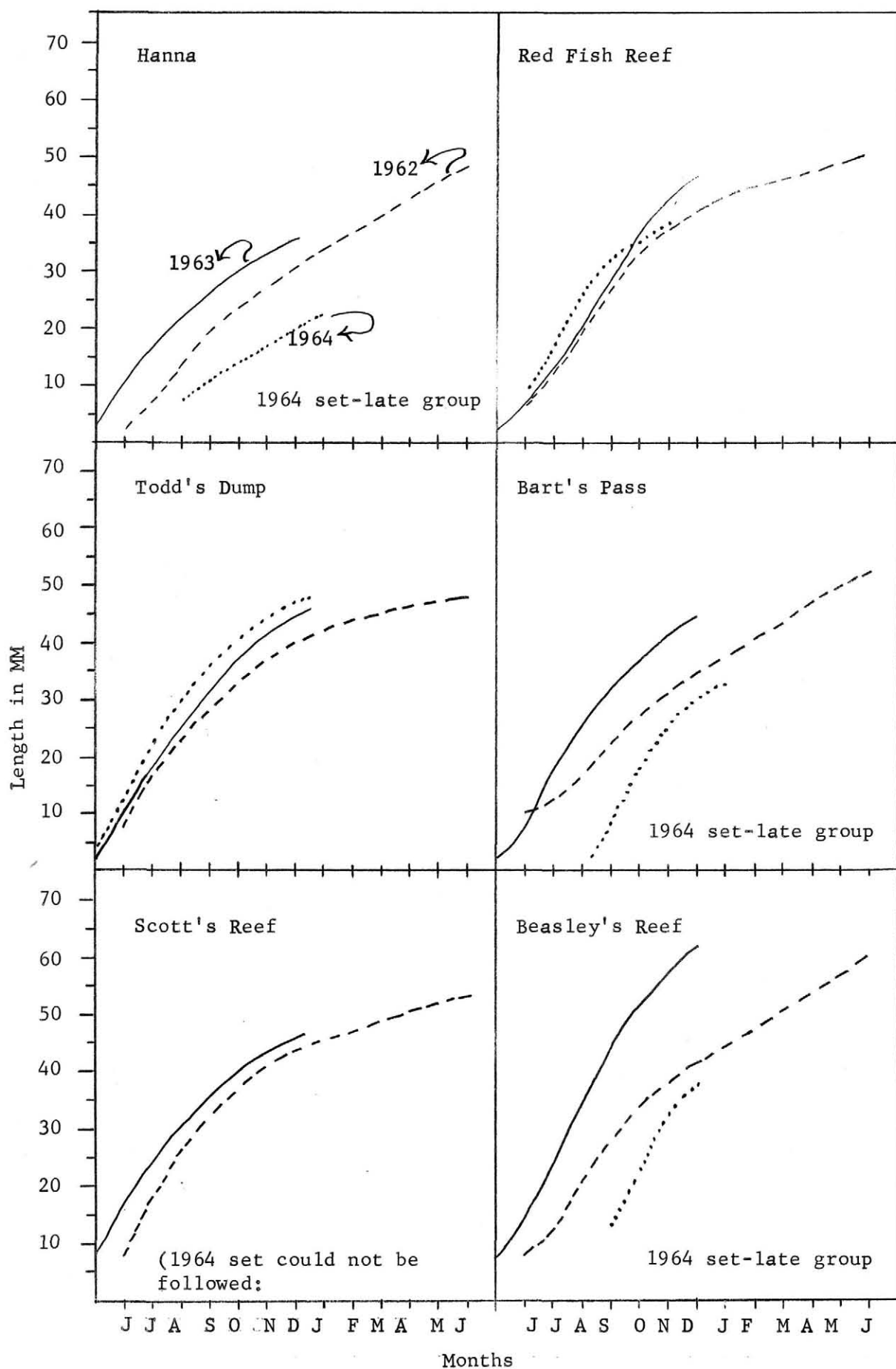


Figure 3: Comparison of the monthly weighted incidence of Dermocystidium marinum infection among market oysters on six reefs in Galveston Bay during 1962 and 1963

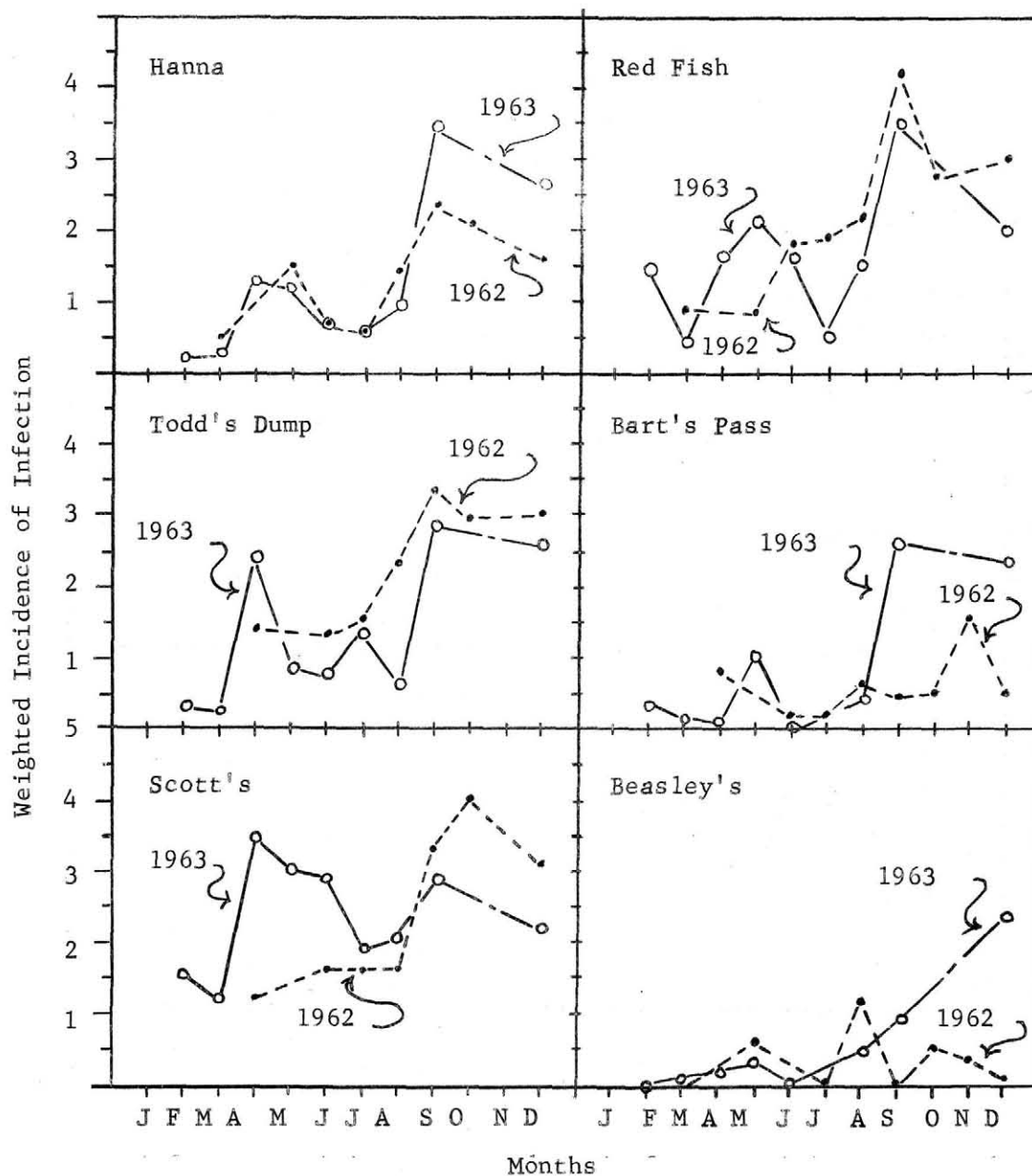


Figure 4: Comparison of the monthly weighted incidence of Dermocystidium marinum infection among market oysters on six reefs in Galveston Bay during 1963-64.

