

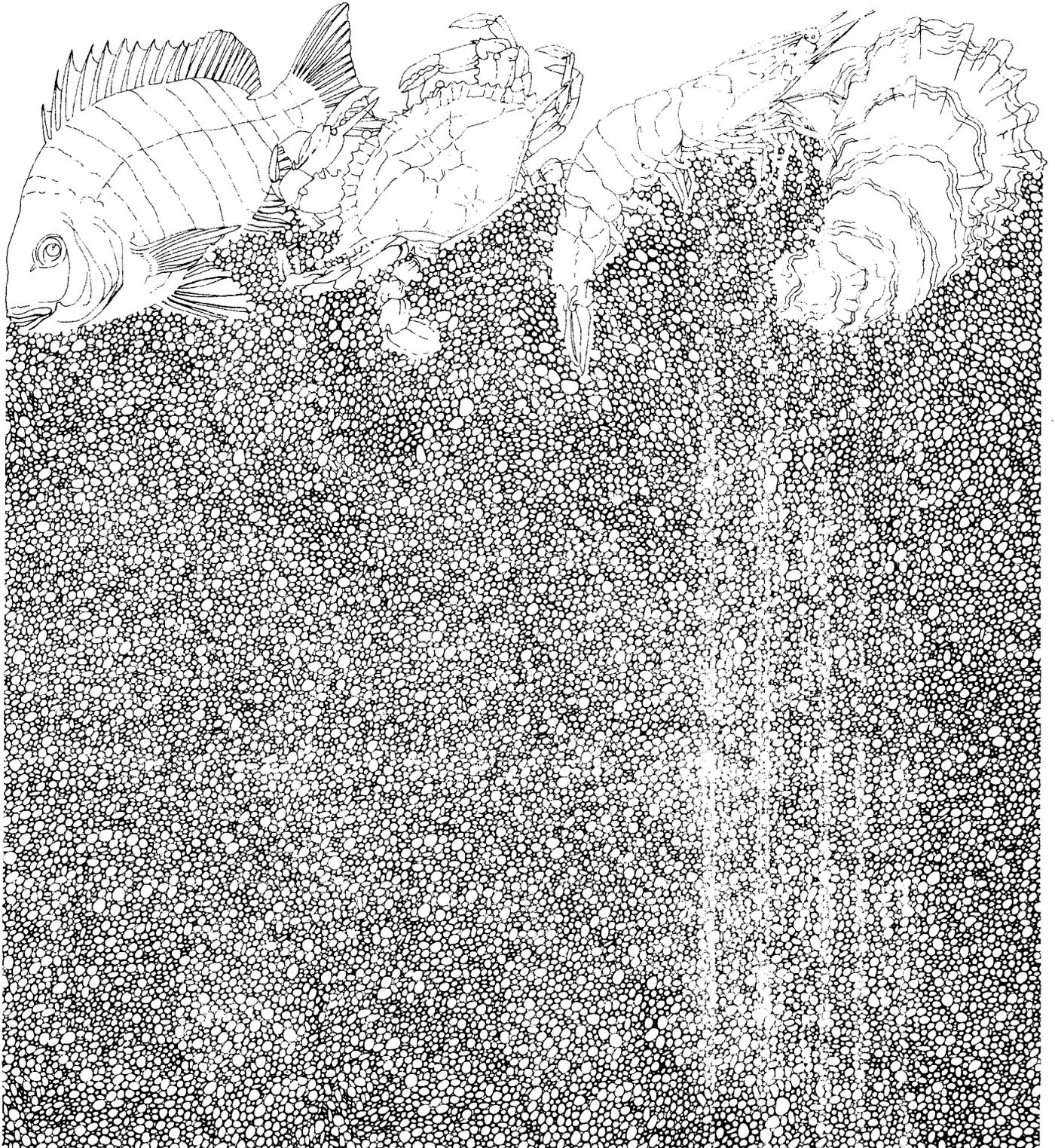
Kyle Spiller

Shell Management Annual Report, September 1981 - August 1982

by Arthur L. Crowe

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SHELL MANAGEMENT ANNUAL REPORT,
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Texas Parks and Wildlife Department
Coastal Fisheries Branch
4200 Smith School Road
Austin, Texas 78744

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ABSTRACT

The Texas Parks and Wildlife Department (TPWD) Shell Management Program was designed to insure shell dredging companies comply with TPWD rules. During fiscal year 1981-82, the shell dredge Trinity I (owned by Parker Brothers Company, Incorporated) was monitored 69 times while it operated in the upper part of San Antonio Bay. No citations for siltation were issued. There were no requests for special permits. During the 1981-82 period, 814,210 m³ (1,064,885 yd³) of shell were removed from San Antonio Bay. The state received \$1,408,376 for the shell. Approximately 2.4 hectares (6 acres) of replacement shell were added to Middleground Reef in the lower part of San Antonio Bay. Oyster populations throughout the bay remained low due to low salinity conditions during the first half of the year.

INTRODUCTION

The shell management program monitors dredging activity in San Antonio Bay to insure protection of exposed oyster reefs and manages shell replacement to promote development of productive oyster habitat.

Texas Parks and Wildlife Department (TPWD) rules (Section 57.41-.50) require shell dredges to operate outside of 91 m (300 ft) of any exposed oyster reef and 0.8 km (0.5 mi) of a shoreline. No more than a trace of silt is allowed on any reef regardless of the distance the dredge is from the reef. Exposed reefs may be removed only with the approval of the TPWD and such reefs must be replaced on at least a one-for-one basis at a location determined by TPWD.

In July 1981, the Texas Parks and Wildlife Commission approved dredging in four state land tracts (ST 74, 101, 102, and 106) above latitude 28°22', an area which had previously been closed to shell dredging. New rules were written expressly for these four state tracts. Rules required the marking of all reefs within 455 m (1,500 ft) of proposed dredging activity and allowed a dredge to operate to within 30 m (100 ft) of an exposed reef. If live oysters were present on reefs in the area, siltation rules remained in effect. However, if live oysters were not present, a dredge could silt the reef provided that the reef was cleaned and restored to its original condition after the dredge left the area. A live reef was defined as having an average of one or more market oysters, or 10 or more seed oysters and spat combined per 0.035 m³ (bushel) sample. In addition, 3% of all shell removed from those four state tracts was to be used as replacement shell for building exposed reefs in San Antonio Bay and the rest of the Texas coast. The royalty dredging companies paid the state for mudshell was set at \$0.96/m³ (\$1.25/cu yd). The price was adjusted semi-annually based on the consumer price index (CPI-U) published by the Bureau of Labor Statistics.

To determine if shell dredging had any adverse effects on oyster populations, oyster samples were collected throughout the bay and compared to those near the dredge.

Reefs above latitude 28°22' were surveyed prior to the dredge beginning operation in the area to compare with size estimates of the reefs during the late 1960's.

MATERIALS AND METHODS

Dredging activities were monitored one to two times a week or more frequently when the dredge operated near an exposed reef. An 11 m (35 ft) twin screw diesel boat (Lookdown) was used to monitor the dredge and collect oyster samples. The position of the dredge was determined by

triangulation using a Navy Mark II sextant and plotting on a 1"=2000' scale Mylar map. Date, shot points used, angles, state tract numbers, and incidences of siltation were recorded.

When dredging occurred in the vicinity of an exposed oyster reef, the reef's edge (that part of the bay bottom that contained more than 50 percent shell) was determined by poling and marked with red flags. Yellow markers were placed at the minimum distance the dredge was allowed to operate from the reef. This established a visual reference for both the dredge operators and the shell management personnel. When the dredge operated within 455 m (1500 ft) of a reef, silt trays placed on the bay bottom were used as indicators that silt was moving toward the reef. Trays were made of galvanized sheet metal 30x30x4 cm, fitted with a wire cradle and tied with a rope to a pole. Siltation of a reef was confirmed by probing the reef with a PVC pole and noting the amount of silt on the pole. The pole was also used to note changes in reef contour.

Cleaning reefs of silt was accomplished with Parker Brothers' boat, The Shellfinder. The boat was equipped with two large spuds that held it in place while the reef surface was cleaned by the prop wash.

Oyster samples were collected in three regions of San Antonio Bay: upper, middle and lower bay (Figure 1). The upper bay included those reefs above latitude 28°22'. The middle bay was from latitude 28°22' to the Gulf Intracoastal Waterway (GIWW). The lower bay stations were below the GIWW. Two sample sites were chosen within each region. Stations were sampled once each month.

One standard bushel (0.035 m³) of unculled oysters was dredged or tonged from each station according to methods described by Hofstetter (1977). Oyster measurements were grouped as follows: Spat 1-25 mm, small 26-75 mm, and market above 75 mm. When large numbers of oysters were present, sub-samples (one-quarter to one-half bushel) were taken and at least 100 individuals measured.

Description of Oyster Sample Stations

Size estimates of oyster reefs presented here were from a 1968-1970 survey, unless updated. Increases or decreases from the 1968-1970 surveys in current estimates are probable.

Upper Bay

Reef 169 was plotted in 1981 at approximately 2.0 hectares located in ST 74 above latitude 28°22'. The initial survey showed it as 2.6 hectares. The crest was exposed on a winter low tide. Average water depth in summer on the flanks was 1.5 m. Orientation was in an almost N-S line.

Reef 80 was plotted in 1981 at approximately 1.2 hectares located in ST 101 above latitude 28°22'. The initial survey showed it as 1.7 hectares. Average depth in summer on the flanks was 1.3 m. It was orientated NW-SE.

Middle Bay

Halfmoon Reef was approximately 22.7 hectares located in ST 62 and ST 77 along the western shore of the bay. The shape of the reef was similar to a boomerang with one handle running NE-SW and the other handle running NW-SE. Small sections of Halfmoon's crest were exposed on an extremely low winter tide. Water depth in summer over the flanks was 1.8 m deep.

Reef 51 was approximately 8.1 hectares of mostly replacement shell located in ST 136 within 0.40 km of the eastern shore of San Antonio Bay. During the summer, portions of the reef were in 1.5 m of water but the largest section was approximately 1.0 m deep.

Lower Bay

Panther Reef at over 202.4 hectares was the largest reef in the bay. It extended in a wide band from Panther Point on Matagorda Island NW to the GIWW where it was breached. It continued above the GIWW for approximately 3.2 km. Spoil areas along the channel also supported some oysters. The western edge of the reef rose sharply almost 1 m off the surrounding bottom, while the eastern side sloped gently.

The sample site was approximately 1.6 km due east of the large Sun Oil gas production platform. Water depth at the sample site ranged from 2.0 m at the flanks to 1.5 m at the crest.

Middleground was approximately 8.1 hectares of mostly replacement shell (placed at 3 separate times during the 1970's) lying between two small natural reefs. The reef was 2.4 km due south of the Turnstake on the GIWW in 2.0 m of water.

RESULTS

The dredge, Trinity I, owned by Parker Brothers Company, Incorporated operated from September 1981 to August 1982 in ST 101 in the upper part of San Antonio Bay (Figure 2). Dredging activities were monitored 69 times (Table 1). No siltation violations were issued since live oysters were not present in the upper part of the bay during 1981-1982. No request for special permits for removing exposed reefs was received.

During 1981-1982, 814,210 m³ (1,064,885 yd³) of shell were removed from San Antonio Bay (Table 2). This is an 11 percent decrease from the amount of shell dredged in the previous year (Crowe 1982). However, the state received \$1,408,376 in revenues, a 330% increase over the previous year. The price paid the state for shell increased from \$0.19 m³ (\$0.25/yd³) in June 1981 to \$1.04 m³ (\$1.36 yd³) in March 1982.

When compared to the size recorded in the original 1968-1970 survey, several reefs in ST 101 had apparently decreased in size (Figure 2) prior to 1981-1982 dredging operations.

Varying amounts of silt (50-200 mm) were recorded on Reefs 80, 107, 108, 110, 169, 170, and 175 in ST 101 and 74. While the dredge operated over 300 m (990 ft) to the east (Figure 2), silt 100-150 mm thick was recorded on Reef 169 and 170. However, silt was not noted on the northern end of Reef 107 until the dredge operated within 45 m (150 ft). Silt indicators on the edge of Reef 107 filled with silt and were emptied repeatedly before silt appeared on the reef itself. The amount of silt on any reef varied from month to month. The most notable example was Reef 110 where silt deposition decreased from 200 mm to 100 mm within 2 months. The amount of silt varied from one part of a reef to another. Reef 80 had several low spots along the crest and silt settled deeper in those areas than elsewhere. Reefs 107 and 170 were washed clean of silt by The Shellfinder. The only reef area that showed subsequent siltation and required recleaning was the northern end of Reef 107 which consisted of fine shell (<10 mm, deposited when dredges did not retain this material).

Approximately 10,004 m³ (13,084 yd³) of shell was placed on the east side of Middleground during January and March (Figure 3). This increased the size by approximately 2.4 hectares.

Oyster populations above the GIWW, on Middleground and the upper half of Panther Point Reef showed 100% mortality during June 1981 (Crowe 1982) due to prolonged flooding. This was followed by record rainfall over the Guadalupe watershed during September causing over seven times the average monthly discharge in cubic meters per second (cms). A record 2461 cms mean daily discharge was recorded on 3 September, 1981 (United States Geological Survey 1982). The previous peak was approximately 1416 cms. Salinity measured during the monthly oyster sampling (Table 3) ranged from 0 to 20 o/oo. Monthly temperature (Table 4) ranged from 14 to 32 C.

Oysters apparently began to recover from the effects of the 1981 floods during the summer of 1982. Spat (5/sample) and small oysters (10/sample) reappeared in samples above the GIWW (middle bay) beginning in June 1982 (Table 5). All sizes were present in the lower bay most of the year indicating that they were not as affected by the flooding. Market oysters were collected only in the lower bay. Even though oysters began to recover, the reefs sampled in the upper bay still did not meet the definition of a live oyster reef by August 1982. There were no market oysters and only a mean of 3 oysters/sample below market size collected.

DISCUSSION

Benefield (1976) found reef contour, sediment composition, and current direction were some primary factors influencing the degree of siltation by shell dredges. By placing the initial dredge cut as close to the reef as allowed and then working away from the reef, the severity of siltation could be lessened. Silt evidently had a tendency to flow into these cuts and fill them in rather than settle on the reef.

It was also observed that natural forces (either current or wave action) had the ability to cleanse reefs of at least some of the silt load. This cleansing process could be accelerated by using prop wash to remove almost all traces of silt.

The decrease in the estimated size of some reefs in ST 101 was similar to several reefs throughout the bay which had also decreased in size. During the past 10 years, reefs in the upper bay were subject to fewer good growing years than reefs in middle and lower bay areas. Therefore, they were more likely to decrease in size. The technique used to mark the reef's edge in the original survey was not known and was probably slightly different from the present technique and some degree of difference between the two techniques can be expected.

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- Hofstetter, R. P. 1977. Trends in population levels of the American oyster, (Crassostrea virginica, Gmelin) on public reefs in Galveston Bay, Texas. Tex. Pks. Wildl. Dept., Tech. Ser. No. 24. 90 p.
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Table 1. Summary of dredge (Trinity I) observations in San Antonio Bay, 1981-1982.

Month	Number of observations	State tract number
September 1981	7	101
October	7	101
November	5	101
December	6	101
January 1982	6	101
February	4	101
March	7	101
April	7	101
May	5	101
June	5	101
July	4	101
August	6	101
Total	69	

Table 2. Shell removed and revenues paid by Parker Brothers Company, Inc. during September 1981-August 1982 ^a.

Month	Shell removed		Revenues paid to state
	m ³	yd ³	
September 1981	71,835	93,951	\$ 117,439
October	66,990	87,614	114,774
November	82,808	108,302	141,876
December	77,775	101,720	133,253
January 1982	66,802	87,369	114,453
February	70,716	92,488	121,159
March	86,519	113,156	148,234
April	81,067	106,026	144,195
May	63,325	82,821	112,637
June	56,824	74,319	101,074
July	38,977	50,977	69,329
August	50,572	66,142	89,953
Total	814,210	1,064,885	\$1,408,376

^aSource: Texas Parks and Wildlife Department Finance Records. Revenues rounded to nearest dollar.

Table 3. Mean salinity (o/oo) values at upper, middle and lower San Antonio Bay oyster sampling stations.

Month	Upper bay	Middle bay	Lower bay
September 1981	0	0	1
October	2	4	5
November	0	0	2
December	0	2	4
January 1982	3	6	12
February	11	13	19
March	2	4	12
April	8	10	19
May	10	18	20
June	0	2	12
July	8	9	16
August	10	14	20

Table 4. Mean water temperature (C) values at upper, middle and lower San Antonio Bay oyster sampling stations.

Month	Upper bay	Middle bay	Lower bay
September 1981	32	30	30
October	15	18	18
November	18	19	22
December	14	16	16
January 1982	18	18	16
February	17	19	20
March	14	18	18
April	23	24	24
May	25	25	25
June	28	28	28
July	30	32	32
August	32	32	32

Table 5. Mean number of spat, small and market oysters per sample at upper (U), middle (M), and lower (L) San Antonio Bay stations in 1981-1982.

	Spat			Small			Market		
	U	M	L	U	M	L	U	M	L
September 1981	0	0	34	0	0	146	0	0	10
October	0	0	12	0	0	104	0	0	3
November	0	0	16	0	0	78	0	0	6
December	0	0	6	0	0	120	0	0	9
January 1982	0	0	6	0	0	165	0	0	10
February	0	0	3	0	0	134	0	0	13
March	0	2	2	0	0	130	0	0	15
April	0	0	5	0	0	106	0	0	18
May	0	0	1	0	0	109	0	0	30
June	0	5	71	0	10	44	0	0	9
July	0	20	46	0	25	170	0	0	0
August	1	6	10	2	34	240	0	0	14

Figure 1. Oyster reef sample stations (X) in San Antonio Bay.

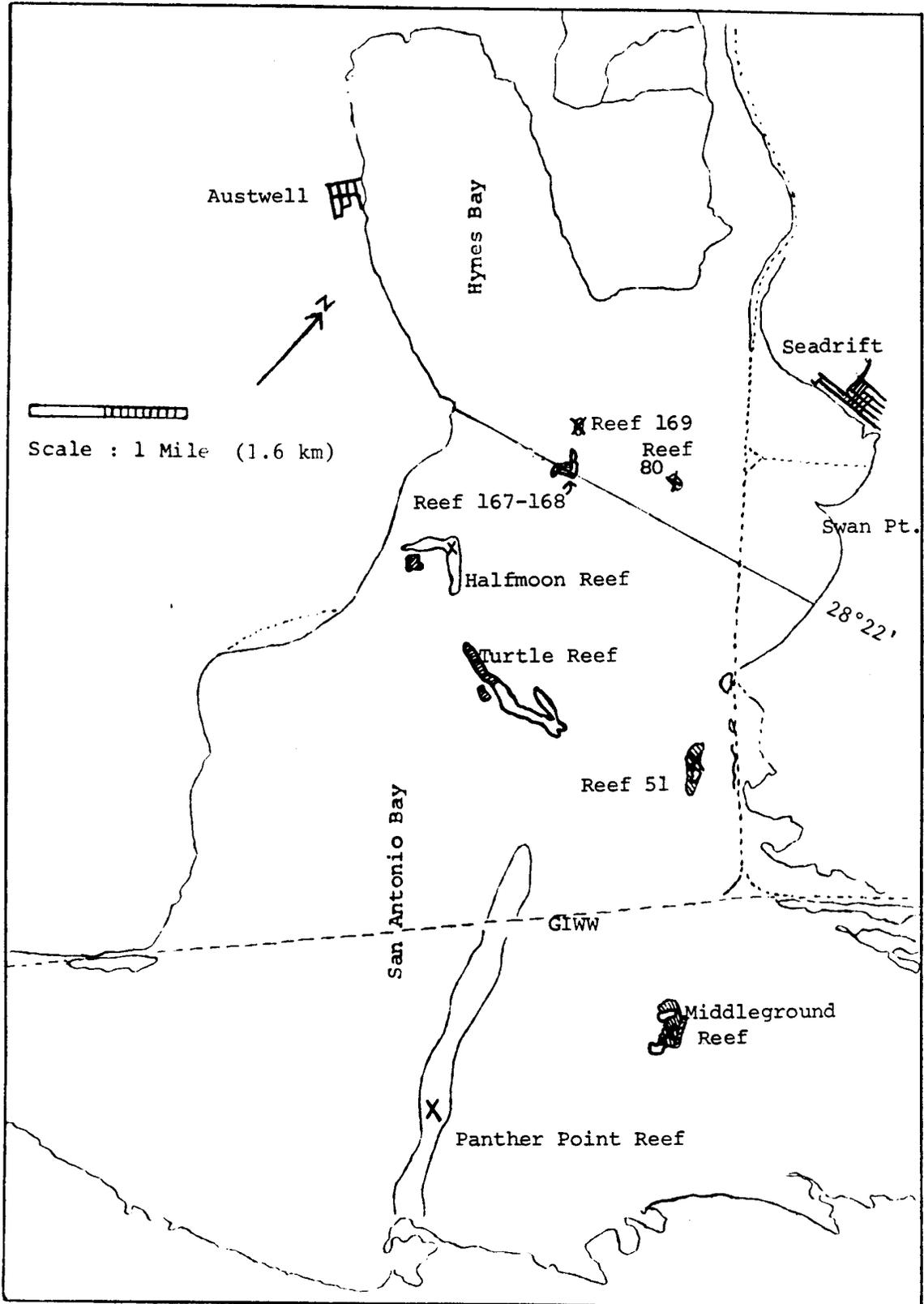
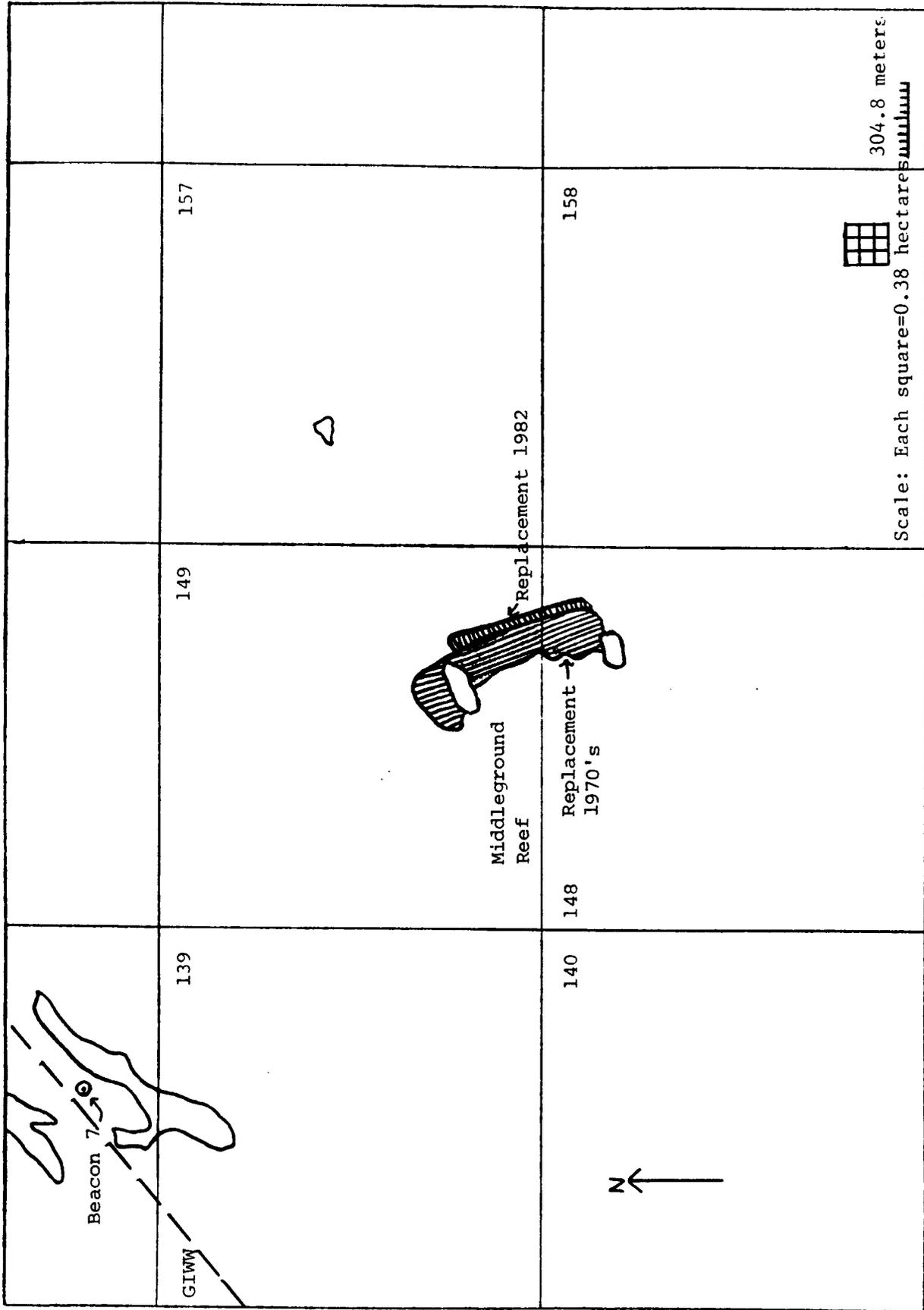


Figure 2. Approximate monthly location of dredge cuts and numbered reefs in state tracts (ST) in San Antonio Bay during 1981-1982.

Figure 3. Replacement shell on Middleground Reef in lower San Antonio Bay.



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