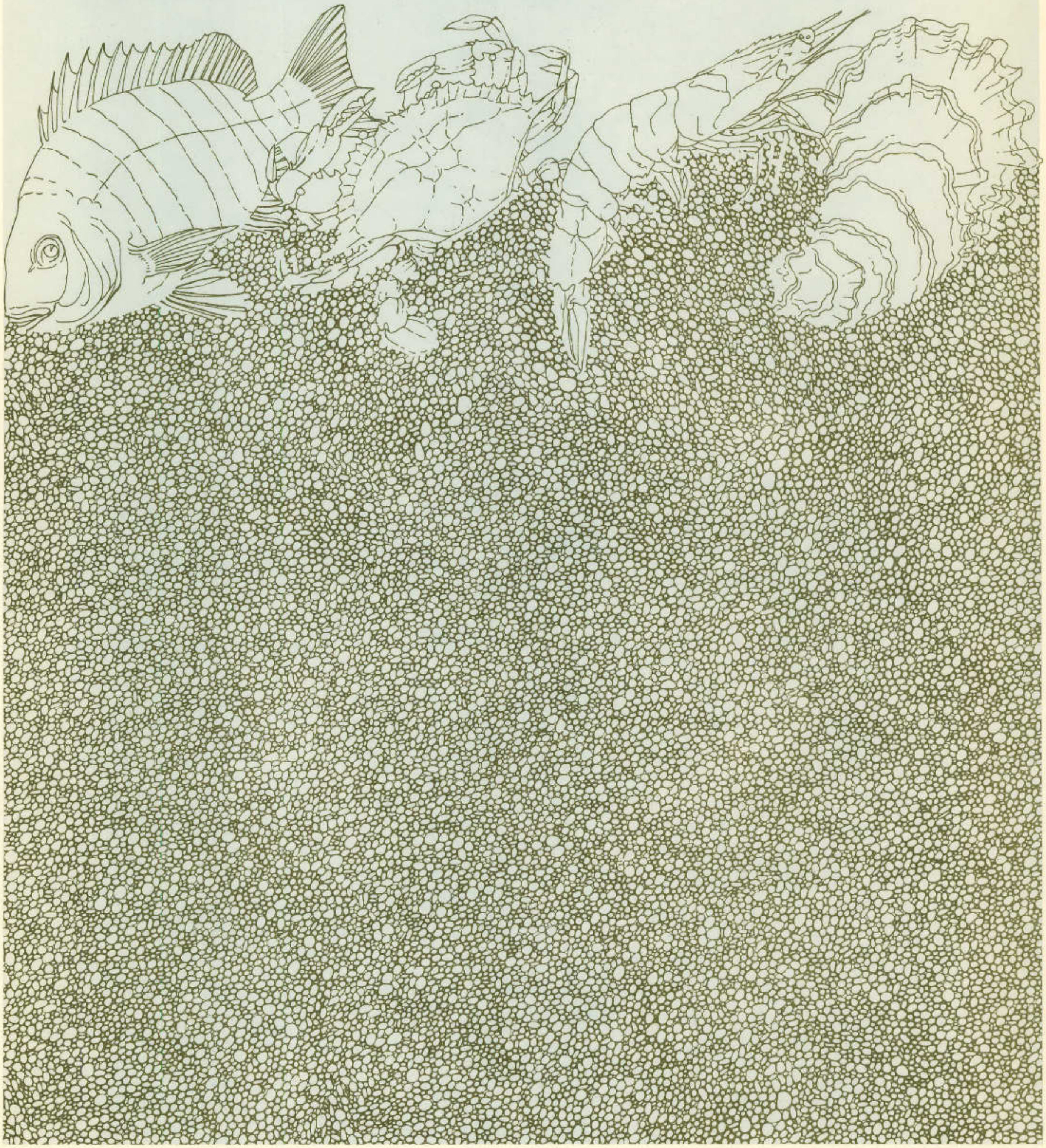
SHELL MANAGEMENT ANNUAL REPORT SEPTEMBER 1979-AUGUST 1980

by Arthur L. Crowe

Management Data Series, Number 39
1982

Texas Parks & Wildlife
Coastal Fisheries Branch



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ABSTRACT

The Texas Parks and Wildlife Department (TPWD) shell management program was designed to insure that shell mining companies comply with TPWD rules. During fiscal year 1979-80, the shell dredge Trinity I (owned by Parker Brothers Company, Incorporated) was monitored 57 times while it operated in San Antonio Bay. No citations for siltation were issued. There were no requests for special permits. During 1979-80, 934,490 m3 (1,222,197 $yd.^3$) of shell were removed from San Antonio Bay. The state received $305,549 for the shell.

INTRODUCTION

The objective of the Texas Parks and Wildlife Department's shell management program is to monitor shell dredging activities to insure that dredging companies comply with Department rules. These rules require shell dredges to operate no closer than 91.4 m (300 ft.) to exposed oyster reefs. Siltation of an exposed reef is not allowed regardless of the distance the dredge operates from the reef. Dredges are not allowed to operate within 0.8 km (0.5 mi) of a shoreline. In San Antonio Bay dredges may not operate north of the 28°22' latitude (Figure 1). Exposed reefs may be dredged only by special permit from the State and such reefs must be replaced on a one-for-one basis at a location determined by the shell management biologist.

LITERATURE REVIEW

Several studies have concentrated on the movement of sediments from hydraulic dredging and their effects on the estuarine environment, specificially benthic and oyster reef communities.

Wilson (1950) listed four factors which determined the movement of suspended sediments in Copano Bay. They included the composition of the material, the flocculation of silt and clay in sea water, wind action, and bottom topography. He also stated that movement of suspended sediments over reefs with little or no rise could produce significant sedimentation at a distance up to 274 m (900 ft.) from the dredge.

Mackin (1962) compared sedimentation characteristics of three types of dredging equipment working in Louisiana. A small hydraulic dredge with a 25 to 30 cm (10 to 12 in.) intake pipe discharged sediments a maximum distance of 396 m (1,300 ft.). He found turbidities beyond a few hundred feet did not exceed natural levels of 20 to 200 ppm.

Ingle (1952) concluded that water flow determined the flow of suspended sediments. He found that heavier particles settled out within 366 m (1,200 ft.) of the dredge, while clay sized particles were transported much farther.

Masch and Espey (1967) took exception with Ingle's statement that the direction of the flow of water current determined the direction of transport of suspended sediment. They found the most severe siltation resulted from sediment density layers. These layers formed when dredge wash waters contained high concentrations of fine sediments, more than 80 o/oo by weight of silt and clay sized particles of which 50 o/oo were clay sized. Movement of these layers was controlled primarily by gravity and they were capable of moving in directions different from either surface or bottom currents.

May (1973) concluded that almost all dredged material disposed of in open water settles very rapidly and either enters dredge cuts or is transported by gravity along the bottom as a flocculated density flow separate from the water column. All other measurable sediment transport did not exceed natural levels caused by normal winds beyond 1,600 feet from the discharge. Spoil dispersion was influenced by size and type of particles being pumped, sediment concentration, volume of material being discharged and bottom topography.

The U. S. Army Corps of Engineers final encironmental impact statement on shell dredging in San Antonio Bay (1974) was based on a 12-month study by the Texas A&M Research Foundation. Compared with undredged flats, recent dredge cuts (3 to 4 years old) had reduced benthic megafaunal and meiofaunal populations. Benthic populations in dredge cuts older than four years recovered to at least 80 o/oo of the numbers found on undredged flats and on two occasions the cuts had higher average populations. During the winter, recent dredge cuts were found to harbor larger populations of nekton than undredged areas.

Burg (1973) measured sedimentation and oyster mortality at special test sites in San Antonio Bay. Sand was placed on the bay bottom prior to a mudshell dredge beginning operation in the area. The sites were later cored to determine the degree of sedimentation. Core samples showed sediment layers from 9.5 to 8 mm (0.4 to 3.4 in.) as the dredge operated within 30 m (100 ft.) of the sample sites. Control stations located 4,328 m (14,220 ft.) from the site accumulated 6.0 mm of natural sediments. At distances varying from 15 to 122 m (50 to 400 ft.) from the dredge, sediment reached 63 cm (24.9 in.) deep on an exposed reef. One year after dredging ceased a follow-up study showed no silt on three of the four locations that could be relocated and 20 mm of sediment remained on the other. Live oysters were placed on trays in seven areas affected by the dredging. Two trays had mortalities less than 7 o/oo, one tray 94 o/oo, and four trays 100 o/oo after two months exposure to dredge sediments.

Benefield (1976) found reef contour, sediment composition, current direction, and the number of dredges discharging sediment in one area were primary factors influencing sedimentation of oyster reefs. He found density flows common in San Antonio Bay because of the large amount of river deposited silt. In one area of San Antonio Bay 15.2 to 45.7 cm (6 to 18 in.) of dredge sediments were found 305 m (1,000 ft.) from a mudshell dredge.

MATERIALS AND METHODS

Dredging activities were monitored one or two times a week, weather permitting. A 10.7 m twin screw diesel boat (Lookdown) was used to get to areas where the dredge was operating. A Navy Mark II sectant was used to triangulate two angles between three accurately surveyed points which were plotted on a 1" = 2,000' scale Mylar map. These angles were set on an engineer's three arm protractor, the angles aligned on the three points on the map and the dredge's position was plotted. Date, shot points used, angles and state tract numbers were recorded.

When dredging occurred in the vicinity of an exposed shell reef, the reef edge was marked with a pole and another set of markers was placed 91.4 m (300 ft.) from the reef edge. This established a visual reference for both the dredge operators and the shell management personnel. Silt tray stations were maintained on the edge of numbered reefs when the dredge operated within 0.8 km (0.5 mi) of the reefs. Silt trays[1] were used to indicate silt movement toward a reef. Reef siltation was verified by shell samples obtained with oyster tongs. If sediments resuspended from dredging operations were noticed approaching the reef, a warning would be given to the dredge operator. If reef siltation exceeded a trace, a siltation citation would be issued and the dredge required to move.

RESULTS AND DISCUSSION

One dredge (Trinity I), owned by Parker Brothers Company, Incorporated, operated in eight state tracts in the central part of San Antonio Bay (Figure 1). Dredging activities were monitored 57 times (Table 1). The Trinity I has 40.6 cm (16 in.) discharge pipes located bow and stern and can operate to a depth of 10 m (33 ft.)

During 1979-80, 934,490 m^3 (1,222,197 $yd.^3$) of mudshell were removed from San Antonio Bay (Table 2; Parker Brothers, 1980). This represents a 16.3 percent decrease from the previous years production (Crowe, 1981). The Parks and Wildlife Department received $305,549 in revenue.

In 1979-80 the dredge operated near three major reefs - Mosquito Point, Turtle and Half Moon (Figure 2 and 3). Traces of natural silt (brownish color) usually collected in the silt trays between observations. The central and upper part of San Antonio Bay has a silty bottom that is easily stirred up by wind throughout the year. The Guadalupe River also introduces a large amount of suspended sediments during certain periods. It was not unusual to observe silt in the trays even after the dredge had left the area. No observations of grey dredge silt were made during the year.

No special permits for removing exposed reefs were requested during 1979-80.

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[1] Trays were made of galvanized sheet metal 30.5 x 30.5 x 3.8 cm, fitted with a wire cradle and tied with a polyvinyl rope to a wooden stake.

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Table 1. Summary of dredge observations (Dredge Trinity I) in San Antonio Bay, 1979-1980.

Month	Number of Observations	State Land Tract
September 1979	1	108
September	3	99
October	7	108
November	6	108
December	1	108
December	3	107
Jamuary 1980	3	107
January	2	98
February	2	98
February	3	77
March	1	77
March	2	78
March	1	62
April	3	76
May	5	76
June	5	76
July	3	76
August	1	77
August	3	76
TOTAL	57	

Table 2. Shell removed by Parker Brothers, Incorporated during September 1979-August 1980.

Month	Shell Removed m^3	Shell Removed yd^3
September 1979	76,771	100,407
October	79,925	104,532
November	92,507	120,987
December	74,763	97,781
January 1980	79,534	104,021
February	88,292	115,475
March	67,419	88,176
April	77,747	101,683
May	75,854	99,208
June	82,719	108,186
July	74,123	96,944
August	64,836	84,797
TOTAL	934,490	1,222,197

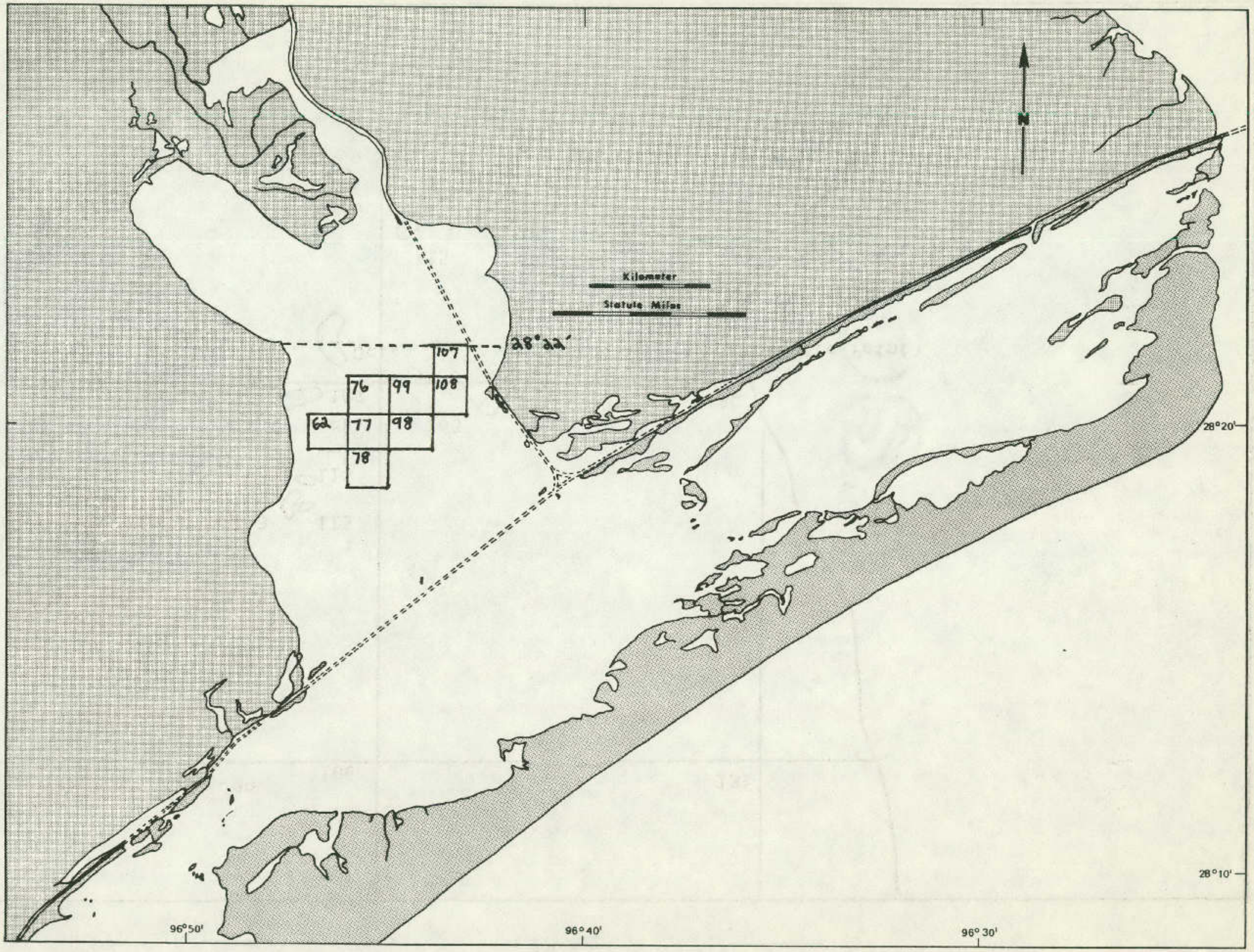

Figure 1. Location of state tracts in San Antonio Bay dredged during 1979-80.

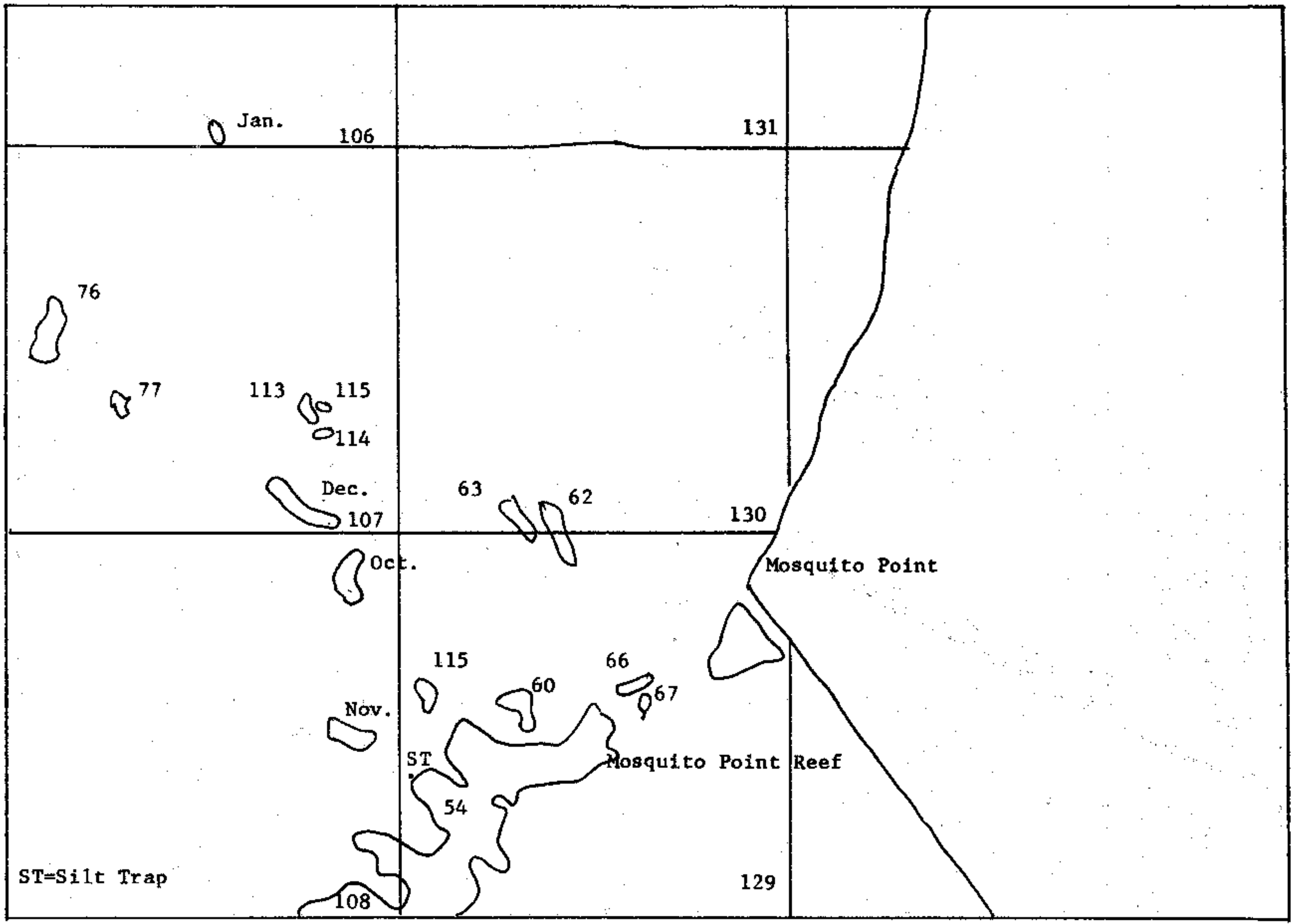

Figure 2. Numbered reefs in relation to dredge cuts during 1979-80.

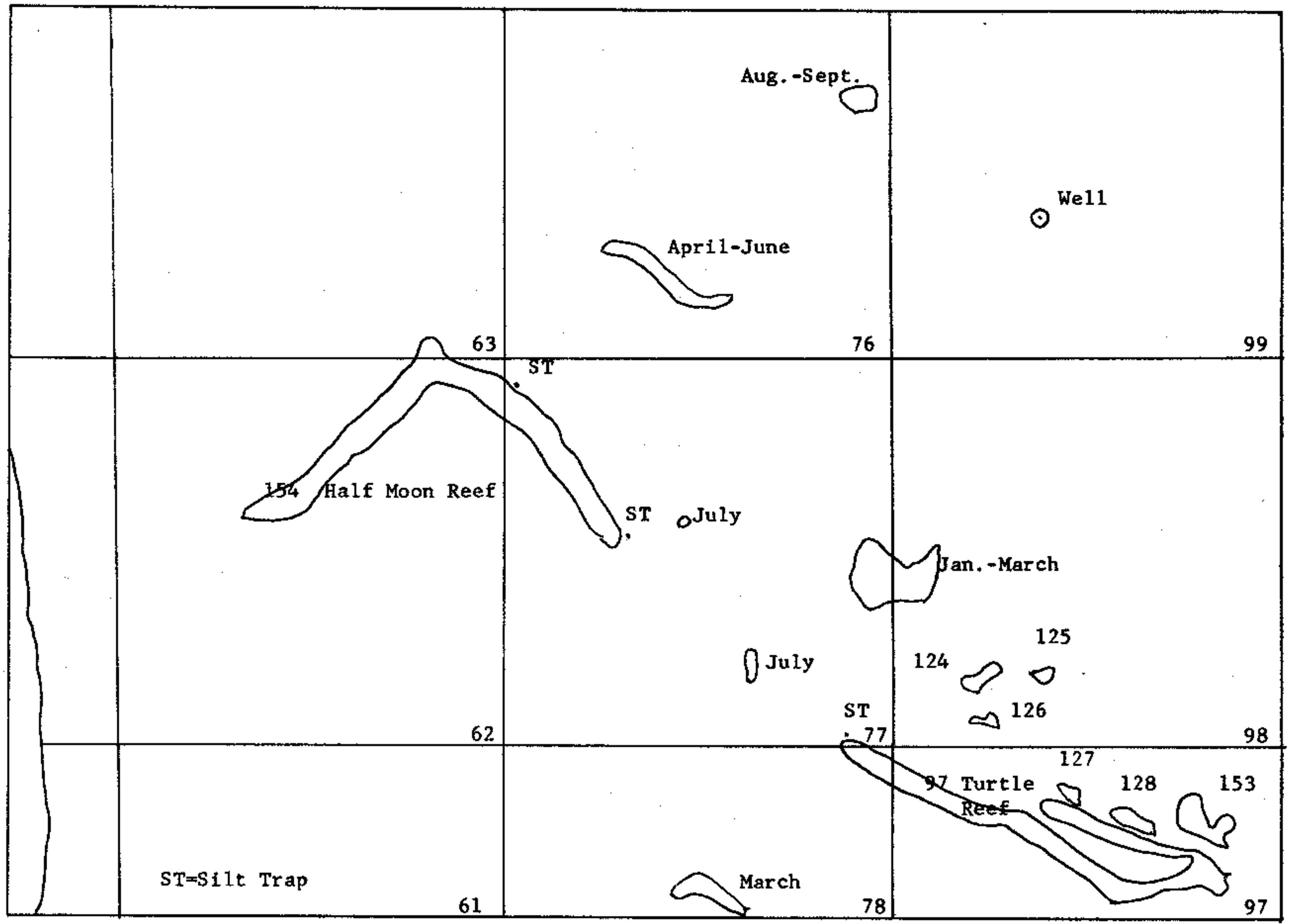

Figure 3. Numbered reefs in relation to dredge cuts during 1979-80.

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