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POPULATION TRENDS AND COMMERCIAL HARVEST OF THE BLUE CRAB *Callinectes sapidus* RATHBUN, IN TEXAS BAYS SEPTEMBER 1978-AUGUST 1979

by Paul C. Hammerschmidt

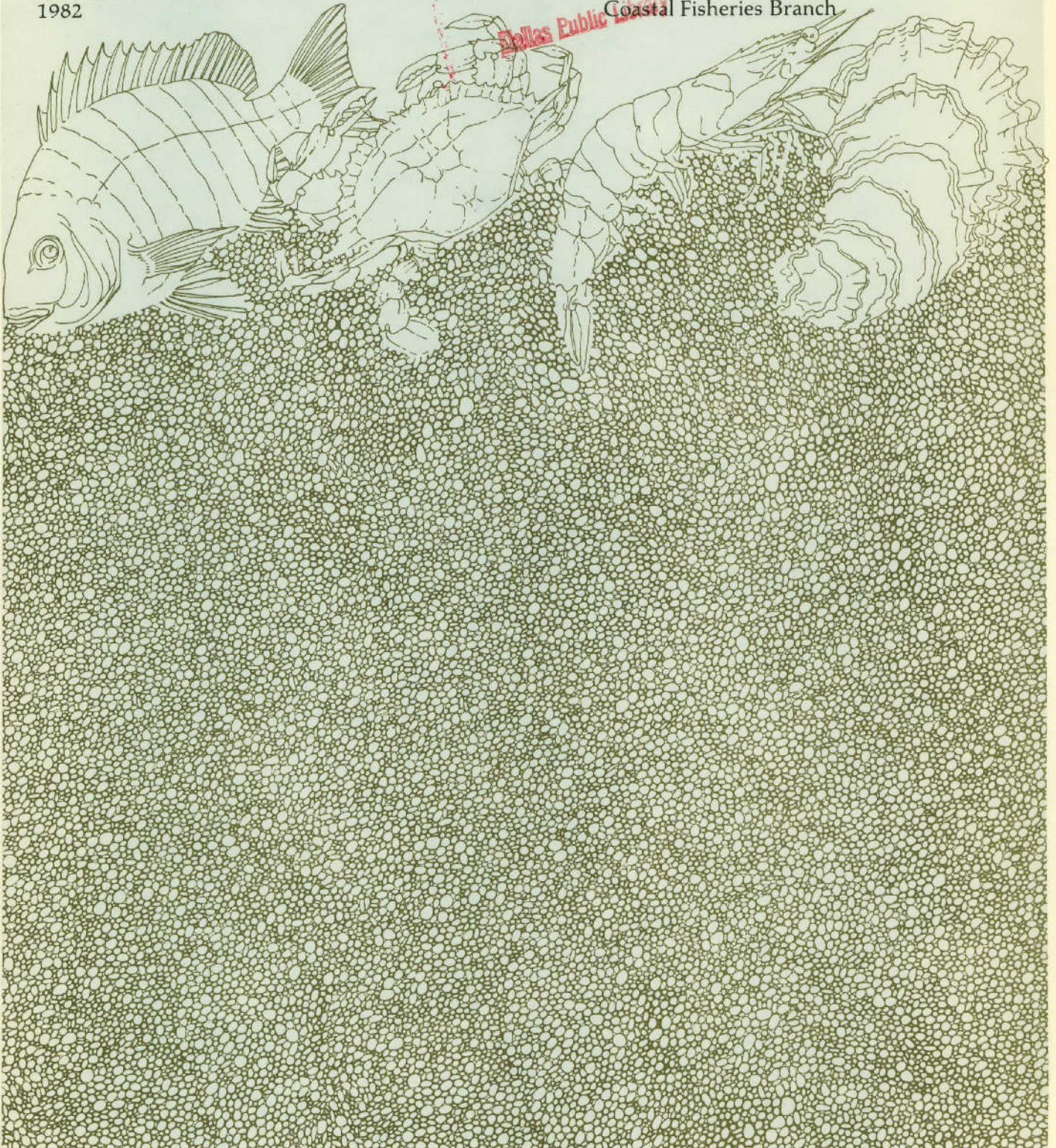
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POPULATION TRENDS AND COMMERCIAL HARVEST OF THE BLUE CRAB,
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ABSTRACT

Blue crab populations were monitored September 1978-August 1979 by Texas Parks and Wildlife Department personnel using 6.1-m trawls in the Galveston, Matagorda, San Antonio and Aransas Bay systems, and 18.3-m seines in the above bay systems plus the Corpus Christi, upper and lower Laguna Madre Bay systems. Monthly commercial blue crab landings for the Texas coast were obtained from Monthly Marine Products Reports. Commercial blue crab catch effort data were obtained during personal interviews conducted at commercial crab houses in the Galveston, Matagorda, San Antonio and Aransas Bay systems.

Mean monthly catch rates from trawl samples for all bay systems combined ranged from 2.3-26.3 crabs/tow with highest catches occurring in April. Mean monthly catch rates from seine samples ranged from 3.9-174.2 crabs/ha with highest catches occurring in March and July. Trawl and seine data indicate blue crabs were more abundant during 1978-79 than during previous study years. This increase in abundance may have been due to lower coastwide salinities than in previous years.

Trawls and seines appear to be selective toward different size classes of blue crabs. Seasonal modal distributions of size classes indicate a growth pattern of a single major spawn class of blue crabs. Growth rates were estimated for the period February-August to be 21.4-25.2 mm/month.

Reported coastwide commercial blue crab landings for 1979 were 3,772,460 kg. This was greater than reported landings from previous years. Monthly commercial catch effort data for all sampled bays combined ranged from 0.8-2.2 kg/pot-day with the highest rates occurring in August.

INTRODUCTION

The blue crab, Callinectes sapidus Rathbun, is found along the entire Texas coast and supports the fourth largest commercial fishery in the State. During 1977, a total of 3,696,952 kg of blue crabs were reported harvested from Texas bays at a dockside value of \$1.9 million (Current Fisheries Statistics, 1980).

The life history of the blue crab in Texas has been investigated primarily by Daugherty (1952) and More (1969). Blue crabs usually spawn during spring and summer in the Gulf of Mexico or lower bay regions where salinities are greater than 20 o/oo. Young crabs migrate toward estuarine areas where salinities are less than 20 o/oo. There they grow and reach maturity in about one year. After mating, female blue crabs migrate to the Gulf of Mexico or lower bay areas to spawn while males remain in the upper bay areas.

Landings of blue crabs have shown wide and sudden fluctuations (More 1969, Pearson 1948 and Tagatz 1965) including a 67% decline in Texas landings from 1962-63. This decline and the lack of knowledge concerning these fluctuations motivated the Texas Parks and Wildlife Department (TPWD) to conduct the blue crab investigation from 1962-1967 (More 1969).

Since blue crab production almost doubled from 1.9-3.7 million kg between 1968 and 1977, the importance of monitoring the blue crab populations for management purposes again became evident. In 1977, TPWD developed a program designed to monitor juvenile and adult blue crab abundance and to investigate possible factors affecting abundance.

The goal of the blue crab program is to manage the resource to provide for optimum sustained harvest by all user groups. In order to accomplish this goal, TPWD monitored trends in catch per effort for standard gear types which were related to hydrographic conditions. Growth rates and blue crab distributions were determined. Commercial harvest and effort were also monitored and related to TPWD data and harvest information from previous years.

MATERIALS AND METHODS

Blue crabs were sampled September 1978-August 1979 in four bay systems along the Texas coast using 6.1-m trawls to sample open water >1 m and in seven bay systems using 18.3-m bag seines to sample shoreline areas <1 m (Figure 1). The trawls had 38.1-mm stretched mesh throughout. The seines measured 1.8 m deep with 19.0-mm stretched mesh in the body and 12.7-mm stretched mesh in the bag.

Trawl samples were taken monthly (February-May) and semi-monthly (June-December) at permanent stations in the Galveston, Matagorda, San Antonio and Aransas Bay systems (Figures 2-6). No samples were taken in

January. The numbers of samples taken during the study in each of the bay systems above were 270, 99, 170 and 183, respectively for a total of 722 samples. Trawls were towed by boat for 15 minutes at each station.

Six seine samples were taken monthly (72 during the study) at randomly selected stations in the Galveston, Matagorda, San Antonio, Aransas, Corpus Christi, upper and lower Laguna Madre Bay systems (Figures 2-9). The sample area covered by the seines during the study year in each of the above bay systems were 2.16, 4.32, 2.16, 3.58, 3.60, 2.88 and 3.05 ha, respectively for a total of 21.75 ha. Seines were pulled parallel or perpendicular to the shoreline from 15.2-30.5 m covering areas of 0.03-0.06 ha per drag.

When possible, 50 blue crabs caught at each station were measured to the nearest 1 mm from lateral spine tip to lateral spine tip. The remainder of the crabs caught were counted. Blue crabs were divided into four size groups according to More (1969) as follows; young (6-30 mm), juveniles (31-75 mm), precommercial (76-125 mm) and commercial (> 126 mm). This was done in order to observe relative strengths and monthly distributions of each size group.

Blue crab growth rates were estimated by fitting a regression line to the progression of modal size groups from monthly width-frequency distributions.

Hydrological data were taken at each station sampled. Water temperature was recorded to the nearest 0.1 C using a mercury thermometer and salinity was recorded to the nearest 0.1 o/oo using a Goldberg refractometer.

Commercial blue crab harvest data were obtained from Monthly Marine Products Reports. Fishing effort as related to the total number of crab pots fished per trip was obtained from estimates given by commercial crab house operators and crab fishermen during personal interviews. Catch per effort calculations were estimated from the total weight of crabs sold and the total number of trips made by each fisherman. One trip represented one day fished. Interviews were conducted at crab houses in the Galveston, Matagorda, San Antonio and Aransas Bay systems.

RESULTS

6.1-m Trawl

Catch per Effort

During the 11-month study, mean catch rates of blue crabs from trawl stations ranged from 9.4 crabs/tow in the Galveston Bay system to 12.1 crabs/tow in the Aransas Bay system (Table 1). Generally, trends in seasonal abundance indicate that greatest catch rates occurred during the spring for all bays sampled (Figure 10).

Galveston Bay System: A total of 2530 blue crabs were taken in trawl samples during the study period in the Galveston Bay system for an 11-month mean catch rate of 9.4 crabs/tow (Table 1). Trends in catch/effort indicate catches below 7.0 crabs/tow from September-March (Figure 10). Highest catch rates of 24.9 crabs/tow occurred during May and declined through August.

Matagorda Bay System: A total of 1112 blue crabs were taken in trawl samples during the study period in the Matagorda Bay system for an 11-month mean catch rate of 11.2 crabs/tow (Table 1). Monthly trends in catch/effort show a sharp decline from September-December increasing slightly in November (Figure 10). Highest catch rates of 23.0 crabs/tow occurred in May.

San Antonio Bay System: A total of 1899 blue crabs were taken in trawl samples during the study period in the San Antonio Bay system for an 11-month mean catch rate of 11.2 crabs/tow (Table 1). Monthly trends in catch/effort show rates below 3.0 crabs/tow from September-December (Figure 10). Highest catch rates of 34.3 crabs/tow occurred during April.

Aransas Bay System: A total of 2222 blue crabs were taken in trawl samples during the study period in the Aransas Bay System for an 11-month mean catch rate of 12.1 crabs/tow (Table 1). Monthly trends in catch/effort show a decline from September-December and April-August (Figure 10). Highest catch rates of 38.2 crabs/tow occurred in February while rates of 36.6 crabs/tow occurred during April.

All Bay Systems Combined: During the study, a total of 7763 blue crabs were taken in trawl samples from all bay systems for an overall 11-month mean catch rate of 10.8 crabs/tow (Table 1). Monthly trends indicate that catch rates declined from September-December and increased to the highest catch rate of 26.3 crabs/tow in April (Figure 10). Catch rates steadily declined through August.

Size

During the 11-month study, mean widths of blue crabs from trawl stations ranged from 76.9 mm in the Matagorda Bay system to 86.5 mm in the San Antonio Bay system (Table 2). Generally, trends in seasonal variation were similar for all bay systems sampled (Figure 11).

Galveston Bay System: Mean widths of blue crabs taken from Galveston Bay system trawl samples ranged from 67.8 mm in November to 98.5 mm in March. The overall mean width was 83.6 mm (Table 2). Monthly trends indicate that mean widths decreased September-November and increased through March (Figure 11). After decreasing in April, mean widths increased gradually through July.

Matagorda Bay System: Mean widths of blue crabs taken from Matagorda Bay system trawl samples ranged from 22.8 mm in September to

106.7 mm in June. The overall mean width was 76.9 mm (Table 2). No blue crabs were caught during October. Monthly trends indicate that mean widths increased September-December and decreased through February (Figure 11). Mean widths then increased through June with slight decreases in May.

San Antonio Bay System: Mean widths of blue crabs taken from San Antonio Bay system trawl samples ranged from 65.8 mm in February to 116.9 mm in July. The overall mean width was 86.5 mm (Table 2). Monthly trends indicate that mean widths increased February-March, decreased in April and increased again through July (Figure 11).

Aransas Bay System: Mean widths of blue crabs taken from Aransas Bay system trawl samples ranged from 60.3 mm in March to 113.1 mm in December. The overall mean width was 83.9 mm (Table 2). Monthly trends indicate that mean widths increased September-December, decreased through March and increased again through May (Figure 11).

All Bay Systems Combined: Mean widths of blue crabs taken from trawl samples from all bay systems combined ranged from 70.2 mm in September to 98.1 mm in July. The overall mean width was 82.7 mm (Table 2). Monthly trends indicate that mean widths increased September-November and decreased through February (Figure 11). Mean widths generally increased again through July.

Size Distribution

During the study, young crabs (6-30 mm), juveniles (31-75 mm), pre-commercial (76-126 mm) and commercial size crabs (>126 mm) represented 6.2, 47.2, 26.4 and 20.1 per cent of the total coastwide trawl catch, respectively. The greatest catch of young crabs occurred during September and February while that for the juveniles occurred during April. The greatest catches of precommercial and commercial size crabs occurred during May and July, respectively (Figure 12).

Growth

The growth rate of blue crabs taken from trawl stations during February-August was estimated to be 25.2 mm/month for all bay systems combined (Figure 13).

Hydrography

During the 11-month study, mean water temperatures from trawl stations ranged from 22.5 C in the Galveston Bay system to 24.1 C in the San Antonio Bay system (Table 3). Mean salinities ranged from 6.2 o/oo in the San Antonio Bay system to 12.6 o/oo in the Galveston Bay system. Generally, trends in seasonal variations in water temperature as well as salinity were similar among all bay systems sampled (Figures 14 and 15, respectively).

Galveston Bay System: During the study, water temperatures ranged from 8.9-32.0 C at trawl stations in the Galveston Bay system with an overall mean of 22.5 C (Table 3). Monthly trends indicate mean water temperatures declined September-December and increased February-August (Figure 14).

Salinity values ranged from 0.0-30.0 o/oo with an overall mean of 12.6 o/oo (Table 3). Monthly trends indicate relatively stable mean salinities of about 21 o/oo September-December declining to their lowest value of 4.7 o/oo in May (Figure 15). Mean salinities again stabilized through August around 5 o/oo.

Matagorda Bay System: During the study, water temperatures ranged from 11.8-32.0 C at trawl stations in the Matagorda Bay system with an overall mean of 23.0 C (Table 3). Monthly trends in mean water temperature are similar to those mentioned above for the Galveston Bay system (Figure 14).

Salinity values ranged from 0.0-25.5 o/oo with an overall mean of 12.4 o/oo (Table 3). Monthly trends indicate that mean salinities increased September-December, decreased February-May and remained stable at about 8 o/oo through August (Figure 15).

San Antonio Bay System: During the study, water temperatures ranged from 12.5-32.0 C at trawl stations in the San Antonio Bay system with an overall mean of 24.1 C (Table 3). Monthly trends in mean water temperature are similar to those mentioned above for the Galveston Bay system (Figure 14).

Salinity values ranged from 0.0-27.8 o/oo with an overall mean of 6.2 o/oo (Table 3). Monthly trends indicate that mean salinities increased September-December, March-April and declined through July to a low of 0.3 o/oo (Figure 15).

Aransas Bay System: During the study, water temperatures ranged from 13.0-32.0 C at trawl stations in the Aransas Bay system with an overall mean of 23.6 C (Table 3). Monthly trends in mean water temperature are similar to those mentioned above for the Galveston Bay system (Figure 14).

Salinity values ranged from 2.0-33.0 o/oo with an overall mean of 12.3 o/oo (Table 3). Monthly trends indicate that mean salinities declined September-October and stabilized around 15 o/oo November-December (Figure 15). Mean salinities declined through May to a low of 5.7 o/oo and increased again through July.

All Bay Systems Combined: During the study, water temperatures ranged from 8.9-32.0 C at trawl stations from all bay systems sampled with an overall mean of 23.3 C (Table 3). Monthly trends indicate a steady decline in mean water temperatures from September-December and an increase from February-August (Figure 14).

Salinity values ranged from 0.0-33.0 o/oo with an overall mean of 10.9 o/oo (Table 3). Monthly trends indicate for all bay systems combined that mean salinities increased gradually September-December and declined to their lowest point of 5.0 o/oo in May (Figure 15). Salinities increased again slightly through August.

Distribution by Temperature and Salinity

The distribution of blue crabs with respect to ranges of water temperature and salinity is based on samples in which at least one crab was caught (Figure 16). Approximately 65% of all samples and 77% of all crabs were taken at trawl stations exhibiting water temperatures >20 C. The greatest mean catch rate of blue crabs was associated with temperatures of 20-25 C.

Approximately 50% of all samples and 71% of all crabs were taken at trawl stations where the salinity was <10 o/oo. The greatest mean catch rate of blue crabs was associated with salinities of 0-10 o/oo.

18.3-m Bag Seine

Catch per Effort

Yearly mean catch rates from seine stations ranged from a low of 28.3 crabs/ha in the Matagorda Bay system to a high of 133.1 crabs/ha in the Corpus Christi Bay System (Table 4). Generally, trends in seasonal abundance indicate that the greatest catch rates occurred once during the spring and again during the summer for all bay systems sampled (Figure 17).

Galveston Bay System: A total of 204 blue crabs were taken in seine samples during the study in the Galveston Bay system for a yearly mean catch rate of 94.4 crabs/ha (Table 4). Monthly trends indicate that catch rates declined September-January increasing to the greatest catch rate of 262.2 crabs/ha in March (Figure 17).

Matagorda Bay System: A total of 103 blue crabs were taken in seine samples during the study in the Matagorda Bay system for a yearly mean catch rate of 23.8 crabs/ha (Table 4). Monthly trends indicate that the greatest catch rate of 175.0 crabs/ha occurred during March while the remaining months showed catch rates of <37 crabs/ha (Figure 17).

San Antonio Bay System: A total of 160 blue crabs were taken in seine samples during the study in the San Antonio Bay system for a yearly mean catch rate of 74.1 crabs/ha (Table 4). Monthly trends indicate a general increase in catch rates from January to a maximum of 322.2 crabs/ha in June (Figure 17).

Aransas Bay System: A total of 210 blue crabs were taken in seine samples during the study in the Aransas Bay system for a yearly mean

catch rate of 58.7 crabs/ha (Table 4). Monthly trends indicate that catch rates fluctuated between 3 and 50 crabs/ha September-February. Catch rates increased in May and reached a maximum of 245.7 crabs/ha in July (Figure 17).

Corpus Christi Bay System: A total of 479 blue crabs were taken in seine samples during the study in the Corpus Christi Bay system for a yearly mean catch rate of 133.1 crabs/ha (Table 4). Catch rates increased from February reaching a maximum of 363.3 crabs/ha during June (Figure 17).

Upper Laguna Madre: A total of 235 blue crabs were taken in seine samples during the study in the upper Laguna Madre for a yearly mean catch rate of 81.6 crabs/ha (Table 4). Monthly trends indicate that catch rates increased January-April and reached a maximum of 404.2 crabs/ha during July (Figure 17). Catch rates remained below 5 crabs/ha September-January.

Lower Laguna Madre: A total of 184 blue crabs were taken in seine samples during the study in the lower Laguna Madre for a yearly mean catch rate of 60.3 crabs/ha (Table 4). Monthly trends indicate that catch rates increased from February to a maximum of 220.0 crabs/ha in April (Figure 17).

All Bay Systems Combined: A total of 1575 blue crabs were taken in seine samples during the study from all bay systems combined for an overall yearly mean catch rate of 72.4 crabs/ha (Table 4). Monthly trends indicate that, generally, catch rates declined September-December, increased in March and declined through May (Figure 17). Values then increased to the greatest catch rate of 174.2 crabs/ha in July.

Size

Yearly mean widths of blue crabs from seine stations ranged from a low of 40.0 mm in the Corpus Christi Bay system to a high of 63.5 mm in Galveston Bay system (Table 5). Generally, trends in seasonal variation were similar for all bay systems sampled (Figure 18).

Galveston Bay System: Mean widths of blue crabs taken from Galveston Bay system seine samples ranged from 20.1 mm in February to 130.0 mm in November (Table 5). The overall mean width was 63.5 mm. No blue crabs were caught during January. The maximum mean width represents one crab. Monthly trends indicate wide fluctuations in mean width September-December (Figure 18). However, mean widths increased steadily February-August.

Matagorda Bay System: Mean widths of blue crabs taken from Matagorda Bay system seine samples ranged from 20.6 mm in February to 111.8 mm in July (Table 5). The overall mean width was 51.1 mm. No blue crabs were caught during November-January and August. Monthly trends indicate no general pattern in mean widths September-January (Figure 18). However, mean widths increased steadily February-August.

San Antonio Bay System: Mean widths of blue crabs taken from San Antonio Bay system seine samples ranged from 23.0 mm in February to 66.6 mm in July (Table 5). The overall mean width was 41.0 mm. No blue crabs were caught during December-January. Monthly trends indicate mean widths increased slightly September-November and February-July (Figure 18).

Aransas Bay System: Mean widths of blue crabs taken from Aransas Bay system seine samples ranged from 26.5 mm in March to 137.0 mm in October (Table 5). The overall mean width was 61.3 mm. The maximum mean represents one blue crab. Monthly trends indicate wide fluctuations in mean widths September-February (Figure 18). Mean widths showed a steady increase from March-August.

Corpus Christi Bay System: Mean widths of blue crabs taken from Corpus Christi Bay system seine samples ranged from 11.0 mm in January to 94.7 mm in October (Table 5). The overall mean width was 40.0 mm. No blue crabs were caught during September. The minimum mean width represents one blue crab. Monthly trends indicate a general decrease in mean widths October-January followed by a general increase through August (Figure 18).

Upper Laguna Madre: Mean widths of blue crabs taken from upper Laguna Madre seine stations ranged from 19.0 mm in November to 68.4 mm in May (Table 5). The overall mean width was 41.4 mm. No blue crabs were caught during September, December and January. The minimum mean width represents one blue crab. Monthly trends indicate no general pattern in mean widths September-January (Figure 18). Mean widths increased steadily February-May and fluctuated slightly through August.

Lower Laguna Madre: Mean widths of blue crabs taken from lower Laguna Madre seine stations ranged from 20.0 mm in October to 106.3 mm in September (Table 5). The overall mean width was 50.9 mm. No blue crabs were caught during January. The minimum mean width represents one blue crab. Monthly trends indicate a general decrease in mean widths September-February followed by a steady increase through May (Figure 18).

All Bay Systems Combined: Mean widths of blue crabs taken from seine samples from all bay systems combined ranged from 22.0 mm in February to 68.3 mm in July (Table 5). The overall yearly mean width was 49.7 mm. Monthly trends indicate, in general, mean widths decreased September-February and increased through July (Figure 18). Slight decreases in mean widths were noted during June and August.

Size Distribution

Young blue crabs (6-30 mm) represented 38.4% of the total seine catch. Juveniles (31-75 mm), precommercial (76-126 mm) and commercial size crabs (> 126 mm) represented 43.2, 14.0 and 4.4 percent of the total seine catch, respectively. The greatest catch of young size class crabs occurred during March and July while juveniles were caught at their

greatest rate during April. Highest catches of precommercial and commercial size crabs occurred during July (Figure 19).

Growth

The growth rate of blue crabs taken from seine stations during February-August was estimated to be 21.4 mm/month for all bay systems combined (Figure 20).

Hydrography

Yearly mean water temperatures ranged from 21.9 C in the Galveston Bay system to 23.3 C in the San Antonio, Aransas, upper and lower Laguna Madre Bay systems (Table 6). Yearly mean salinities ranged from 12.4 o/oo in the Matagorda, San Antonio and Aransas Bay systems to 35.0 o/oo in the upper Laguna Madre Bay system. Generally, trends in seasonal variations in water temperature as well as salinity were similar among all bay systems sampled (Figures 21 and 22, respectively).

Galveston Bay System: During the study, water temperatures ranged from 2.0-33.0 C at Galveston Bay system seine stations for a yearly mean of 21.9 C (Table 6). Monthly trends indicate that mean water temperatures decreased September-January and increased through August (Figure 21).

Salinity values ranged from 0.0-29.4 o/oo for a yearly mean of 16.5 o/oo (Table 6). Monthly trends indicate salinities generally decreased September-August with slight increase noted during November and March (Figure 22).

Matagorda Bay System: During the study, water temperatures ranged from 5.0-34.0 C for a yearly mean of 22.5 C (Table 6). Monthly trends in water temperature are similar to those mentioned above for the Galveston Bay system (Figure 21).

Salinity values ranged from 0.0-30.0 o/oo for a yearly mean of 12.4 o/oo (Table 6). Monthly trends indicate salinity increased September-November and generally decreased overall through August (Figure 22). Slight increases were noted during April and July.

San Antonio Bay System: During the study, water temperatures ranged from 7.0-35.0 C for a yearly mean of 23.3 C (Table 6). Monthly trends in mean water temperatures are similar to those mentioned above for the Galveston Bay systems (Figure 21).

Salinity values ranged from 0.0-29.4 o/oo for a yearly mean of 12.4 o/oo (Table 6). Monthly trends indicate salinities generally decreased through July. Salinities increased slightly during April and August (Figure 22).

Aransas Bay System: During the study, water temperatures ranged from 5.5-33.0 C for a yearly mean of 23.3 C (Table 6). Monthly trends in

water temperature are similar to those mentioned above for the Galveston Bay system (Figure 21).

Salinity values ranged from 1.5-29.0 o/oo for a yearly mean of 12.4 o/oo (Table 6). Monthly trends indicate salinities gradually decreased September-June and then increased through August (Figure 22). Slight increases were noted during November and February.

Corpus Christi Bay System: During the study, water temperatures ranged from 6.0-33.0 C for a yearly mean of 22.8 C (Table 6). Monthly trends in mean water temperature are similar to those mentioned above for the Galveston Bay system (Figure 21).

Salinity values ranged from 5.0-36.0 o/oo for a yearly mean of 25.2 o/oo (Table 6). Monthly trends indicate salinities gradually decreased September-May and increased May-August (Figure 22).

Upper Laguna Madre: During the study, water temperatures ranged from 5.0-34.0 C for a yearly mean of 23.3 C (Table 6). Monthly trends in mean water temperature are similar to those mentioned above for the Galveston Bay system (Figure 21).

Salinity values ranged from 15.5-47.7 o/oo for a yearly mean of 35.0 o/oo (Table 6). Monthly trends indicate salinities gradually decreased September-February and April-July (Figure 22). Slight increases were noted during April and August.

Lower Laguna Madre: During the study, water temperatures ranged from 5.5-35.0 C for a yearly mean of 23.3 C (Table 6). Monthly trends in mean water temperature are similar to those mentioned above for the Galveston Bay system (Figure 21).

Salinity values ranged from 5.0-42.0 o/oo for a yearly mean of 25.9 o/oo (Table 6). Monthly trends indicate salinities decreased September-November and increased through August (Figure 22).

All Bay Systems Combined: During the study, water temperatures ranged from 2.0-35.0 C at seine stations from all bay systems combined (Table 6). The overall yearly mean temperature was 22.9 C. Monthly trends indicate mean water temperatures declined steadily September-January and increased through August (Figure 21).

Salinity values ranged from 0.0-47.7 o/oo for an overall yearly mean of 20.0 o/oo (Table 6). Monthly trends indicate salinities decreased generally September-June with slight increases noted November, April and July-August (Figure 22).

Distribution by Temperature and Salinity

The distribution of blue crabs from seine stations with respect to ranges of water temperature and salinity are based on samples in which at least one crab was caught (Figure 23). Approximately 56% of all

samples and 60% of all crabs were taken at seine stations exhibiting water temperatures > 20 C. The highest mean catch rate was associated with temperatures > 30 C.

Approximately 49% of all samples and 62% of all crabs were taken from seine stations exhibiting salinities > 20 o/oo. The highest mean catch rate was associated with salinities of 25-30 o/oo.

Commercial Blue Crab Landings

Total Landings

Total reported commercial blue crab landings for September 1978-August 1979 ranged from 774 kg from the Gulf of Mexico to 1,122,191 kg from the San Antonio Bay system (Table 7). Monthly trends indicate landings were generally greatest during fall and early summer (Figure 26).

Sabine Lake: During the study, a total of 137,266 kg of blue crabs was landed from Sabine Lake (Table 7). Monthly trends indicate landings were greatest in November (Figure 24). After a sharp decline in February, landings remained relatively stable through June and declined through August.

Galveston Bay System: During the study, a total of 842,078 kg of blue crabs was landed from the Galveston Bay system (Table 7). Monthly trends indicate landings declined steadily September-January and increased through June when the greatest landings occurred (Figure 24). Slight declines in landings were noted during May, July and August.

East and West Matagorda Bay Systems: During the study, a total of 360,462 kg of blue crabs was landed from East and West Matagorda Bay systems (Table 7). Monthly trends in landings are similar to those mentioned above for the Galveston Bay system (Figure 24). However, the May and August declines were not noted.

San Antonio Bay System: During the study, a total of 1,122,191 kg of blue crabs was landed from the San Antonio Bay system (Table 7). Monthly trends indicate landings sharply declined October-January then steadily increased through August (Figure 24).

Aransas Bay System: During the study, a total of 757,570 kg of blue crabs was landed from the Aransas Bay system (Table 7). Monthly trends indicate landings sharply declined October-January then steadily increased through June (Figure 24).

Corpus Christi Bay System: During the study, a total of 2078 kg of blue crabs was harvested from the Corpus Christi Bay system (Table 7). Monthly trends in landings showed no definite pattern. Greatest landings occurred during May (Figure 25).

Upper Laguna Madre: During the study, a total of 3299 kg of blue crabs was landed from the upper Laguna Madre (Table 7). Monthly trends in landings showed no definite pattern (Figure 25). Greatest landings occurred during July.

Lower Laguna Madre: During the study, a total of 52,308 kg of blue crabs was landed from the lower Laguna Madre (Table 7). Monthly trends indicate landings sharply declined September–November and March–May (Figure 25). Greatest landings occurred during September, March and August.

Gulf of Mexico: During the study, a total of 774 kg of blue crabs was landed from the Gulf of Mexico (Table 7). Greatest landings occurred during September (Figure 25).

The Entire Texas Coast: The total reported landings of blue crabs for the Texas coast was 3,298,026 kg during September 1978–August 1979 (Table 7). Over 94% of the total landings came from the Galveston, East and West Matagorda, San Antonio and Aransas Bay systems. The San Antonio Bay landings represented 34% of the total landings.

Monthly trends in commercial blue crab landings for all bay systems combined generally indicate that landings declined September–January and increased through June when the greatest landings occurred (Figure 26).

Catch per Effort

Based on commercial crab house interviews, yearly mean catch rates by commercial crabbers ranged from 1.0 kg/pot-day, in the Aransas Bay system to 2.0 kg/pot-day in the Galveston Bay system (Table 8). Generally, trends in commercial catch per effort indicate catch rates increased from spring through late summer (Figure 27).

Galveston Bay System: Commercial catch/effort data were not available September–February from the Galveston Bay system. Interviews conducted in this system indicated that each crabber fished approximately 300 crab pots every trip. The estimated 6-month mean catch rate was 2.0 kg/pot-day (Table 8). Monthly trends indicate catch rates declined sharply March–April and increased through August when the greatest catch rate of 3.1 kg/pot-day occurred (Figure 27).

East and West Matagorda Bay System: Interviews conducted in this system indicated that each crabber fished approximately 175 crab pots every trip. The estimated 12-month mean catch rate was 1.6 kg/pot-day (Table 8). Monthly trends indicate catch rates increased September–December when the greatest catch rate of 2.2 kg/pot-day occurred (Figure 27). Catch rates again increased following sharp declines in January and March.

San Antonio Bay System: Commercial catch/effort data were not available September–January from the San Antonio Bay system. Interviews

conducted in this system indicated that each crabber fished approximately 200 crab pots every trip. The estimated 7-month mean catch rate was 1.3 kg/pot-day (Table 8). Monthly trends indicate catch rates generally increased February-August when the greatest catch rate of 1.8 kg/pot-day occurred (Figure 27).

Aransas Bay System: Commercial fishing catch/effort data were not available October-December from the Aransas Bay system. Interviews conducted in this system indicated that each crabber fished approximately 150 pots every trip. The estimated 9-month mean catch rate was 1.0 kg/pot-day (Table 8). Monthly trends indicate catch rates increased April-July when the greatest catch rate of 1.4 kg/pot-day occurred (Figure 27). Catch rates also increased February-March.

All Bay Systems Combined: Commercial fishing catch/effort values for all bay systems combined were calculated only for months when data from at least three bay systems were available. The estimated 7-month mean catch rate for all bay systems combined was 1.4 kg/pot-day (Table 8). Monthly trends indicate catch rates increased slightly February-March and after a decline in April, increased through August when the greatest catch rate of 2.0 kg/pot-day occurred (Figure 27).

DISCUSSION

Differences in catch rates for each of the bay systems sampled by trawl during September 1978-August 1979 indicate blue crabs increased slightly in abundance progressively down the Texas coast. This progression is not apparent in the catch rates from each of the bay systems sampled by seine during the same period.

The greatest catch of blue crabs from both trawl and seine stations occurred during the spring in April and March, respectively. Spring peaks in juvenile blue crab catches were also found in 1977-78 unpublished TPWD data and were observed by Daugherty (1952), King (1971) and More (1969).

Seine samples show an additional peak during the summer of 1979 as they did in 1978. This summer peak is not mentioned by the above authors, however, it may represent the spring spawn indicated in the life history diagram by More (1969). It is possible that a summer peak actually existed in More's data but it was obscured when seine, trawl and bar seine data were combined. Darnell (1950), on the other hand, postulated that the absence of juvenile crabs from his summer trawl collections in Lake Pontchartrain, Louisiana was a result of those crabs moving into shallower water. If this was the case, the smaller crabs would become unavailable to the trawl and available to the seine.

Comparisons of 1978-79 trawl catch rates with those of 1977-78 unpublished data indicate blue crabs were generally more abundant

during the present study than during 1977-78. The San Antonio Bay system exhibited the greatest increase in trawl catch rates (Table 9).

Comparisons of 1978-79 seine data with 1964-67 data presented by More (1969) and with 1977-78 unpublished TPWD seine data indicate blue crabs were generally more abundant during the present study than during any previous study year (Table 10). The Galveston, Matagorda, Aransas and upper Laguna Madre Bay systems did not follow this pattern exactly, but normal sample variations could account for this. Examination of the coastwide yearly mean catch rates from seine stations indicate blue crabs were progressively more abundant from 1964 to the present study. For the purpose of these superficial comparisons, it was assumed that the 19.1-mm mesh bag seine used by More (1969) from 1964-67 had the same efficiency as the 12.7-mm mesh bag seine used during this study.

The observed increases in abundance may have been due to a correspondingly lower salinity than previous years (Tables 9-10). Hoese (1960) noted that increases in blue crab abundance coincided with declines in salinity in Mesquite Bay, Texas. Simmons (1957) also suggested that salinity limited blue crab abundance in the upper Laguna Madre.

This preference for lower salinities seems to be verified by the fact that the distribution of blue crabs from trawl samples showed the greatest catch rates occurring in areas where salinities were 0-5 o/oo. This also corresponds with the findings of Gunter (1950) and More (1969). Crabs from seine samples, however, were caught at their greatest rate in areas where salinity was 20-30 o/oo. This uncharacteristic distribution was caused by the relatively large catches of blue crabs from the Corpus Christi and upper Laguna Madre systems where yearly mean salinities were above 25 o/oo. Even though this is more than twice the yearly mean salinity of the four bay systems sampled by trawl, it represents an overall lower salinity for Corpus Christi and upper Laguna Madre. It is possible that salinity changes in general rather than just low salinities affect juvenile crab abundance.

Based upon visual examination of trawl and seine data, there appears to be no obvious relationship between seasonal catch rates and monthly mean salinity. The determination of a mathematical relationship between seasonal catch rates and salinity was not attempted on the basis of one year of data.

The distribution of blue crabs by water temperature indicated the greatest catch rate of crabs occurred where water temperatures were 20-30 C. Gunter (1950) observed that the optimum temperatures for blue crabs were 17-32 C. Seine samples showed two peaks in temperature distribution while trawl samples showed only one (Figures 23 and 16, respectively). These differences were due to a large number (1.5 times more than any other bay system) of crabs caught during July in the upper Laguna Madre. Mean water temperatures during that month were all above 30 C which corresponds to the second peak in

the seine data.

Despite the differences in temperature distribution between gear types, there is an apparent direct relationship between seasonal trends in catch and water temperature. Both factors decline or remain low during the fall and winter and then increase through March or April. After early spring, this relationship apparently disappears. The low winter and high spring catches were also noted by More (1969) and may be primarily related to water temperature. The declines in catches may be due to other, as yet unknown, factors. The determination of a mathematical relationship between seasonal catch rates and water temperature was not attempted on the basis of one year of data.

Yearly mean widths of blue crabs indicate crabs taken from each bay system sampled by trawl were of similar sizes. The same indication applies to crabs taken from each bay system sampled by seine. According to distributions by size class, both seine and trawl were selective for juvenile blue crabs in the 31-75 mm range. This size class made up 43 and 47 percent of the total seine and trawl catches, respectively. This corresponds to the width-frequency distributions described by More (1969).

The two gear types, however, exhibited different selectivities for crabs <31 - and >75 -mm size classes. This difference was most obvious for the 6-30 mm size class which represented 38% of the total seine and 6% of the total trawl catch. Churchill (1919) and More (1969) found that young crabs of this size frequented the shallow marginal bay areas where the seine samples were taken. The scarcity of 6-30 mm crabs in trawl samples, however, may also have been due to the relatively large mesh size of the trawl (38.1 mm) as compared to that of the bag portion of the seine (12.7 mm). It is conceivable that the small crabs could escape through the trawl mesh.

Blue crabs >75 mm represented less than 20% of the total seine catch and over 46% of the total trawl catch. Again Churchill (1919) and More (1969) felt that larger crabs frequented deeper water where trawl samples were taken. It is possible that many of these larger crabs were able to avoid the seine by simply swimming faster than the seine could be pulled. Perhaps both mesh size and the preference of different size crabs for different depths of water affect the catches of the two gear types. Darnell (1959) felt that the size differences he noted between the seine and trawl were mainly a result of differences in lateral distribution of the various size classes of blue crabs present in the bay.

These differences in selectivity indicate that a large portion of the entire blue crab population was sampled by the use of both the seine and trawl. It is important that this broad sampling be continued for at least three years in order to determine if any mathematical correlations exist between the trawl and seine data.

Seasonal variations in mean blue crab widths indicate a general increase in crab size from spring through early summer in both trawl and seine catches. This pattern is similar for all bay systems sampled and indicates a possible measure of blue crab growth rates. When regression lines were fitted to the progression of modal size groups (based on 5-mm increments) from monthly width-frequency distributions, growth rates of 21.4 and 25.2 mm/month were determined for seine and trawl data, respectively.

These growth rates are greater than the 15.3-18.5 mm/month determined by More (1969) which were calculated for the calendar year 1965 including the winter months. Monthly catch rates from the present study were plotted by size class and indicated that modes for successively larger size classes of blue crabs occurred progressively later in the sampling year. This smooth progression indicates the possibility of a single major year class of blue crabs that dominated the catch from February-August 1978. The catch from September-December 1977 does not appear to contribute to the general pattern. Therefore growth rates for this study were determined for the period February-August. Darnell (1959), Gunter (1950) and More (1969) concluded that crabs grow very little during winter months. Consequently, when More included low-growth months in his calculations, the overall growth rate was reduced. Perry (1975), however, determined from two years of data that growth rates of blue crabs from the Mississippi Sound area were 24.0-25.0 mm/month.

In general, reported coastwide blue crab landings have increased almost every year since 1962 (Table 11). The most dramatic regional increases in landings occurred in the San Antonio and Aransas Bay systems. Steady declines in landings have occurred in Sabine Lake and the Gulf of Mexico. The Corpus Christi Bay and upper and lower Laguna Madre system landings have been highly variable from year to year.

The overall historical increase in blue crab landings is probably the result of increased fishing pressure coastwide. According to Fishery Statistics of the United States (1962-1976) the number of crab fishermen and operating units (i.e. crab traps) almost doubled from 1962-1976 (Table 12). The increases in landings from one bay system and corresponding decreases in another bay system were probably the result of shifts in fishing pressure from one area to another. The principle reasons for these shifts were either 1) regional environmental changes which adversely affected crab populations locally or 2) an effort by the fishermen to move to areas of low competition, or both.

Reported blue crab landings from September 1978-August 1979 showed similar seasonal trends as those mentioned by More (1969). Greatest landings occurred from May-August with low landings December-March.

From February-May catch/effort also showed a direct relationship to landings and effort. From June-August, however, there appeared to be an inverse relationship. As total landings declined, catch per pot-day increased. More (1969) felt that the seasonal declines he noted in commercial fishing effort during 1966 and 1967 were the result of crabbers leaving the fishery for other fisheries such as shrimp and oysters. Perhaps this is the case for the present study.

There are several problems associated with the catch effort data presented in this paper. First, data were not available for all bay systems every month. This biased the overall mean catch data. Secondly, the total number of pots fished is based upon estimates given by the crabbers. There have been times when crab pots were not checked for two or more days, yet the landings from those pots were recorded for only one day. These problems can be reduced by conducting regular interviews with individual crabbers.

Commercial blue crab catch/effort during this study was greater for the Galveston and Matagorda Bay systems and less for the San Antonio and Aransas Bay systems as compared with data presented by More (1969) for 1966 and 1967 (Table 13).

There is an apparent inverse relationship between TPWD catches and commercial landings from April-June. This relationship is probably the result of the growth-avoidance phenomenon discussed earlier. As the seasons progress, the dominant year class of blue crabs eventually grows large enough to be able to avoid TPWD gear and at the same time become vulnerable to the commercial crab pot fishery. Mathematical correlations were not calculated on the basis of one year of data.

The data presented in this paper represent only 12 months of sampling. Additional data will be required to (1) verify a southerly increase in abundance, (2) determine a relationship between TPWD catch rates and salinity, (3) determine a relationship between TPWD catch rates and temperature, (4) determine a relationship between trawl and seine catch rates, (5) determine blue crab growth rates, (6) determine causes of fluctuations in commercial blue crab landings and catch effort and (7) to determine a relationship between TPWD catch rates and reported commercial blue crab landings.

CONCLUSIONS

1. Greatest trawl catches occurred during spring.
2. Greatest seine catches occurred during spring and summer.
3. Juvenile crabs were more abundant during the present study than during previous studies.
4. Increases in abundance may be due to overall lower salinities.

5. Seasonally, there appears to be no direct relationship between TPWD catches and salinity.
6. There is an apparent direct seasonal relationship between TPWD catches and water temperature.
7. Trawls and seines are selective for 31-75 mm crabs.
8. Trawls are selective for crabs ≥ 75 mm while seines are selective for crabs < 31 mm.
9. Seasonal modes in size classes of blue crabs indicate growth of a major year class.
10. Additional modes in the 6-30 mm size class during the year indicate recruitment of a secondary year class of blue crabs.
11. Reported commercial landings in 1979 were greater than those of 1978 by 380,000 kg.
12. Greatest commercial landings occur during fall and early summer.
13. Greatest commercial catch/effort occurs during late summer.
14. There is an apparent inverse relationship between TPWD catches and commercial landings from April-June.

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Table 1. Monthly summary of 6.1-m trawl catch rates (no./tow) of blue crabs by bay system, September 1978-August 1979.

Month	Year	Galveston Bay			Matagorda Bay			San Antonio Bay			Aransas Bay			All Bays Combined		
		Number per Tow	Total Crabs	Total Tows	Number per Tow	Total Crabs	Total Tows	Number per Tow	Total Crabs	Total Tows	Number per Tow	Total Crabs	Total Tows	Number per Tow	Total Crabs	Total Tows
Sept.	1978	2.4	72	30	23.8	214	9	0.6	6	10	10.1	162	16	7.0	454	65
Oct.		3.1	93	30	0.0	0	9	0.5	10	20	4.0	87	22	2.3	190	81
Nov.		6.9	207	30	5.1	46	9	1.2	24	20	3.2	71	22	4.3	348	81
Dec.		5.7	172	30	0.2	2	9	2.2	44	20	2.8	61	22	3.4	279	81
Jan.	1979	-	-	NS	-	-	NS	-	-	NS	-	-	NS	-	-	NS
Feb.		5.6	84	15	2.1	19	9	22.8	228	10	38.2	420	11	16.7	751	45
Mar.		4.5	68	15	18.4	166	9	4.1	41	10	19.6	216	11	10.9	491	45
Apr.		16.1	241	15	22.0	198	9	34.3	343	10	36.6	403	11	26.3	1185	45
May		24.9	374	15	23.0	207	9	29.0	290	10	23.9	263	11	25.2	1134	45
June		22.4	672	30	19.1	170	9	20.1	402	20	22.4	493	22	21.4	1737	81
July		12.7	381	30	8.0	72	9	20.3	406	20	1.5	20	13	12.2	879	72
Aug.		5.5	166	30	2.0	18	9	5.2	105	20	1.2	26	22	3.9	315	81
12-month Total		9.4	2530	270	11.2	1112	99	11.2	1899	170	12.1	2222	183	10.8	7763	722

NS - No samples taken.

Table 2. Monthly summary of the mean widths of blue crabs taken in 6.1-m trawls by bay system, September 1978-August 1979.

Month	Year	<u>Galveston Bay</u>			<u>Matagorda Bay</u>			<u>San Antonio Bay</u>			<u>Aransas Bay</u>			<u>All Bays Combined</u>	
		Mean Size(mm)	+1 S. D.	Total Crabs	Mean Size(mm)	+1 S. D.	Total Crabs	Mean Size(mm)	+1 S. D.	Total Crabs	Mean Size(mm)	+1 S. D.	Total Crabs	Monthly Mean Size (mm)	+1 S. D.
Sept.	1978	95.6	45.3	72	22.8	21.9	214	81.0	45.7	6	81.5	41.0	162	70.2	32.3
Oct.		71.4	33.9	93	--	--	0	73.2	38.9	10	95.1	51.6	87	79.9	13.2
Nov.		67.8	37.2	207	93.9	46.3	46	83.7	55.1	23	102.8	52.1	71	87.0	15.0
Dec.		69.1	44.0	172	96.0	106.1	2	67.0	52.0	44	113.1	58.2	61	86.3	22.2
Jan.	1979	--	--	NS	--	--	NS	--	--	NS	--	--	NS	--	--
Feb.		92.8	47.3	84	48.5	21.4	19	65.8	42.9	210	80.5	57.3	176	71.9	19.1
Mar.		98.5	50.7	68	71.1	39.2	166	107.8	38.8	41	60.3	46.7	190	84.4	22.4
Apr.		73.6	35.6	241	86.9	43.2	198	78.8	35.5	322	71.8	39.3	258	77.8	6.8
May		81.0	35.9	334	72.9	24.3	207	86.0	38.2	264	85.1	37.1	235	81.2	6.0
June		86.6	38.5	633	106.7	32.8	138	97.9	36.9	317	82.0	33.5	446	93.3	11.2
July		90.8	39.4	375	102.8	34.7	72	116.9	37.1	385	81.8	60.0	20	98.1	15.2
Aug.		89.0	42.9	168	67.6	30.3	18	93.5	47.6	105	68.8	49.8	26	79.7	13.4
11-month Means		83.6	11.5		76.9	26.2		86.5	16.2		83.9	15.1		82.7	8.4

NS - No samples taken.

Table 3. Monthly summary of water temperature (C) and salinities (o/oo) from 6.1-m trawl stations by bay systems, September 1978-August 1979.

Bay System	Month	Year	No. of Samples	Water Temperature (C)			Salinity (o/oo)		
				Range	Mean	±1 S.D.	Range	Mean	±1 S.D.
Galveston Bay	Sept.	1978	30	24.7-31.0	28.1	1.5	13.9-30.0	20.9	3.7
	Oct.		30	21.8-28.0	24.3	1.8	13.9-26.6	21.0	3.2
	Nov.		29	16.6-19.7	17.9	0.7	15.5-27.8	21.9	3.3
	Dec.		30	8.9-17.8	13.0	2.0	14.4-26.1	20.0	3.6
	Jan.	1979	NS	--	--	--	--	--	--
	Feb.		15	11.8-17.1	14.0	1.7	5.5-21.1	11.6	5.1
	Mar.		15	16.4-19.2	17.8	0.9	1.1-22.8	12.6	5.8
	Apr.		15	21.5-23.6	22.3	0.7	0.0-17.2	9.5	6.2
	May		15	22.5-26.5	24.4	1.0	0.0-12.2	4.7	4.3
	June		30	26.5-32.0	28.2	0.9	0.0-23.7	5.4	6.0
	July		30	27.5-30.5	28.7	0.7	0.0-18.9	5.3	5.3
Aug.		30	28.0-32.0	29.5	1.0	0.0-18.9	5.4	5.4	
	11-month								
	Mean				22.5	6.0		12.6	7.1
Matagorda Bay	Sept.	1978	9	27.4-30.4	28.9	1.1	0.0-21.1	9.6	9.1
	Oct.		9	21.3-22.5	21.9	0.4	7.8-21.9	15.3	4.7
	Nov.		9	12.6-16.6	14.4	1.1	11.6-25.5	18.6	4.5
	Dec.		9	13.4-15.8	15.1	0.8	16.6-24.4	20.9	2.6
	Jan.	1979	NS	--	--	--	--	--	--
	Feb.		9	11.8-14.3	13.3	0.9	8.9-23.9	14.9	4.8
	Mar.		9	20.2-21.5	20.8a	0.5	6.7-20.5	13.7	4.8
	Apr.		9	24.0-25.5	24.7	0.5	2.2-17.2	12.8	6.2
	May		9	24.5-26.5	25.6	0.7	0.0-13.3	6.2	4.5
	June		9	26.0-30.0	27.9	1.3	1.7-13.9	8.0	4.4
	July		9	30.0-32.0	31.0b	0.9	1.1-13.3	8.2	4.7
Aug.		9	28.5-30.5	29.5	0.6	2.2-16.1	8.2a	5.2	
	11-month								
	Mean				23.0	6.4		12.4	4.8
San Antonio Bay	Sept.	1978	10	28.0-29.5	28.5	0.6	1.0-16.7	6.5	5.3
	Oct.		20	23.0-26.0	24.7	1.3	0.0-23.3	9.0	7.4
	Nov.		20	23.0-25.0	24.0	0.6	0.0-25.5	11.1	6.7
	Dec.		20	12.5-19.0	16.0	2.3	0.0-27.8	12.7	8.0
	Jan.	1979	NS	--	--	--	--	--	--
	Feb.		10	16.0-19.0	17.3	1.2	0.0-18.9	6.6	6.7
	Mar.		10	17.0-19.0	18.2	0.8	0.0-14.4	6.2	4.2
	Apr.		10	24.0-25.0	24.1	0.3	0.0-23.3	8.4	8.3
	May		10	23.0-25.0	23.9	0.8	0.0-11.7	3.4	4.3
	June		20	27.0-29.0	27.9	0.6	0.0- 2.9	1.2	1.0
	July		20	28.5-32.0	30.2	1.2	0.0- 1.6	0.3	0.5
Aug.		20	29.0-31.5	30.3	0.7	0.0-10.0	2.6	3.0	
	11-month								
	Mean				24.1	5.1		6.2	4.0

Table 3. (Cont'd.)

Bay System	Month	Year	No. of Samples	Water Temperature (C)			Salinity (o/oo)		
				Range	Mean	±1 S.D.	Range	Mean	±1 S.D.
Aransas Bay	Sept.	1978	16	26.8-28.5	27.6	0.6	2.0-33.0	19.8	9.0
	Oct.		22	21.0-28.0	24.3	2.4	4.0-25.0	12.4	4.8
	Nov.		22	13.0-24.5	20.9	3.9	6.0-29.0	15.1	6.5
	Dec.		22	13.8-18.5	16.4	1.4	10.0-28.0	15.2	5.1
	Jan.	1979	NS	--	--	--	--	--	--
	Feb.		11	13.0-18.5	16.6	1.8	6.0-17.0	10.6	6.7
	Mar.		11	17.0-20.0	18.4	0.8	7.0-28.0	13.5	7.0
	Apr.		11	23.5-24.8	24.0	0.3	6.0-15.0	9.8	2.8
	May		11	23.5-25.5	24.4	0.5	2.0-10.0	5.7	2.9
	June		22	27.0-28.5	27.9	0.3	4.0-26.0	8.3	4.8
	July		13	28.0-32.0	29.6	1.0	4.0-22.0	12.5	6.9
	Aug.		22	29.0-31.0	29.8	0.7	4.0-28.0	12.4	7.8
	11-month Mean					23.6	5.0		12.3
All Bay Systems Combined	Sept.	1978	4	27.6-28.9	28.3	0.6	6.5-20.8	14.2	7.2
	Oct.		4	21.9-24.7	23.8	1.3	9.0-21.0	14.4	5.1
	Nov.		4	14.4-24.0	19.3	4.1	11.1-21.9	16.7	4.6
	Dec.		4	13.0-16.4	15.1	1.5	12.7-20.9	17.2	3.9
	Jan.	1979	NS	--	--	--	--	--	--
	Feb.		4	13.3-17.3	15.3	1.9	6.6-14.9	10.9	3.4
	Mar.		4	17.8-20.8	18.8	1.4	6.2-13.7	11.5	3.6
	Apr.		4	22.3-24.8	23.8	1.0	8.4-12.8	10.1	1.9
	May		4	23.9-25.6	24.6	0.7	3.4- 6.2	5.0	1.2
	June		4	27.9-28.2	28.0	0.2	1.2- 8.3	5.7	3.3
	July		4	28.7-31.0	29.9	1.0	0.3-12.5	6.6	5.1
	Aug.		4	29.5-30.3	29.8	0.4	2.6-12.4	7.6	4.0
	11-month Mean					23.3	5.5		10.9

NS - No Samples Taken

a - 8 Samples Taken

b - 6 Samples Taken

Table 4. Monthly summary of 18.3-m bag seine catch rates (no./ha) of blue crabs by bay system, September 1978-August 1979.

Month	Year	<u>Galveston Bay</u>			<u>Matagorda Bay</u>			<u>San Antonio Bay</u>			<u>Aransas Bay</u>		
		Number per Ha	Total Crabs	Total Ha	Number per Ha	Total Crabs	Total Ha	Number per Ha	Total Crabs	Total Ha	Number per Ha	Total Crabs	Total Ha
Sept.	1978	66.7	12	0.18	2.8	1	0.36	5.6	1	0.18	50.0	15	0.30
Oct.		5.6	1	0.18	2.8	1	0.36	38.9	7	0.18	3.3	1	0.30
Nov.		5.6	1	0.18	0.0	0	0.36	16.7	3	0.18	25.0	7	0.28
Dec.		5.6	1	0.18	0.0	0	0.36	0.0	0	0.18	3.3	1	0.30
Jan.	1979	0.0	0	0.18	0.0	0	0.36	0.0	0	0.18	43.3	13	0.30
Feb.		83.3	15	0.18	36.1	13	0.36	27.8	5	0.18	3.3	1	0.30
Mar.		261.1	47	0.18	175.0	63	0.36	77.8	14	0.18	6.7	2	0.30
Apr.		105.6	19	0.18	11.1	4	0.36	72.2	13	0.18	25.0	7	0.28
May		211.1	38	0.18	16.7	6	0.36	44.4	8	0.18	146.7	44	0.30
June		222.2	40	0.18	13.9	5	0.36	322.2	58	0.18	53.6	15	0.28
July		111.1	20	0.18	27.8	10	0.36	133.3	24	0.18	245.7	86	0.35
Aug.		55.6	10	0.18	0.0	0	0.36	150.0	27	0.18	62.1	18	0.29
12-month Total		94.4	204	2.16	23.8	103	4.32	74.1	160	2.16	58.7	210	3.58

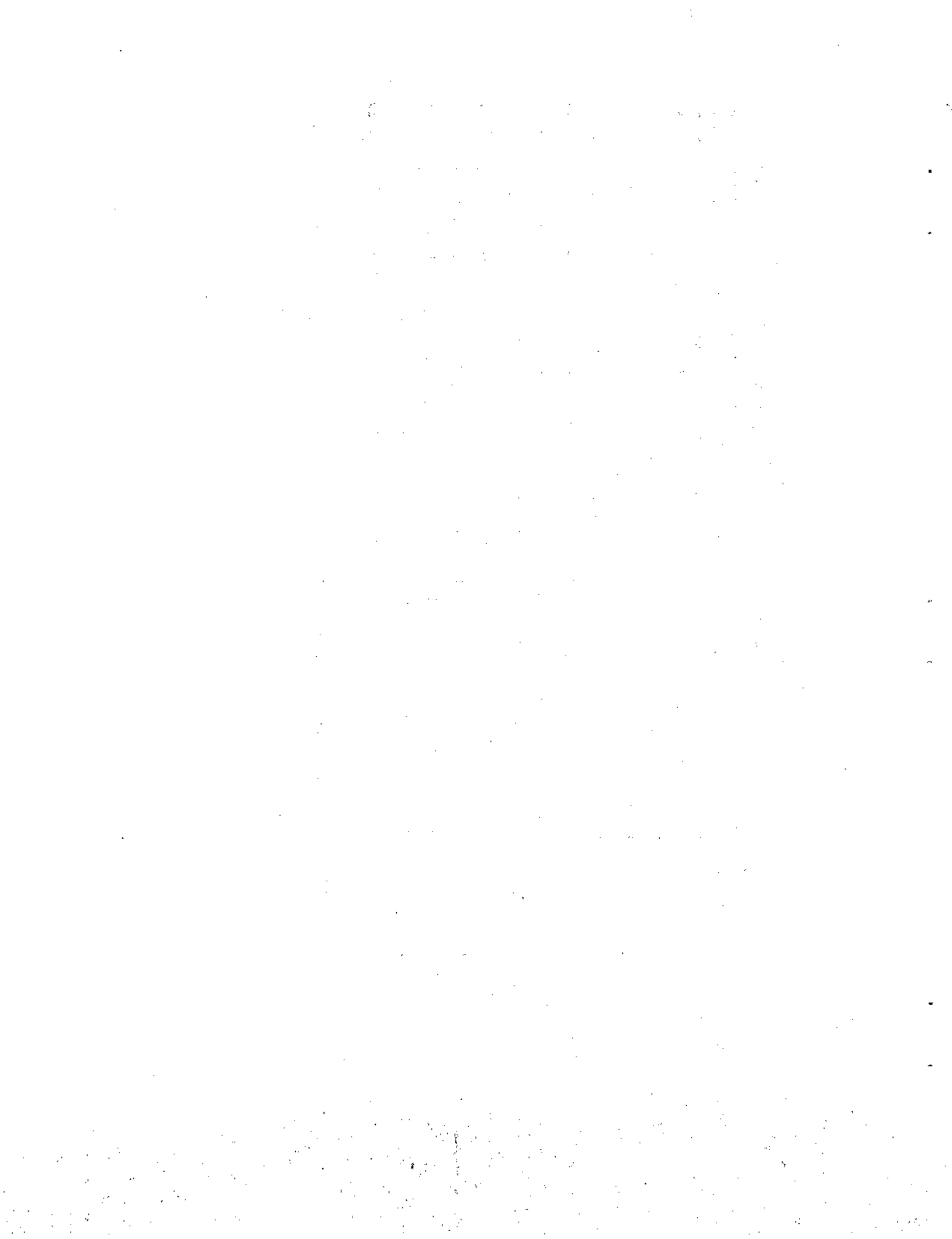


Table 5. Monthly summary of mean widths of blue crabs taken in 18.3-m bag seines by bay system, September 1978-August 1979.

Month	Year	Galveston Bay			Matagorda Bay			San Antonio Bay			Aransas Bay		
		Mean Size (mm)	+ 1 S.D.	Total Crabs	Mean Size (mm)	+ 1 S.D.	Total Crabs	Mean Size (mm)	+ 1 S.D.	Total Crabs	Mean Size (mm)	+ 1 S.D.	Total Crabs
Sept.	1978	64.9	60.4	12	28.0	0.0	1	30.0	0.0	1	70.2	50.9	15
Oct.		41.0	0.0	1	52.0	0.0	1	48.6	50.2	7	137.0	0.0	1
Nov.		130.0	0.0	1	--	--	0	51.3	52.5	3	17.3	7.4	7
Dec.		68.0	0.0	1	--	--	0	--	--	0	85.0	0.0	1
Jan.	1979	--	--	0	--	--	0	--	--	0	51.8	25.6	13
Feb.		20.1	7.1	15	20.6	5.3	13	23.0	5.7	5	28.0	0.0	1
Mar.		26.2	25.1	32	37.4	17.1	44	26.1	11.0	14	26.5	2.1	2
Apr.		57.0	29.5	19	38.5	18.3	4	24.7	9.0	13	52.0	20.0	7
May		53.3	27.2	38	45.7	34.2	6	40.9	26.4	8	57.5	29.5	39
June		65.6	37.9	36	74.8	11.7	5	59.1	30.5	38	51.1	41.3	15
July		80.5	43.8	20	111.8	37.3	10	66.6	42.7	24	60.2	45.2	64
Aug.		91.8	42.3	10	--	--	0	39.6	32.1	26	98.7	40.8	18
12-month Mean		63.5	30.8		51.1	29.5		41.0	15.2		61.3	33.5	

Table 5. (Cont'd.)

Month	Year	<u>Corpus Christi Bay</u>			<u>Upper Laguna Madre</u>			<u>Lower Laguna Madre</u>			<u>All Bay Systems</u>	
		Mean Size (mm)	+1 S.D.	Total Crabs	Mean Size (mm)	+ 1 S.D.	Total Crabs	Mean Size (mm)	+ 1 S.D.	Total Crabs	Monthly Mean Size (mm)	Total + 1 S.D.
Sept.	1978	--	--	0	--	--	0	106.3	8.0	3	59.9	32.4
Oct.		94.7	55.6	3	37.0	0.0	1	20.0	0.0	1	61.5	40.4
Nov.		27.0	0.0	1	19.0	0.0	1	40.9	31.1	9	47.6	42.4
Dec.		24.0	7.1	2	--	--	0	33.7	13.6	3	52.7	28.6
Jan.	1979	11.0	0.0	1	--	--	0	--	--	0	31.4	28.8
Feb.		15.3	3.1	3	25.3	11.1	4	22.0	7.1	2	22.0	4.0
Mar.		38.5	24.0	27	48.6	18.2	18	46.9	19.4	38	35.7	9.7
Apr.		44.2	19.0	53	52.2	24.5	42	52.1	19.0	61	45.8	11.1
May		52.5	28.6	43	68.4	33.0	10	71.8	54.5	18	55.7	11.2
June		41.2	24.6	61	36.3	30.6	24	26.1	21.3	9	50.6	17.2
July		38.7	34.3	40	46.2	32.7	60	74.1	42.0	15	68.3	24.2
Aug.		53.1	33.3	26	39.8	9.1	5	66.4	49.6	5	64.9	25.6
12-month Mean		40.0	22.8		41.4	14.7		50.9	26.7		49.7	14.1

Table 6. Monthly summary of water temperature (C) and salinities (o/oo) from 18.3-m bag seine stations by bay system, September 1978-August 1979.

Bay System	Month	Year	No. of Samples	Water Temperature (C)			Salinity (o/oo)		
				Range	Mean	±1 S.D.	Range	Mean	±1 S.D.
Galveston Bay	Sept.	1978	6	24.0-31.0	27.2	3.5	16.7-28.3	23.7	4.8
	Oct.		6	23.0-27.0	25.5	1.6	16.1-26.6	21.1	3.8
	Nov.		6	14.0-28.0	20.8	5.2	17.8-29.4	24.8	4.2
	Dec.		6	8.0-19.0	12.7	4.9	13.9-29.4	24.1	5.6
	Jan.	1979	6	2.0- 9.0	5.3	2.9	10.0-23.3	17.7	5.2
	Feb.		6	6.5-17.0	14.1	4.2	1.1-24.4	13.0	9.4
	Mar.		6	14.0-23.0	18.4	4.1	15.5-22.2	19.5	2.7
	Apr.		6	19.0-23.0	21.4	1.9	8.9-22.2	16.1	5.9
	May		6	21.0-30.0	25.8	2.9	0.5-17.8	9.8	6.6
	June		6	27.5-34.5	30.5	2.8	0.0-17.2	10.2	7.1
	July		6	26.0-37.0	30.8	3.5	0.0-21.1	9.7	9.1
	Aug.		6	29.0-33.0	30.8	1.6	1.1-13.9	8.0	5.7
	12-month Mean				21.9	8.1		16.5	6.2
Matagorda Bay	Sept.	1978	6	25.0-31.0	28.3	2.4	0.0-30.0	9.5	12.7
	Oct.		6	23.0-27.5	25.8	1.5	0.5-20.0	12.3	5.2
	Nov.		6	13.0-23.0	17.2	4.0	14.0-24.0	20.0	3.6
	Dec.		6	7.5-17.5	13.2	4.4	10.0-28.0	19.5	6.3
	Jan.	1979	6	5.0-14.5	7.9	3.8	2.0-22.0	13.0	6.9
	Feb.		6	11.0-22.0	15.7	3.9	0.0-20.0	10.0	6.5
	Mar.		6	16.0-23.0	21.3	2.9	4.0-23.0	13.8	6.4
	Apr.		6	22.0-24.0	22.7	0.8	10.0-20.0	16.7	3.9
	May		6	24.0-28.5	25.9	1.7	0.0-12.0	5.7	6.3
	June		6	28.5-32.0	30.8	1.6	0.0-16.0	9.2	5.6
	July		6	27.5-33.0	30.1	2.2	0.0-20.0	10.3	7.2
	Aug.		6	29.0-34.0	31.5	1.6	0.0-18.0	8.5	6.1
	12-month Mean				22.5	7.6		12.4	4.5
San Antonio Bay	Sept.	1978	6	29.0-31.0	29.7	0.8	8.8-28.9	20.5	9.0
	Oct.		6	24.0-28.0	26.0	1.4	0.0-26.1	14.6	12.4
	Nov.		6	12.0-25.0	17.6	5.5	1.7-25.5	19.4	9.0
	Dec.		6	9.0-20.0	14.7	4.2	1.1-28.9	17.2	9.3
	Jan.	1979	6	7.0-12.5	8.8	2.0	5.6-26.6	17.6	8.2
	Feb.		6	14.5-19.5	17.8	1.8	0.0-22.8	8.6	8.7
	Mar.		6	18.5-26.0	21.3	3.3	0.0-23.9	11.5	10.1
	Apr.		6	20.5-27.5	24.2	2.4	0.0-29.4	16.6	12.4
	May		6	26.0-29.0	27.3	1.2	1.1-23.3	11.6	11.0
	June		6	28.0-33.5	30.6	2.2	0.0-12.8	4.2	5.7
	July		6	27.0-32.5	30.0	2.2	0.0- 4.4	1.6	1.9
	Aug.		6	29.0-35.0	31.4	2.4	0.5-13.9	6.0	5.7
	12-month Mean				23.3	7.3		12.4	6.2

Table 6. (Cont'd.)

Bay System	Month	Year	No. of Samples	Water Temperature (C)			Salinity (o/oo)		
				Range	Mean	±1 S.D.	Range	Mean	±1 S.D.
Aransas Bay	Sept.	1978	6	27.5-29.0	28.2	6.1	10.5-23.0	18.9	4.8
	Oct.		6	21.0-27.5	24.9	2.7	1.5-13.0	8.9	4.9
	Nov.		6	16.5-21.0	18.9	1.5	11.0-20.0	14.2	3.4
	Dec.		6	18.0-23.5	20.7	2.5	12.0-17.0	13.4	1.9
	Jan.	1979	6	5.5-16.5	9.8	4.6	4.0-20.0	12.0	5.5
	Feb.		6	13.5-16.5	15.3	1.3	4.0-15.0	14.8	8.8
	Mar.		6	16.5-25.5	21.3	3.4	7.0-20.0	11.9	5.6
	Apr.		6	18.0-26.5	22.8	3.6	7.0-18.0	11.7	4.7
	May		6	23.5-32.5	27.3	3.3	2.2-19.0	7.2	6.4
	June		6	23.5-32.0	8.0	3.5	2.0-10.0	6.5	3.1
	July		6	29.0-32.5	31.2	1.7	6.0-21.0	14.3	3.3
	Aug.		6	27.5-33.0	31.2	2.0	2.0-29.0	15.5	4.3
	12-month Mean				23.3	6.5		12.4	3.6
Corpus Christi Bay	Sept.	1978	6	27.0-29.5	27.9	1.1	25.0-36.0	30.5	5.0
	Oct.		6	20.0-32.5	25.4	4.5	25.0-28.0	26.3	1.4
	Nov.		6	13.5-25.0	16.5	8.4	20.0-30.0	25.3	4.3
	Dec.		6	12.0-20.0	17.1	3.4	25.0-30.0	28.3	2.1
	Jan.	1979	6	6.0-13.0	9.9	3.4	15.0-19.0	27.3	1.5
	Feb.		6	13.5-18.0	15.6	1.8	22.0-28.0	25.0	2.8
	Mar.		6	15.5-24.0	19.6	3.4	24.0-29.0	27.5	1.8
	Apr.		6	21.0-27.0	24.0	2.1	16.5-26.0	23.2	3.6
	May		6	24.5-30.0	26.8	2.1	12.0-27.0	20.0	6.7
	June		6	24.0-32.0	28.8	2.9	21.0-25.0	23.2	1.5
	July		6	29.5-33.0	31.8	1.3	5.0-27.0	21.0	8.3
	Aug.		6	29.0-32.0	30.1	2.0	15.0-33.0	25.3	5.8
	12-month Mean				22.8	6.9		25.2	3.0
Upper Laguna Madre	Sept.	1978	6	25.5-31.0	27.6	2.2	37.8-47.7	42.7	4.3
	Oct.		6	25.0-29.5	27.8	2.1	33.3-46.6	40.0	5.6
	Nov.		6	17.0-23.0	19.2	2.5	29.4-42.7	34.0	5.0
	Dec.		6	8.0-16.0	12.4	3.8	27.8-45.5	33.6	6.2
	Jan.	1979	6	5.0-15.0	9.8	3.3	30.5-43.3	36.4	4.6
	Feb.		6	9.0-19.0	15.2	4.6	28.8-42.2	31.6	5.2
	Mar.		6	15.5-23.5	20.1	3.2	30.0-41.6	35.1	5.1
	Apr.		6	23.0-27.0	24.8	1.9	31.1-42.2	37.4	4.3
	May		6	23.0-32.5	28.9	4.6	29.4-38.9	35.3	3.4
	June		6	26.5-34.0	31.4	2.6	27.8-34.4	30.7	2.4
	July		6	28.0-33.0	30.6	2.0	15.5-35.0	29.2	7.5
	Aug.		6	29.0-33.0	31.4	1.7	31.1-37.8	33.4	2.9
	12-month Mean				23.3	7.7		35.0	3.8

Table 6. (Cont'd.)

Bay System	Month	Year	No. of Samples	Water Temperature (C)			Salinity (o/oo)		
				Range	Mean	±1 S.D.	Range	Mean	±1 S.D.
Lower Laguna Madre	Sept.	1978	6	26.5-30.0	28.1	1.3	27.0-34.0	31.7	2.7
	Oct.		6	21.0-28.0	25.5	3.0	12.0-32.0	23.2	8.0
	Nov.		6	16.5-26.0	20.3	4.4	5.0-30.0	18.5	9.9
	Dec.		6	10.0-17.5	14.9	2.6	16.0-25.0	20.0	3.2
	Jan.	1979	6	5.5-17.0	13.8	4.1	29.0-34.0	31.8	2.2
	Feb.		6	7.5-18.0	14.2	4.7	19.5-35.0	28.2	5.8
	Mar.		6	17.0-24.0	19.8	2.7	10.0-33.0	23.5	10.6
	Apr.		6	24.0-28.5	25.8	1.8	26.0-32.0	28.5	2.4
	May		6	25.0-31.5	26.7	2.4	10.0-30.0	24.2	7.3
	June		6	25.0-32.5	28.8	3.0	9.0-33.0	16.2	8.9
	July		6	27.0-35.0	32.2	2.8	14.0-42.0	26.8	10.2
	Aug.		6	28.0-33.0	29.9	2.2	36.0-39.0	37.7	1.4
	12-month Mean				23.3	6.5		25.9	6.2
All Bay Systems Combined	Sept.	1978	7	27.2-29.7	28.1	0.8	9.5-42.7	25.4	10.7
	Oct.		7	24.9-27.8	25.8	0.9	8.9-40.0	20.9	10.5
	Nov.		7	16.5-20.8	18.6	1.6	14.2-34.0	22.3	6.4
	Dec.		7	12.4-20.7	15.1	3.0	13.4-33.6	22.3	6.9
	Jan.	1979	7	5.3-13.8	9.3	2.6	12.0-36.4	22.3	9.6
	Feb.		7	14.1-17.8	15.4	1.2	8.6-31.6	18.7	9.3
	Mar.		7	18.4-21.3	20.3	1.1	11.5-35.1	20.4	8.9
	Apr.		7	21.4-25.8	23.7	1.5	11.7-37.4	21.4	8.9
	May		7	25.8-28.9	27.0	1.0	5.7-35.3	16.3	10.8
	June		7	28.0-31.4	29.8	1.3	4.2-30.7	14.3	9.6
	July		7	30.0-32.2	31.0	0.8	1.6-29.2	16.1	10.0
	Aug.		7	29.9-31.5	30.9	0.7	6.0-33.4	19.2	13.0
	12-month Mean				22.9	7.1		20.0	3.2

Table 7. Monthly summary of reported commercial blue crab landings (kg) by bay system, September 1978-August 1979.

Month	Year	Sabine Lake	Galveston Bay	East & West Matagorda Bays	San Antonio Bay	Aransas Bay	Corpus Christi Bay	Upper Laguna Madre	Lower Laguna Madre	Gulf of Mexico	Coastwide Total
Sept.	1978	4,733	110,814	26,949	96,245	82,670	0	536	8,247	503	330,697
Oct.		18,111	88,306	23,201	108,689	97,195	509	0	5,135	82	341,228
Nov.		35,681	19,077	20,921	86,072	81,534	41	583	0	0	243,909
Dec.		10,871	9,568	10,324	69,469	55,913	0	0	1,543	0	157,688
Jan.	1979	565	297	323	9,871	11,933	0	0	3,730	0	26,719
Feb.		0	880	8,327	22,937	26,615	0	0	4,799	189	63,747
Mar.		15,672	32,009	21,228	35,147	46,314	0	175	8,191	0	158,736
Apr.		12,403	101,071	28,862	37,934	50,306	0	644	5,929	0	237,149
May		12,503	84,213	49,447	142,758	67,092	893	0	1,997	0	358,903
June		15,976	150,165	69,255	155,320	104,183	635	0	2,782	0	498,316
July		10,220	126,638	55,473	158,826	91,582	0	726	4,134	0	447,599
Aug.		531	119,040	66,152	198,923	42,233	0	635	5,821	0	433,335
Total		137,266	842,078	380,462	1,122,191	757,570	2,078	3,299	52,308	774	3,298,026

Table 8. Monthly summary of commercial blue crab catch effort (kg/pot-day) by bay system and based on interviews with crab house operators, September 1978-August 1979.

Month	Year	Galveston Bay Kg/Pot-day	Matagorda Bay Kg/Pot-day	San Antonio Bay Kg/Pot-day	Aransas Bay Kg/Pot-day	All Bays Combined ^a Kg/Pot-day
Sept.	1978	ND	1.6	ND	1.1	--
Oct.		ND	1.5	ND	ND	--
Nov.		ND	2.1	ND	ND	--
Dec.		ND	2.2	ND	ND	--
Jan.	1979	ND	0.8	ND	1.0	--
Feb.		ND	1.6	0.9	0.7	0.9
Mar.		2.4	0.8	0.9	1.2	1.1
Apr.		0.8	1.4	0.6	0.8	0.8
May		1.2	1.8	1.1	0.9	1.2
June		2.0	1.9	1.5	1.2	1.7
July		2.8	1.8	1.5	1.4	1.8
Aug.		3.1	1.6	1.8	1.1	2.0
Yearly Mean ^b		2.0	1.6	1.2	1.0	1.4

ND - No Data Available

a - Calculated for months when data from at least three bay systems were available.

b - Calculated for months only when data were available.

Table 9. Historical 6.1-m trawl catch rates (no./tow) of blue crabs and associated yearly mean salinities (o/oo) by year and bay system.

Year	<u>Galveston Bay</u>		<u>Matagorda Bay</u>		<u>San Antonio Bay</u>		<u>Aransas Bay</u>		<u>All Bays Combined</u>	
	Number per Tow	Salinity (o/oo)	Number per Tow	Salinity (o/oo)	Number per Tow	Salinity (o/oo)	Number per Tow	Salinity (o/oo)	Number per Tow	Salinity (o/oo)
1977-78	3.5	18.0	4.5	14.8	3.2	14.2	10.2	18.4	4.9	16.4
1978-79	9.4	12.6	11.2	12.4	11.2	6.2	12.1	12.3	10.7	10.9

Table 10. Historical 18.3-m bag seine catch rates (No./1525 m²) of blue crabs and associated yearly mean salinities (o/oo) by year and bay system (1964-1967 from More 1969).

Year	<u>Galveston Bay</u>		<u>Matagorda Bay</u>		<u>San Antonio Bay</u>		<u>Aransas Bay</u>	
	Number ₂ per 1525m ²	Salinity (o/oo)	Number ₂ per 1525m ²	Salinity (o/oo)	Number ₂ per 1525m ²	Salinity (o/oo)	Number ₂ per 1525m ²	Salinity (o/oo)
1964	12.2	22.1	4.5	29.5	1.3	25.9	3.8	33.3
1965	13.5	20.4	6.2	24.1	0.8	16.8	3.2	25.9
1966	8.3	15.7	2.1	16.9	--	14.7	4.3	20.3
1967	7.0	22.6	2.8	23.6	2.5	18.2	7.0	20.8
1977-78 ^a	15.0	22.6	3.1	20.8	10.0	22.1	12.3	22.3
1978-79 ^b	14.3	16.5	3.6	12.4	11.3	12.4	9.0	12.4

a - Sample period was Oct. 1977-Aug. 1978

b - Sample period was Sept. 1978-Aug. 1979

Year	<u>Corpus Christi Bay</u>		<u>Upper Laguna Madre</u>		<u>Lower Laguna Madre</u>		<u>Coastwide Yearly Mean</u>	
	Number ₂ per 1525m ²	Salinity (o/oo)	Number ₂ per 1525m ²	Salinity (o/oo)	Number ₂ per 1525m ²	Salinity (o/oo)	Number ₂ per 1525m ²	Salinity (o/oo)
1964	1.7	34.0	0.3	51.1	6.5	42.2	4.3	34.0
1965	4.5	29.3	0.1	46.8	8.0	39.4	5.2	29.0
1966	2.1	30.6	7.4	38.6	7.6	35.7	5.3	24.6
1967	3.0	32.6	7.4	38.9	5.9	33.5	5.1	27.2
1977-78 ^a	7.8	31.8	16.5	40.6	2.5	31.5	9.6	27.4
1978-79 ^b	20.3	25.2	12.4	35.0	9.2	25.9	11.4	20.0

a - Sample period was Oct. 1977-Aug. 1978

b - Sample period was Sept. 1978-Aug. 1979

Table 11. Historical reported commercial blue crab landings (kg) by calendar year and bay system (from Current Fisheries Statistics 1963-1980 and Monthly Marine Product Reports 1979).

Year	Sabine Lake	Galveston Bay	East & West Matagorda Bays	San Antonio Bay	Aransas Bay	Corpus Christi Bay	Upper Laguna Madre	Lower Laguna Madre	Gulf of Mexico	Coastwide Total
1962	107,637	141,203	910,269	77,519	728,197	0	0	0	66,542	2,031,368
1963	47,400	443,387	330,397	446,743	56,790	20,548	0	0	7,439	1,352,703
1964	123,422	542,315	102,467	273,924	50,938	0	0	0	17,690	1,127,086
1965	230,969	824,586	182,027	314,340	17,962	51,573	0	0	21,546	1,643,002
1966	252,107	615,888	216,454	164,518	8,754	0	0	0	2,222	1,259,944
1967	351,852	475,319	163,656	125,237	70,579	0	0	0	3,946	1,190,589
1968	357,794	699,712	423,338	214,322	89,584	0	56,291	0	11,249	1,852,290
1969	374,486	773,693	404,151	673,131	328,492	69,173	239,724	0	14,152	2,877,000
1970	310,711	1,189,319	354,709	241,175	398,299	0	2,132	0	9,934	2,506,279
1971	869,990	980,122	178,946	264,354	268,436	45,586	91	0	27,760	2,635,190
1972	584,544	848,263	400,068	451,551	607,315	32,069	1,860	0	6,532	2,932,202
1973	616,069	925,328	512,378	389,636	577,287	18,643	454	5,262	75,158	3,121,214
1974	254,375	899,474	435,131	509,974	489,562	148,007	907	5,761	18,098	2,761,289
1975	281,636	845,269	407,190	698,124	404,831	57,017	4,037	1,588	18,008	2,717,699
1976	233,237	725,521	295,606	970,869	598,198	56,109	363	135,624	9,208	3,024,735
1977	102,557	836,878	242,853	989,557	1,018,133	46,629	57,516	442,343	5,035	3,741,502
1978	283,132	871,306	263,628	873,391	930,409	4,218	72,393	88,949	771	3,388,199
1979	76,497	886,202	397,747	1,216,132	1,105,071	22,906	12,207	55,465	235	3,772,460

Table 12. Historical commercial blue crab fishing effort for the Texas coast based on the number of full-time fishermen and pots fished each year (from Fishery Statistics of the United States Statistical Digests Nos. 56-68 and 70).

Year	Number of Fulltime Pot Fishermen	Number of Pots
1962	84	9,220
1963	80	9,668
1964	72	8,680
1965	54	8,200
1966	55	8,460
1967	65	11,100
1968	74	12,820
1969	86	14,440
1970	90	14,300
1971	74	12,700
1972	84	14,225
1973	108	16,500
1974	113	16,950
1975	ND	ND
1976	173	23,375
1977	ND	ND
1978	ND	ND

ND - No Data Available

Table 13. Historical commercial blue crab catch effort (kg/pot-day) by year (1965-1967 from More 1969).

Year	Galveston Bay Kg/Pot-day	East & West Matagorda Bay Kg/Pot-day	San Antonio Bay Kg/Pot-day	Aransas Bay Kg/Pot-day
1965	1.7	--	--	--
1966	1.9	1.5	1.6	0.9
1967	1.6	1.0	1.6	1.6
1978-79	1.9	1.7	1.3	1.0

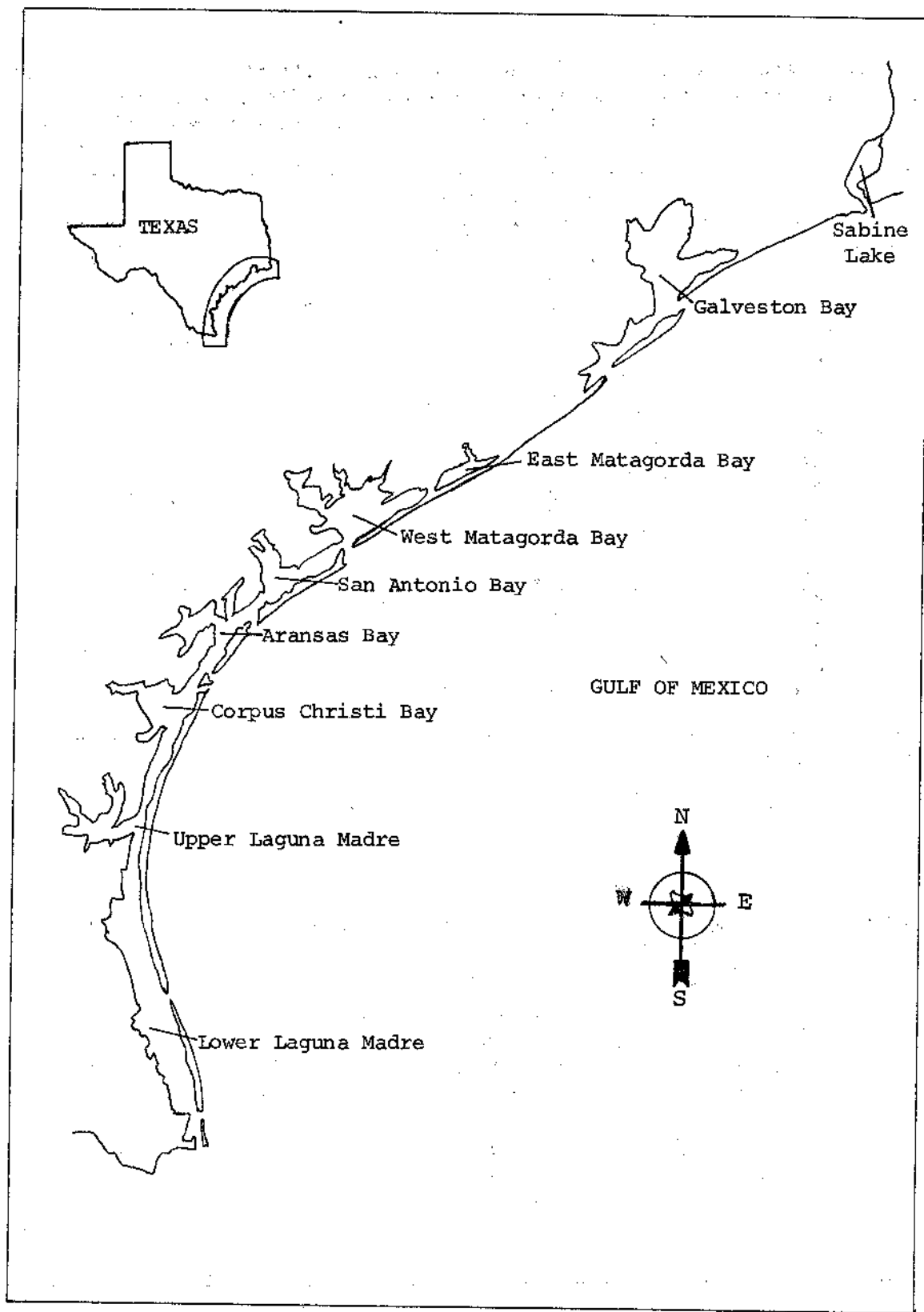


Figure 1. Map of the Texas coast indicating bay system locations.

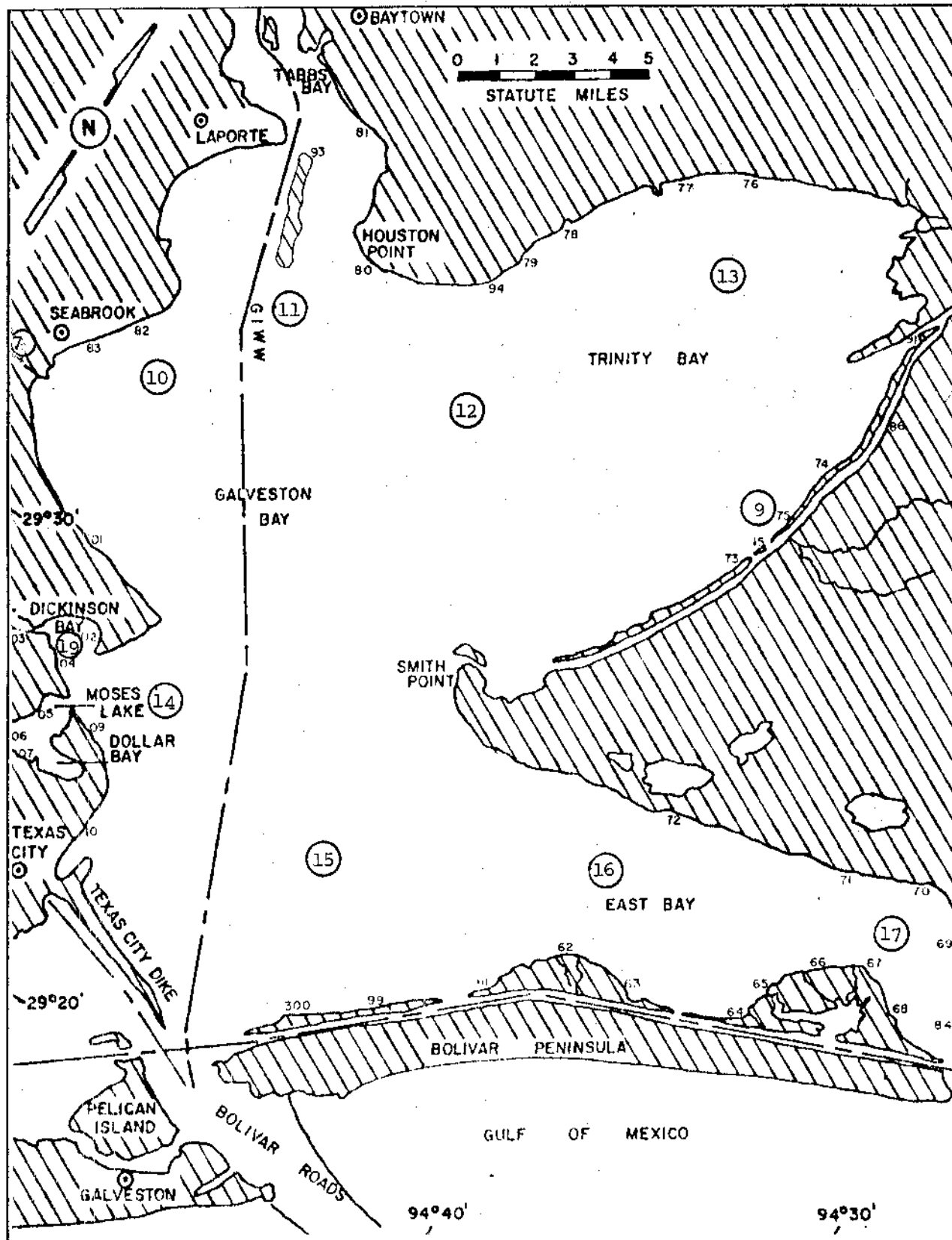


Figure 2. Map of the Galveston Bay system indicating 6.1-m trawl station (circled numbers) and 18.3-m bag seine station locations, September 1978-August 1979.

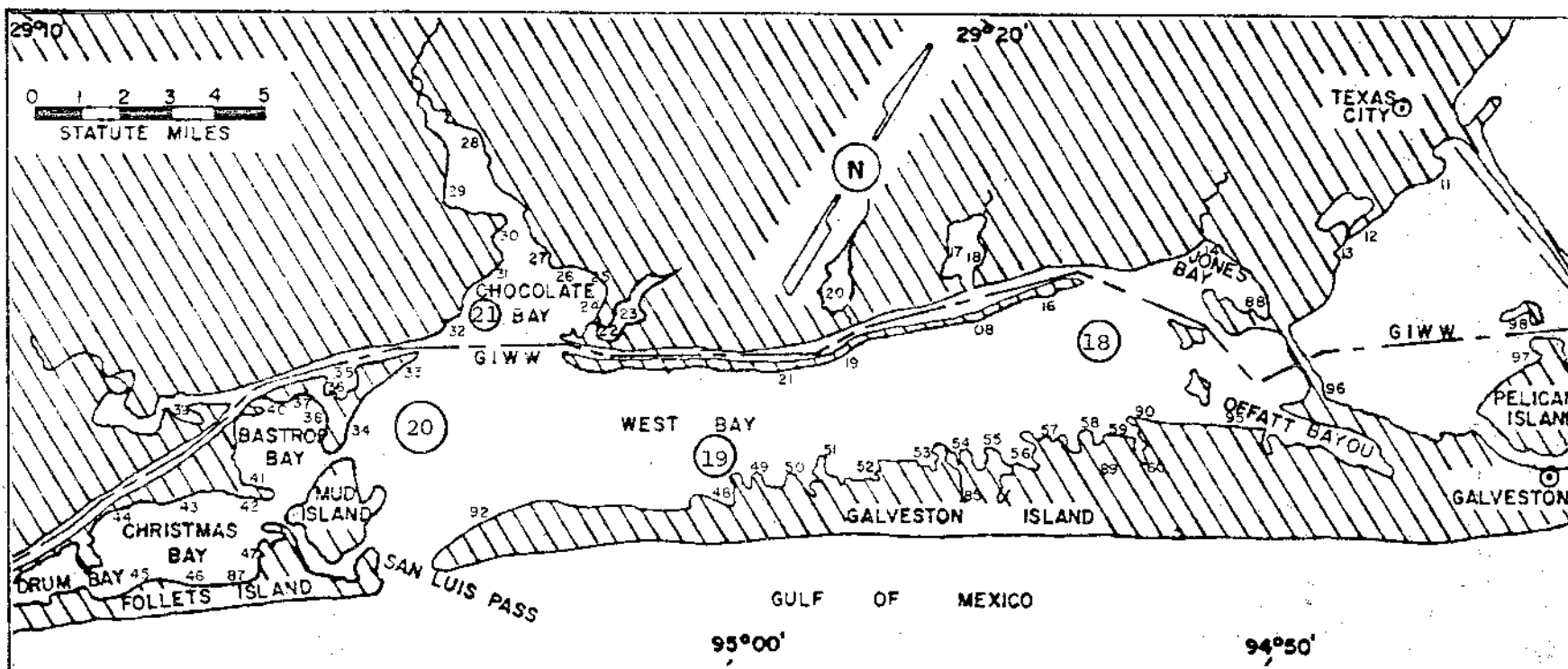


Figure 3. Map of the Galveston Bay system indicating 6.1-m trawl station (circled numbers) and 18.3-m bag seine station locations, September 1978-August 1979.

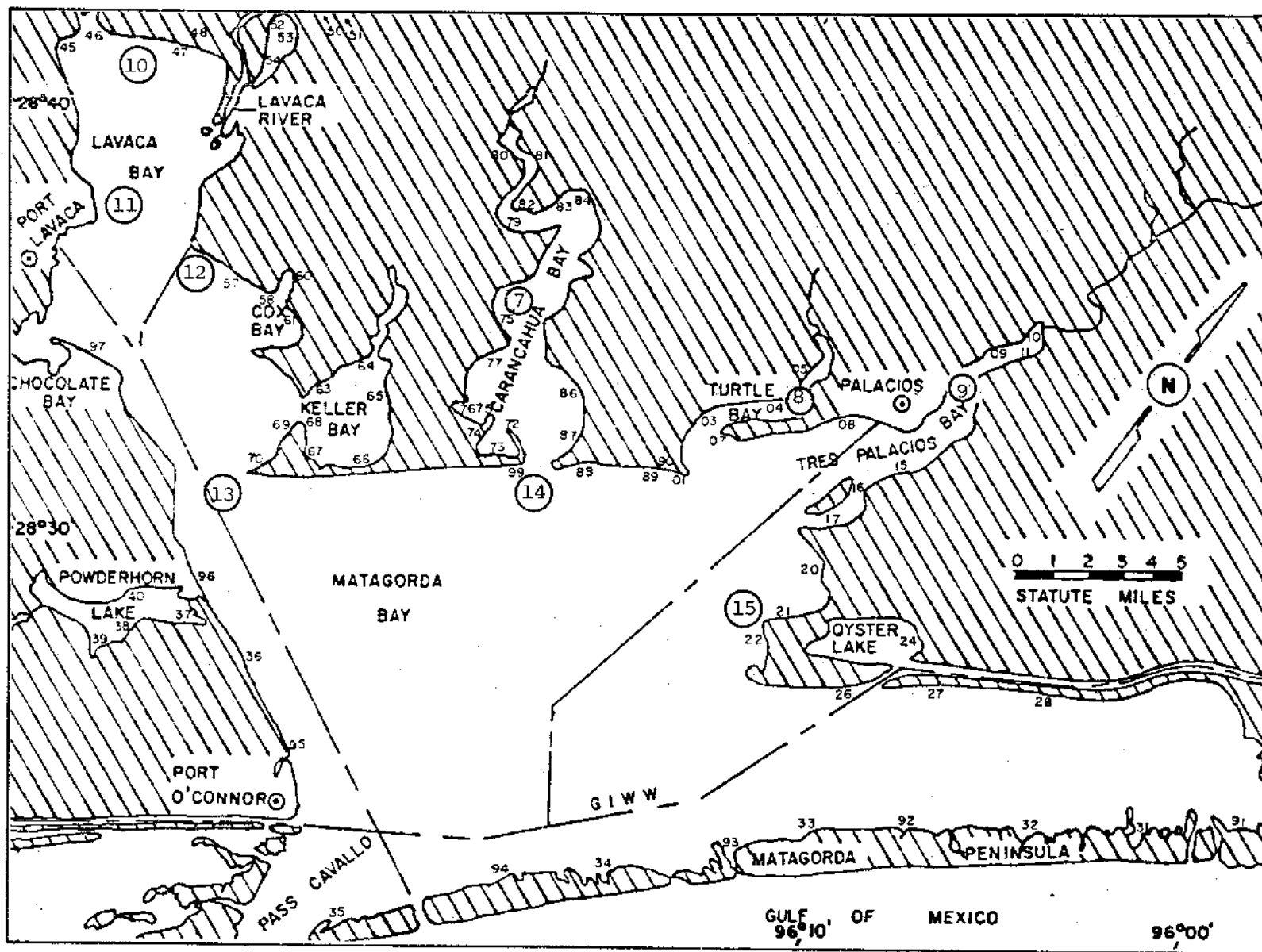


Figure 4. Map of the Matagorda Bay system indicating 6.1-m trawl station (circled numbers) and 18.3-m bag seine station locations, September 1978–August 1979.

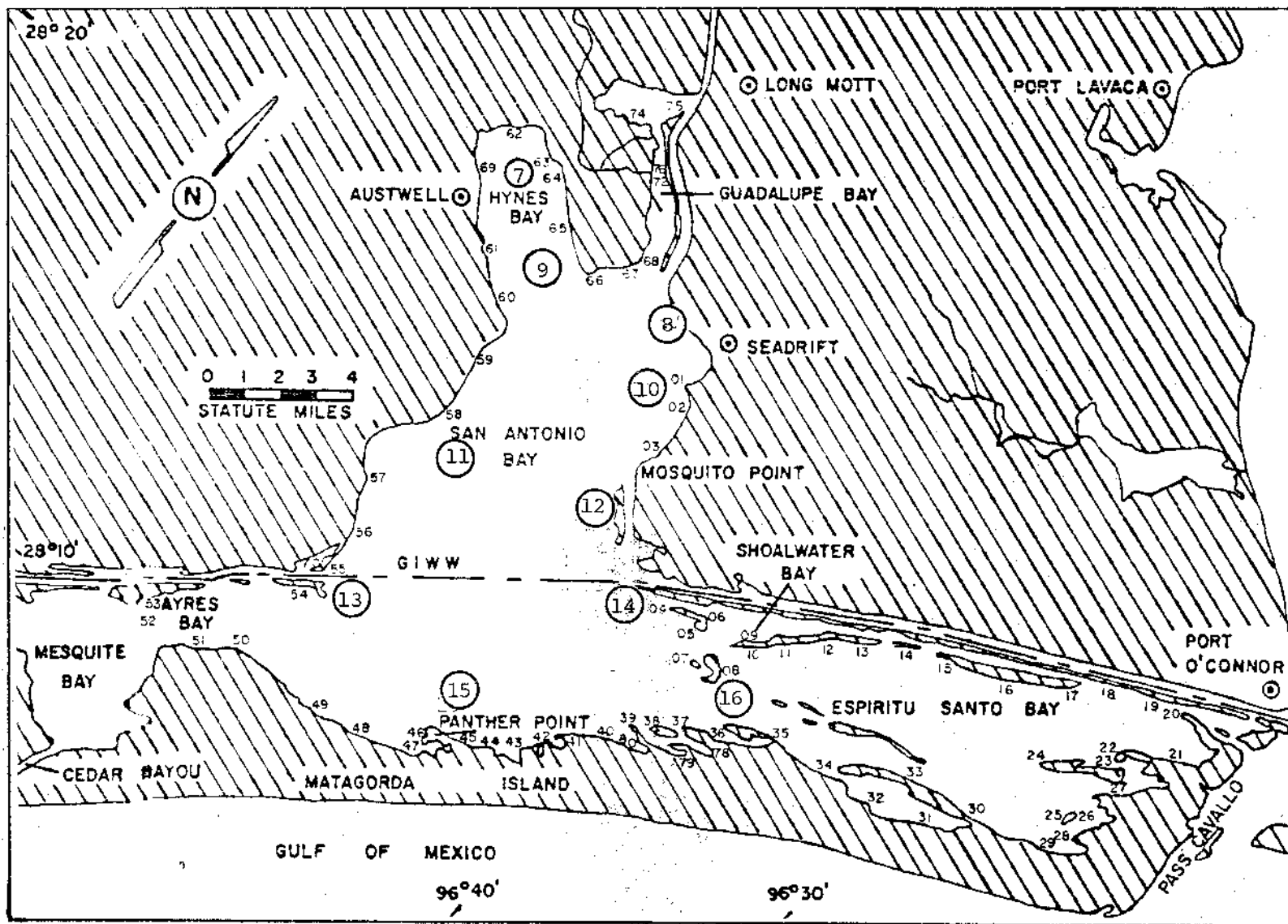


Figure 5. Map of the San Antonio Bay system indicating 6.1-m trawl station (circled numbers) and 18.3-m bag seine station locations, September 1978-August 1979.

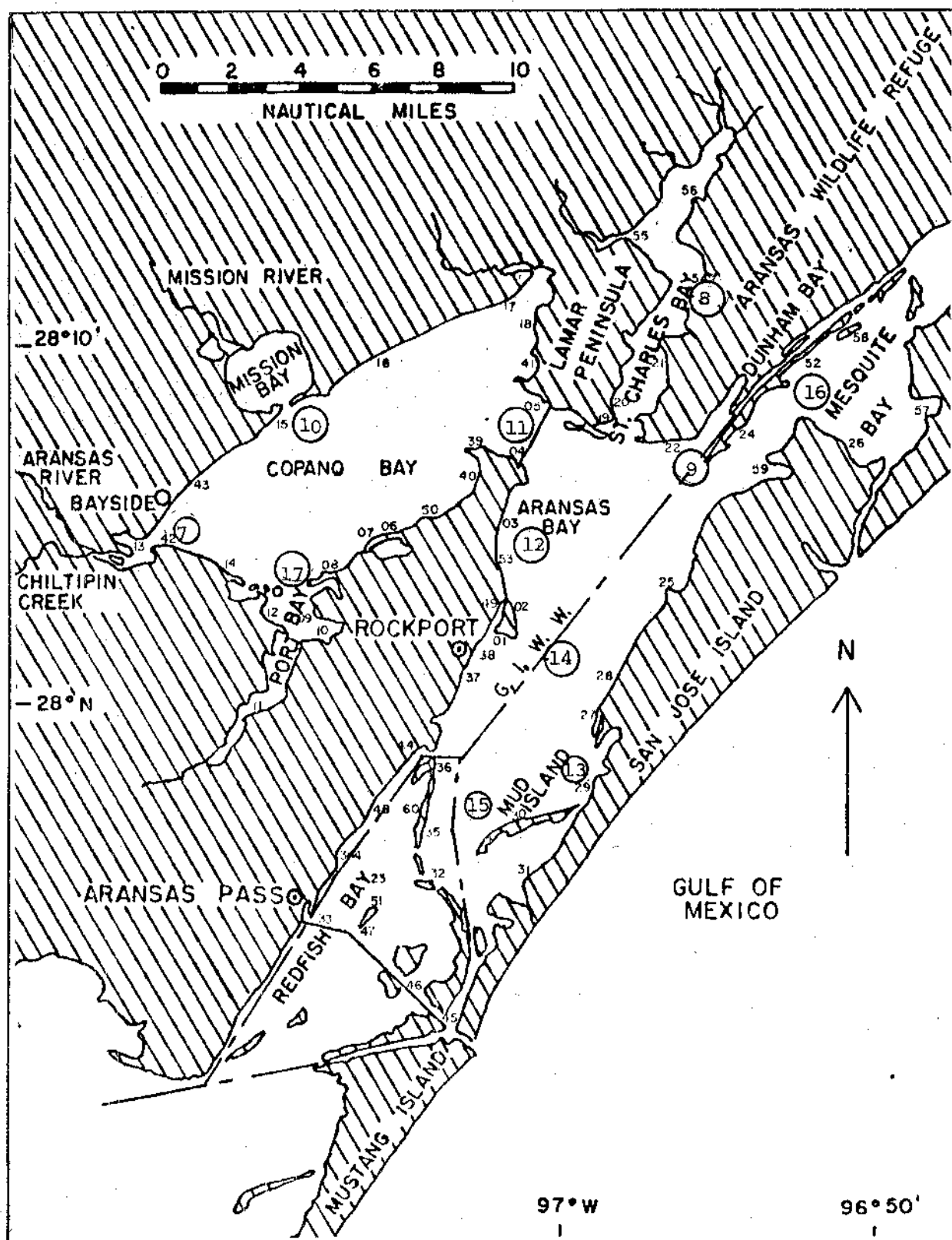


Figure 6. Map of the Aransas Bay system indicating 6.1-m trawl station (circled numbers) and 18.3-m bag seine station locations, September 1978-August 1979.

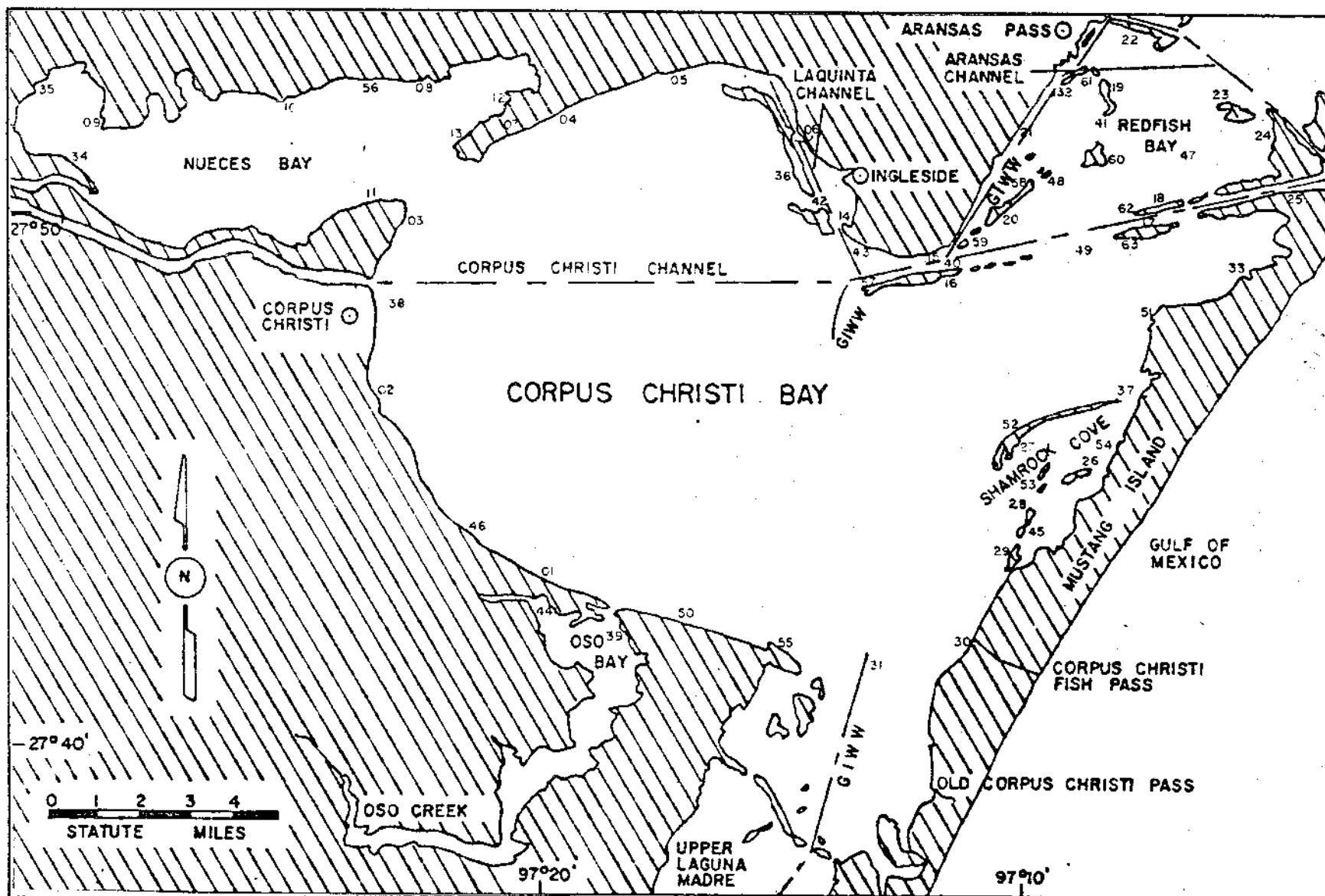


Figure 7. Map of the Corpus Christi Bay system indicating 18.3-m bag seine station locations, September 1978–August 1979.

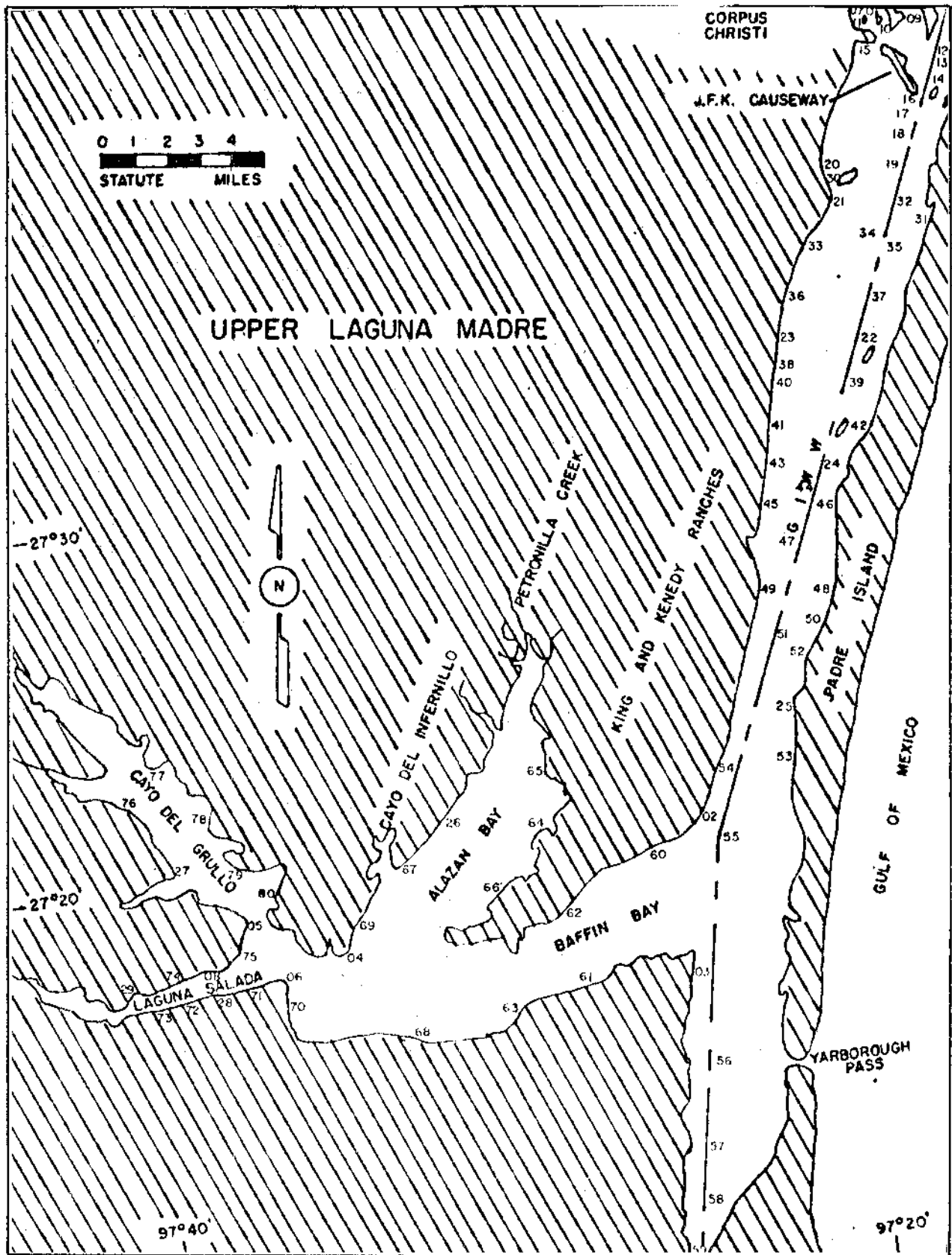


Figure 8. Map of the upper Laguna Madre indicating 18.3-m bag seine station locations, September 1978-August 1979.

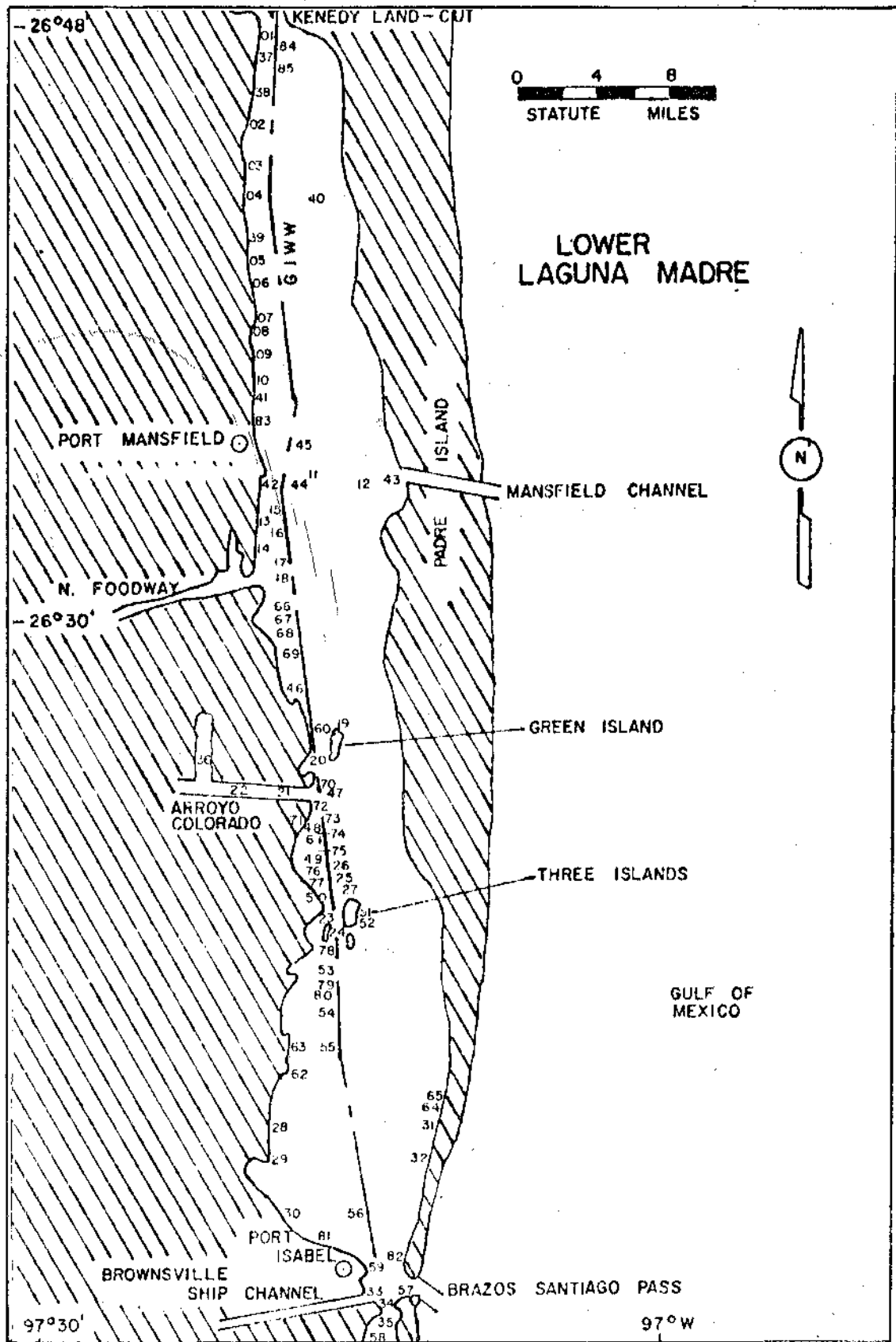


Figure 9. Map of the lower Laguna Madre indicating 18.3-m bag seine station locations, September 1978-August 1979.

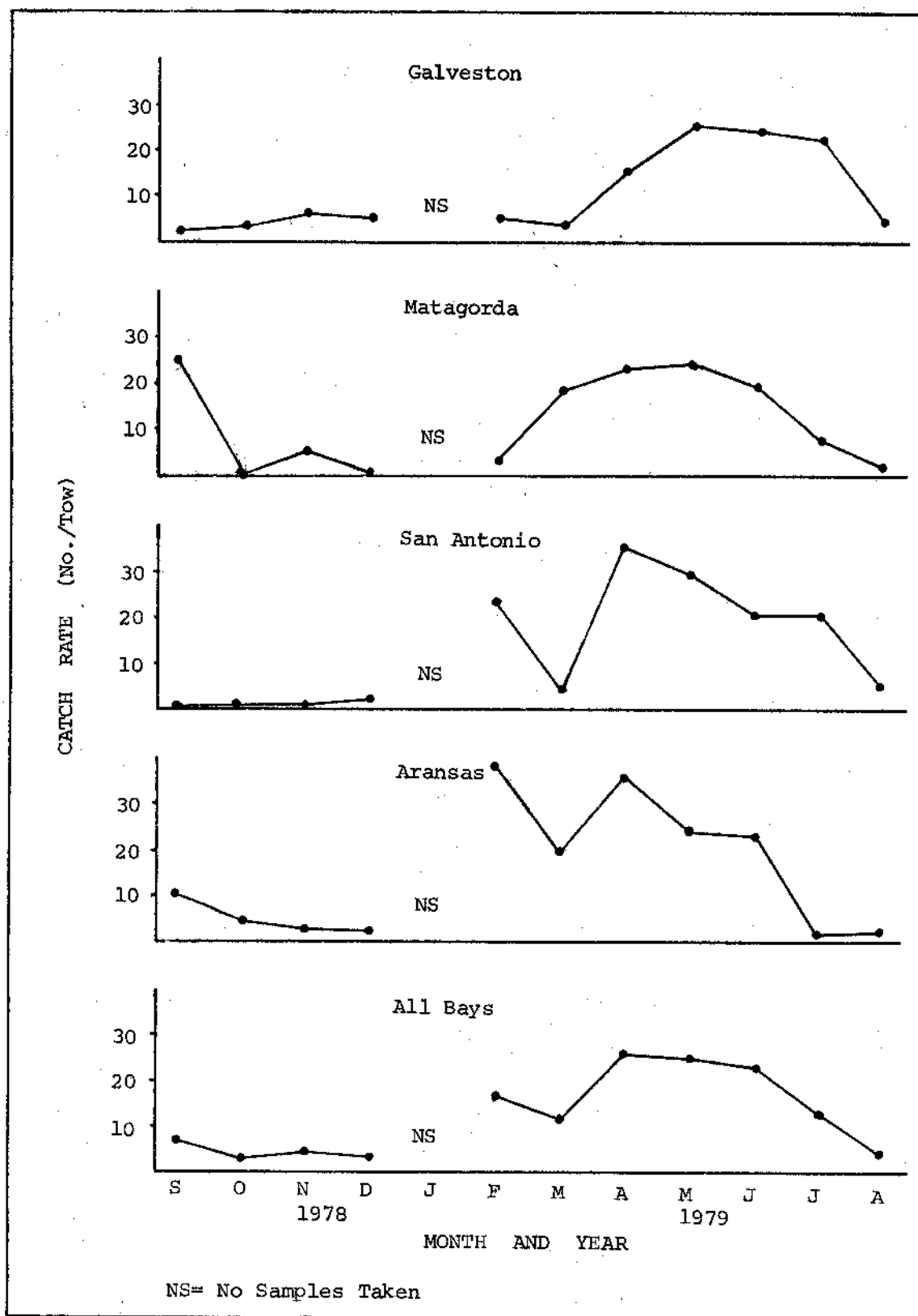


Figure 10. Mean monthly 6.1-m trawl catch rates (no./tow) of blue crabs by bay system, September 1978-August 1979.

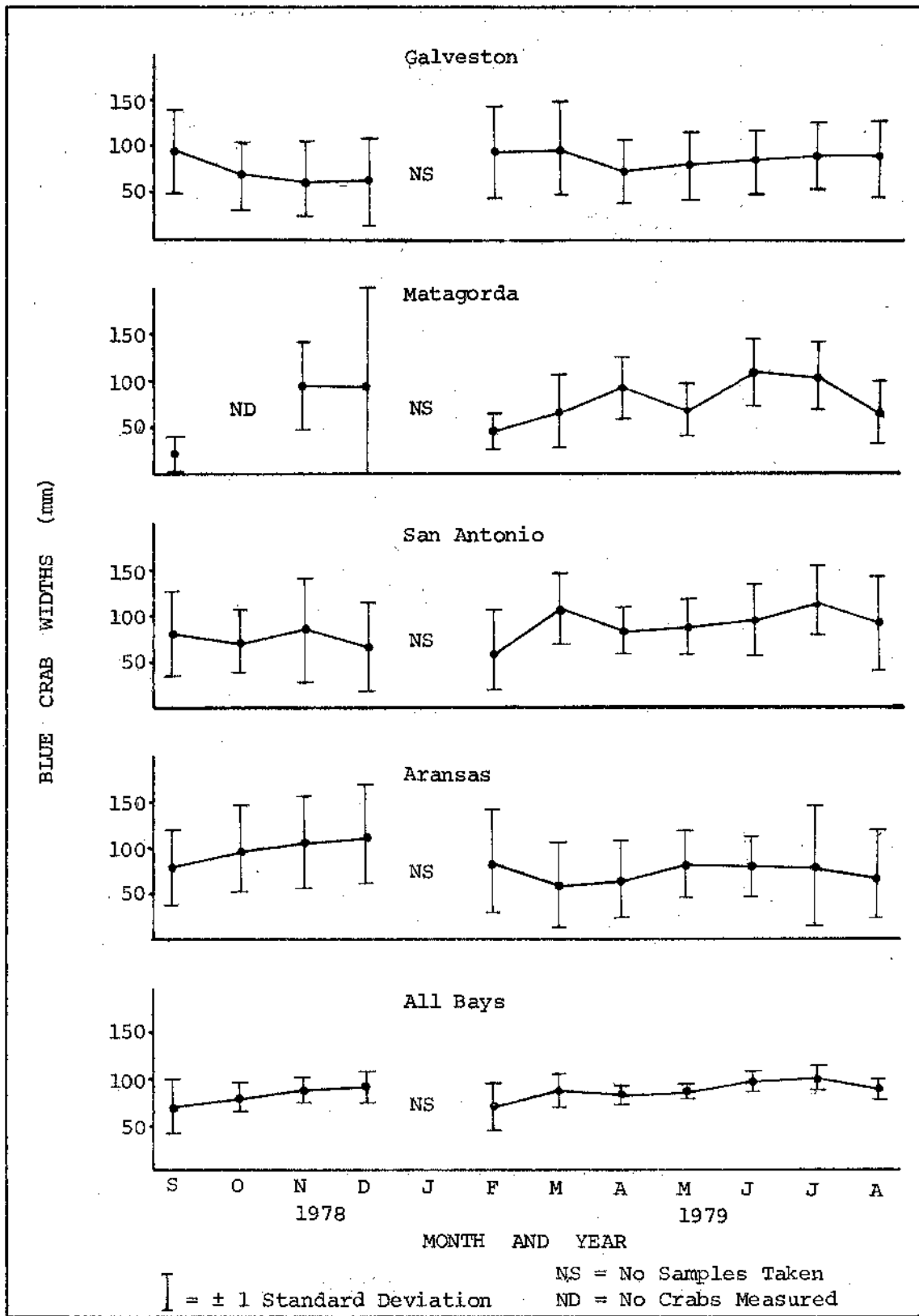


Figure 11. Mean widths of blue crabs taken in 6.1-m trawls by month and bay system, September 1978-August 1979.

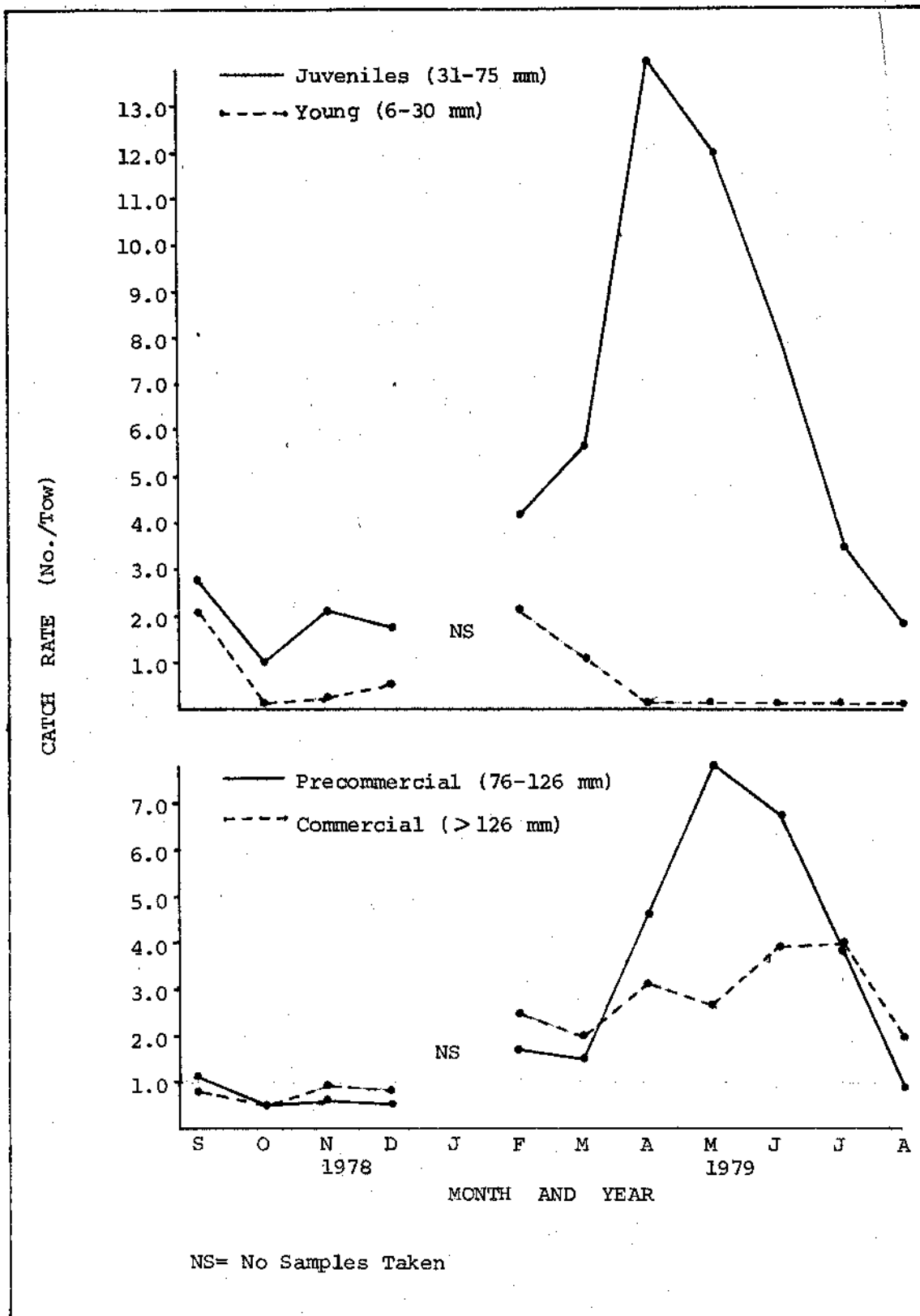


Figure 12. Mean monthly 6.1-m trawl catch rates (no./tow) of blue crabs by size group (mm) for the Galveston, Matagorda, San Antonio and Aransas Bay systems combined, September 1978-August 1979.

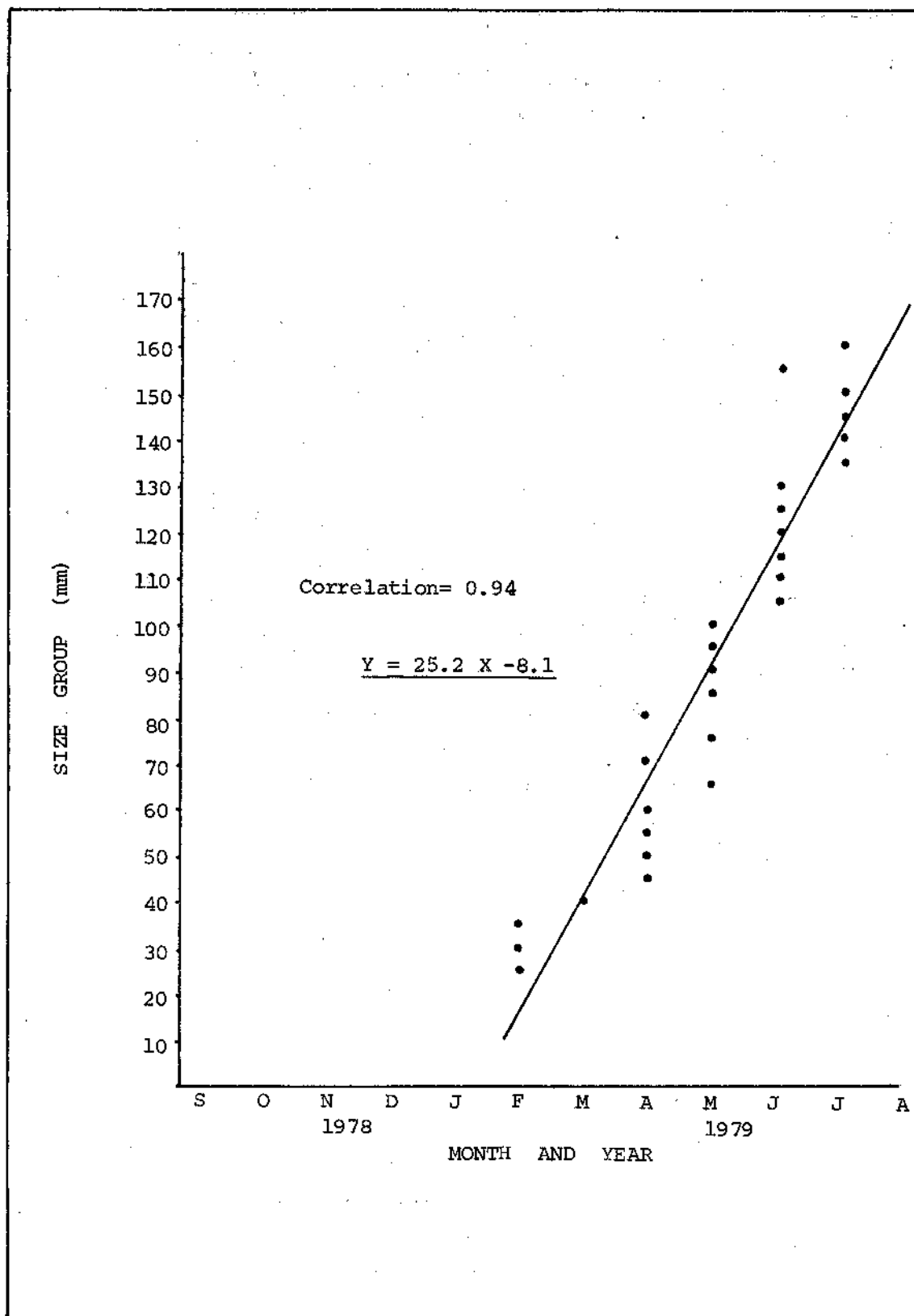


Figure 13. Estimated growth curve of blue crabs taken in 6.1-m trawls from the Galveston, Matagorda, San Antonio and Aransas Bay systems combined, September 1978-August 1979.

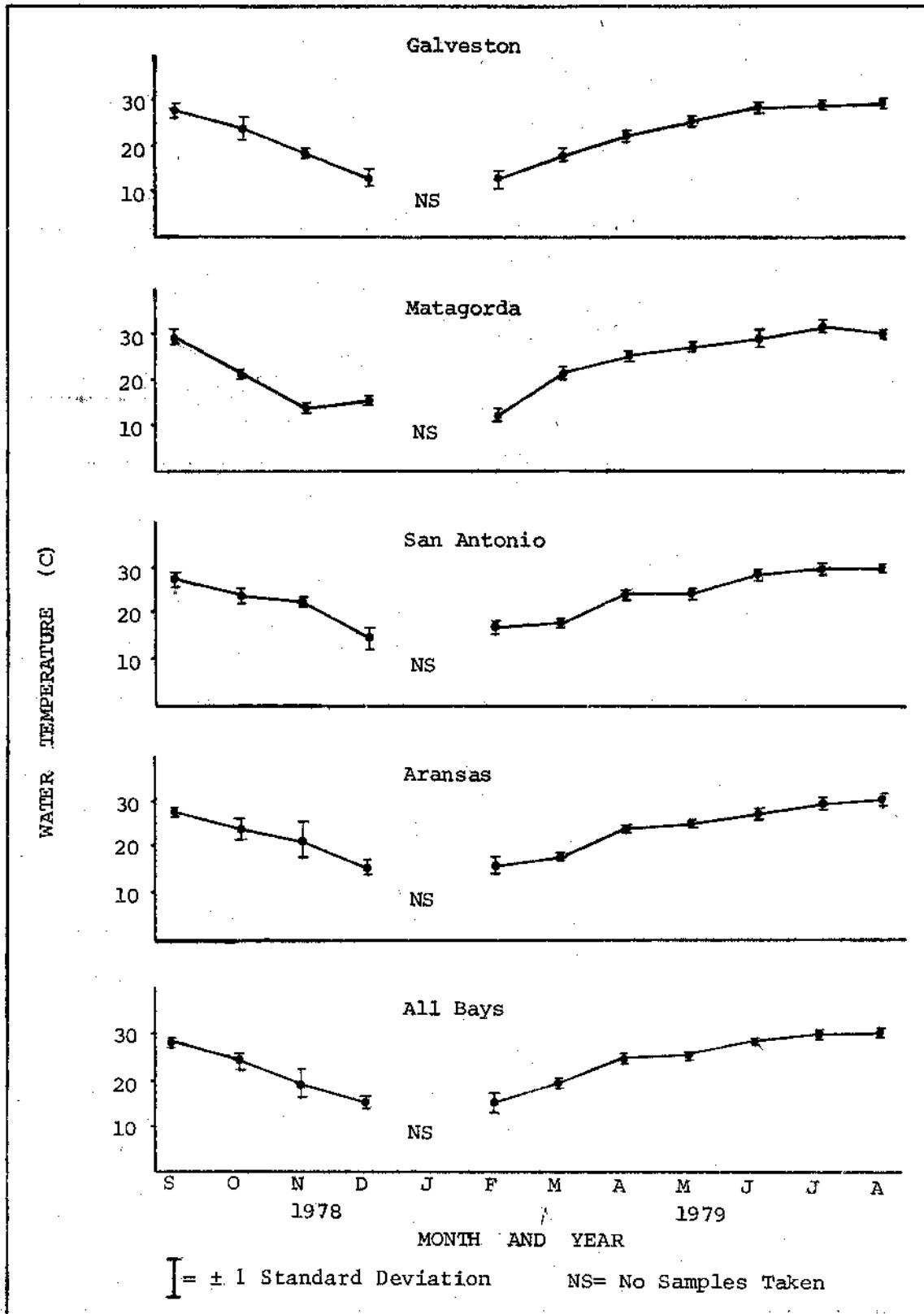


Figure 14. Mean water temperatures (C) from 6.1-m trawl stations by month and bay system, September 1978-August 1979.

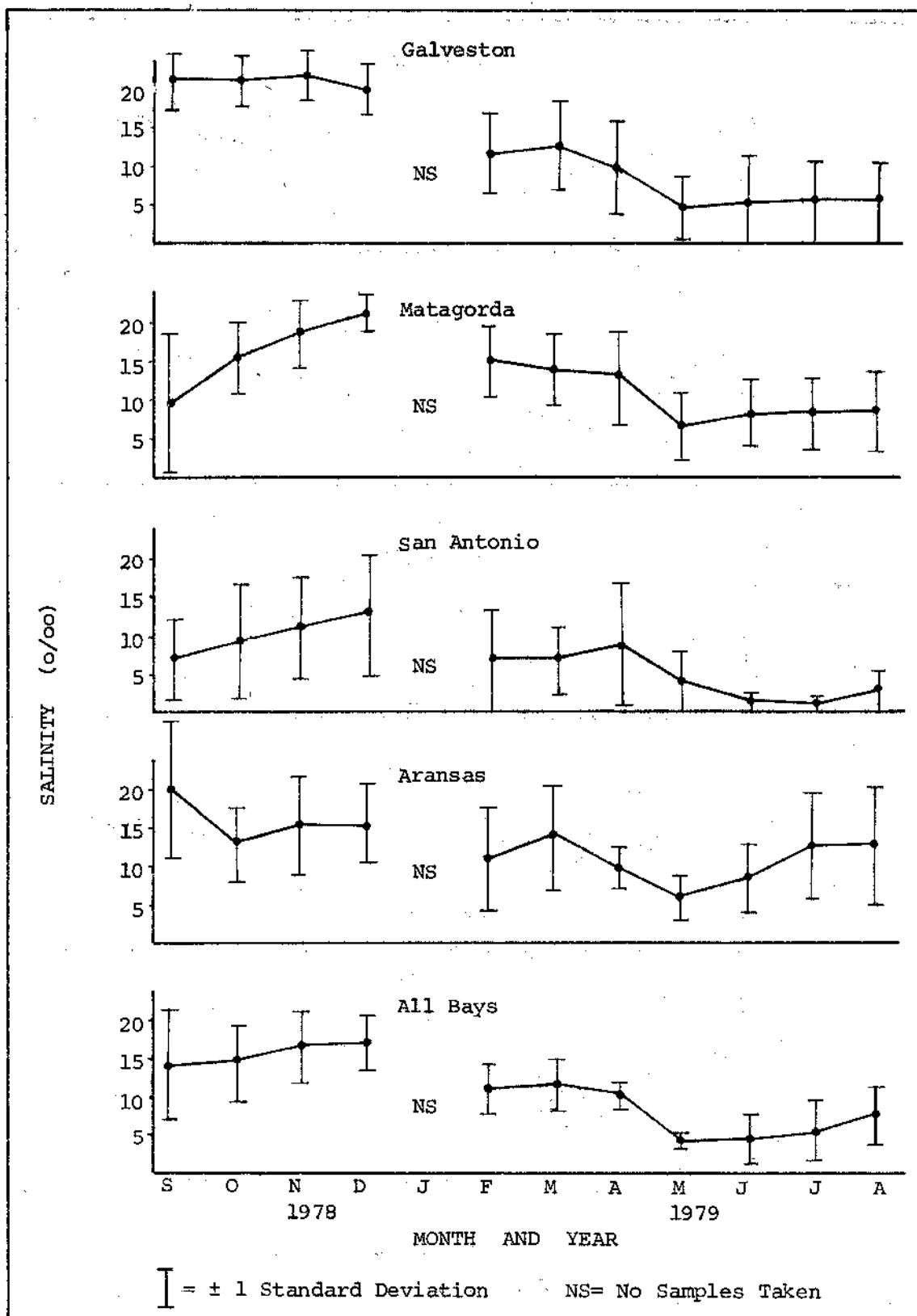


Figure 15. Mean salinities (o/oo) from 6.1-m trawl stations by month and bay system, September 1978-August 1979.

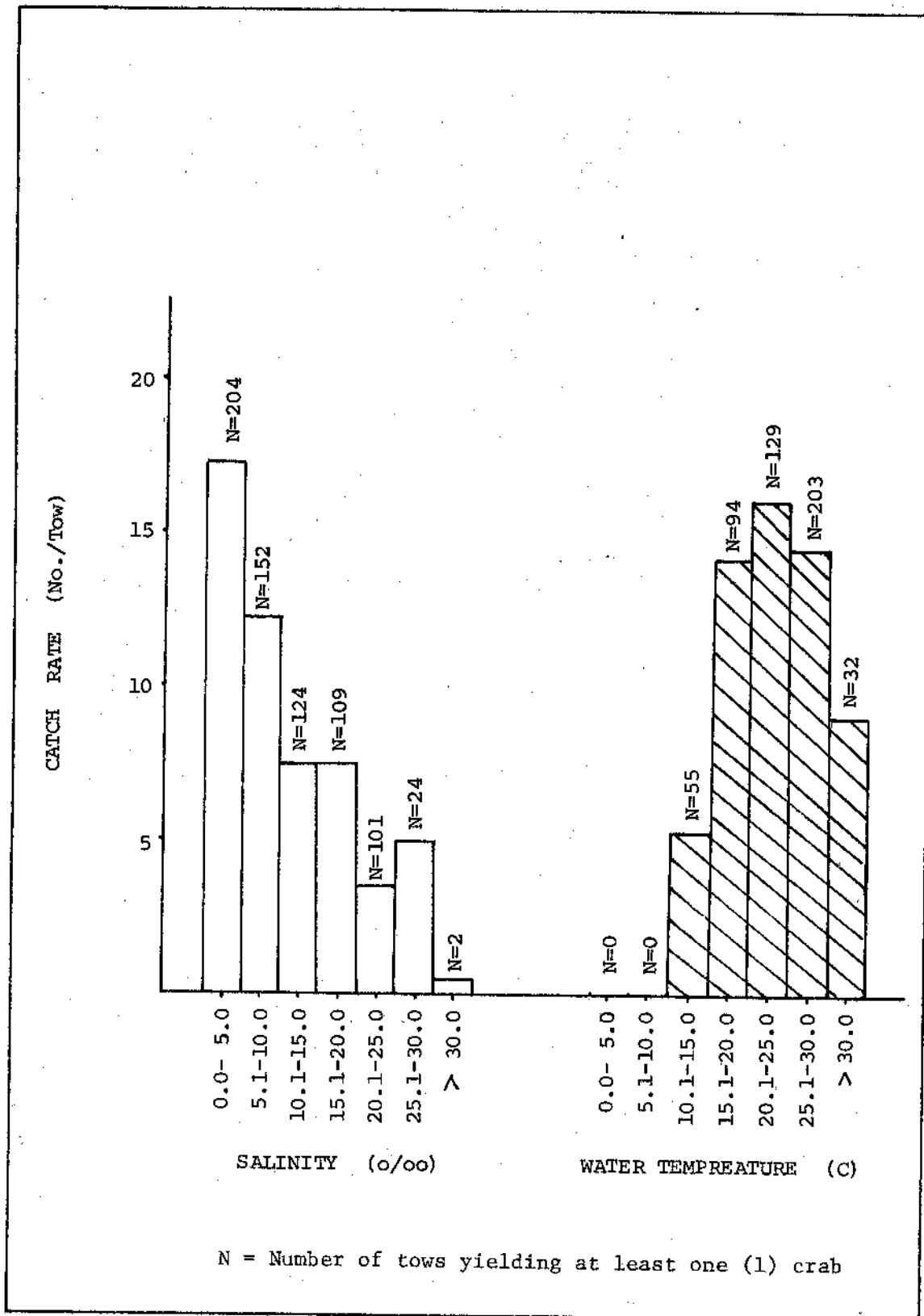


Figure 16. Distribution of blue crabs taken at 6.1-m trawl stations with respect to salinity (o/oo) and water temperature (C) from the Galveston, Matagorda, San Antonio and Aransas Bay systems, September 1978-August 1979.

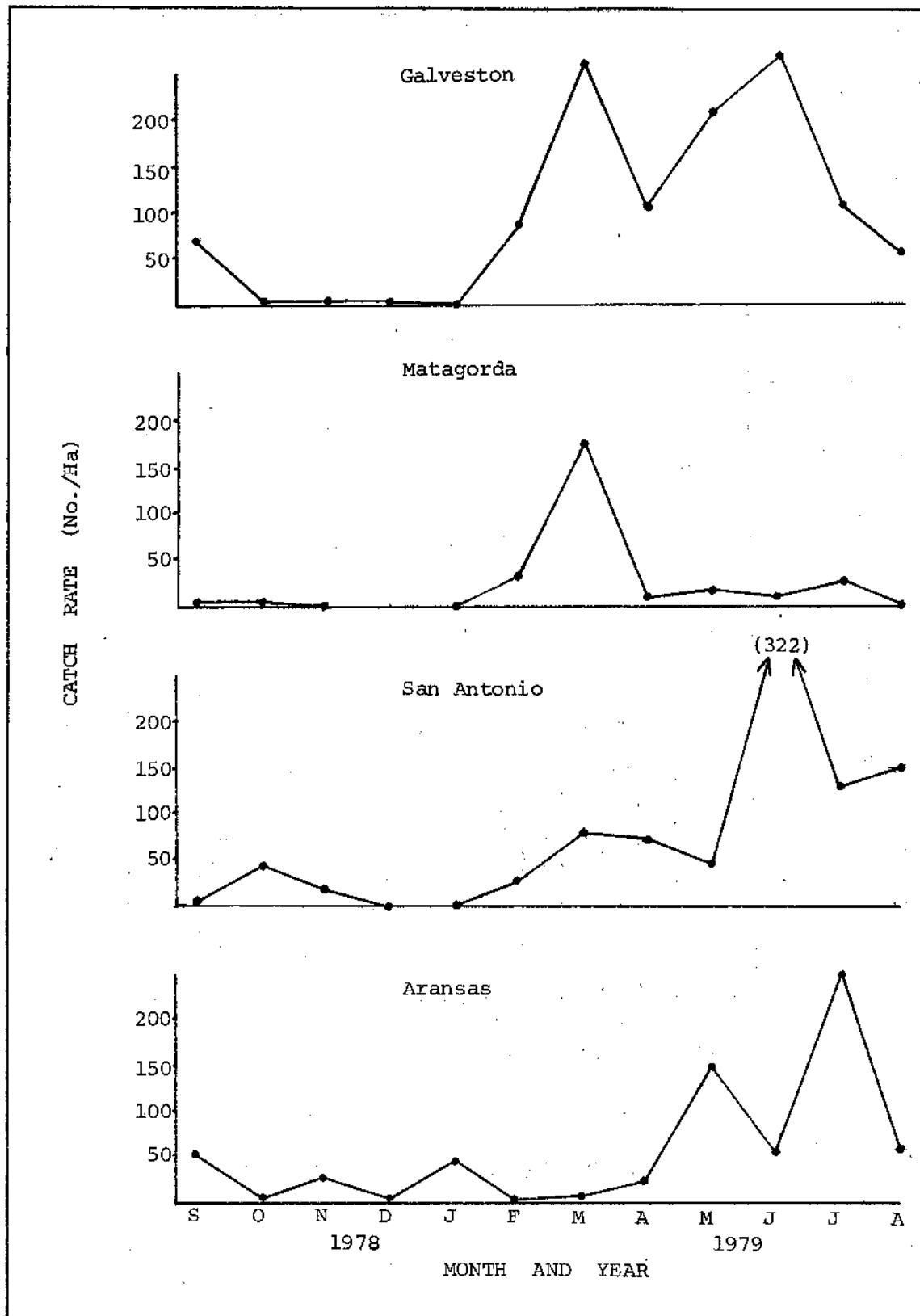


Figure 17. Mean monthly 18.3-m bag seine catch-rates (no./ha) of blue crabs by bay system, September 1978-August 1979.

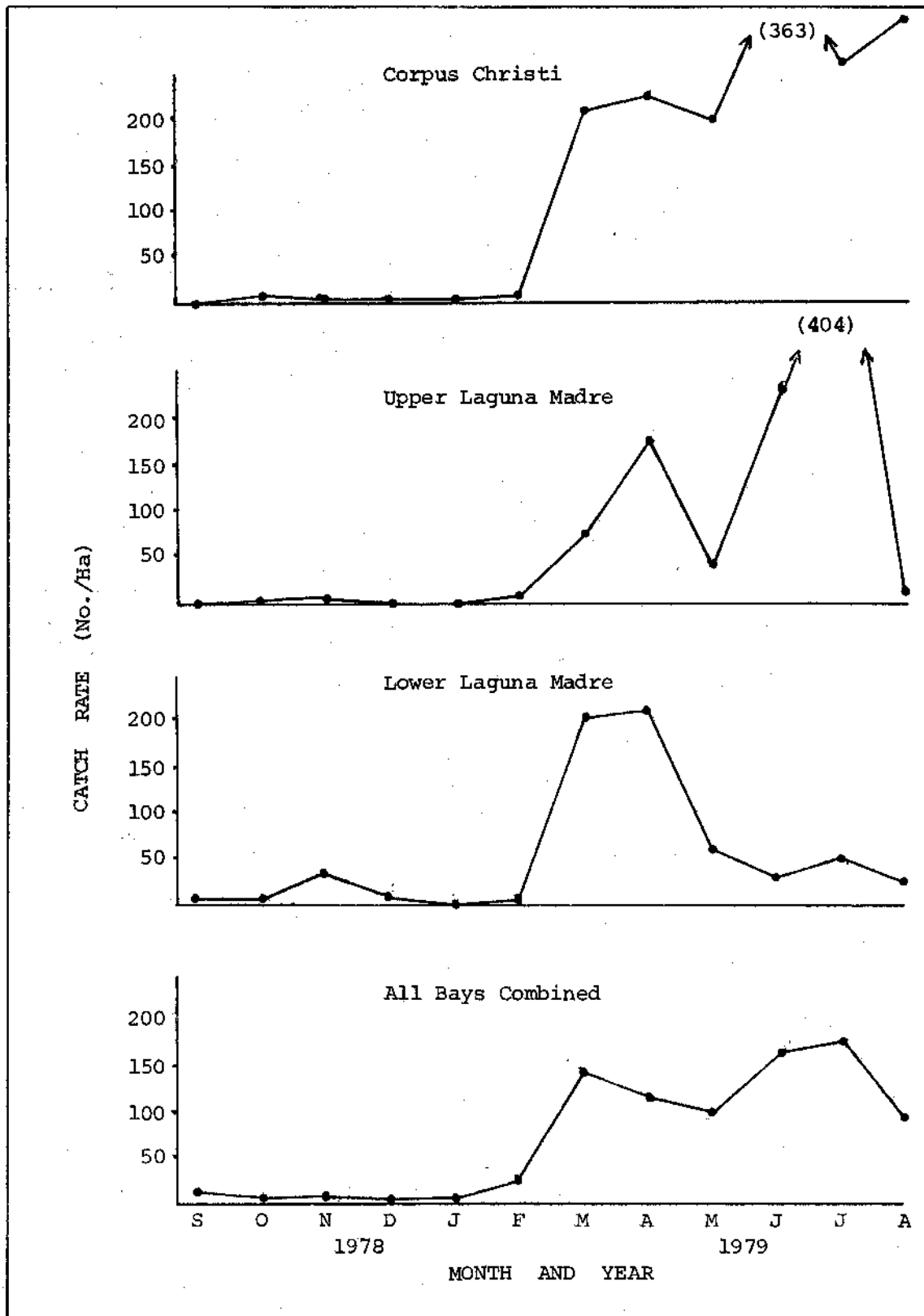


Figure 17. (Cont'd)

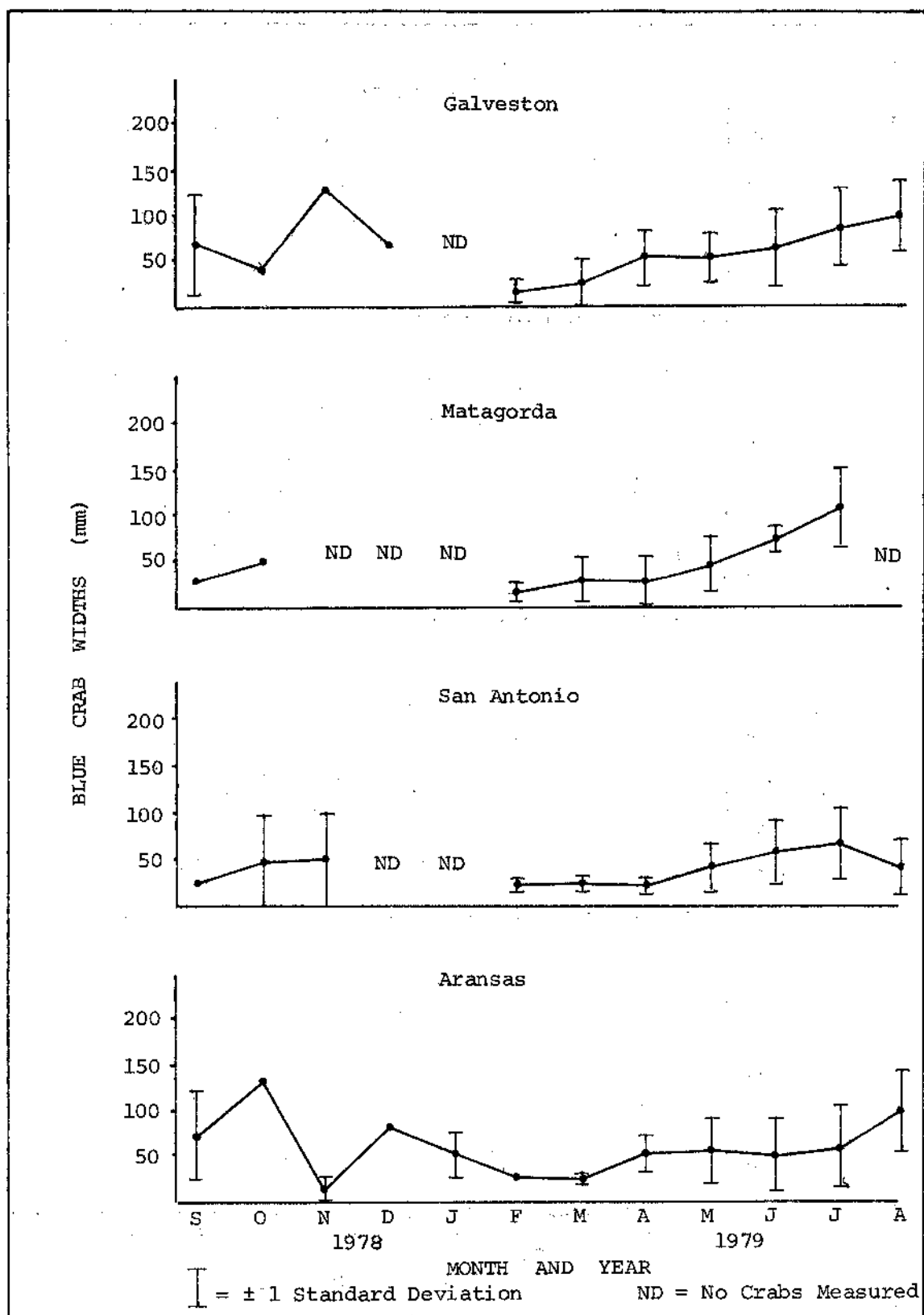


Figure 18. Mean widths of blue crabs taken in 18.3-m bag seines, by month and bay system, September 1978-August 1979.

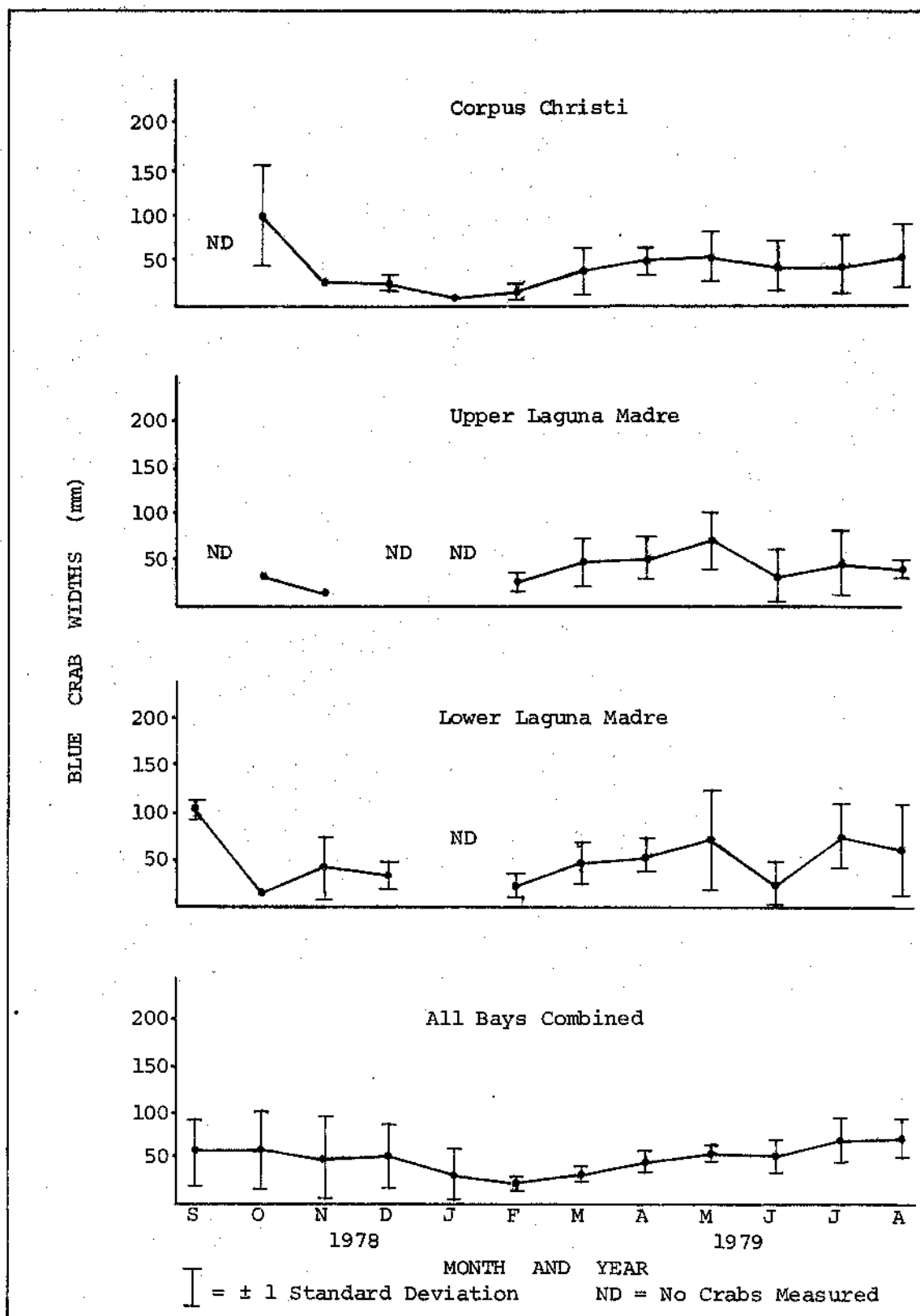


Figure 18. (Cont'd).

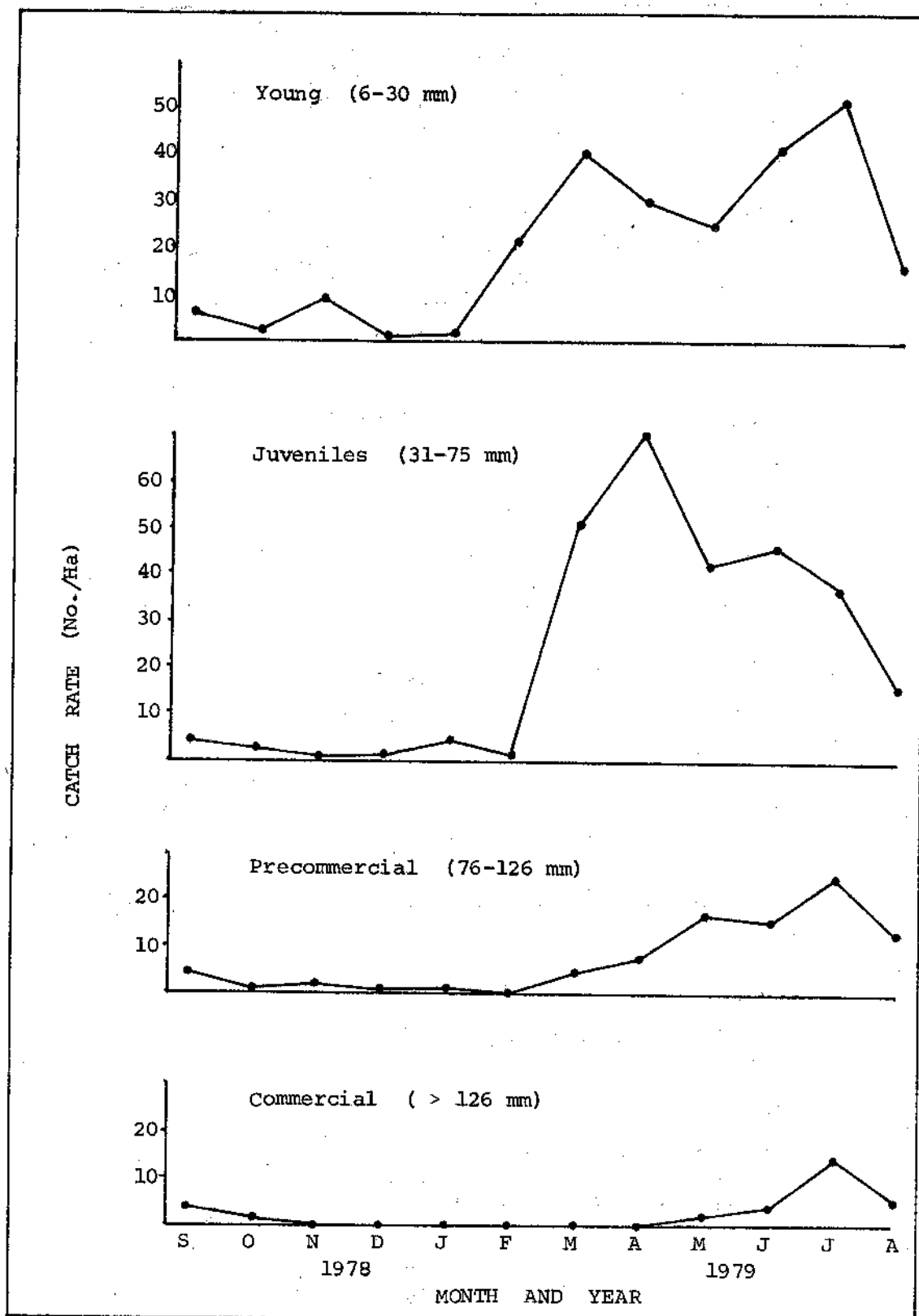


Figure 19. Mean monthly 18.3-m bag seine catch rates (no./ha) of blue crabs by size group (mm) for the Galveston, Matagorda, San Antonio, Corpus Christi, upper and lower Laguna Madre Bay systems combined, September 1978-August 1979.

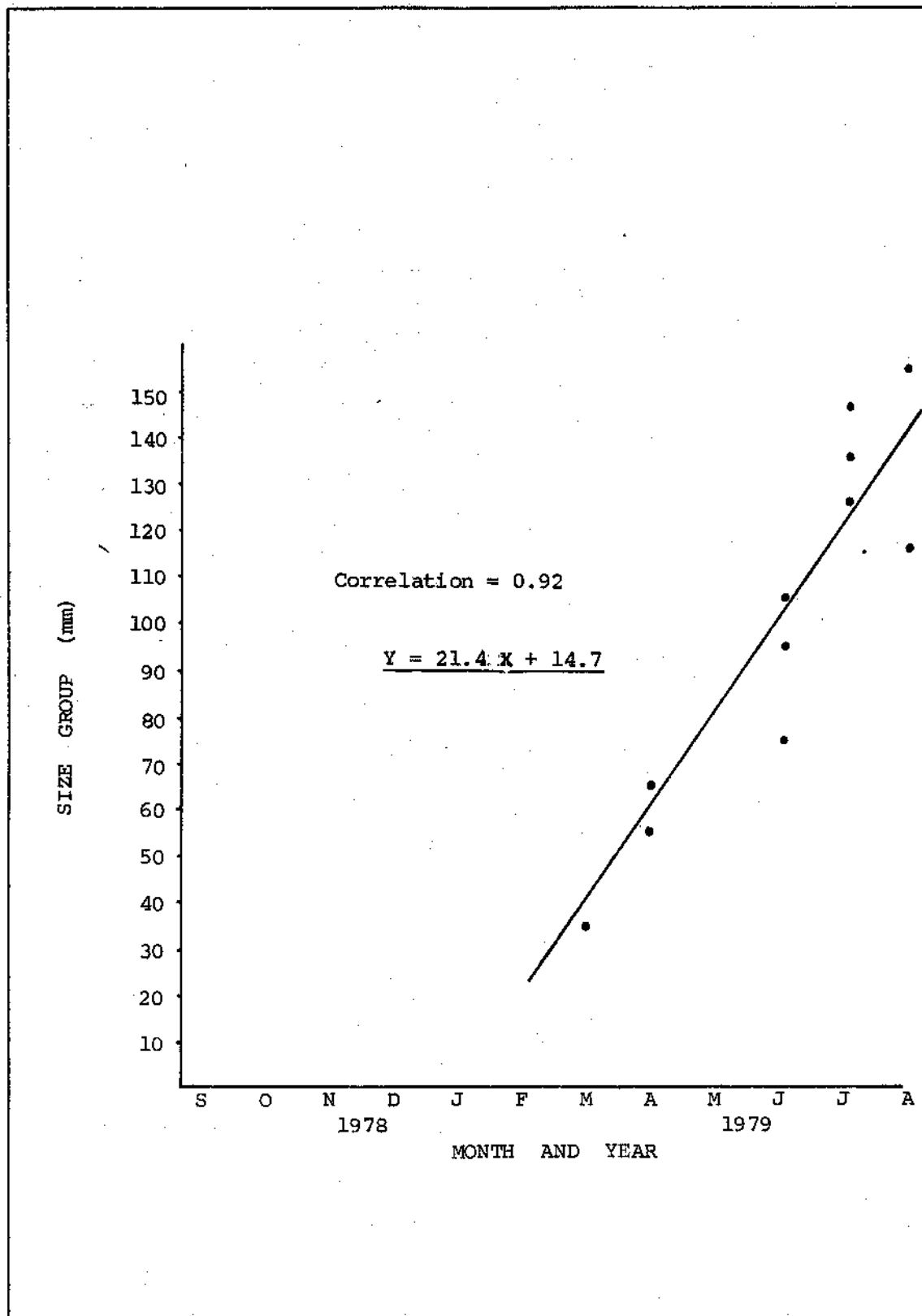


Figure 20. Estimated growth curve of blue crabs taken in 18.3-m bag seines from the Galveston, Matagorda, San Antonio, Aransas, Corpus Christi, upper and lower Laguna Madre Bay systems combined, September 1978-August 1979.

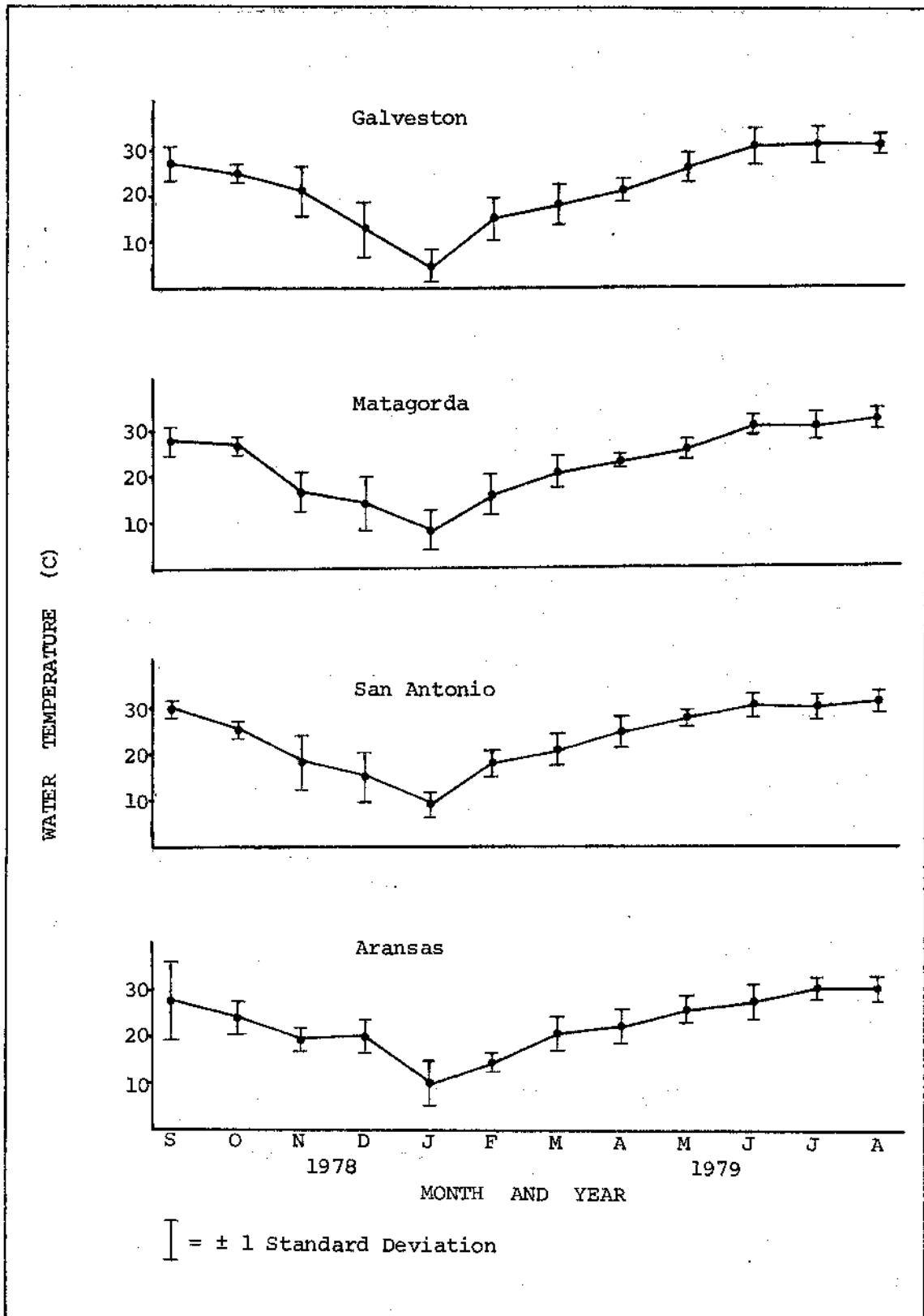


Figure 21. Mean water temperatures (C) from 18.3-m bag seine stations by month and bay system, September 1978-August 1979.

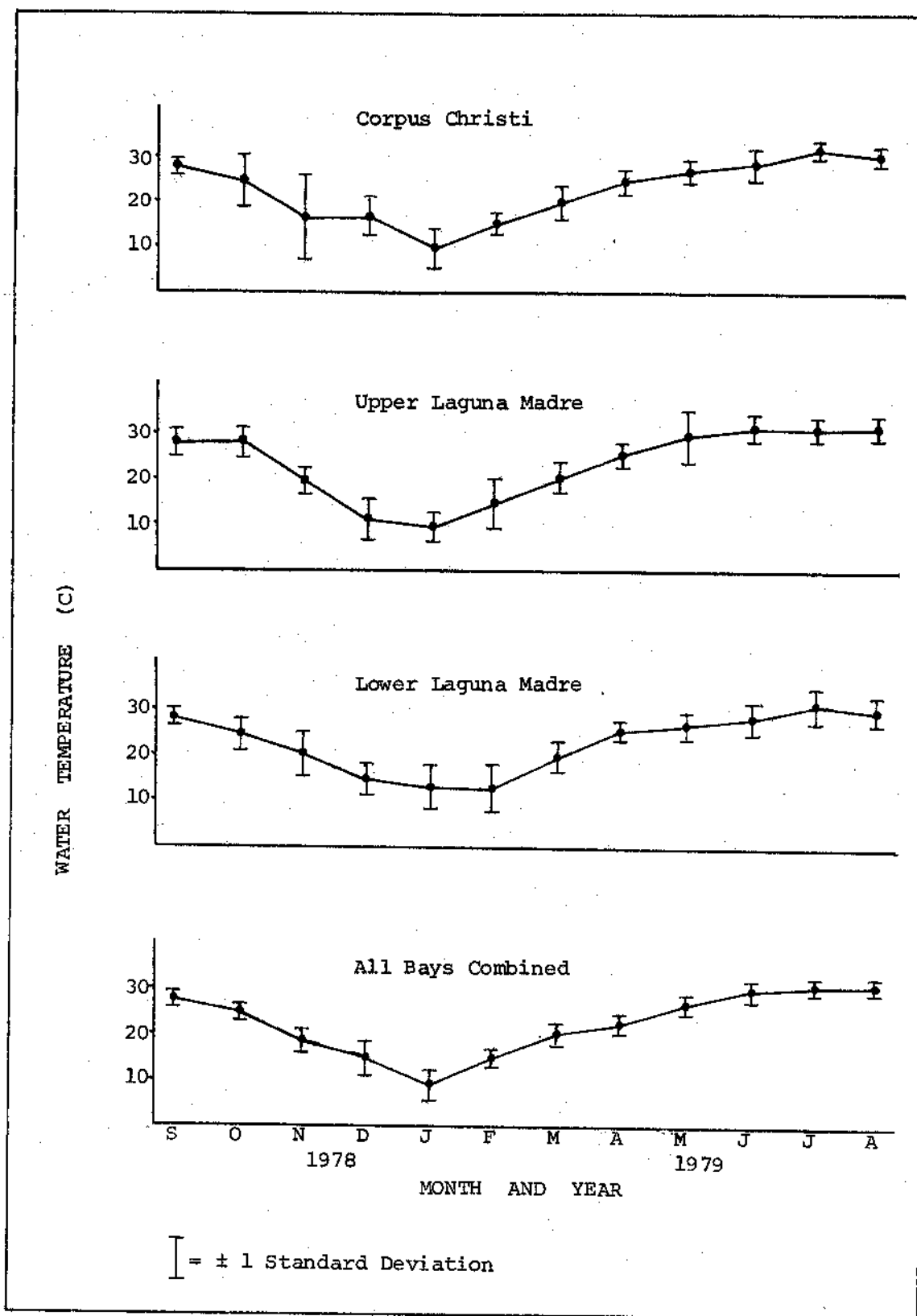


Figure 21. (Cont'd).

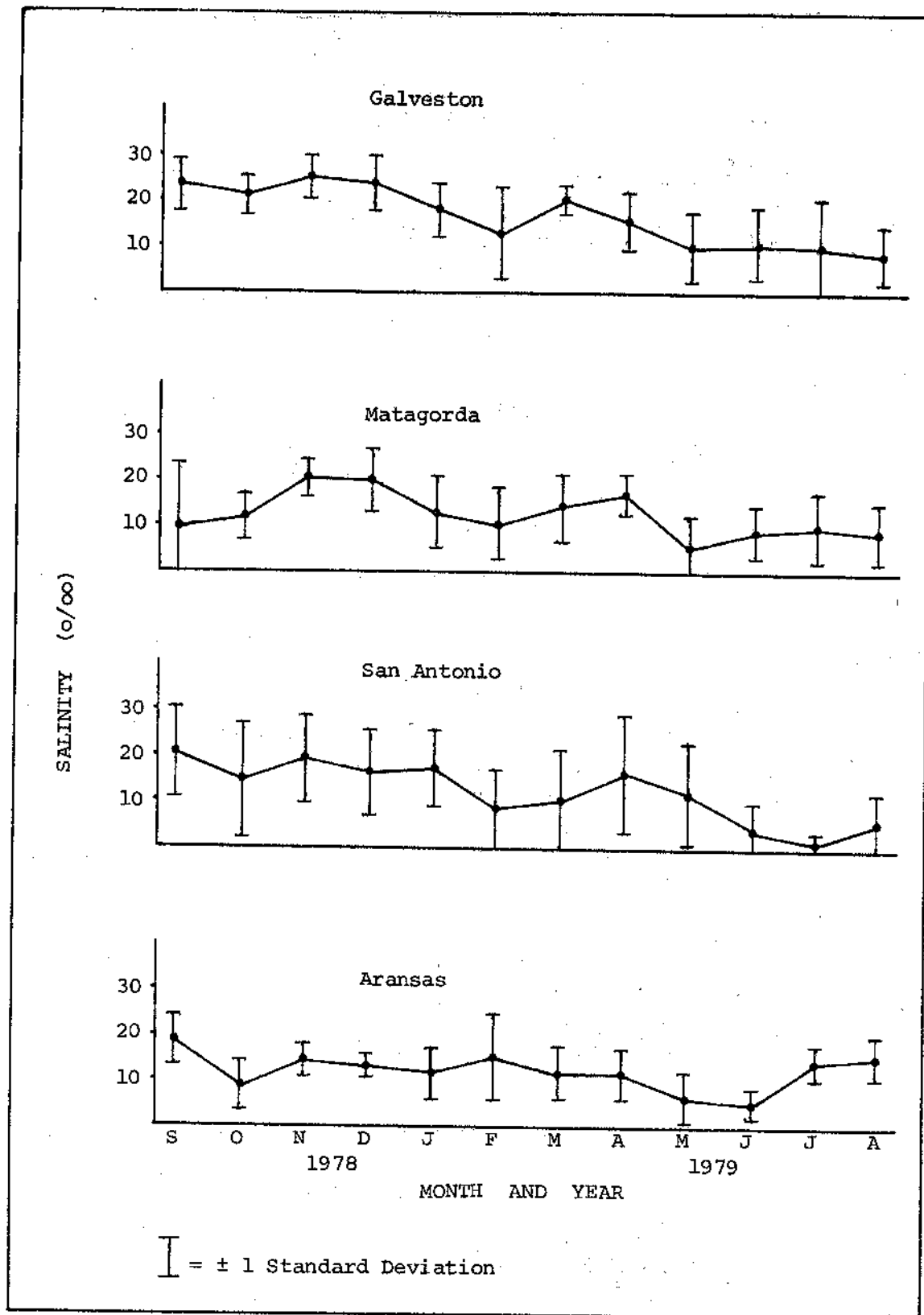


Figure 22. Mean salinities (o/oo) from 18.3-m bag seine stations by month and bay system, September 1978-August 1979.

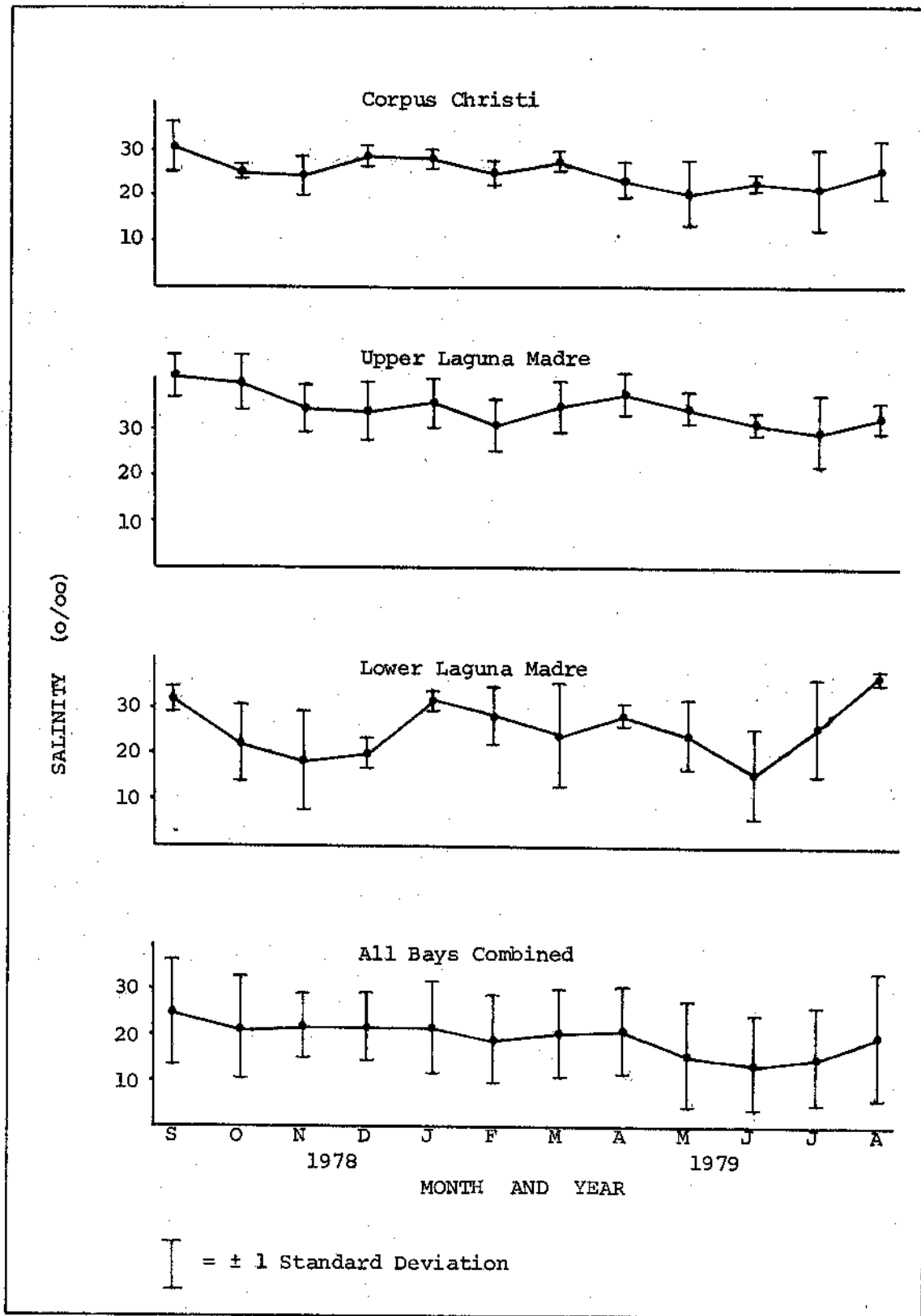


Figure 22. (Cont'd).

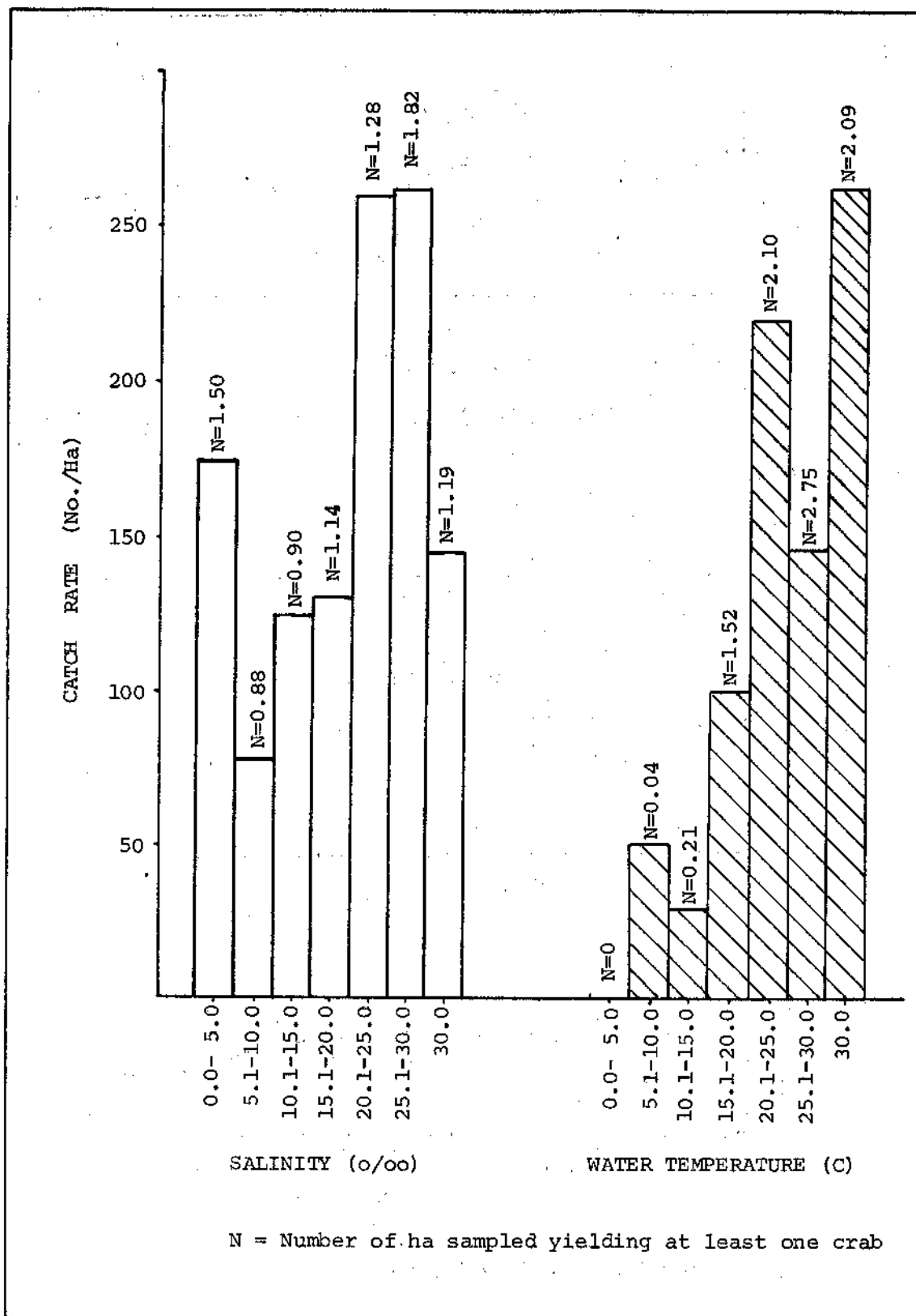


Figure 23. Distribution of blue crabs taken at 18.3-m bag seine stations with respect to salinity (o/oo) and water temperature (C) from the Galveston, Matagorda, San Antonio, Aransas, Corpus Christi, upper and lower Laguna Madre Bay systems combined, September 1978-August 1979.

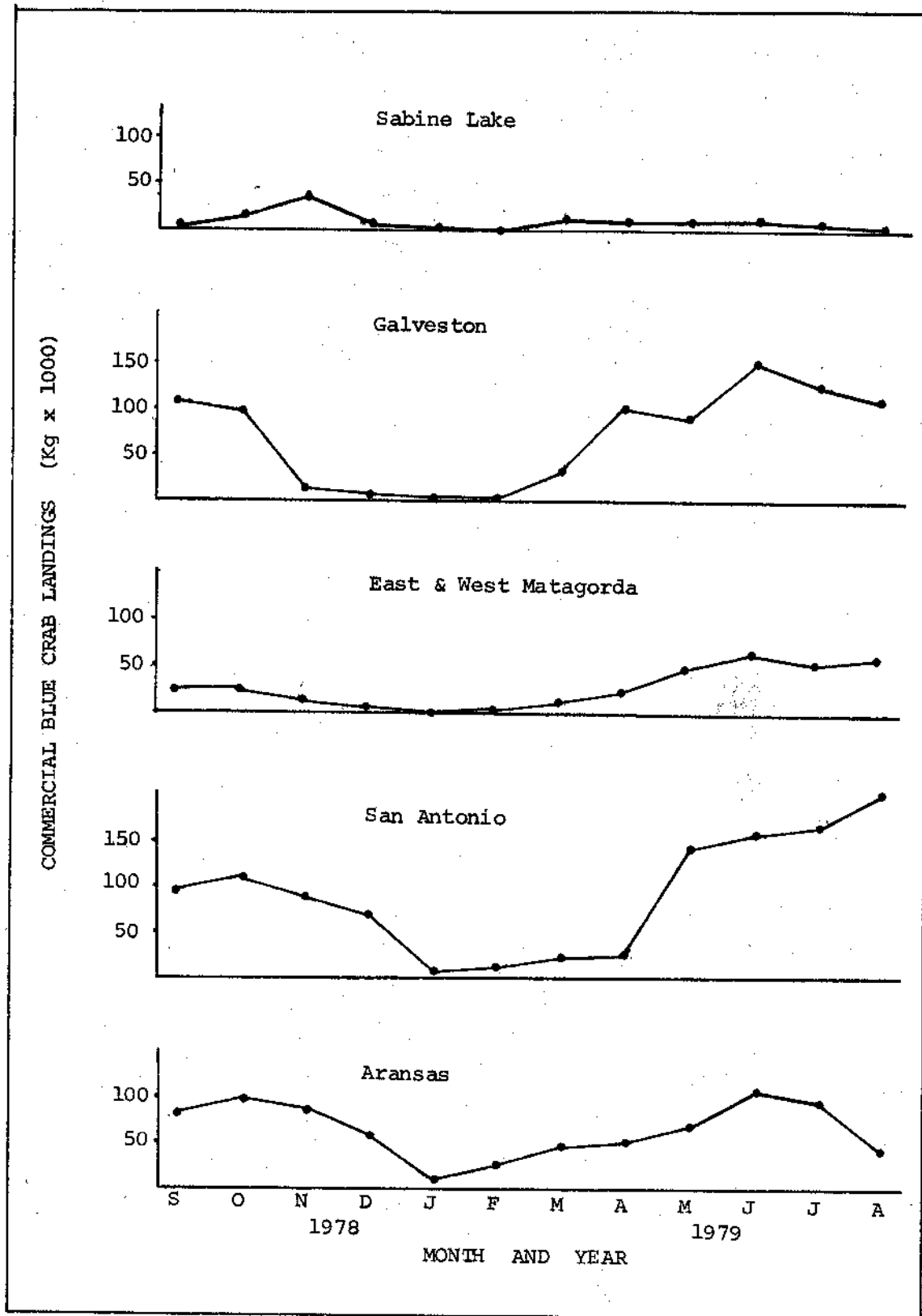


Figure 24. Monthly reported commercial blue crab landings (kg x 1000) by bay system, September 1978-August 1979.

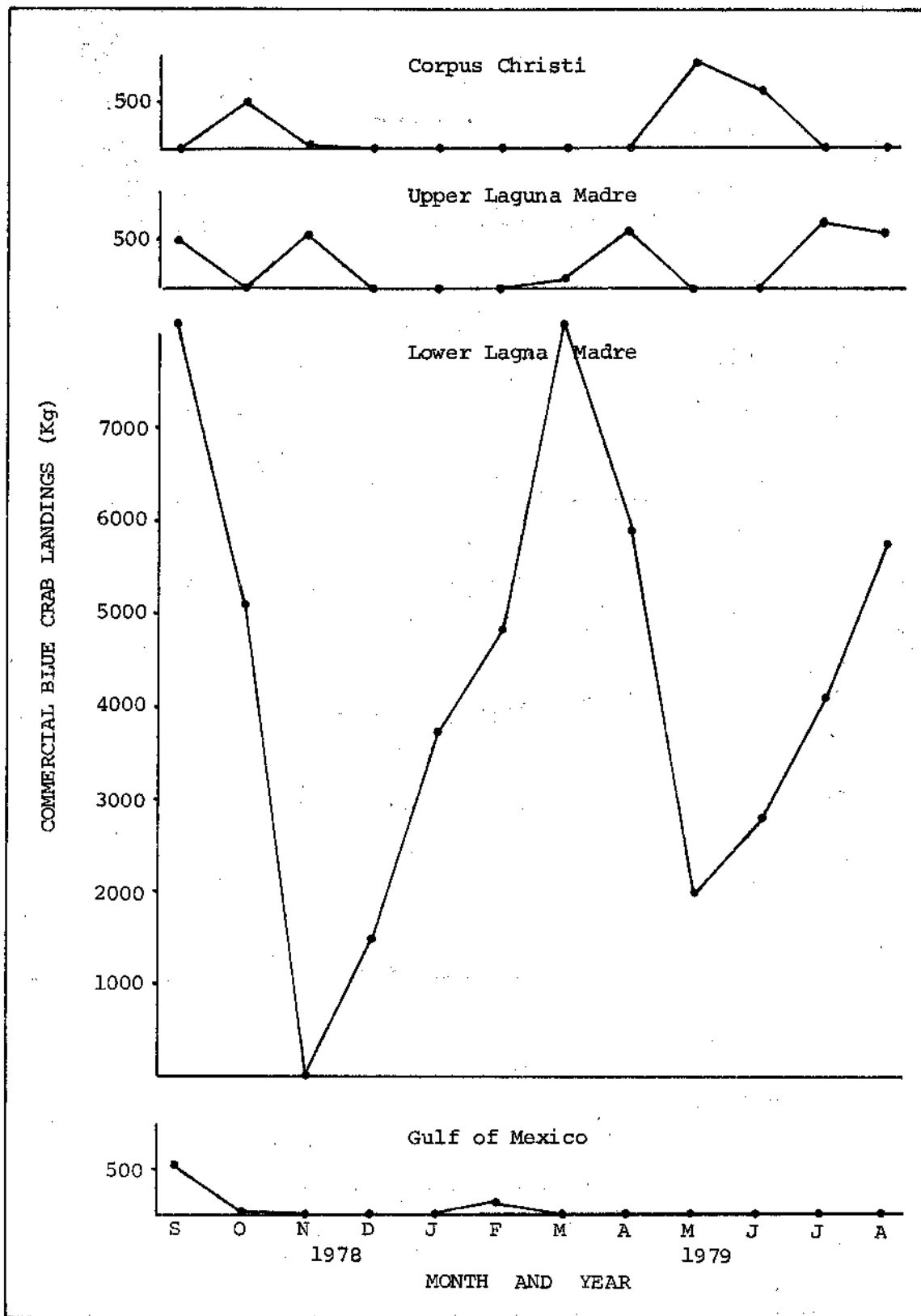


Figure 25. Monthly reported commercial blue crab landings (kg) by bay system, September 1978-August 1979.

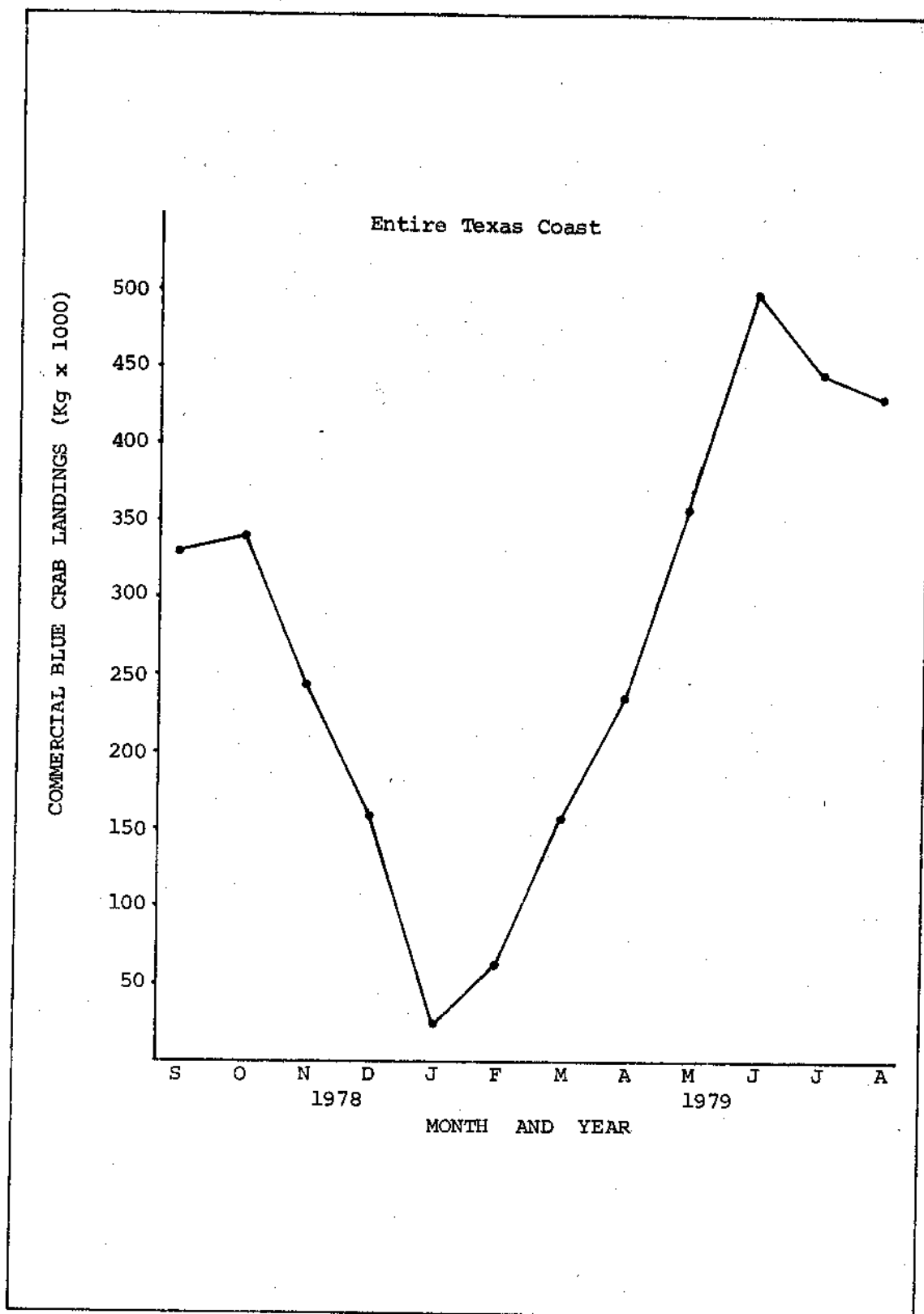


Figure 26. Monthly reported commercial blue crab landings (kg x 1000) for the Texas coast, September 1978-August 1979.

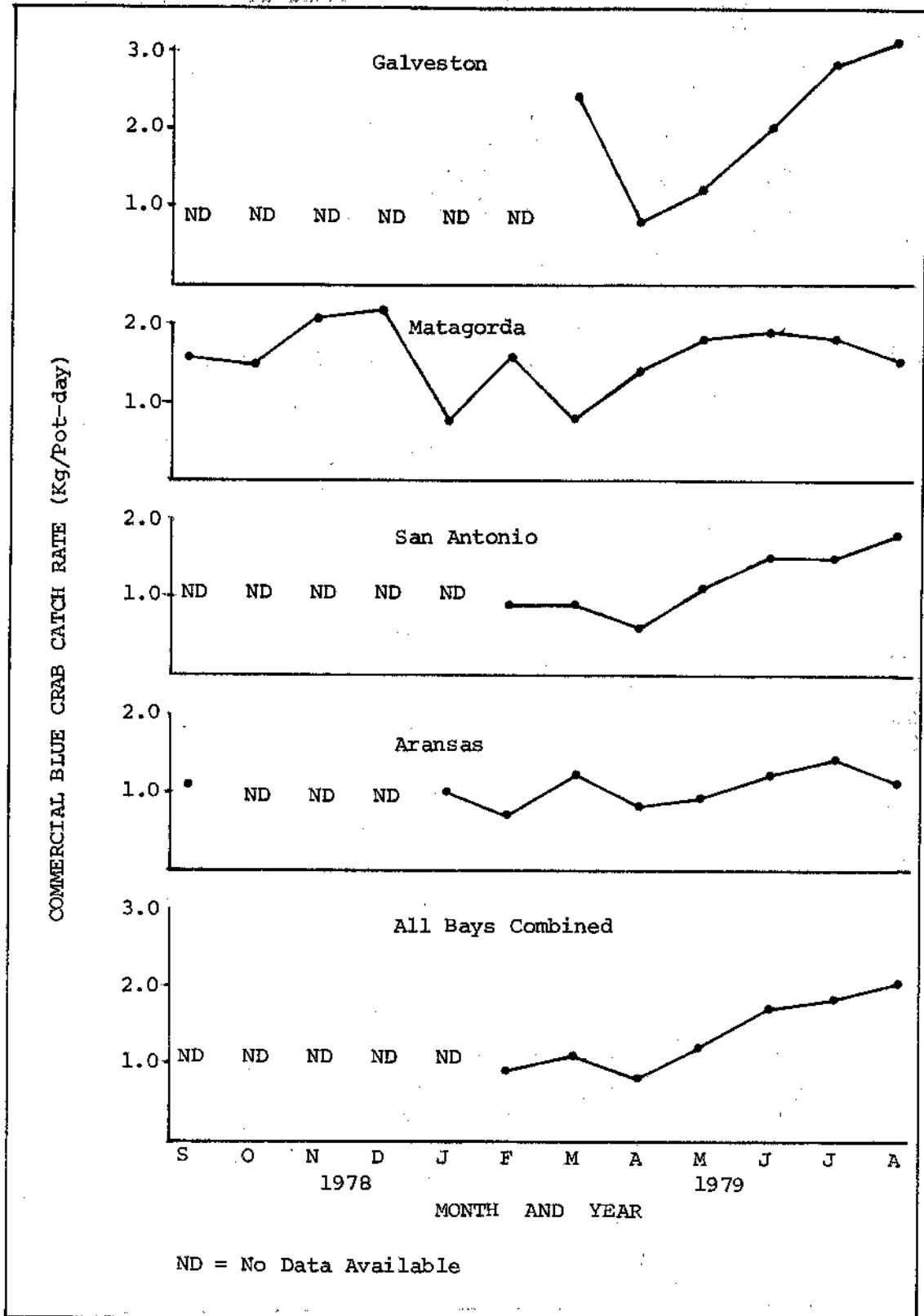
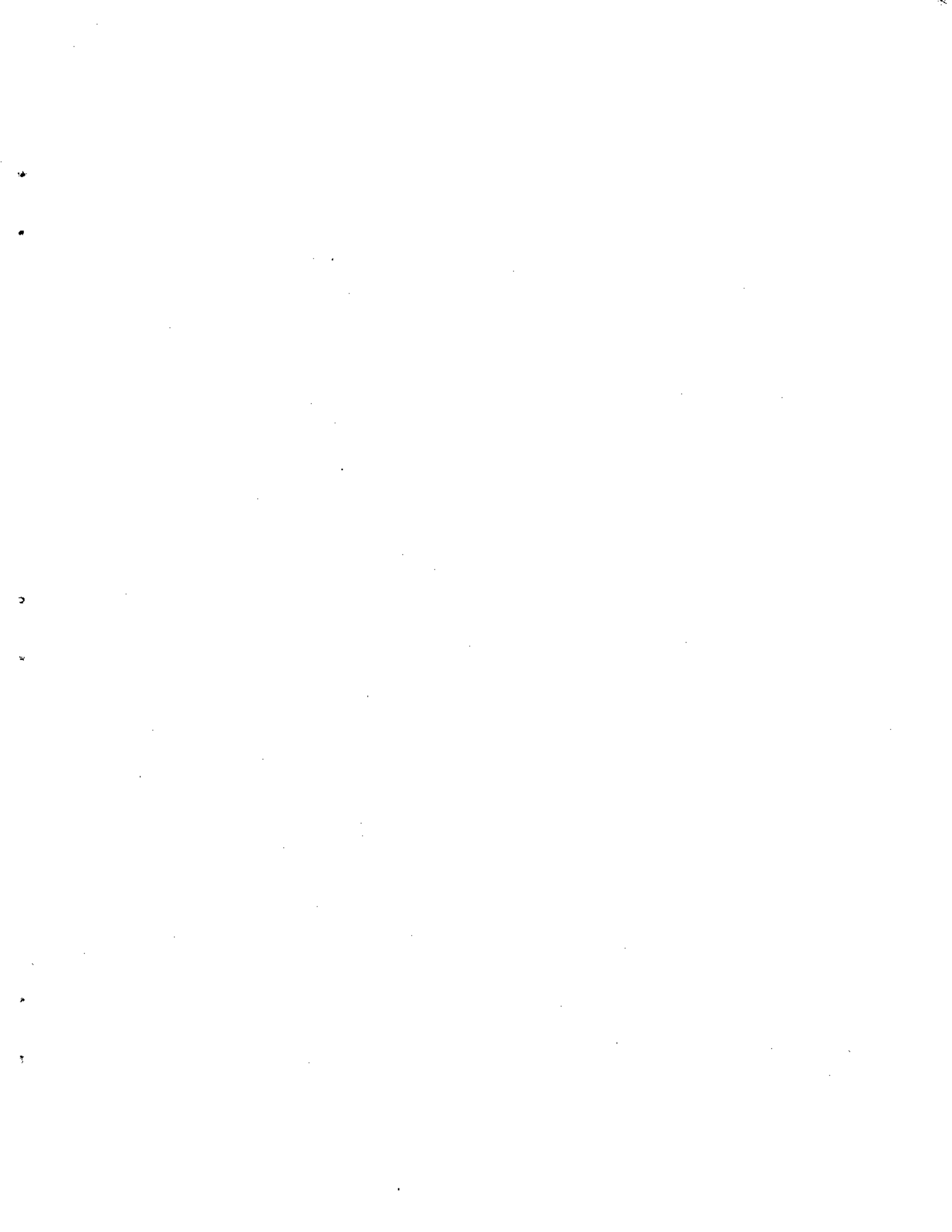


Figure 27. Monthly commercial blue crab catch effort (kg/pot-day) by bay system based on interviews with crab house operators, September 1978-August 1979.



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