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NOAA FINAL REPORT TO BLM

Environmental Studies of the South Texas Outer Continental Shelf 1975

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A report to the Bureau of Land Management, Department of Interior, on work conducted under provisions of the Interagency Agreement, #08550-IA5-19 during calendar year 1975.

VOLUME I
Plankton and Fisheries

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Environmental Studies of the South
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SUMMARY

In January 1975 a coordinated research effort sponsored by the Bureau of Land Management, Department of Interior, began in Gulf of Mexico waters over the continental shelf off the south Texas coast for the purpose of establishing baseline information on specific marine parameters prior to mineral exploration. The study area covered approximately 8,760 sq km (5,444 sq mi), and principle participants or elements and their respective levels of funding in this study were: U.S. Geological Survey (USGS), $512K; University of Texas (UT), $630K; and National Oceanic and Atmospheric Administration (NOAA), $546K. General areas of research by elements were: USGS - sediments; UT - biology/chemistry; and NOAA - biology/physical oceanography. Mr. Henry Berryhill, USGS, Corpus Christi, Texas, was the designated Project Manager.

The NOAA investigation, led by Dr. Joseph W. Angelovic, Director, Gulf Fisheries Center, involved a number of different research groups. Participants included selected staff members of the Gulf Fisheries Center, the Southeast Fisheries Center, the Atlantic Environmental Group, and the National Ocean Survey. In addition, three segments of the study were completed under contract with staff members of Texas A&M University. For the most part, the combined effort of these participants, with one or two exceptions, was directed toward the analysis of either historical data or samples already available for study. For summarization purposes, the studies completed may be categorized into three general areas: plankton, finfish and crustaceans, and physical oceanography.

Plankton

Specific objectives of this research included identifying the various components of the zooplankton and determining their seasonal and areal distribution and abundance with specific emphasis on shrimp larvae and ichthyoplankton. Zooplankton in general was approached by an in-depth analysis of samples that had been collected monthly from 4 stations within the study area between 1963 and 1965. Station depths were 13.7, 27.5, 45.8, and 73.2 meters. The numerical abundance of zooplankton showed a marked temporal variation without a discernible seasonal pattern, and this variation was highly pronounced at the shallowest station. Averaged over the 3-year period, the zooplankton abundance showed a gradual decrease seaward. Copepods were the most abundant group, comprising approximately 70% of the zooplankton by number, and their developmental stages were equally abundant throughout the study period. A total of 118 species of copepods were found, of which Paracalanus indicus and Paracalanus quasimoto were most abundant at all the stations. Common copepod species more abundant toward the shore were Acartia tonsa, Paracalanus crassirostris, and Oithona nana, and those more abundant toward the open ocean were Clausocalanus furcatus and Oithona plumifera. Species diversity indices, based on adult female copepods, showed a marked temporal fluctuation, which was progressively extensive from deep to shallow stations. Averaged over the 3-year period, the species diversity indices showed a gradual increase seaward in conformity to the number of species found. The coefficients of equitability, however, did not show such a trend.

The areal distribution and abundance of larval shrimp of the commercially important Penaeus spp. were documented by the analysis of historical data generated from monthly sampling at 19 stations from 1962 to 1965. Of the 19 stations, 13 were in the study area and the remaining 6 were adjacent to the study area.

In the shallowest depth zone (7.3-13.7 m), larvae occurred between April and October with a spring and fall period of peak abundance. This timing of larval occurrence coincides closely with the spawning seasons of white shrimp. In the intermediate depth zones (22.9-82.3 m), larvae generally occurred throughout the year with two periods of increased abundance, one in the spring and the other in the fall and early winter. Larval abundance was greatest in the fall/ early winter peak, occurring slightly later as depth increased. Larval occurrence at the intermediate depths is hypothesized to reflect the spawning activities of brown shrimp. In the deepest depth zone (109.7 m), the trend in larval abundance was poorly defined because of low catches, but the trend did approximate those observed in the intermediate depths. Larvae occurred throughout the study area, but the highest concentration was evident in the waters over the middle of the continental shelf.

The seasonal occurrence, distribution, and abundance of ichthyoplankton was investigated by two methods. One was the examination of plankton samples collected with a 1 m net from a series of 12 stations that were occupied from December 1974 through September 1975 on a quarterly basis. Stations were positioned along four transects extending from the coastal waters to the continental shelf. The second was by examining samples collected monthly from May through September at 16 stations. These collections were made with paired 61 cm Bongo net plankton samplers. During the survey 49 families, 84 genera, and 50 species were identified with anchovies, gobies, and codlets accounting for 57% of the total larvae. Larval species diversity was highest during April-May and lowest during December-January. Family dominance varied by season. Based on the number of eggs per cruise, the late summer and early fall period appears to be the dominant spawning time for fishes in the study area although spawning probably occurs throughout the year. King mackerel larvae occurred in all monthly samples taken from May through September, but greatest numbers were taken in September. The larvae of Spanish mackerel occurred in greatest numbers in May and abundance generally decreased through September. Larvae of the king mackerel, for the most part, occurred in deep waters (32-36 m) whereas those of the Spanish mackerel were restricted to shallow waters (13 m or less). Extremely high catches of fish eggs and larvae indicated that these waters are highly productive and serve as a major spawning area for many forage, sport, and commercial fishes.

Finfish and Crustaceans

Research on the adult fish and crustacean populations within the study area included analyses of historical data on groundfish and shrimp as well as newly generated information on pelagic fishes and those of recreational importance. From the analysis of ground fish data collected monthly from 1963 through 1965, it was determined that a diverse ichthyofauna occurred at depths of 7-100 m, but that species richness apparently was lower than that present to the north and east of the study area. Within the study area 14 identified families made up approximately 97% of the biomass and 96% of the numbers of fishes. Of the families, the Lutjanidae (snappers - 34%), Triglidae (searobins - 14%), Sparidae (porgies - 11%), Serranidae (sea basses - 9%), Synodontidae (lizardifishes - 6%), Sciaenidae (drums - 5%), Bothidae (lefteye flounders - 5%) and Gadidae (codfishes - 5%) comprised approximately 89% of the biomass. Over 78% of the numbers of fishes were composed of snappers (20%), searobins (20%), sea basses (19%), porgies (12%), and lefeye flounders (7%). The most dominant species was *Pristipomoides aquilonaris* (wenchman) and comprised approximately 20-33% of the catch in biomass or numbers and was followed in importance by *Prionotus paralatus* (Mexican searobin - 18%), *Stenotomus caprinus* (longspine porgy - 12%), *Serranus atrobranchus* (blackear bass - 7%) and *Synodus foetens* (inshore lizardfish - 5%).

Twelve species of penaeid shrimp occurred within the study area. Of these, however, only three--the white, brown, and pink shrimp--are harvested commercially. The brown shrimp was the most abundant species with greatest concentration occurring in water depths between 22.9 and 27.5 meters. White and pink shrimp occurred generally in waters less than 22.9 meters deep. Between 1970 and 1974 commercial shrimp landings from the study area varied from 4.4 to 7.3 million pounds (heads off) whereas the value of the catch ranged from $5.7 to $13 million.

Finfish Analysis

Assessment of pelagic and recreational fish species was conducted through hydroacoustical surveys, periodic sampling with gill nets, and a creel survey. The number of pelagic fish schools occurring in the area varied from a low of 7 targeted in December to a high of 27 targeted in August. The analysis of available historical data revealed that the schooling fishes included 5 families and 13 species. The most dominant families were Clupeidae (herrings), Engraulidae (anchovies), Carangidae (jacks and pompanos), scombridae (mackerels and tunas) and Stromatiidae (butterfishes) with the most dominant species being Brevoortia patronus (Gulf menhaden). During the 28-week period from April to November, sportsfishermen caught 62 species of fish from the study area. The estimated total number of man-days of fishing during this period was 344,455, and of these about 30% were spent fishing from the beach, 25% from a pier, 16% from a jetty, 13% on a headboat, 10% from an inboard, and 5% from an outboard. By platform, i.e., beach vs. outboard, etc., the three species caught in greatest abundance were: beach--southern kingfish, Gulf kingfish, and bluefish; pier--pinfish, sea catfish, and Atlantic croaker; jetty--sand seatrout, Atlantic croaker, and pinfish; headboat--red snapper, king mackerel, and little tunny; inboard--king mackerel, red snapper, and little tunny; and outboard--king mackerel, Spanish mackerel and crevalle jack. A comparison of yearly landings of billfish from 1972 to 1975 indicated that sailfish were most abundant in 1975, whereas blue marlin and white marlin were most abundant in 1974. The total value of the recreational fishery during the study period was estimated conservatively as being between $3.9 and $7.4 million.

Physical Oceanography

Available historical hydrographic, water movement, and meteorological data have been analyzed to derive as comprehensive a picture as possible of physical oceanographic conditions in the South Texas lease area. Data are sparse in the area, and spatial and temporal variability is high so that it has been necessary to consider data for the entire Texas coast, shelf, and slope.

The climate of the lease area is subtropical and semiarid. The Gulf of Mexico extension of the Bermuda High controls the weather during the long summer with winds predominantly from the SE quadrant. Air mass control is dominant in the winter, with frequent cold fronts and northerly winds interrupting the mild southeast flow from the open Gulf. Wind speeds are the highest, but are less steady in the winter. Vector mean speeds are highest in June and July, when almost 90% of the winds are from the Southeast quadrant. Nine severe hurricanes have affected the lease area during the months of August and September in this century, including four between 1961 and 1971.

Shelf water temperatures during the winter are characterized by vertical homogeneity and a strong lateral gradient. Surface water temperature averages slightly higher than that of the air but can vary by as much as 10°C nearshore during a winter month due to alternating warm and cold air masses. Subsurface waters over the outer shelf reach their minimum temperature in the spring, and there is evidence of upwelling. Temperatures in the summer have generally strong vertical stratification and lateral homogeneity. The nearshore waters off Brownsville may be an exception, with indications of lower mean temperature and periodic upwelling. The high vertical stability of spring and summer is eliminated by overturning in the fall, when subsurface waters on the outer shelf reach their maximum temperature.

An onshore/offshore salinity gradient is present in most seasons due to fresh water outflow. It is moderate, generally under 5 °/oo in fall and winter, usually absent in the summer, but is quite strong in the spring. Salinities in the northern part of the lease arc can be lowered 10 °/oo or more nearshore from open Gulf values. The effects of the Mississippi and Atchafalaya are dominant in this season, and onshore/offshore salinity gradients decrease markedly from north to south. This increase is also present in the fall and winter.

Tides in the area are mixed, and ranges are small. Mean daily sea level, however, varies significantly in response to synoptic and seasonal influences. A relationship to the wind is apparent, and currents may also be correlated with these changes.

Drifter, ship drift reports, and current meter records reveal a complex surface current structure. From Corpus Christi northward to the Galveston area, surface currents tend to set south and west from September to February, and north and east in June and July. March to May and August to September are transitional months. Farther south conditions are more complex with indications of convergence and shear zones in fall, winter, and spring. The interaction of prevailing winds and density structure is important for open-shelf flow in all seasons, except in the summer when winds are dominant. At all times, the possibility of distinct current regimes nearshore, over the open shelf, and in the deep Gulf must be considered.

Modelling of water mass characteristics shows clearly the effects of changing depth. However, water mass characteristics are not reliable for quantifying between shelf and oceanic waters because of the importance of local surface processes.

Modelling of local shelf processes reveal important aspects of one-shelf circulation. As a result of strong density gradients, baroclinic effects are dominant over most of the Texas coast (except in the summer) with resultant flow to the south and west. In the southern part of the lease area, stratification is weaker and direct wind effects more important, with a tendency for a northerly set in all seasons. Convergence and shear regions develop where density structure changes markedly and where density and wind effects oppose each other. Close to shore, onshore winds and a shoaling bottom can generate strong southward nearshore flows.

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Environmental Studies of the South Texas Outer Continental Shelf

INTRODUCTION

Location of Study Area

The South Texas OCS study area, as described herein, corresponds to the area outlined by the Department of the Interior for oil and gas leasing. The area covers approximately 8,760 sq km (5,444 sq mi). It extends northward from the Mexican-United States boundary to the northern end of Matagorda Island, Texas and seaward from the Federal-State territorial boundary, which is 16.6 km (10.3 mi) offshore to the approximate position of the 200-m isobath or the outer edge of the continental shelf (Figures 1 & 2).

Purpose and Scope of Study

In 1974, the Bureau of Land Management (BLM) was authorized to initiate a National Outer-Continental Shelf (OCS) Environmental Studies Program. The objectives of the program, as stated by BLM, are to:

- provide information about the OCS environment that will enable the Department and the Bureau to make sound management decisions regarding the development of mineral resources;

- provide a basis for predicting the impact of oil and gas exploration and development on the marine environment;

- establish a basis for the prediction of the impact of OCS oil and gas activities in frontier areas;

- provide impact data that could result in modification of leasing regulations, operating regulations, or operating orders.

The initial study of the OCS program, as outlined by BLM, is to establish environmental baselines (bench marks) in selected regions prior to oil and gas exploration. The Gulf Fisheries Center of the National Marine Fisheries Service was authorized to begin their part of the study with the signing of the BLM/NOAA Interagency Agreement on January 24, 1974 and subsequent transfer of funds to support the NMFS investigations.

The biological aspects of the OCS study are concerned with the side effects of energy production activities on living marine organisms, which can be lethal. The impact of oil and gas production will be more apparent for the living resources than for some of the non-living components of the environment. Because of the multiple public use made of the waters of the study area, such as recreational and commercial fishing, it will be critical that cyclical population fluctuations and other changes resulting from natural causes can be distinguished from the effects of energy production. Otherwise, little understood natural changes are likely to be attributed to the effects of oil and gas production, or vice versa. An adequate base of information is essential if accurate assessments are to be made.

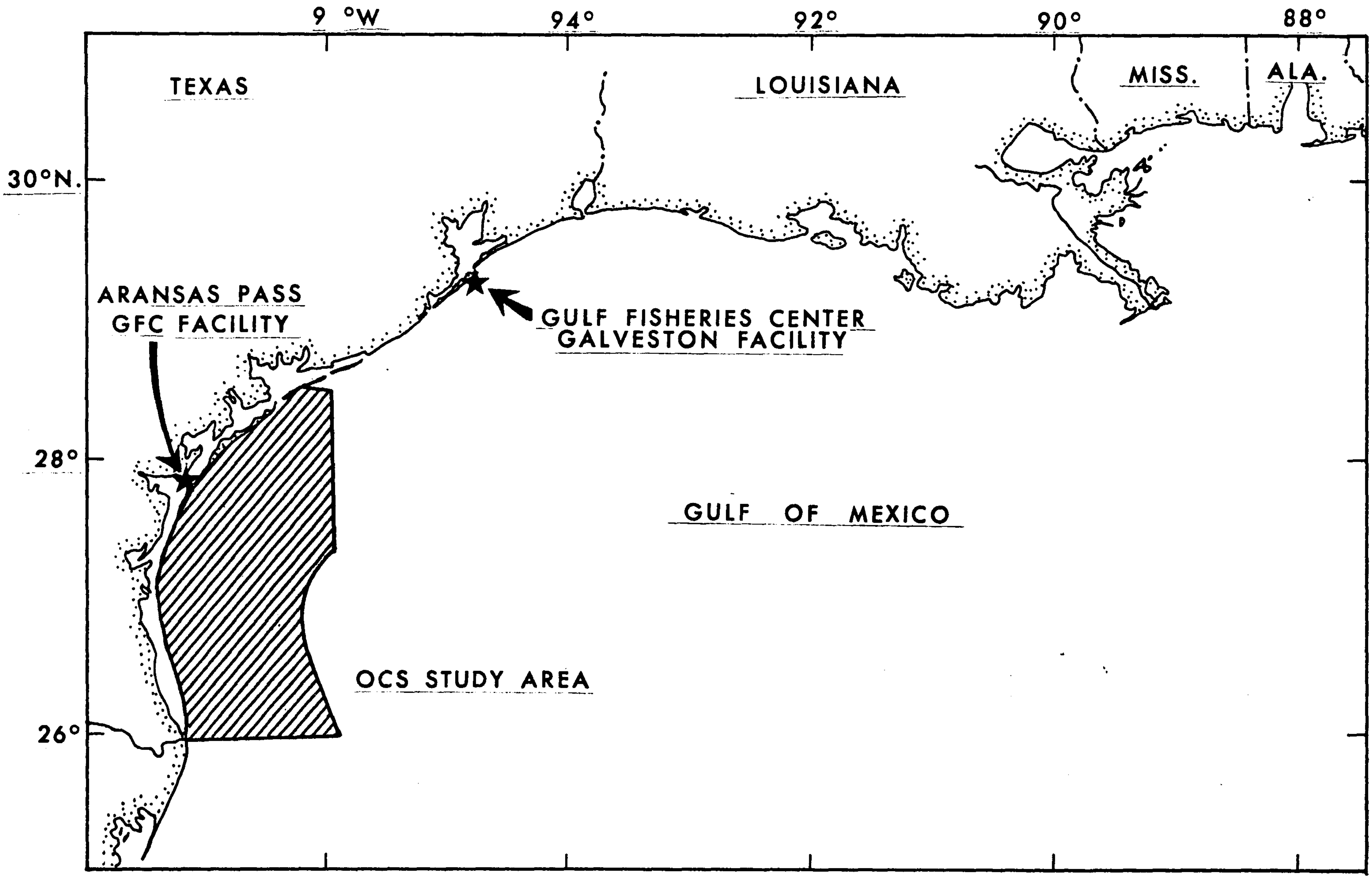

FIGURE 1. Location of the OCS study area.

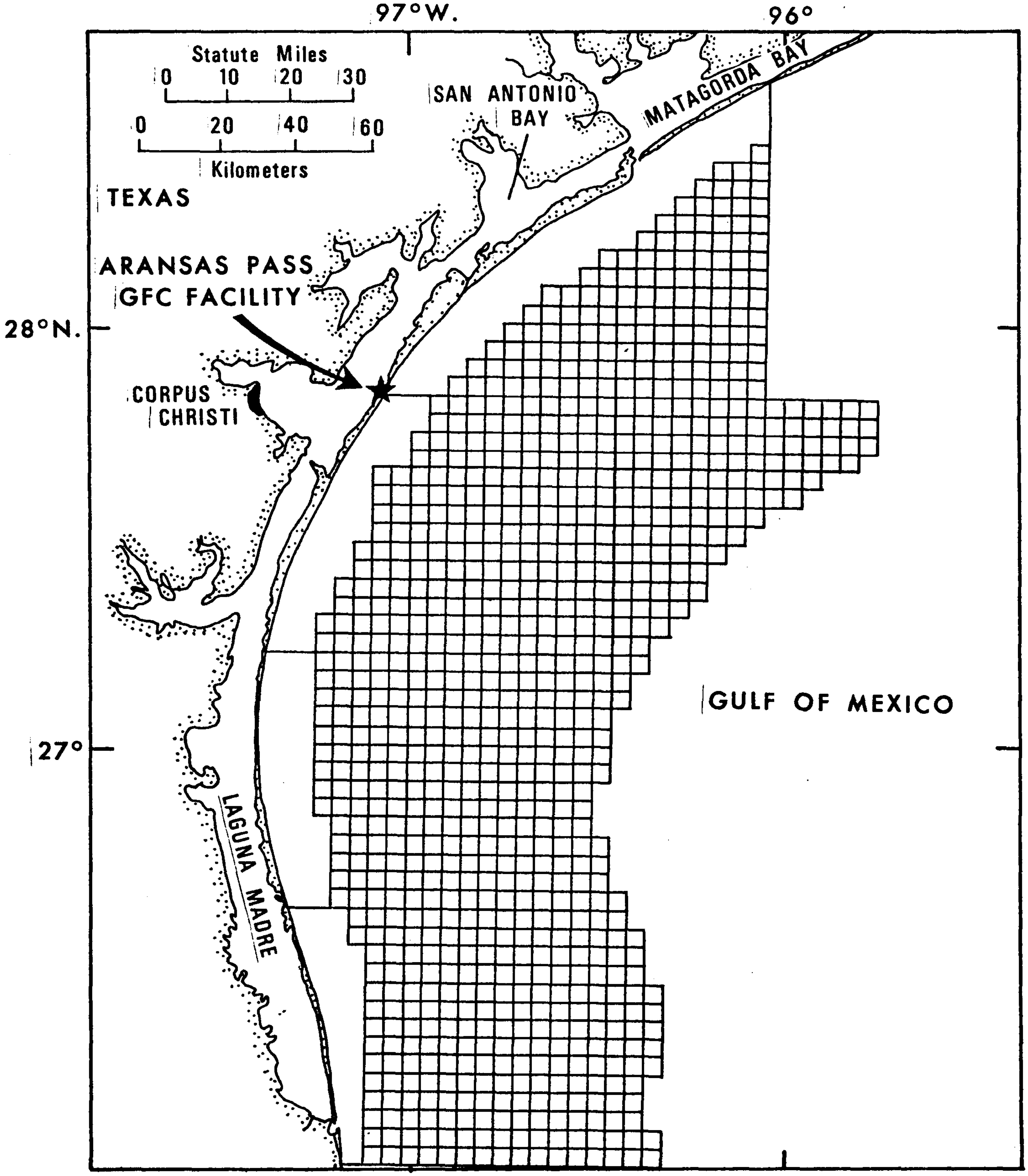

FIGURE 2. BLM lease/investigation area.

The biological studies undertaken during the first year were selected from among the investigations needed to establish adequate baselines of knowledge. The rationale for the selection of the initial studies included: (1) a consideration of the magnitude and significance of the contribution to be gained from the expenditure of minimal funds, and (2) the essential prerequisite nature of the information to be gained by the initial studies, in reference to the other investigations to be subsequently conducted. A significant amount of data has been scattered through the literature and should be collected into a single source to implement effective use. A long series of historical plankton collections and oceanographic data from the study area is available at the Gulf Fisheries Center for analysis. A major contribution to essential knowledge will be gained from completing the analysis of these samples and data. At today's costs, a duplication of the above samples with their analyses would probably cost in the neighborhood of several million dollars. Collection and analysis of current samples have continued the series and extended their coverage.

I. PLANKTON

A. HISTORICAL ZOOPLANKTON[1]

INTRODUCTION

It is a well-known fact that the distribution of zooplankton is highly variable with time and space. It is also known that the variability of zooplankton is closely related to that of environmental conditions. In view of the hydrographical complexity and seasonal variability of neritic waters, a high degree of temporal and spatial variations was expected in the species composition and their relative abundance of the zooplankton community on the South Texas continental shelf. In order to document these variabilities and provide historical data of the zooplankton community, zooplankton samples collected from the South Texas continental shelf for a 3-year period (1963-1965) by the Galveston Laboratory of the Gulf Coastal Fisheries Center have been analyzed.

The zooplankton samples were collected monthly from 13 stations along three transects radiating offshore and located in waters varying in depth from 13.7 to 109.8 meters. These samples were highly valuable mainly because they were collected regularly with a consistent method. Although the samples were unsuitable for biomass determination, they were in excellent condition with well-preserved specimens. The sample analyses involved the identification and enumeration of specimens with a primary objective of establishing the temporal and spatial pattern of abundance and species composition of zooplankton.

MATERIAL AND METHODS

1. Sampling

Samples analyzed in this study were those collected from four stations along the middle transect during the 3-year period from 1963 to 1965. The coordinates of the sampling stations are as follows and their locations are shown in Figure 3.

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[1] All tables and figures identified with an asterisk (*) in this section of the report are found in Appendix A.

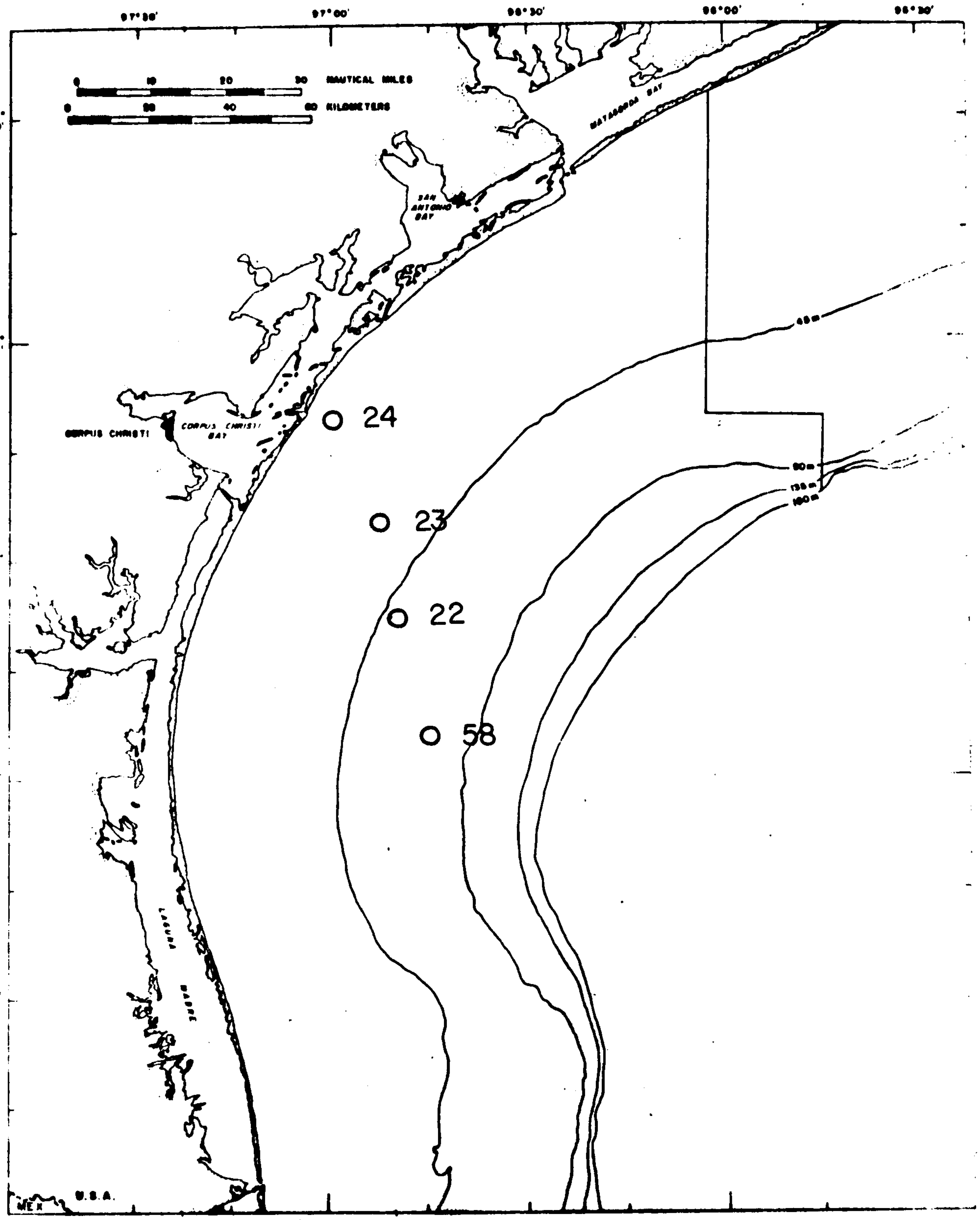

Figure 3. Location of sampling stations.

Station	Latitude (N)	Longitudes (W)
W24	27°48'	97°00'
W23	27°35.5'	96°55'
W22	27°21'	96°50'
W58	27°06'	96°45'

The samples were collected with a Gulf-V plankton net about 40.5 cm in mouth diameter and made of wire screen about 200μ in mesh size. Tows were of the oblique-step variety of about 20 minutes duration from 3 m above the bottom to the surface. The amount of water filtered during each tow was estimated from a flowmeter positioned in the center of the net mouth. The sampling data, which include the date, time of tow, and amount of water filtered are shown in Table 1*

2. Sample Analysis

The samples were split by means of a Folsom plankton splitter to achieve adequate subsamples for analysis. The size of subsample analyzed for species and their abundance varied between 1/8 and 1/128, and the number of zooplankters found in a subsample varied from 683 to 3832 (Table 1*). Each subsample was sorted initially into major taxonomic components which were placed in separate dishes for further taxonomic and quantitative analysis. The copepods were most intensively studied. They were first separated into the three suborders (Calanoida, Cyclopoida, and Harpacticoida) and then each suborder into adult females, males, and immature forms. All adult female copepods were identified to the species level and their numbers were recorded for each species.

3. Species Diversity and Equitability

The species diversity index was calculated for each sample on the basis of adult female copepods according to the Shannon-Wiener function. The coefficient of equitability was calculated for each sample using two different formulas as shown below:

a. $E = \frac{S'}{S}$

where S = number of species found in the subsample
S' = hypothetical species number for a given species diversity (Lloyd and Ghelardi, 1964)

b. $E = \frac{H(S)}{H_{max}(S)}$

where H(S) = observed species diversity
$H_{max}(S) = \log_2 S$ (maximum species diversity for a given S)

RESULTS AND DISCUSSION

1. Numerical Abundance of Zooplankton

The number of zooplankters per m^3 of water filtered varied considerably from month to month at all the stations (Table 2*). The average number and range of variation over the 3-year period at each station are as follows:

Station	Average (range)
W24	1901 (259-6288)
W23	1580 (507-4268
W22	1337 (165-5028)
W58	1080 (136-4435)

These average values clearly show a gradual decrease of zooplankton abundance from the shallow to deep stations. However, as shown in Figure 1*, no clearly definable seasonal pattern was evident in the numerical abundance of zooplankton at any station. The greatest temporal fluctuation was found at the shallowest station (W24), and the three offshore stations were more or less similar in the extent of their zooplankton fluctuations.

At station W24, peaks of abundance occurred in summer-fall in the first 2 years (1963-1964) and at the three offshore stations, peaks occurred more often in spring (April-May) than in any other season. At all the stations, peaks were usually followed by a sudden drop which was in turn followed by an abrupt increase giving a picture of short-term and irregular fluctuations.

In all samples the Copepoda were the most abundant group, comprising approximately 70% of the zooplankton by number (Table 3*). The relative abundance of the Copepoda is indicated in Figure 1* by a line within the bar representing the total zooplankton number. As depicted in the figure, the relative abundance of the Copepoda tended to be lower as the total zooplankton reached a high peak.

Other than the Copepoda, the more abundant groups were the Larvacea, Ostracoda, Mollusca and Chaetognatha (Table 3, Figure 2-5*), and all of them showed extensive and irregular temporal variations. The Larvacea and Chaetognatha occurred quite regularly in large numbers and showed no obvious difference in their abundance among stations (Figures 2-3*). However, the Ostracoda were abundant only at two deep stations and the Mollusca only at two shallow stations (Figures 4-5*). The Ostracoda consisted mainly of a single species (Euconchoecia chierchiae), and the Mollusca were mostly veliger larvae.

2. Numberical abundance of copepods

The number of copepods, including all developmental stages, showed a similar temporal variation to the total zooplankton at all the stations (Table 2*, Figure 2*). The average number per m^3 and the range of variation over the 3-year period were as follows:

Station	Average (range)
W24	1180 (118-4385)
W23	873 (312-2095)
W22	690 (82-1640)
W58	640 (94-2379)

As evident from these average figures, the copepods showed a gradual decrease from the shallow to deep stations as in the total zooplankton.

The most abundant suborder of copepods was the Calanoida, followed by the Cyclopoida and Harpacticoida (Tables 4, 5*). Except for the Harpacticoida, the developmental stages were abundant throughout the 3-year period, comprising nearly 50% in the Calanoida and about 20% in the Cyclopoida.

By identifying and counting all adult female copepods in the subsample, the numerical abundance of each copepod species per m^3 was determined (Table 6*). Contrary to the trend of numerical abundance, the number of copepoda species increased considerably from the shallow to deep station (Table 8*). A total of 118 species of copepods were found which consisted of 70 species of calanoids, 41 species of cyclopoids, and 7 species of harpacticoids. The number of copepod species found at each station is as follows:

Station	Number of Copepod Species			
	Calanoida	Cyclopoida	Harpacticoida	Total
W24	24	18	2	44
W23	31	22	3	56
W22	57	36	7	100
W58	64	36	4	104

The most abundant species at all the stations were Paracalanus indicus and Paracalanus quasimoto (Table 7*).

As shown in Figure 6*, the relative abundance of these two species showed an extreme fluctuation and was poorly correlated with the abundance of total zooplankton. Clausocalanus furcatus was found more often and in larger numbers at deep stations than at the shallow stations (Figure 7*). Its quantitative distribution was clearly seasonal with peaks of abundance usually in summer months, and only when it was abundant in the area, it occurred close to the shore. Oithona plumifera also showed an increase seaward in its quantitative distribution, and its peaks of abundance occurred about the same time at all four stations indicating its occasional invasions into the area from the open ocean (Figure 8*).

Acartia tonsa, Paracalanus carrirostris, and Oithona nana showed a pattern of distribution quite opposite to that of the offshore species mentioned above. Acartia tonsa occurred in large numbers in spring or early summer at the shallowest station and reached as far out as the deepest station (Figure 9*). Paracalanus crassirostris was abundant at the shallowest station in winter and spring and only in these seasons it also occurred at the offshore stations but in much lower numbers (Figure 10*). Oithona nana, although not showing a regular seasonal pattern, showed a gradual increase shoreward in its frequency of occurrence and abundance (Figure 11*).

3. Species Diversity

Species diversity indices based on adult female copepods and coefficients of equitability calculated from these diversity indices are presented in Table 8* and Figure 4. As evident in the figure, a close agreement was shown between the species diversity indices and coefficients of equitability. The species diversity indices gradually increased from the shallow to deep stations in conformity to the number of species. The coefficients of equitability calculated from these species diversity indices, however, did not show such a regular trend. Both the diversity indices and the coefficients of equitability showed a gradual increase in the degree of fluctuation from the deep to shallow stations, but this fluctuation was poorly correlated with either the zooplankton abundance or the number of species at each station.

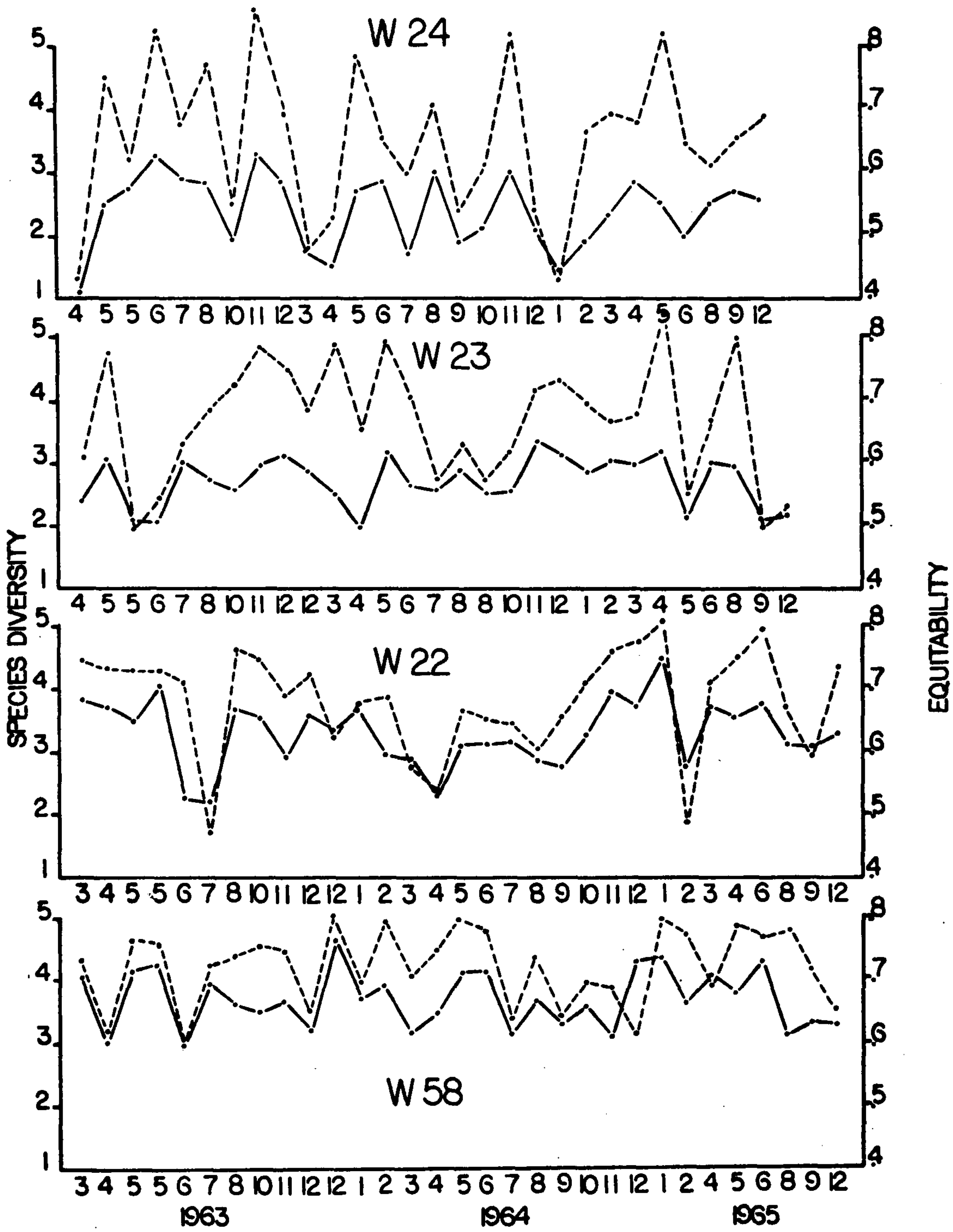

Figure 4. Species diversity indices and coefficients of equitability based on adult female copepods.

The coefficients of equitability (E) will have a maximum value of 1.0 when MacArthur's model is perfectly obeyed. The values of E obtained in the present study are obviously too low to be interpreted as being close in the theoretical model. However, the values seem to indicate that the copepod community in this area is rather unstable and poorly organized, as are those of any neritic waters.

SUMMARY

To provide information on the temporal variation and historical data of the zooplankton community of the South Texas continental shelf, zooplankton samples collected from four stations along a transect for a 3-year period (1963-1965) by the Galveston Laboratory of the Gulf Coastal Fisheries Center have been analyzed. The numerical abundance of zooplankton showed a marked temporal variation without a discernible seasonal pattern, and this variation was highly pronounced at the shallowest station. Averaged over the 3-year period, the zooplankton abundance showed a gradual decrease seaward. Copepods were the most abundant group, comprising approximately 70% of the zooplankton by number, and their developmental stages were equally abundant throughout the study period. A total of 118 species of copepods were found, of which *Paracalanus indicus* and *Paracalanus quasimoto* were most abundant at all the stations. Common copepod species more abundant toward the shore were *Acartia tonsa*, *Paracalanus crassirostris*, and *Oithona nana*, and those more abundant toward the open ocean were *Clausocalanus furcatus* and *Oithona plumifera*. The species diversity indices based on adult female copepods showed a marked temporal fluctuation, which was progressively extensive from deep to shallow stations. Averaged over the 3-year period, the species diversity indices showed a gradual increase seaward in conformity to the number of species found. The coefficients of equitability, however, did not show such a trend.

B. RELATIVE SEASONAL ABUNDANCE AND AREAL DISTRIBUTION OF LARVAL SHRIMP (*Penaeus* spp.)[1]

INTRODUCTION

The most valuable commercial fishery in the Gulf of Mexico is supported by three species of penaeids, the white (*Penaeus setiferus*), brown (*P. aztecus*), and pink (*P. duorarum*) shrimp. These three species, although having different bathymetric ranges, live in coastal waters (shelf and estuarine) and have similar life histories. Generally, the benthic adults live and spawn in shelf waters while the young or larvae are members of the planktonic community. It is during this early life history phase that the young move shoreward where they enter the estuaries as postlarvae. Shrimp grow rapidly in the estuaries, and after several months, they return to shelf waters to spawn and complete their life cycle.

A considerable amount of research has been conducted on the white, brown, and pink shrimp that inhabit the waters of the Gulf of Mexico, and these efforts are summarized by Lindner and Cook (1970), Cook and Lindner (1970), and Costello and Allen (1970). Although extensive information exists on juvenile and adult shrimp, there is a lack of field data on the seasonal distribution and relative abundance of larval shrimp. Information on these life stages is generally confined to the works of Pearson (1939), Munro, et. al. (1968), Temple and Fischer (1965 and 1968), and Jones et. al. (1970).

As part of the expanded Bureau of Commercial Fisheries (National Marine Fisheries Service) shrimp research programs initiated in 1962 and described by Kutkuhn (1963), plankton hauls were made monthly in the south Texas OCS study area between 1962 and 1965 in an effort to document the seasonal distribution and relative abundance of larval penaeids. The analysis of this data is presented here for the following reasons: (1) the high commercial value of shrimp in the Gulf of Mexico; and (2) the sensitivity of larval forms to environmental changes, either man-made or natural.

Cruise Coverage--Between February 1962 and December 1965, monthly cruises were conducted in the south Texas OCS study area with chartered shrimp vessels. This schedule was followed as closely as possible with the only exceptions being due to adverse weather conditions or mechanical breakdowns. Plankton sampling was conducted at 30 predetermined stations in 1962 and at 20 stations from 1963 through 1965. Station data are listed by years in Table 1, and those stations occupied from 1963 through 1965 are illustrated in Figure 5. Tows were made upon arrival at station, irregardless of time of day.

Sampling Gear and Methods--Plankton samples were obtained with a Gulf-V plankton net described by Arnold (1959). This gear consists of a metal frame, to which a conical, monel net with a mesh size of 31.5 strands per centimeter is attached. Plankton was collected in a cup attached to the end of the net, and after each tow, the net was washed down and the plankton removed and preserved in 5% Formalin. Estimates of water volume filtered during each tow were calculated from a flowmeter positioned in the center of the net mouth. Both TSK and Atlas flowmeters, calibrated by the techniques outlined by Ahlstrom (1948) were used.

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[1] All tables and figures identified with an asterisk (*) in this section of the report are found in Appendix B.

Table 1
Stations at which 20-minute plankton hauls were made monthly in 1962 and 1963-1965.

1962				1963-1965			
Stations	Depth (m)	Location		Stations	Depth (m)	Location	
		Latitude	Longitude			Latitude	Longitude
W- 1	13.7	29°01'	95°05'	W- 1	13.7	29°01'	95°05'
W- 2	27.5	28°40'	94°56'	W- 2	27.5	28°40'	94°56'
W- 3	45.8	28°18'	94°46'	W- 3	45.8	28°18'	94°46'
W- 4	64.0	28°05'	94°41'				
W- 5	82.3	27°58'	94°38'				
W- 6	109.8	27°55'	94°36'	W- 6	109.8	27°55'	94°36'
W- 7	109.8	27°44'	95°30'				
W- 8	82.3	27°49'	95°32'				
W- 9	64.0	27°54'	95°35'				
W-10	45.8	28°04'	95°40'				
W-11	27.5	28°17'	95°46'				
W-12	13.7	28°34'	95°55'				
W-13	13.7	28°02'	96°46'	W-13	13.7	28°19'	96°21'
W-14	27.5	27°54'	96°37'	W-14	27.5	28°07'	96°14'
W-15	45.8	27°47'	96°30'	W-15	45.8	27°57'	96°07'
W-16	64.0	27°41'	96°23'				
W-17	82.3	27°37'	96°20'				
W-18	109.8	27°32'	96°14'				
W-19	109.8	27°01'	96°32'				
W-20	82.3	27°04'	96°42'				
W-21	64.0	27°06'	96°48'				
W-22	45.8	27°08'	96°56'	W-22	45.8	27°21'	96°50'
W-23	27.5	27°12	97°08'	W-23	27.5	27°36'	96°55'
W-24	13.7	27°15'	97°19'	W-24	13.7	27°48'	97°00'
W-25	13.7	26°14'	97°08'				
W-26	27.5	26°15'	97°00'				
W-27	45.8	26°21'	96°41'				
W-28	64.0	26°24'	96°31'				
W-29	82.3	26°25'	96°26'				
W-30	109.8	26°26'	96°21'				
				W-53	7.3	29°19'	94°41'
				W-54	73.2	28°00'	94°38'
				W-55	7.3	29°03'	95°06'
				W-56	7.3	28°23'	96°20'
				W-57	73.2	27°46'	96°00'
				W-58	73.2	27°06'	96°45'
				W-59	7.3	27°51'	97°01'
				W-60	7.3	26°34'	97°16'
				W-61	22.9	26°36'	97°08'
				W-62	45.8	26°41'	96°53'

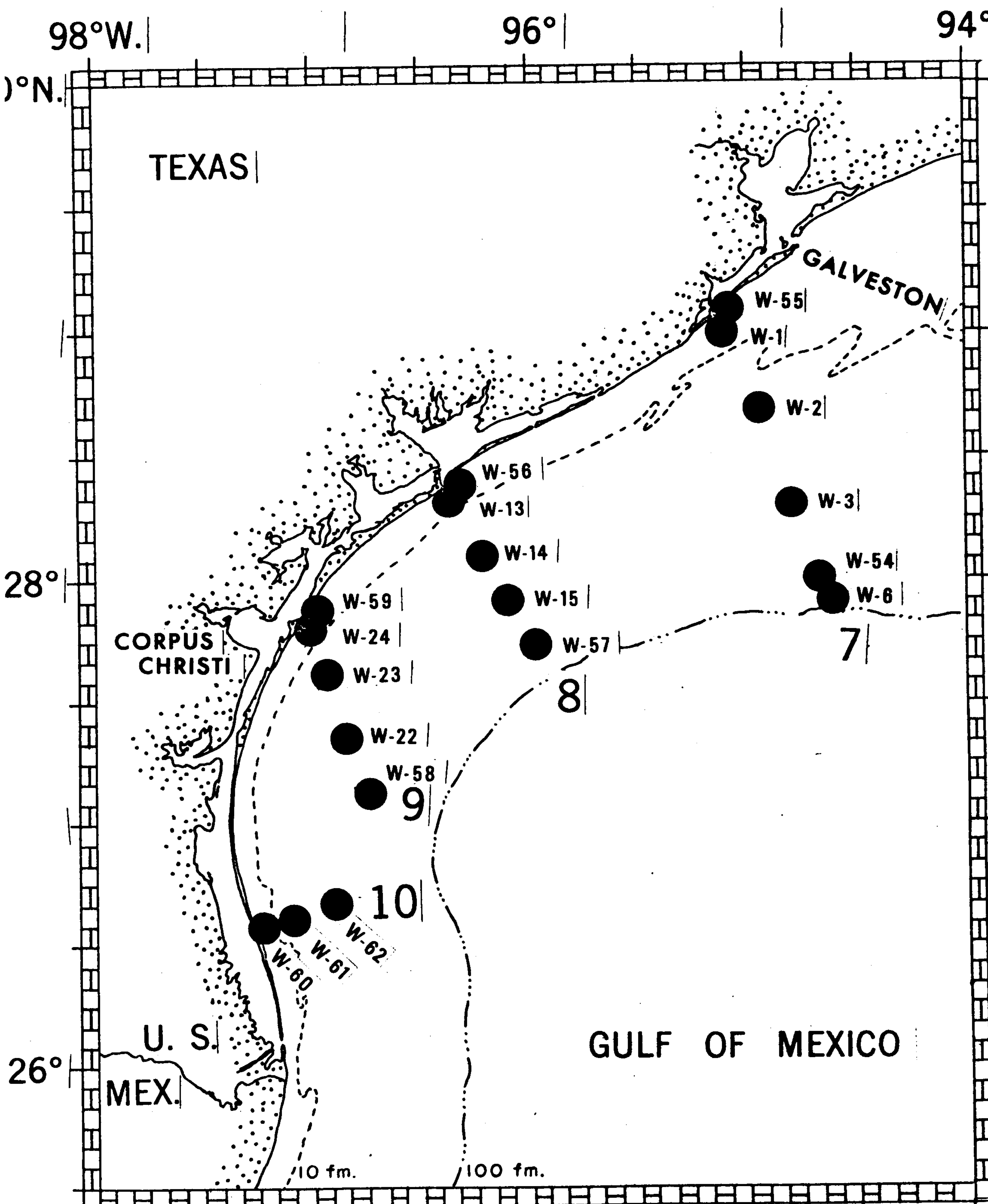

Figure 5. The location of transects 7-10 with their respective stations at which monthly sampling was conducted between January 1963 and December 1965.

Oblique-step tows were made at each station. Each tow lasted 20 minutes, and towing speeds averaged 4.6 km per hour (2.5 knots). Each of four depths was fished for 5 minutes during each tow: 3 m above the bottom, two intermediate depths, and 3 m below the surface. The two intermediate depths fished were equally spaced vertically within the water column and depended on the total water depth. Sampling depths were determined by the trigonometric function of the wire angle and length of towing cable. An evaluation of this technique is provided by Temple and Fischer (1968).

In the laboratory, each sample was examined under a microscope at magnifications ranging from 0.7X to 6.0X. All planktonic stages of penaeids were removed, sorted to developmental stage (i.e., nauplii, protozoea, mysis, and postlarvae), identified to genus using the key developed by Cook (1966), and counted. The amount of each sample examined depended on the settled volume of plankton. Hauls in which the settled volume was less than 25 ml were examined in their entirety; whereas, when sample volume exceeded 25 ml, only one-fifth of the total sample was examined. Aliquots were extracted directly from the samples with a syringe device. Subsampling accuracy was checked by applying chi-square tests to pooled counts from aliquot sizes ranging from one-fifth to four-fifths of the total sample. These tests indicated that the subsampling technique provided adequate estimates of total counts (Temple and Fischer, 1968).

Larval Data--Although about 35 penaeids are known to occur in the Gulf of Mexico, studies on the larval stages of penaeids taken in plankton hauls have been hampered by a lack of descriptive material that permits identification to species (Burkenroad, 1936; Springer and Bullis, 1956; Bullis and Thompson, 1965). Until recently, the most extensive work available was that of Pearson (1939) who described planktonic stages of several penaeids from specimens obtained in planktonic hauls. Today, there exist descriptive works on the pink shrimp (Dobkin, 1961); the seabob, *Xiphopeneus kroyeri* (Renfro and Cook, 1963); the rock shrimp, *Sicyonia brevirostris* (Cook and Murphy, 1965); and the brown shrimp (Cook and Murphy, 1971). Cook (1966) has provided a generic key to the protozoeal, mysis, and postlarval stages of the littoral penaeids of the northwestern Gulf of Mexico. Nevertheless, it is still not possible to identify larval penaeids taken in plankton hauls to species, and consequently data reported herein are for the larvae (nauplii, protozoeae, and mysis) of the genus *Penaeus* only, i.e., a grouping of the young of the white, pink, and brown shrimp.

During the sampling period (1962-1965), flowmeter readings indicated that approximately 100 m^3 of water were strained during each tow. Consequently, to approximate total numbers taken, larval catches by station and month are presented as number caught per 100 m^3 of water strained for 1962 in Tables 1-4*, and for 1963-1965 in Tables 5-8*.

Trends in Seasonal Abundance of *Penaeus* spp. Larvae--Average monthly catches of *Penaeus* spp. larvae were determined for specific depth zones over a 4-year period to illustrate yearly trends in abundance and differences or similarities between depths and years (Figure 6). The zones arbitrarily established were: 7.3-13.7 m; 22.9-27.5 m; 45.8 m; 64.0-82.3 m; and 109.7 m. Rationale for this separation is based on knowledge of the general bathymetric distribution of adult white, pink, and brown shrimp, and that *Penaeus* spp. larvae occurring in these zones probably reflect the spawning activities of the respective species. More specifically, the presence or absence of larvae in the 7.3-13.7 m depth zone should reflect spawning activities of the white shrimp, and those in the depth zones greater than 13.7 m, primarily the spawning of brown shrimp. While pink shrimp do occur, its population level, as reflected in commercial landings from the area, is considerably lower than that of the brown shrimp. Consequently, it is assumed that most larvae occurring in the deeper waters of the study area are primarily brown shrimp.

Average monthly catches of Penaeus spp. larvae varied considerably throughout the study area, but several trends were apparent (Figure 6). In the nearshore zone (7.3-13.7 m), the larval abundance trend was characterized by two periods of increased abundance, one in the spring, and another in the late summer and early fall. Over the 4-year period the occurrence of Penaeus spp. larvae in this depth zone was generally restricted to April through October, although differences were noted between years. This time period, i.e., April-October, agrees closely with the spawning of white shrimp as discussed by Lindner and Anderson (1956).

Within the three depth zones between 22.9 and 82.3 meters (Figure 6), similar trends in larval abundance were apparent each year. Larval catches increased in the spring (April-June) and then again in the fall and early winter (September-December). In each instance the greatest catches were made in the fall, indicating the greatest amount of spawning activity. Another characteristic of the fall/winter peak was that generally it occurred later in the year with an increase in depth zone. This shift was probably associated with the movement of the spawning population of brown shrimp into deeper waters. With few exceptions, Penaeus spp. larvae were taken every month of the year, particularly in the 45.8-m and 64.0-82.3-m depth zones.

The trend in larval abundance at the deepest stations (109.7 m) was poorly defined because of the low numbers of Penaeus spp. larvae taken in the plankton hauls. These low catches probably reflect the seaward boundary of larval Penaeus spp. shrimp populations. Generally, in 1962-1964 the trend followed those observed at the intermediate depths, i.e., two periods of increased abundance with the greatest catches occurring in the fall and early winter. Surprisingly, no trend was evident in 1965 for larvae were taken only in the January hauls.

To illustrate and compare the importance of the five depth zones for the production of Penaeus spp. larvae, the average catch within each zone was computed for each year and for the overall 4-year period in which equal weight was given to each year (Table 2). From these calculations, it is apparent that most larvae were caught in waters between 22.9 and 82.3 meters total depth. With one exception, greatest average larval catches were made each year at stations in 45.8 meters of water, and lowest catches were made at stations in 109.7 meters of water. The only exception to this was in 1965 when catches in the 22.9-27.5 meter zone were slightly greater than those in the 45.8-meter zone. Considering all five groupings, it is clear that most larvae occurred in the three intermediate depth zones.

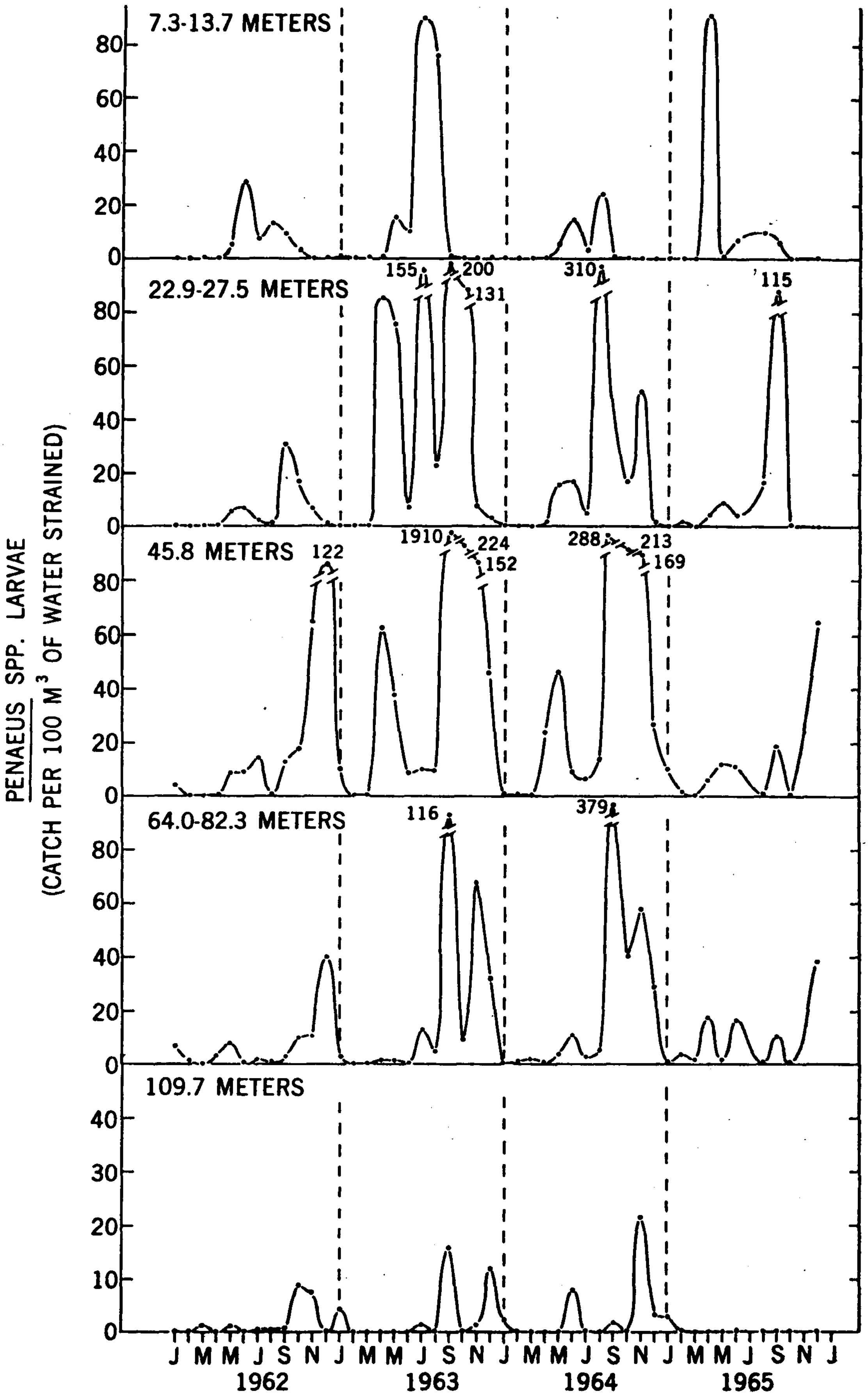

Figure 6. Abundance trends of Penaeus spp. larvae by depth zones, 1962-1965.

Table 2

Average yearly catch (#/100 m^3) of Penaeus spp. larvae by depth zones over a 4-year period, 1962-1965

Depth Zones (Meters)	1962	1963	1964	1965	4-year Average
7.3-13.7	5.0	15.5	4.1	8.9	8.3
22.9-27.5	6.9	57.6	48.3	14.8	31.9
45.8	25.0	218.0	71.4	14.4	82.2
64.0-82.3	7.6	24.7	54.6	10.4	24.3
109.7	2.1	3.6	3.6	0.3	2.4

Charts illustrating the areal distribution of Penaeus spp. larvae were made for each of the last 3 years of the study period. (The 1962 data were not included because of the differences noted previously in the number and location of stations.) Values plotted at each station were obtained by averaging catches per 100 m^3 of water filtered for each year. Isopleths were then drawn to delineate areas of larval concentrations and to permit comparisons between years. (The positioning of all isopleths was estimated using proportional dividers and should be considered approximations.) Because distribution patterns were similar between years, it was decided to group the data and depict the areal distribution of larvae by using 3-year averages. Results of this effort are shown in Figure 7.

Three features of the areal distribution chart are of significance. First, Penaeus spp. larvae, the young of the most valuable U.S. fishery, occurred throughout the entire study area. Second, the abundance of larvae tended to increase with an increase in depth out to 45.8 meters, then decreased again. Third, high catches of larvae were made in a zone paralleling the shore and indicated brown shrimp spawning activities.

SUMMARY

1. In the 7.3-13.7 meter zone, Penaeus spp. larvae occurred between April and October with a spring and fall period of peak abundance. This timing of larval occurrence coincides closely with the spawning seasons of white shrimp postulated by Lindner and Anderson (1956).

2. In the intermediate depth zones, i.e., 22.9-27.5, 45.8, and 64.0-82.3 meters, Penaeus spp. larvae generally occurred throughout the year with two periods of increased abundance, one in the spring and the other in the fall and early winter. Larval abundance was greatest in the fall/early winter peak, occurring slightly later as depth increased. Based on knowledge of the bathymetric range of adult shrimp of the genus Penaeus, larval occurrence at the intermediate depths is hypothesized to reflect the spawning activities of brown shrimp.

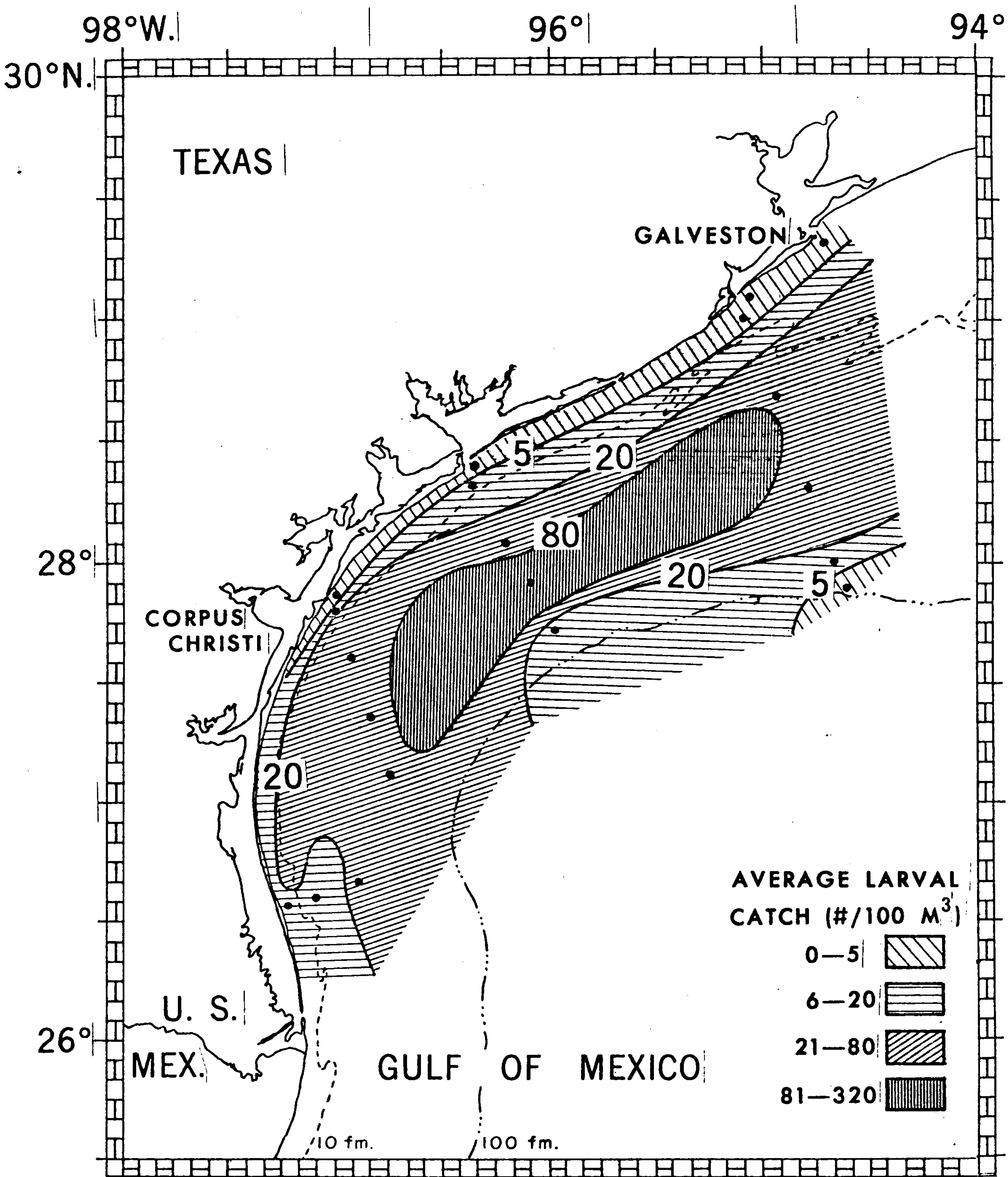

Figure 7. Average areal distribution and relative abundance of *Penaeus* spp. larvae over the south Texas OCS study area. Data are derived from monthly catches over a 3-year period, 1963-1965.

3. In the deepest depth zone (109.7 m), the trend in larval abundance was poorly defined because of low catches, but the trend did approximate those observed in the intermediate depths.

4. A comparison of catches of *Penaeus* spp. larvae by depth zones over a 4-year period revealed that greatest catches were made at stations in 45.8 meters of water. Lowest catches were made at stations in 109.7 meters of water.

5. *Penaeus* spp. larvae occurred throughout the study area, but the highest concentration was evident in the waters over the middle of the continental shelf.

C. ICHTHYOPLANKTON[1]

1. Baseline Survey of the Ichthyoplankton

INTRODUCTION

Prior to this baseline survey and the seasonal study by Texas A&M University (part 2), little published information on the fish eggs and larvae of the northwest Gulf of Mexico was available although the literature on juvenile and adult fishes is extensive. Early work by Gunter (1945, 1950 and 1959) established the species diversity and richness of the marine fishes of Texas. Miller (1965) did a trawl survey of the shallow water fishes off Port Aransas, Texas, and McFarland (1963) reported seasonal changes in the numbers and biomass of fishes from the surf at Mustang Island, Texas. These studies supplemented Gunter's work. More recently, Gallaway et al. (1972) and Walls (1975) added additional reference material on the fishes of Texas and the northern Gulf. These collections plus those of the Gulf Fisheries Center from the northeastern Gulf helped to determine the known fish fauna off the South Texas coast.

The zoogeography of the northern Gulf is not completely clear. It is believed by some marine ichthyologists that the fish fauna of this area is divided by the discharge of the Mississippi into two distinct east and west populations (Baughman 1950; Ginsburg 1952). The checklist compiled by Hoese (1958) on the marine fishes of Texas lists 424 species while Briggs (1958) reported 108 species from the northeastern Gulf that were not recorded from the northwestern Gulf. Many of the tropical species common as adults in more southern Gulf waters are either absent in Texas waters or are apparently strays during warmer months. The larval fish collections have added additional species that are being reported for the first time in the western Gulf and should help to understand some of the faunal differences between these areas.

Because of the lack of knowledge of the early life histories of many fishes from this study area, identification was often based on available references of similar species from other areas in the Gulf of Mexico, Atlantic and Pacific coasts. Particularly useful was the paper on the meristic characters of some marine fishes of the western North Atlantic Ocean by Miller and Jorgenson (1973). Other papers covering the early life histories of certain species were helpful. They included, Aprieto (1973) who described the early development of some carangid fishes and Houde and Fore (1973) on the eggs and larvae of clupeid fishes in the Gulf of Mexico. Additional references used to identify larvae were Wollam (1970) for king and Spanish mackerels in the western North Atlantic and Manseuti and Hardy (1967) on the development of fishes of the Chesapeake Bay region. Many of the larvae were identified by referring to other reference collections from the west coast of Florida. Various groups such as the myctophids, serranids, bothids, and scombrids were sent to specialists to verify identification. Despite this help, some larvae and most eggs were not classified to family level due to

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[1] All tables and figures identified with an asterisk (*) in this section of the report are found in Appendix C.

the lack of reference material of known identity. The eggs of many Gulf fishes remain largely unknown since positive identification requires knowledge of the source of the eggs.

The classification of most larval fishes follows that given by Bailey et al. (1970). A complete tabulation of the larvae and eggs collected during this study is given in Special Table 1*.

A series of 12 stations was occupied from Decmeber 1974 through September 1975 on a quarterly basis along four transects extending from the coastal waters to the continental shelf on a day and night schedule (Figure 8). The exact station locations and water depths are given in Table 1*. Three cruises by the R/V Longhorn were completed during this period. The duration of each cruise was about a month.

METHODS

All plankton collections were made with a 1-meter net of 250 micron-mesh throughout the net. A flow meter inside the net was used to determine the volume of water strained (Table 2*, 3*, and 4*). Tows were oblique and covered most of the water column from near bottom to surface and were made at a ship's speed of about 2 knots. Towing times varied with the depth and are shown in Tables 2*, 3*, and 4* for each cruise.

The plankton in the cod end of the net was drained through a 100-micron-mesh screen and transferred immediately to a jar containing about 7% buffered formalin in seawater. All plankton samples were divided in the laboratory using a Folsom plankton splitter after removing large ctenophores, sargassum and detrital material. The displacement volume of the aliquot was determined by means of a Yentsch plankton volume gauge.

All aliquots used for the ichthyoplankton study consisted of one-half of the total sample, except for the day and night samples of Cruise 1, Transect I, Station 3, both of which consisted of one-quarter of the entire sample. All values given for the fish eggs and larvae in the text of this report have been converted so they represent the entire sample, except those given in the appendix tables which show the actual counts for each aliquot.

Fish eggs and larvae were removed from the plankton aliquots, counted, measured and classified to the lowest possible taxon. In some cases larvae that were mutilated or otherwise unidentifiable were listed as unknown. Most of the fish eggs could not be specifically identified although some were identified to family. Larvae were measured to the nearest 0.1 mm (standard length) or the nearest 1 mm when over 10 mm in size. Length ranges of larvae are given in Special Table 1*.

Separate day and night tows were taken to measure diurnal differences at each station and for all cruises. Many fish have a diel migration and are often found at different depths depending upon time. These day and night samples are shown separately for each cruise (Table 2-4*).

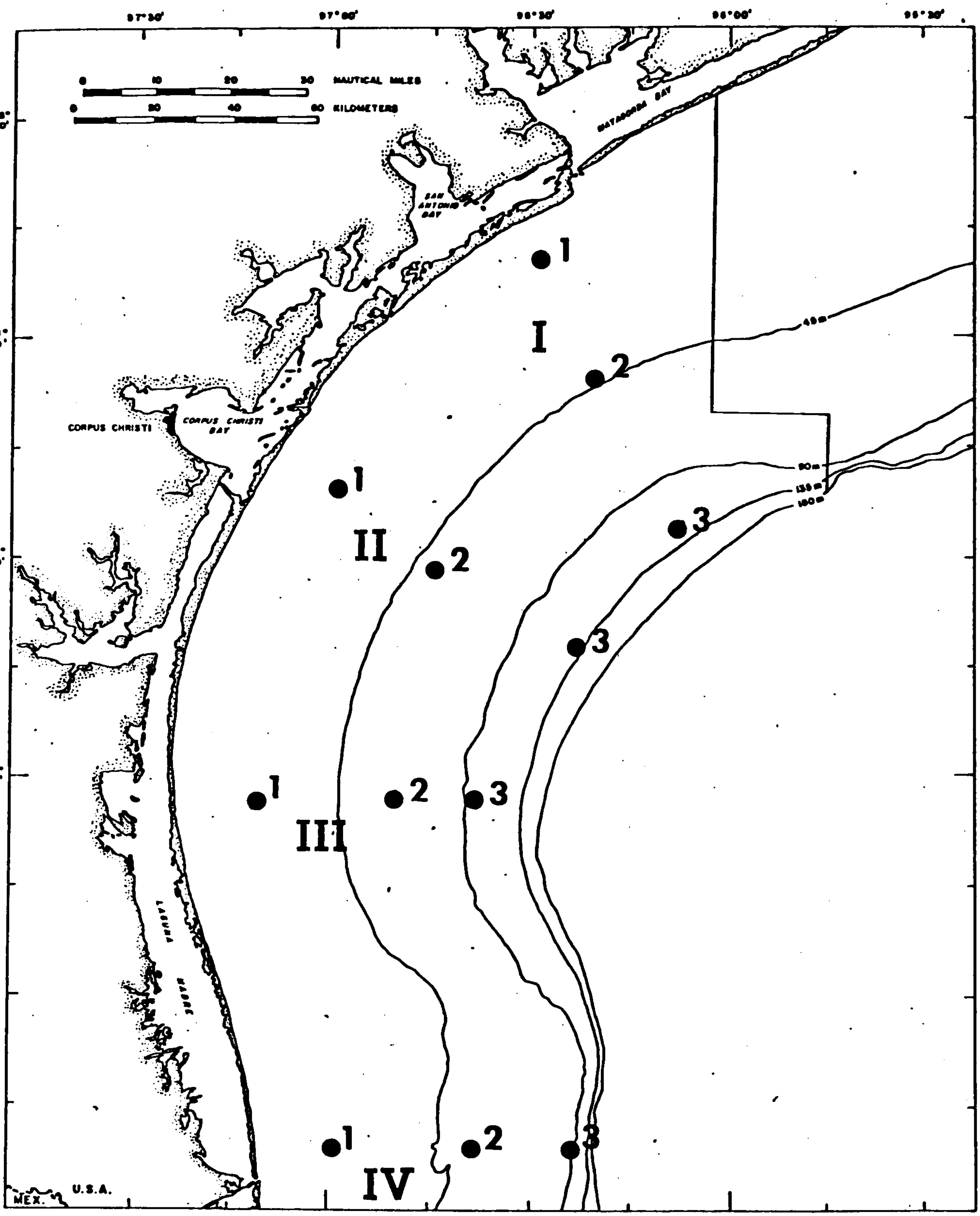

Figure 8. Location of ichthyoplankton sampling stations for 1974-75 by transects.

ABUNDANCE AND SPECIES COMPOSITION

During this preliminary survey a total of 78,378 fish larvae and 57,816 eggs were collected from the three cruises. The actual numbers of larvae and eggs for each cruise are given in Tables 2-4* for both day and night samples. The greatest larval and egg abundance occurred during August and September (Cruise 3) when 44% of the total larvae and 40% of the total eggs were collected. The lowest egg numbers were noted during April and May (Cruise 2) and the lowest larval numbers during December and January (Cruise 1). The majority of eggs (60%) and larvae (71%) for all cruises was taken at night. These data indicate that larval and egg abundance followed a seasonal pattern, and night sampling was the most productive.

Eight of the dominant familes: Bothidae, Bregmacerotidae, Clupeidae, Engraulidae, Myctophidae, Sciaenidae, Scombridae and Serranidae were plotted to show their abundance per 1,000 m^3 for each cruise (Figures 1-24*). These data indicate that larval abundance varied between cruises, transects and the distance from shore. For example, the codlets and lanternfishes were more abundant as the distance from shore and depth of station increased (Figures 2, 5, 10, 13, 18, 21*). The reverse pattern was noted for the herrings, anchovies, and drums which were most abundant in the neritic waters and intermediate depths (Figures 3, 4, 6, 11, 13, 14, 19, 20, 22*). Mackerels were virtually absent in the neritic waters except during Cruise 3, while the sea basses generally followed a similar pattern with the exception of Cruise 2. The lefteye flounders were about equally abundant throughout the entire sampling area.

When the abundance of representative genera and species of these same families were compared in most cases similar numbers per 1,000 m^3 were noted (Figures 25-57*). The genus Citharichthys of the flounder family generally occurred in greater numbers nearer to shore than Bothus or Syacium spp. (Figures 25, 26, 23, 34, 35, 46, 47, 48*). Greater numbers of Spanish mackerel were present in the nearshore stations while king mackerel were more abundant in water depths exceeding 45 meters (Figures 42, 43, 54, 55*).

The ten dominant familes for each cruise and for all three cruises are given in Table 3 together with the total number of families, genera and species. During this survey 49 families, 84 genera and 50 species were identified. The anchovies, gobies and codlets accounted for 57% of the total larvae. The highest species diversity occurred during the second cruise and the lowest during the first cruise. Family, genera and species for each cruise are listed in Tables 5* to 7*, and the occurrence of these fish by transect and station number for all cruises is shown in Table 8*. Family dominance varied by season. For example, codlets were dominant during the winter while the reverse pattern was noted for the anchovies which were virtually absent during this same period.

SEASONAL OCCURRENCE

The three sampling cruises did not completely cover a full year but the length of each cruise at least gave some seasonal coverage during the winter, spring, and fall. Larval species diversity (Table 3) was highest during April and May (Cruise 2) and lowest during December and January (Cruise 1). The seasonal occurrence of ichthyoplankton in general is influenced by many environmental factors such as current, water temperature and spawning which are not covered in this report.

Table 3. Ten most abundant families by cruises.

Cruise 1		Cruise 2		Cruise 3		All Cruises	
Family	%	Family	%	Family	%	Family	%
Bregmacerotidae	33.7	Engraulidae	26.4	Gobiidae	28.5	Engraulidae	17.4
Gobiidae	11.0	Clupeidae	20.6	Engraulidae	21.0	Gobiidae	16.6
Clupeidae	7.7	Bregmacerotidae	13.9	Carangidae	8.4	Bregmacerotidae	14.5
Sciaenidae	4.3	Synodontidae	8.9	Bothidae	7.4	Clupeidae	8.5
Mugilidae	3.4	Myctophidae	6.3	Sciaenidae	6.4	Sciaenidae	5.3
Carangidae	3.4	Sciaenidae	4.5	Bregmacerotidae	4.3	Carangidae	4.8
Bothidae	2.7	Gobiidae	3.2	Synodontidae	3.0	Bothidae	4.6
Myctophidae	1.9	Bothidae	2.0	Cynoglossidae	2.8	Synodontidae	4.5
Stromateidae	1.9	Serranidae	1.3	Scombridae	2.8	Myctophidae	3.0
Synodontidae	1.8	Nettastomidae	1.0	Serranidae	2.7	Serranidae	2.0
Total	71.8		94.0		87.3		81.2
(33 families 44 genera and 21 species)		(43 families 62 genera and 35 species)		(33 families 54 genera and 28 species)		(49 families 84 genera and 50 species)	

Larval dominance varied by season. For example, codlets (Bregmacerotidae) were the dominant family during the winter, the third highest in the spring and only the sixth highest during the fall. The herrings (Clupeidae) were the third most abundant family in the spring and were completely absent from the top 10 familes in the fall (Table 3). The reverse pattern was noted for the anchovies (Engraulidae) which were virtually absent during the winter cruise and the first and second highest family in abundance in the spring and fall.

The highest number of eggs per cruise were collected during August and September (Cruise 3), and the lowest during April and May (Cruise 2). Based on these data the late summer and early fall period appears to be the dominant spawning time for the pelagic fishes off the South Texas coast although spawning probably occurs throughout the year.

DISTRIBUTION

The distribution of ichthyopalnkton is shown in Figures 58-63* by cruise, transect, and station number. These data are based on the percentage of total larvae and eggs collected.

The data on distribution of larvae, as shown in Figure 58*, indicate that no consistent patterns of larval distribution were present, either inshore-offshore or north-south directions. For example, the percentages of larvae taken at the inshore stations of each transect (Station 1) were not consistently high or consistently low. Neither were the percentages at the northern stations (sum of Stations 1, 2, and 3 of Transect I) consistently high or consistently low during each of the three cruises.

When distribution of ichthyoplankton is compared on a day and night basis marked diel differences were noted (Figures 59-60 and 62-63*). These data show the greater abundance of fish eggs and larvae at night.

Egg distribution is shown in Figure 61* by cruise, transect, and station. These data indicate that egg distribution followed a different pattern than larval distribution. For example, during all cruises, eggs were more abundant at inshore and intermediate stations (Stations 1 and 2) in an inshore-offshore direction and least abundant at the offshore stations (Station 3). The distribution patterns during both day and night (Figures 62-63*) were similar.

Another evaluation of the distribution pattern based on the number of eggs and larvae per 1,000 m^3 is shown in Figures 9-11 and Figures 64-69*. These data are similar to that shown for the percentage of eggs and larvae but give a more precise estimate of abundance based on the actual amount of water filtered through the plankton nets.

SPAWNING

The egg stages shown in Figure 12 for six representative familes gives some idea of the importance of the South Texas outer continental shelf area as a major spawning ground. Eggs of the dragonet (Callionymidae) were present during all three cruises and occurred primarily in depths greater than 45 meters. Herring (Clupeidae) eggs were present throughout the sampling area during Cruise 1 and 2 but were virtually absent during the third cruise. Spawning based on early stage eggs occurred mainly in water depths less than 45 meters. Anchovy (Engraulidae) spawning followed a similar pattern. In contrast, mullet (Mugilidae) spawning was heaviest during Cruise 1 and 2 in water depths exceeding 45 meters. The tunas and

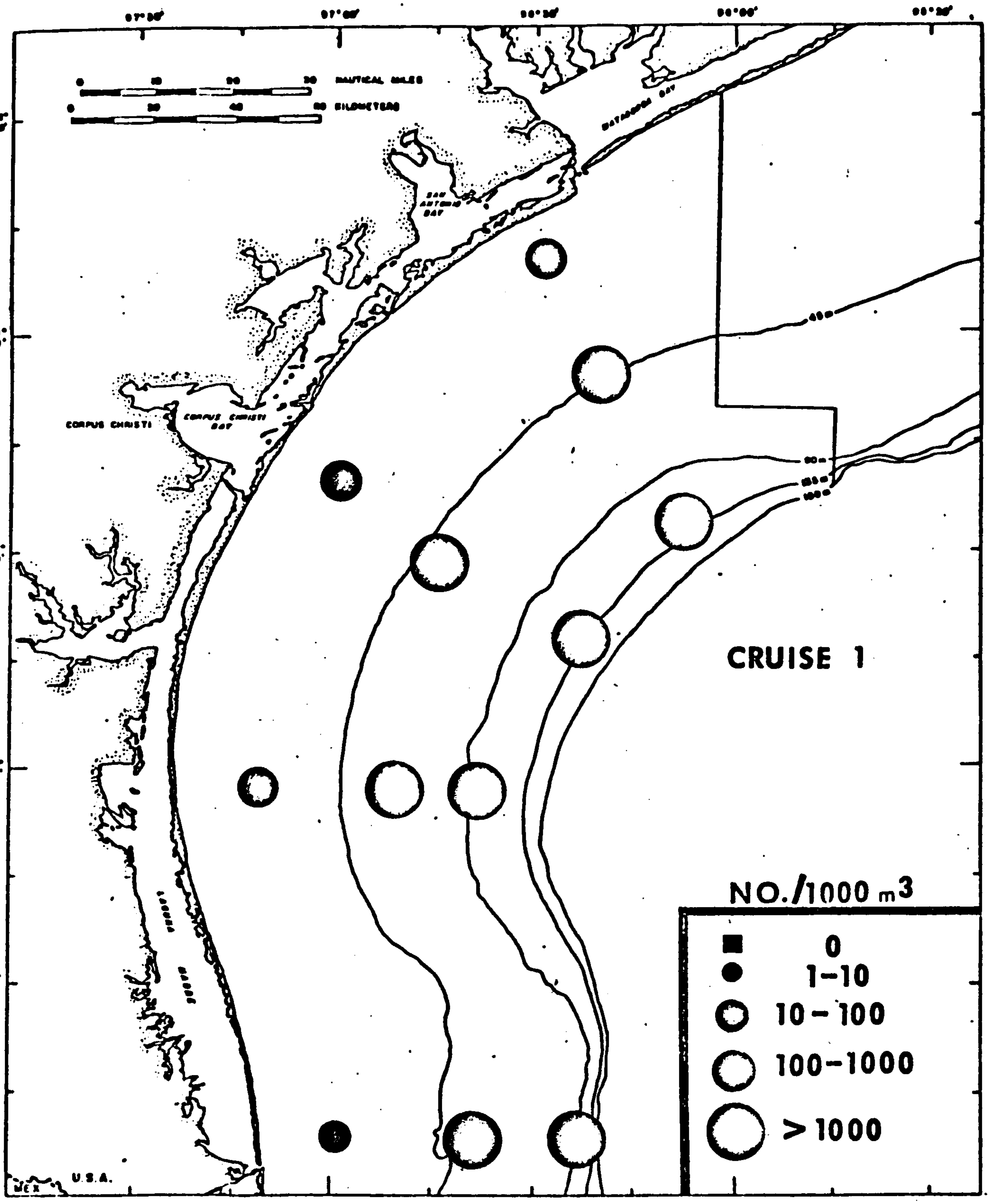

Figure 9. Numbers of larvae per 1,000 m^3 by transect and station on Cruise 1.

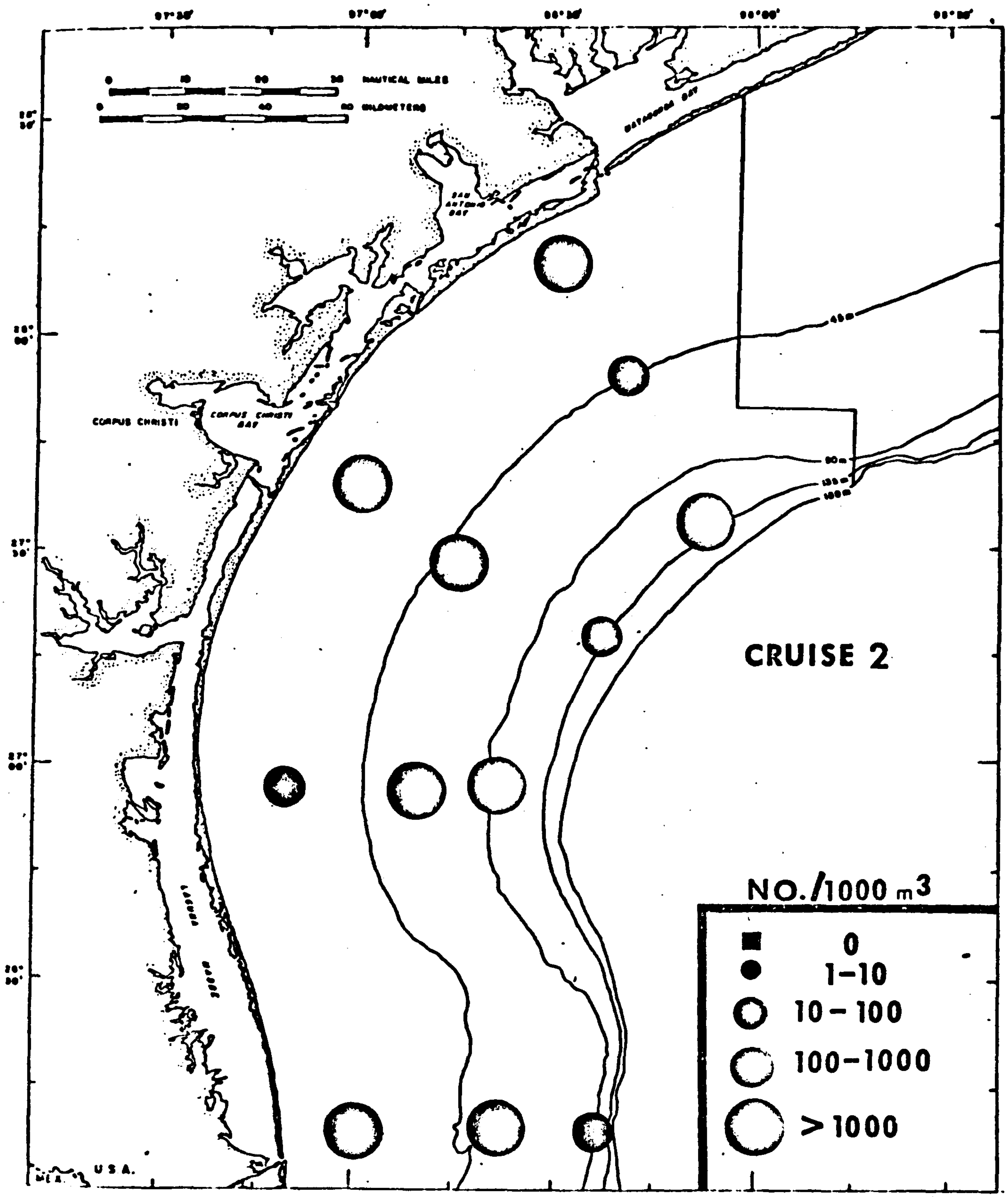

Figure 10. Numbers of larvae per 1,000 m^3 by transect and station on Cruise 2.

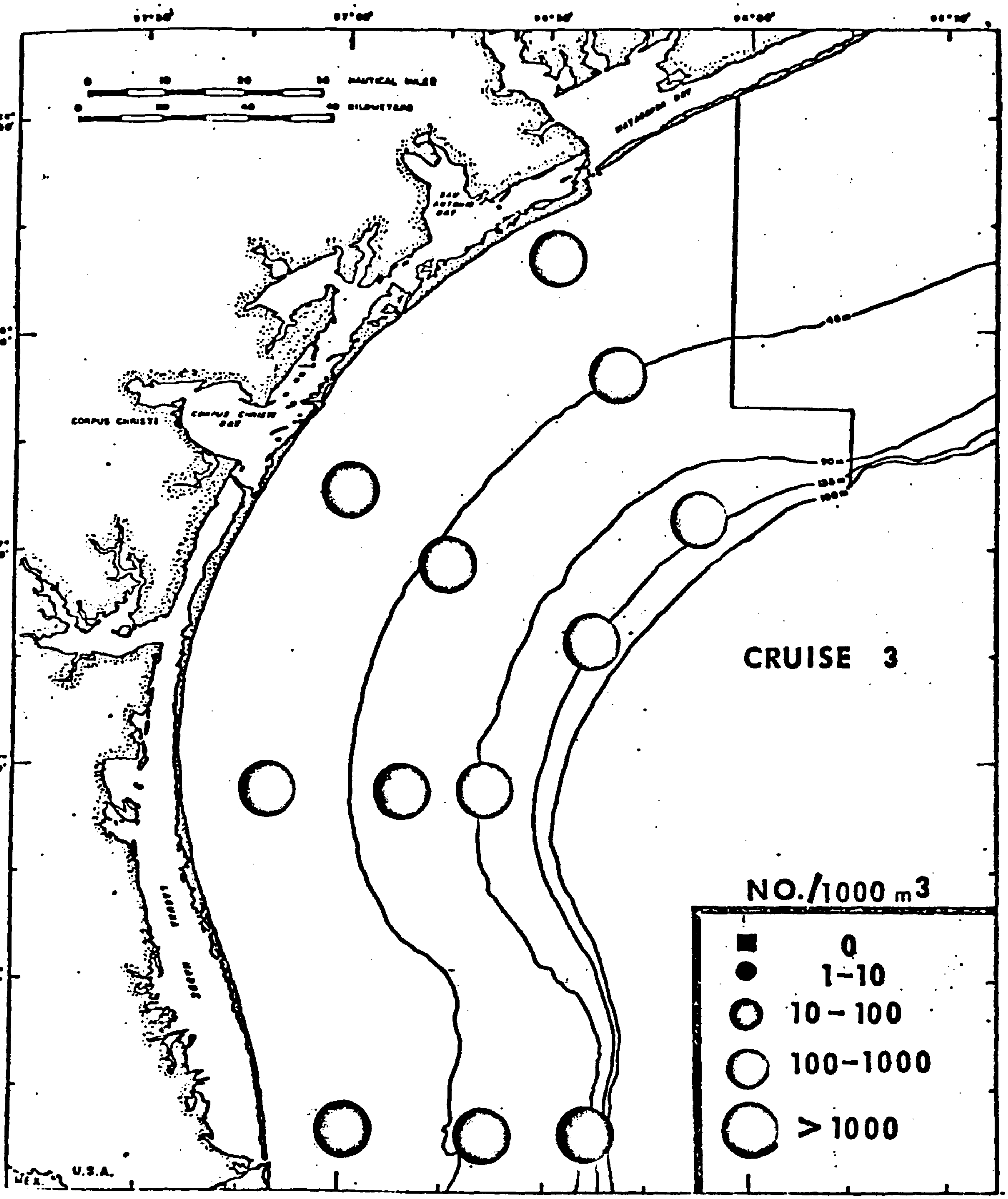

Figure 11. Numbers of larvae per 1,000 m^3 by transect and station on Cruise 3.

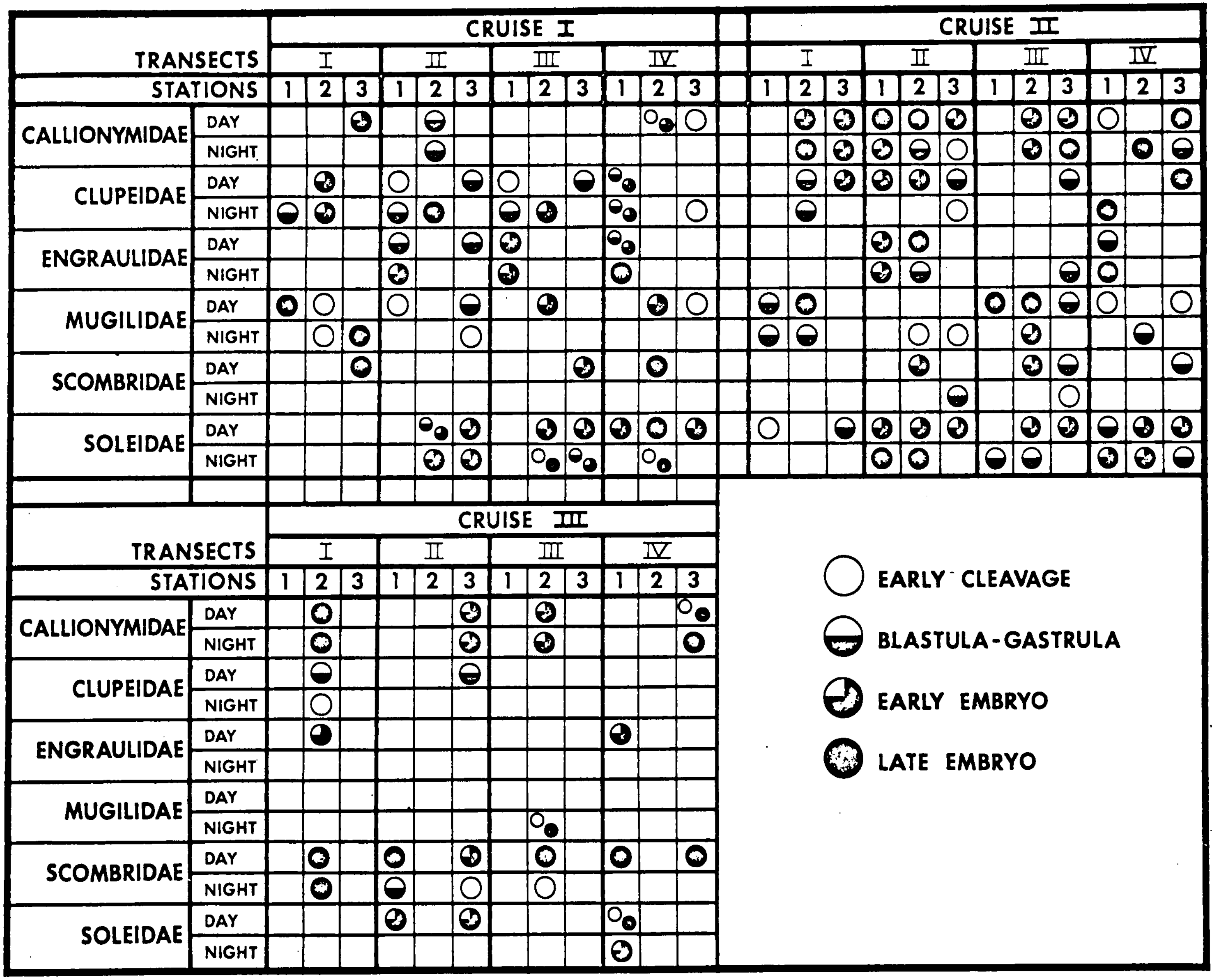

Figure 12. Egg stages of selected fish families by cruise, transect, and station.

mackerels (Scombridae) spawned mainly during August and September (Cruise 3) although some spawning was recorded during Cruise 1 and 2. Sole (Soleidae) eggs occurred during all three cruises, but appeared to reach their peak during Cruise 2.

The size range of larvae and their relative abundance can give another indication of spawning times, place, and intensity (Figures 25-57*). Larvae of the genera *Syacium* and *Citharichthys* belonging to the bothid family were found in all size ranges throughout the sampling area (Figures 26, 34, 35, 47, 48*), while the related genus *Bothus* occurred primarily in water depths greater than 45 meters (Figures 26, 33, 46*). These data suggest that *Syacium* and *Cittarichthys* spawn in relatively shallow water while *Bothus* prefers waters of greater depth probably along the continental shelf. When the herrings are considered, the genus *Harengula* showed a spawning peak during Cruise 3, and their size range indicates that spawning occurred throughout the sampling area (Figure 50*). In contrast, *Etrumeus teres* appeared to reach a spawning peak during Cruise 2 and based on the smallest larvae, spawning was principally in water depths greater than 45 meters (Figure 37*). The anchovy, *Anchoa hepsetus*, also reached a spawning peak during Cruise 2 although in contrast to *E. teres* most of the spawning occurred in the relatively shallow coastal water less than 45 meters deep (Figure 39*). The genus *Diaphus* of the lanternfish family appeared to spawn most of the year, although the peak spawning occurred during Cruise 2 in water depths greater than 45 meters (Figure 30*). The seatrout of the genus *Cynoscion* spawned during all three cruises and showed two spawning peaks: one in Cruise 2 and the other in Cruise 3 (Figures 31, 41, 53*). Again, the smallest larvae were found in the coastal and intermediate water depths. Larvae of the king mackerel, *Scomberomorus cavalla*, were present only during Cruise 2 and 3. The spawning peak appeared to be in August and September. Based on the smallest larvae, spawning occurred mainly in water depths exceeding 45 meters (Figures 42, 54*). In contrast, the Spanish mackerel, *S. maculatus*, spawned during the same time period at depths usually less than 45 meters (Figures 43, 55*). These data suggest that the Spanish mackerel are essentially coastal spawners while the king mackerel prefer the deeper oceanic waters. In the seabass family, larvae of the genus *Diplectrum* were present only during Cruise 2 and these fish seemed to prefer water depths exceeding 45 meters for spawning (Figure 44*). The same depth pattern was noted for the genus *Serranus* although spawning occurred during Cruises 2 and 3 (Figures 45, 57*).

SUMMARY AND CONCLUSIONS

Based on the limited period of field sampling, this preliminary ichthyoplankton study has provided a wealth of basic taxonomic and environmental data that should prove extremely valuable in future studies. Even though a complete seasonal coverage was not achieved, information on the species composition, abundance, seasonal occurrence, distribution and spawning given in this report represents the first documentation of the ichthyoplankton fauna in the waters of the South Texas outer continental shelf.

The great variety and numbers of species in these waters indicate that they are highly productive and serve as a major spawning area for many forage, sport, and commercial fishes. With continued research, biomass estimates and yearly fluctuation in stock size can be determined for the benefit of both sport and commercial fishermen.

ACKNOWLEDGMENTS

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2. Temporal Survey of King and Spanish Mackerel Eggs and Larvae

INTRODUCTION

Paired Bongo net plankton samplers were used to collect king and Spanish mackerel larvae monthly from May through September 1975. An intensive 6-month collecting program was initiated to determine seasonal variations in the distribution and abundance of the eggs and larvae of the king mackerel (*Scomberomorus cavalla*) and Spanish mackerel (*S. maculatus*).

King and Spanish mackerel have long supported important fisheries in the U.S. Average annual commercial landings of Spanish mackerel since the mid-1800's have been about 8 million pounds (Lyles, 1969, cited by Beaumariage, 1969). Commercial landings of king mackerel were about 7 million pounds in 1970 (Wheeland, 1973). Both species are also high quality, avidly sought sport fishes. Sport fishermen caught about 63 million pounds of king mackerel in 1970 and about 23 million pounds of Spanish mackerel (Deuel, 1973). The major commercial fishery for mackerel is in Florida. Texas landings are presently negligible, although Gunter (1945) reported that mackerel were very abundant in Texas. There is a large and developing sport fishery for these species in Texas and increasing interest in development of commercial fishery.

Most studies of mackerel in U.S. waters have been limited to Florida (Klima, 1959; Moe, 1963; Deuel and Clark, 1968; Beaumariage, 1969, 1973; Dwinell and Futch, 1973). Adult Spanish and king mackerels are found off Texas during the spring and summer and some overwinter near the Florida Keys (Gunter, 1945; Pew, 1958; Klima, 1959; Beaumariage, 1969, 1973; Dwinell and Futch, 1973). Spawning takes place during the late spring and summer in the northern Gulf of Mexico and along the East coast of the United States (Earll, 1883; Hildebrand and Schroeder, 1928; Beaumariage, 1969, 1973; Wollom, 1970; Dwinell and Futch, 1973). Larval and young mackerel have been reported from Texas (Pew, 1958; Hoese, 1965; Wollom, 1970) but none of these studies attempted to determine the abundance of eggs and larvae in the northwestern Gulf.

MATERIAL AND METHODS

Collections were made monthly from May through September 1975 at 16 stations along four transects perpendicular to the coast off Port Aransas to northern Padre Island, Texas (Figure 13 and Table 4). Each transect contained four stations at 15 nautical mile intervals; the first station was about 2 to 3 miles from shore. Transects were located at intervals of 10 nautical miles.

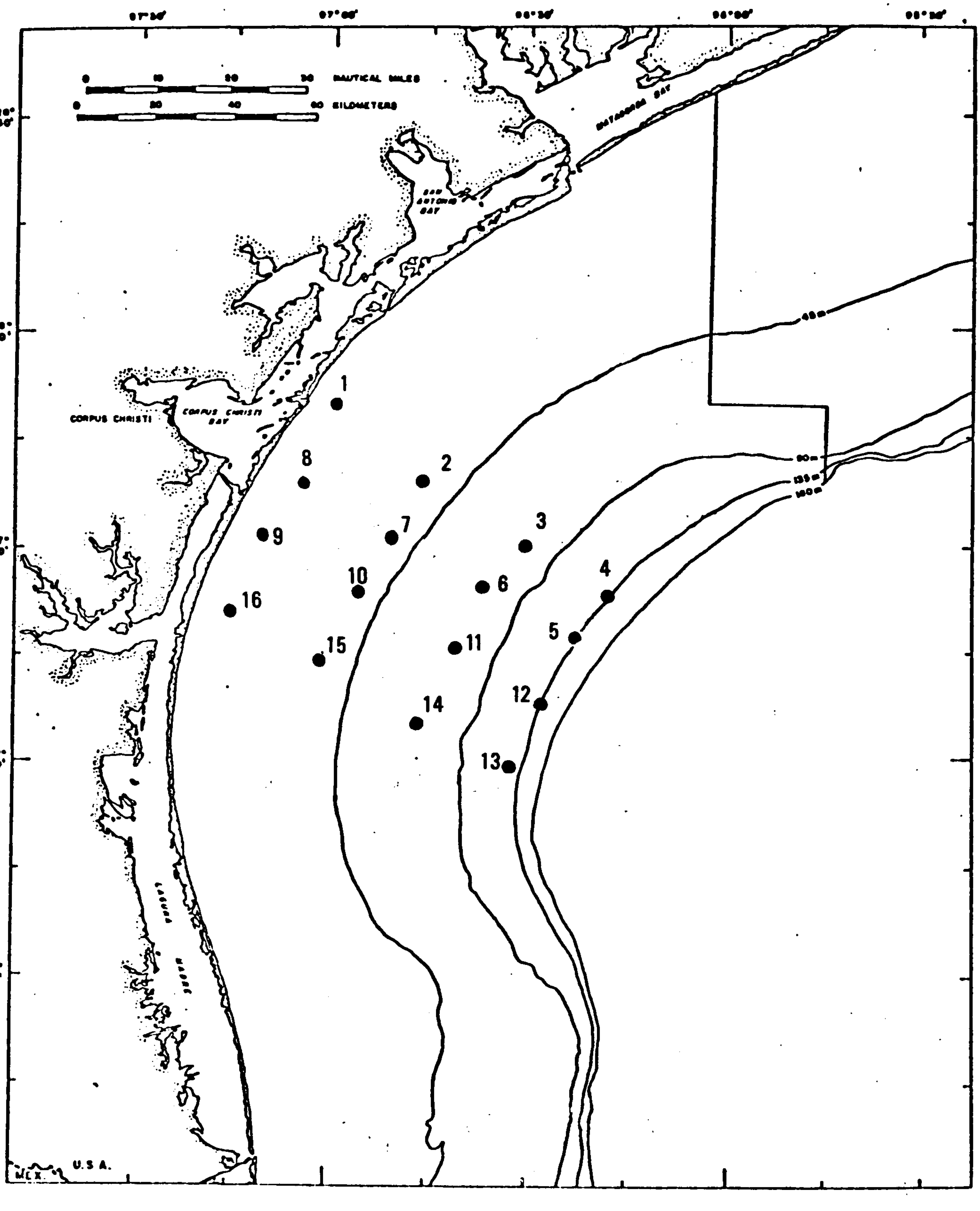

Figure 13. Collection stations from May through September 1975.

Table 4. Station Locations

Station	N. Lat.	W. Long.	Depth (m)	Station	Lat.	Long.	Depth
1	27°49'	97°00'	12	9	27°32'	97°12'	14
2	27°40'	96°46'	33	10	27°24'	96°57'	32
3	27°33'	96°31'	65	11	27°16'	96°43'	65
4	27°24'	96°17'	139	12	27°08'	96°29'	135
5	27°17'	96°23'	133	13	26°59'	96°33'	109
6	27°25'	96°38'	65	14	27°07'	96°47'	64
7	27°32'	96°52'	34	15	27°15'	97°02'	32
8	27°40'	97°06'	14	16	27°22'	97°16'	12

The ichthyoplankton was collected with paired 61-cm Bongo net plankton samplers (Posgay, Marak and Hennemuth, 1968). A 333 micron-mesh net was fitted to one of the Bongo net frames and a 505 micron-mesh net was fitted to the other. A General Dynamics flow meter was tied across the opening of each frame.

A double oblique tow to within 5 meters of the bottom was made at each station for each of the 5 months. The net was released at 50 meters per minute, held at maximum depth for 30 seconds and retrieved at 20 meters per minute. The wire angle was maintained at 45 degrees during the entire tow.

The contents of each net were preserved separately in 5% buffered Formalin. Fish eggs and larvae were sorted from the 505 micron-mesh sample; the 333 micron-mesh sample was archived. Scomberomorus larvae were sorted from the remainder of the fish larvae and were counted and measured to the nearest 0.01 mm of standard length (SL). Numerous scombrid eggs were encountered in the samples, but none could be definitely identified as Scomberomorus eggs. Identification of Scomberomorus eggs must be delayed until they can be obtained and artificially fertilized from gravid male and female mackerel.

RESULTS

Scomberomorus cavalla

King mackerel larvae were collected on all of the 5 cruises. They became progressively more abundant in the monthly samples and were by far the most abundant in the September sample (Table 5). Larvae were present at the three deeper sets of stations (2, 3, 4) of the four transects and were most abundant at the two sets of intermediate depth (2, 3) (Fig. 14).

Only 8 larvae were captured on the May cruise. More larvae per distance samples (X/1,000 m) were found at set 2 (0.6/1,000 m) than at sets 3 and 4 (0.3/1,000, 0.1/1,000 m) (Table 6). There did not appear to be a relationship between size of the larvae and distance captured from shore.

Nine larvae were captured in the June cruise at the two deeper sets of stations. Set 3 yielded a greater density of larvae (0.8/1,000 m) than set 4 (0.4/1,000 m). There was no relationship between larval size and distance captured from shore.

A total of 32 larvae were taken during the July cruise at the two sets of stations of intermediate depths. Set 2 had the greater density of larvae than set 3 (5.9/1,000 m and 1.5/1,000 m), respectively. There was no relationship between larval size and distance captured from shore.

A total of 59 larvae were captured in August at the four sets of stations. The second shoalest set of stations (2) yielded by far the greatest density of larvae (6.6/1,000 m). Only one larva was captured at the shoalest stations. There was no relationship between size of larvae and distance captured from shore.

During the September cruise 91 larvae were collected at all but the shoalest set of stations. The third set of stations from shore yielded a greater density of larvae (5.5/1,000 m) than did the second set (5.1/1,000 m) or the deepest set of stations (0.5/1,000 m). There was no evident correlation between larval size and distance captured from shore.

Table 5. Data for <u>Scomberomorus</u> <u>cavalla</u> larvae caught in double oblique Bongo net tows.

Station	Number of Specimens	Size Range (mm SL)	Mean Length	Date 1975	Depth Range of Sample (m)	Surface Temp (C)	Time
2	1	2.54	2.54	May 21	Surf.- 28	27.0	1123
7	1	2.15	2.15	May 21	Surf.- 29	27.0	2145
10	1	4.34	4.34	May 22	Surf.- 27	25.8	0300
11	2	2.32-3.00	2.66	May 22	Surf.- 60	26.0	0500
13	3	4.36-4.58	4.45	May 22	Surf.-104	27.0	0915
Subtotal	8		3.46				
5	1	4.26	4.26	June 23	Surf.-128	29.0	1720
6	1	6.39	6.39	June 24	Surf.- 60	29.0	0120
11	3	3.14-4.14	3.65	June 23	Surf.- 60	28.0	2350
12	1	3.44	3.44	June 23	Surf.-130	29.0	1850
13	2	2.44-2.64	2.54	June 23	Surf.-104	28.8	2030
14	1	2.42	2.42	June 23	Surf.- 59	28.5	2245
Subtotal	9		3.61				
2	5	2.36-4.08	3.29	July 28	Surf.- 28	30.0	1300
3	4	2.31-3.31	2.85	July 28	Surf.- 60	30.0	1500
6	1	3.35	3.35	July 29	Surf.- 60	29.2	0130
7	6	2.45-3.86	2.93	July 29	Surf.- 29	27.7	0320
10	3	2.61-2.92	2.74	July 29	Surf.- 27	27.0	0505
11	2	3.66-6.09	4.88	July 29	Surf.- 60	29.0	0020
15	11	1.90-3.68	2.81	July 29	Surf.- 60	27.5	0630
Subtotal	32		3.04				
3	3	2.53-2.78	2.66	Aug 21	Surf.- 60	29.4	1330
4	3	2.32-2.61	2.43	Aug 21	Surf.-134	29.6	1530
5	1	2.77	2.77	Aug 21	Surf.-128	29.7	1750
6	6	2.56-4.01	3.22	Aug 22	Surf.- 60	28.6	0030
7	12	2.38-4.78	3.47	Aug 22	Surf.- 29	28.4	0235
10	6	2.08-4.24	3.29	Aug 22	Surf.- 27	28.0	0340
11	1	3.01	3.01	Aug 21	Surf.- 60	29.0	2320
12	9	2.36-3.46	3.14	Aug 21	Surf.-130	29.5	1815

Table 5. continued.

Station	Number of Specimens	Size Range (mm SL)	Mean Length	Date 1975	Depth Range of Sample (m)	Surface Temp (C)	Time
13	7	2.51-4.31	3.21	Aug 21	Surf.-104	29.3	1940
14	10	3.12-5.34	3.98	Aug 21	Surf.- 59	28.9	2145
16	1	4.11	4.11	Aug 22	Surf.- 27	28.0	0655
Subtotal	59		3.31				
2	5	2.54-4.15	2.98	Sept 15	Surf.- 28	28.7	0730
3	30	2.02-4.12	2.67	Sept 14	Surf.- 60	28.7	1715
4	2	4.03-4.48	4.26	Sept 14	Surf.-134	28.6	1515
5	1	3.14	3.14	Sept 14	Surf.-128	28.4	1345
6	13	2.65-4.95	3.26	Sept 14	Surf.- 60	28.7	1800
7	4	2.31-3.61	2.76	Sept 15	Surf.- 29	28.7	0600
10	13	2.31-3.59	2.96	Sept 15	Surf.- 27	28.7	0410
11	1	2.44	2.44	Sept 14	Surf.- 60	28.7	1933
12	4	2.79-3.71	3.17	Sept 14	Surf.-130	28.4	1210
13	3	3.25-3.74	3.39	Sept 14	Surf.-104	28.4	1035
14	11	2.51-5.21	4.08	Sept 14	Surf.- 59	28.7	2045
15	4	2.50-3.94	3.10	Sept 14	Surf.- 27	28.8	2350
Subtotal	91		3.13				
TOTAL	199						

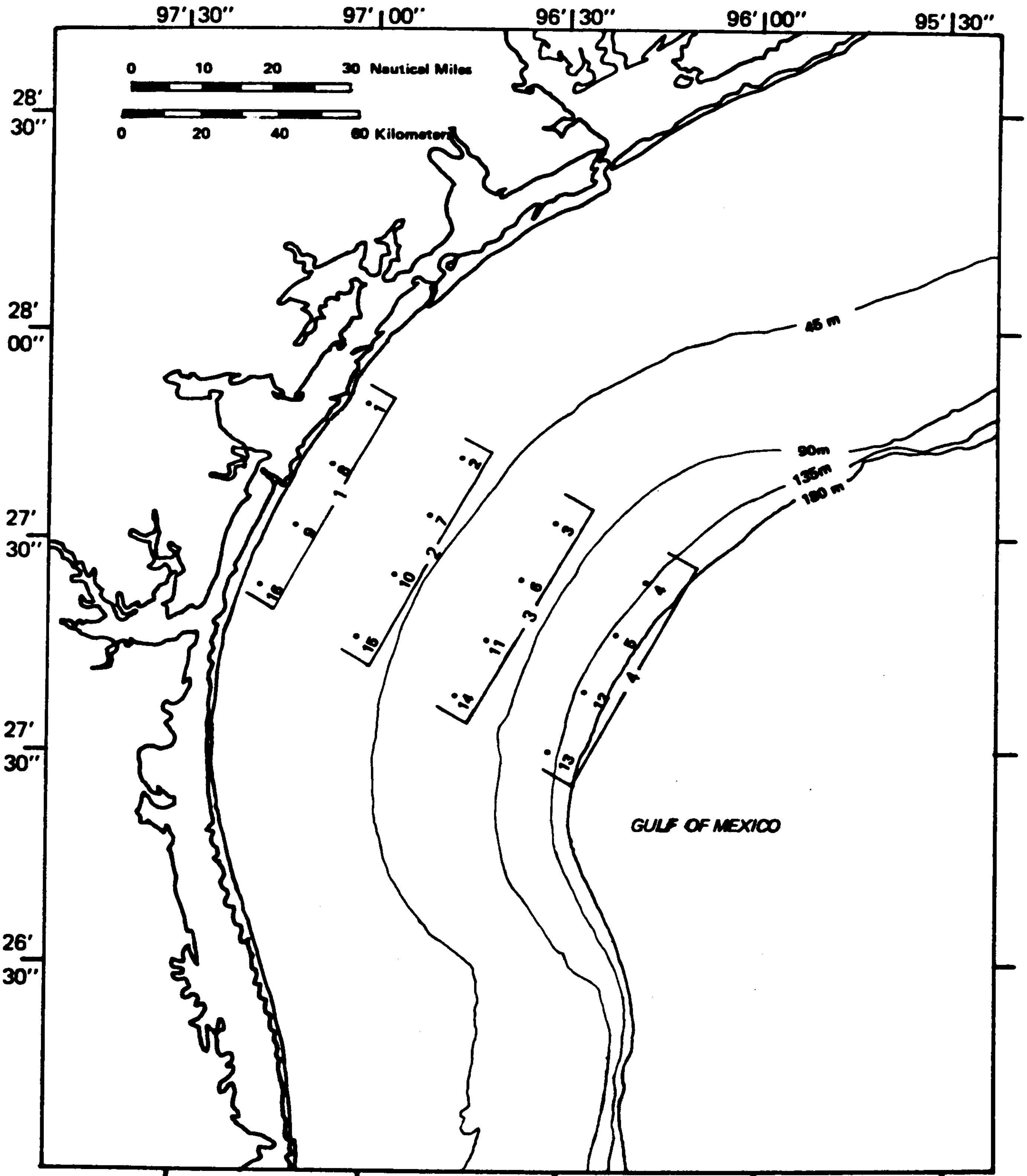

Figure 14. Area of study with numbers 1 through 16 representing the sampling stations and numbers within the brackets representing the sets of stations by depth.

Table 6. Number of *Scomberomorus cavalla* larvae per 1000 meters of tow length for each of the stations per cruise and each of the depth zones per cruise.

CRUISE I

Depth 12-14 m	X/1000	32-34 m	X/1.000	64-65 m	X/1000	109-139 m	X/1000
Sta. 1	0	Sta. 2	1.0	Sta. 3	0	Sta. 4	0
Sta. 8	0	Sta. 7	0.5	Sta. 6	0	Sta. 5	0
Sta. 9	0	Sta. 10	1.6	Sta. 11	1.9	Sta. 12	0
Sta. 16	0	Sta. 15	0	Sta. 14	0	Sta. 13	0.9
Depth Zone	0		0.6		0.3		0.1

CRUISE II

Sta. 1	0	Sta. 2	0	Sta. 3	0	Sta. 4	0
Sta. 8	0	Sta. 7	0	Sta. 6	0.7	Sta. 5	0.4
Sta. 9	0	Sta. 10	0	Sta. 11	2.0	Sta. 12	0.3
Sta. 16	0	Sta. 15	0	Sta. 14	0.7	Sta. 13	0.9
Depth Zone	0		0		0.8		0.4

CRUISE III

Sta. 1	0	Sta. 2	4.9	Sta. 3	2.5	Sta. 4	0
Sta. 8	0	Sta. 7	5.6	Sta. 6	0.8	Sta. 5	0
Sta. 9	0	Sta. 10	2.7	Sta. 11	1.1	Sta. 12	0
Sta. 16	0	Sta. 15	9.8	Sta. 14	0	Sta. 13	0
Depth Zone			5.9		1.5		0

CRUISE IV

Sta. 1	0	Sta. 2	0	Sta. 3	1.9	Sta. 4	1.1
Sta. 8	0	Sta. 7	11.6	Sta. 6	3.4	Sta. 5	0.4
Sta. 9	0	Sta. 10	8.2	Sta. 11	0.6	Sta. 12	3.2
Sta. 16	2.2	Sta. 15	–	Sta. 14	6.6	Sta. 13	3.2
Depth Zone	0.6		6.6		3.1		1.9

CRUISE V

Sta. 1	0	Sta. 2	4.1	Sta. 3	10.2	Sta. 4	0.4
Sta. 8	0	Sta. 7	3.0	Sta. 6	4.7	Sta. 5	0.2
Sta. 9	0	Sta. 10	12.4	Sta. 11	0.5	Sta. 12	0.8
Sta. 16	0	Sta. 15	1.8	Sta. 14	9.8	Sta. 13	0.7
Depth Zone	0		5.5		5.1		0.5

There was no progression in the mean size of the larvae during the 5 months of sampling (Table 6). Mean size decreased during the sampling period. Small larvae, <2.50 mm SL, were found in all of the monthly samples. The largest larva (6.39 mm SL) was captured in June and the second largest (6.09 mm SL) was captured in July.

Scomberomorus maculatus

Spanish mackerel larvae were collected from June through September cruises (Table 7). Most of the 32 larvae were collected at the two inshore sets of stations.

Nine larvae were captured in the June cruise. Although they occurred at all of the sets of stations, the highest concentration (2.6/1,000 m) occurred at the shoalest set (Table 8). There was no relationship between size of the larvae and distance at which they were captured from shore.

Eight larvae were captured during the July cruise at the two inshore sets of stations. The higher concentration of larvae was obtained from the inshore set (1.7/1,000 m).

In August seven larvae were captured at the two inshore sets of stations (1, 2). The highest concentration was captured at the inshore set (2.3/1,000 m).

Eight larvae were collected in September at the two shoaler sets of stations. The larval concentration was slightly greater in the inshore set (1.6/ 1,000 m) than in the offshore set (1.1/1,000 m).

Most of the smaller larvae <3.00 mm SL were captured during the June and July cruises. The mean length increased from 2.49 mm SL and 2.29 mm SL in June and July to 4.95 mm SL in September. The largest larvae 11.65 mm SL was captured during the September cruise.

DISCUSSION

The data indicate that the northwestern Gulf of Mexico is a major spawning site of the king mackerel. A total of 199 larvae were captured during the five monthly cruises. Dwinell and Futch (1973) captured only 139 king mackerel larvae in the northeastern Gulf of Mexico on monthly cruises from June through October although they expended considerably greater sampling effort than was expended in this study. They made 105 stations in comparison to 90 in this study. At each station they towed two 1-meter plankton nets, one at the surface and one mid-depth/ oblique for 30 minutes. In this study a 61-cm net was used and average tow time was about 6 minutes.

The king mackerel has a protracted spawning season in the northwestern Gulf of Mexico. Small larvae (<2.5 mm SL) were captured from May through September. Dwinell and Futch (1973) stated that mackerel larvae 2.8 mm SL are "probably not much older than three days (after spawning)". The high density of larvae in September and the fact that modal size decreased from May through September indicate that spawning is protracted and most intense in late summer. Spawning may extend into October. Dwinell and Futch (1973) likewise found no modal increase in size through September and captured larvae <5.0 mm SL in October in the northeastern Gulf of Mexico. Beaumariage (1973) found vitellogenic oocytes in king mackerel from the northeastern Gulf of Mexico from May through October.

Table 7. Data for *Scomberomorus maculatus* larvae caught in double oblique Bongo net tows.

Station	Number of Specimens	Size Range (mm SL)	Mean Length	Date 1975	Depth Range of Sample (m)	Surface Temp (C)	Time
1	1	2.26	2.26	Jun 23	Surf.- 7	29.5	1030
8	1	2.66	2.66	Jun 24	Surf.- 9	29.2	1000
9	2	2.55-3.16	2.86	Jun 24	Surf.- 9	29.5	0945
10	1	1.96	1.96	Jun 24	Surf.- 27	29.8	0510
13	1	2.60	2.60	Jun 23	Surf.-104	28.8	2030
14	1	2.69	2.69	Jun 23	Surf.- 59	28.5	2245
15	1	2.30	2.30	Jun 24	Surf.- 27	28.8	0630
16	1	3.36	3.36	Jun 24	Surf.- 7	29.5	0730
Subtotal	9		2.62				
2	1	2.76	2.76	Jul 28	Surf.- 28	29.5	1300
8	2	1.75-2.31	2.03	Jul 29	Surf.- 9	28.4	1000
9	1	2.12	2.12	Jul 29	Surf.- 9	27.7	0800
10	1	2.53	2.53	Jul 29	Surf.- 27	27.0	0505
15	2	2.17-2.47	2.32	Jul 29	Surf.- 60	27.5	0630
16	1	1.63	1.63	Jul 29	Surf.- 7	28.3	0800
Subtotal	8		2.22				
6	1	2.01	2.01	Aug 22	Surf.- 60	28.6	0030
7	1	2.16	2.16	Aug 22	Surf.- 29	28.4	0235
9	1	2.00	2.00	Aug 22	Surf.- 9	28.1	0820
10	1	1.86	1.86	Aug 22	Surf.- 27	28.0	0340
16	3	1.83-2.42	2.17	Aug 22	Surf.- 27	28.0	0655
Subtotal	7		2.08				
2	1	4.56	4.56	Sept 15	Surf.- 28	28.7	0730
7	1	2.69	2.69	Sept 15	Surf.- 29	28.7	0600
8	2	3.59-11.65	7.62	Sept 15	Surf.- 9	28.7	0930
10	2	2.46- 2.88	2.67	Sept 15	Surf.- 27	28.7	0410
15	1	4.36	4.36	Sept 14	Surf.- 27	28.8	2350
16	1	7.39	7.39	Sept 15	Surf.- 7	28.6	0051
Subtotal	8		4.95				
TOTAL	32						

Table 8. Number of Scomberomorus maculatus larvae per 1000 meters of tow length for each of the stations per cruise and each of the depth zones per cruise.

CRUISE II

Depth 12-14 m	X/1000	32-34 m	X/1000	64-65 m	X/1000	109-139 m	X/1000
Sta. 1	1.9	Sta. 2	0	Sta. 3	0	Sta. 4	0
Sta. 8	2.2	Sta. 7	0	Sta. 6	0	Sta. 5	0
Sta. 9	3.5	Sta. 10	1.3	Sta. 11	0	Sta. 12	0
Sta. 16	2.6	Sta. 15	1.2	Sta. 14	0.7	Sta. 13	0.4
Depth Zone	2.6		0.6		0.2		0.1

CRUISE III

Depth 12-14 m	X/1000	32-34 m	X/1000	64-65 m	X/1000	109-139 m	X/1000
Sta. 1	0	Sta. 2	1.0	Sta. 3	0	Sta. 4	0
Sta. 8	3.7	Sta. 7	0	Sta. 6	0	Sta. 5	0
Sta. 9	1.4	Sta. 10	0.9	Sta. 11	0	Sta. 12	0
Sta. 16	0	Sta. 15	1.9	Sta. 14	0	Sta. 13	0
Depth Zone	1.7		0.9				

CRUISE IV

Depth 12-14 m	X/1000	32-34 m	X/1000	64-65 m	X/1000	109-139 m	X/1000
Sta. 1	0	Sta. 2	0	Sta. 3	0	Sta. 4	0
Sta. 8	0	Sta. 7	1.0	Sta. 6	0	Sta. 5	0
Sta. 9	2.2	Sta. 10	1.4	Sta. 11	0	Sta. 12	0
Sta. 16	6.6	Sta. 15	-	Sta. 14	0	Sta. 13	0
Depth Zone	2.3		0.7				

CRUISE V

Depth 12-14 m	X/1000	32-34 m	X/1000	64-65 m	X/1000	109-139 m	X/1000
Sta. 1	0	Sta. 2	0.8	Sta. 3	0	Sta. 4	0
Sta. 8	3.5	Sta. 7	0.7	Sta. 6	0	Sta. 5	0
Sta. 9	0	Sta. 10	1.9	Sta. 11	0	Sta. 12	0
Sta. 16	2.8	Sta. 15	0.8	Sta. 14	0	Sta. 13	0
Depth Zone	1.6		1.1				

Most of the spawning apparently occurs at depths corresponding to the outer three sets of stations (32 to 139 meters, about 34 to 85 kilometers from the coast) since this is the area where the larvae were captured. The deepest set of stations (4) had a lower density of larvae than the two sets of stations (2, 3) at intermediate depths (32-65 meters) indicating that most spawning occurs over the continental shelf. Dwinell and Futch (1973) also obtained most of their larvae from the deeper areas of the continental shelf.

Spanish mackerel larvae were much less abundant and less widespread than the king mackerel larvae. Low abundance of the larvae may be explained by the fact that the Spanish mackerel spawn in shallow water. The majority of the larvae were found in the two inshore sets of stations, and the highest density was found in the shoalest set. Dwinell and Futch (1973) encountered most larvae in water shallower than 13 meters. Less than 10 percent of water sampled in this study was shallower than 13 meters thus the low abundance of Spanish mackerel may have been due to sample error.

There was a modal increase in length of the Spanish mackerel larvae from June-July to September which indicates that most spawning is completed by September. Dwinell and Futch (1973) also recorded larger larvae in September than in June.

Unlike Dwinell and Futch (1973), larger larvae were not encountered in this study. It is possible that the large-eyed, quick swimming mackerel larvae were better able to avoid the 61-cm Bongo nets than the 1-meter nets used by Dwinell and Futch (1973).

II. CRUSTACEANS AND FISH

A. MEAN CATCH INDICES OF PENAEID SHRIMP

INTRODUCTION

Reported herein are geometric (G)and arithmetic (A) mean catches (number of individuals per hour of trawling) of shrimp (family Penaeidae) taken in the Gulf of Mexico off the Texas Coast. Data from which these mean catches were calculated were obtained from Lyon and Baxter (1974) (Figures 15 and 16), who described sampling procedures, trawling gear, and sampling stations. These mean catches are indices of abundance of shrimp. Also reported herein are annual commercial shrimp catches (pounds, heads-off) and value of these catches at first sale for the years 1970-1974. These catches also are indices of abundance of shrimp in Texas.

For calculation of geometric and arithmetic means, each tow of the trawl was considered a single sampling unit designated the "ith" sampling unit, with a corresponding catch per hour, C_i. Thus, each geometric mean catch per hour, G, was calculated as follows:

$$G = \text{Antilog}_{10}\left[\sum_{i=1}^{N} \log_{10}(C_i + 1)\right] - 1$$

where n represents the number of tows upon which the mean is based. Because some tows contained zero (0) catch, 1 was added to all catches prior to taking logarithms. This geometric mean catch per hour also can be expressed as:

$$G = \sqrt[n]{(C_i + 1)\ (C_{i+1} + 1)\ (C_{i+2} + 1)\ \ldots\ (C_n + 1)} - 1$$

The frequency distribution of catches of organisms taken in trawls tends to be skewed to the right (most catches are small, but there occasionally are large catches). Therefore, the geometric mean usually better represents the central tendency or the distribution than does the arithmetic mean. The arithmetic mean usually is higher, because its magnitude is strongly influenced by the occasional large catches. The arithmetic mean catch per hour also is given for comparison with the geometric mean, but the discussion which follows will refer only to geometric mean catch per hour, hereafter referred to as <u>catch rate</u>. The arithmetic mean catch per hour (A) was calculated as follows:

$$a = \left[\sum_{i=i}^{n} C_i\right] / n$$

Statistical areas 18-21 along the Texas coast are shown in the grid map (Figure 17).

DISCUSSION

Table 9 is a summary of station number, station code, calendar years of sampling, depth zone, station coordinates, and statistical area, and gives the mean catches (all species combined) by station number. Table 9 and all subsequent tables also show the number of tows, n, upon which each mean catch was calculated.

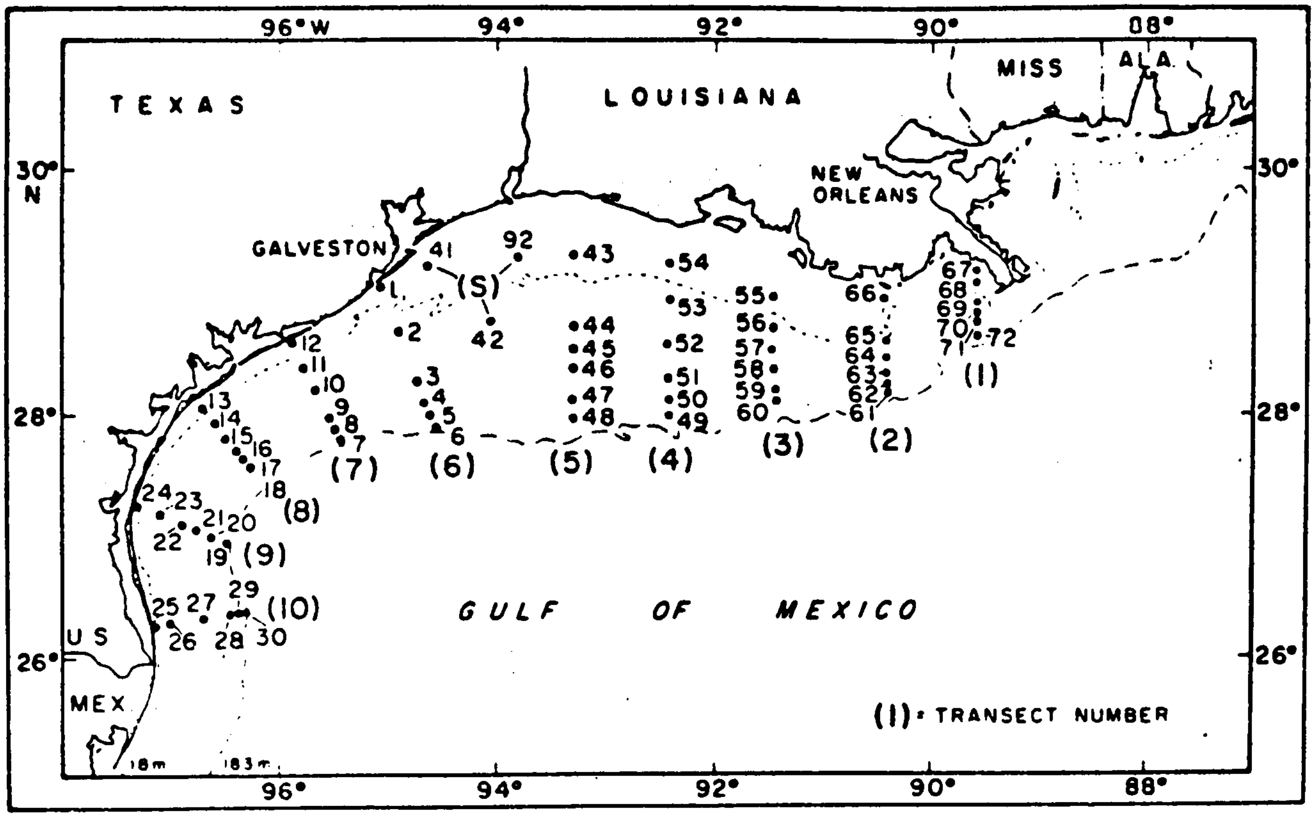

Figure 15. Station and transect (numbers) pattern in the northwestern Gulf of Mexico, 1961-62.

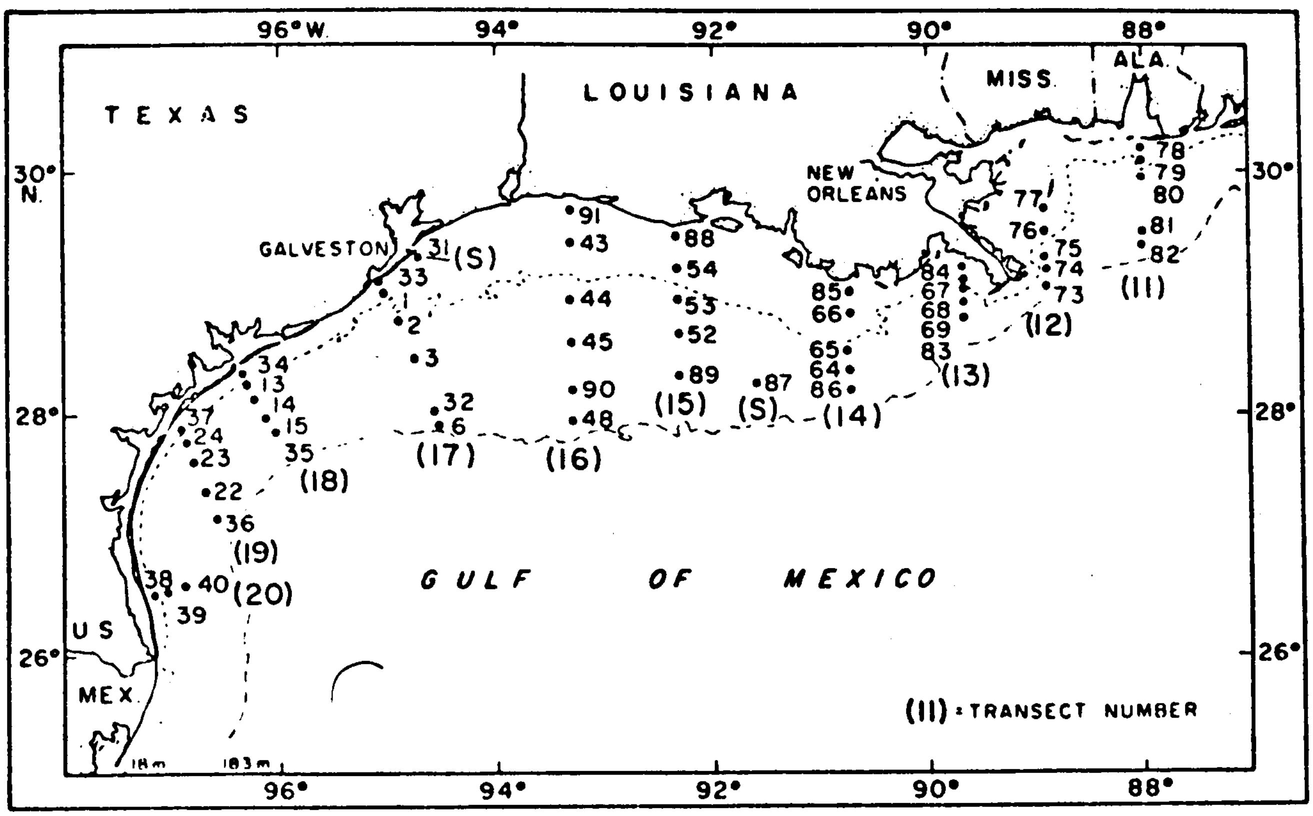

Figure 16. Station and transect (numbers) pattern in the northwestern Gulf of Mexico, 1963-65.

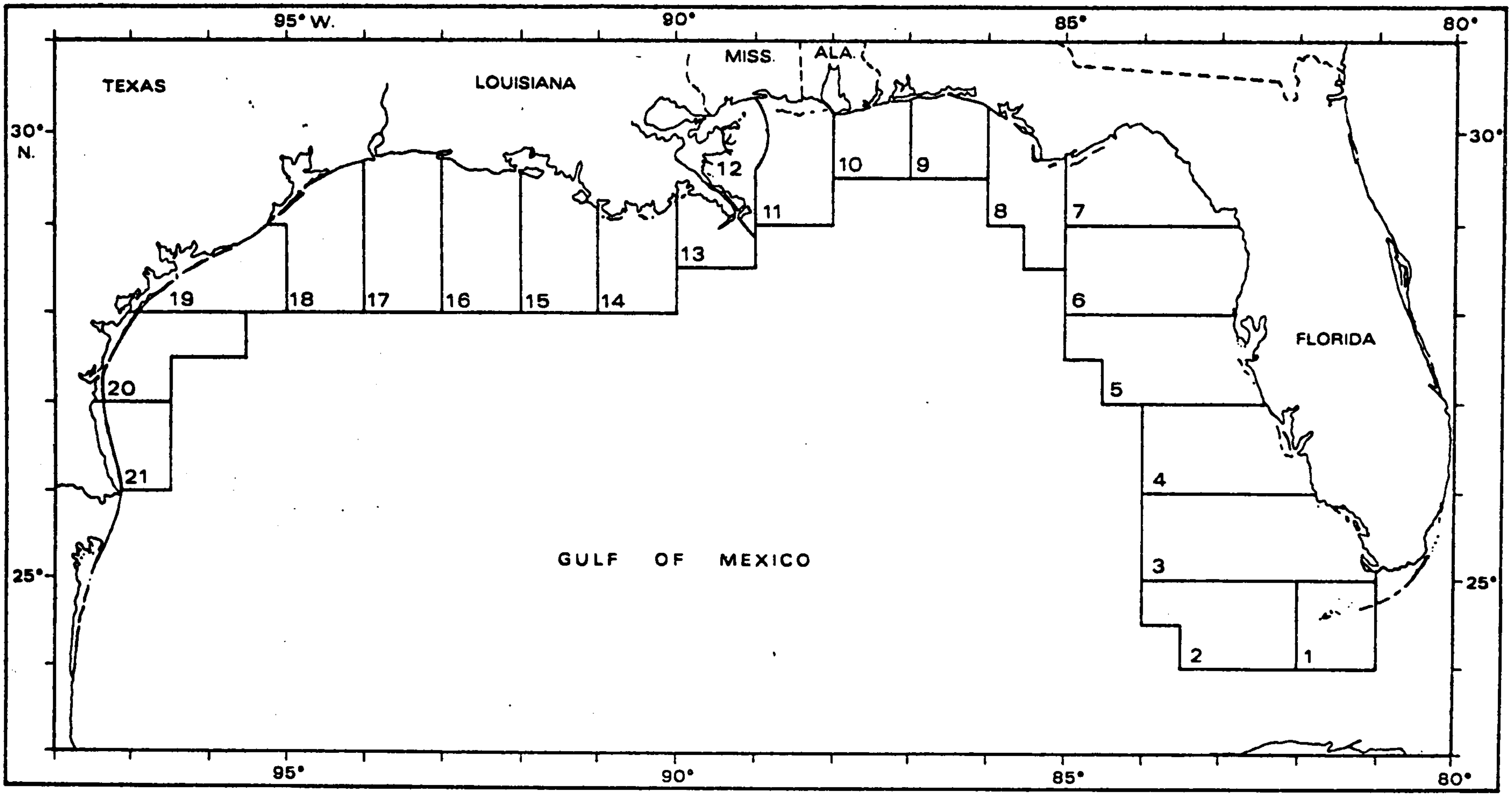

Figure 17. Statistical Zones.

Table 9

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by station number, station code, period, depth zone, coordinate position, and statistical area.

Station Number	Station Code	Period	Depth Zone (Meters)	Latitude	Longitude	Statistical Area	Number of tows	G	A
1	W01	1961-65	13.7	29°01'	95°05'	18	61	102.4	181.6
2	W02	1961-65	27.5	28°40'	94°56'	18	60	169.7	385.2
3	W03	1961-65	45.8	28°18'	94°46'	18	59	86.9	272.3
4	W04	1961-62	64.0	28°05'	94°41'	18	12	5.5	8.8
5	W05	1961-62	82.3	27°58'	94°38'	18	23	5.3	13.9
6	W06	1961-65	109.8	27°55'	94°36'	18	29	1.9	5.7
7	W07	1961-62	109.8	27°44'	95°30'	20	13	5.3	42.2
8	W08	1961-62	82.3	27°49'	95°32'	20	15	19.5	35.4
9	W09	1961-62	64.0	27°54'	95°35'	20	15	51.3	139.1
10	W10	1961-62	45.8	28°04'	95°40'	19	14	34.0	115.3
11	W11	1961-62	27.5	28°17'	95°46'	19	14	125.8	263.2
12	W12	1961-62	13.7	28°34'	95°55'	19	13	44.7	105.6
13	W13	1961-62	13.7	28°02'	96°46'	19	15	145.5	436.1
14	W14	1961-62	27.5	27°54'	96°37'	20	14	182.6	529.1
15	W15	1961-62	45.8	27°47'	96°30'	20	14	80.6	171.1
16	W16	1961-62	64.0	27°41'	96°23'	20	14	51.3	215.4
17	W17	1961-62	82.3	27°37'	96°20'	20	14	32.2	107.6
18	W18	1961-62	109.8	27°32'	96°14'	20	12	12.2	28.3
19	W19	1961-62	109.8	27°01'	96°32'	20	10	9.9	22.7
20	W20	1961-62	82.3	27°04'	96°42'	20	11	21.3	50.4
21	W21	1961-62	64.0	27°06'	96°48'	20	11	16.9	35.7
22	W22	1961-62	45.8	27°08'	96°56'	20	11	51.2	148.0
23	W23	1961-62	27.5	27°12'	97°08'	20	11	143.5	266.8
24	W24	1961-62	13.7	27°15'	97°19'	20	11	42.5	128.1
25	W25	1961-62	13.7	26°14'	97°08'	21	11	11.5	40.9
26	W26	1961-62	27.5	26°15'	97°00'	21	11	158.0	370.6
27	W27	1961-62	45.8	26°21'	96°41'	21	11	44.5	185.2
28	W28	1961-62	64.0	26°24'	96°31'	21	10	55.1	81.0
29	W29	1961-62	82.3	26°25'	96°26'	21	9	13.4	31.8
30	W30	1961-62	109.8	26°26'	96°21'	21	7	3.9	12.0
31	W53	1963-65	7.3	29°19'	94°41'	18	28	29.7	78.2
32	W54	1963-65	73.2	28°00'	94°38'	18	22	67.5	16.7
33	W55	1963-65	7.3	29°03'	95°06'	18	32	45.3	140.7
34	W56	1963-65	7.3	28°23'	96°20'	19	28	32.8	88.2
35	W57	1963-65	73.2	27°46'	96°00	20	12	6.1	29.4
36	W58	1963-65	73.2	27°06'	96°45'	20	14	17.7	36.3
37	W59	1963-65	7.3	27°51'	97°01'	20	29	24.4	127.7
38	W60	1963-65	7.3	26°34'	97°16'	21	25	17.2	63.2
39	W61	1963-65	22.9	26°36'	97°08'	21	24	127.7	289.5
40	W62	1963-65	45.8	26°41'	96°53'	21	23	94.8	195.7
41	W63	1961-62	13.7	29°12'	94°45'	18	17	131.4	181.5
42	W64	1961-62	27.5	28°43'	94°03'	18	17	38.3	200.7
13	W13	1963-65	13.7	28°19'	96°21'	19	30	48.2	101.8
14	W14	1963-65	27.5	28°07'	96°14'	20	32	158.1	301.3
15	W15	1963-65	45.8	27°57'	96°07'	20	31	83.9	241.0
22	W22	1963-65	45.8	27°21'	96°50'	20	30	81.7	213.1
23	W23	1963-65	27.5	27°36'	96°55'	20	32	162.1	252.8
24	W24	1963-65	13.7	27°48'	97°00	20	31	84.5	218.0

Catch rate (all species combined) was highest in statistical area 19 and lowest in 21 (Table 10). The 22.9 and 27.5 meter depth zones exhibited the highest catch rate (all species combined; Table 11). Catch rate (all species combined) was highest in 1961 and lowest in 1962, of the 5-year period of sampling (Table 12). Highest catch rate (all species combined) occurred in January and the lowest in August (Table 13). Catch rate (all species combined) was higher at night than during the day (Table 14).

Table 15 portrays catch rate (all species combined) by statistical area and depth zone. The highest catch rate (all species combined) was observed in statistical area 20 at the 27.5 meter depth, and the lowest catch rate (all species combined) in statistical area 18 at the 109.8 meter depth.

Table 16 shows catch rate (all species combined) by statistical area and year of sampling. The highest catch rate (all species combined) occurred in 1961 in statistical area 19, and the lowest in 1962 in statistical area 18.

Table 17 gives catch rate (all species combined) by statistical area and month. The highest catch rate (all species combined) occurred in May in satatistical area 21 and the lowest in August in the same statistical area.

Catch rate of brown shrimp, _Penaeus aztecus_, exceeded that of the other 11 species taken (Table 18). Catch rates of white shrimp, _Penaeus setiferus_, and of _Trachypeneus similis_ were similar, and these two species were next in abundance. Brown and white shrimp make up the bulk of the commercial shrimp catch in Texas. _Sicyonia atlantidus_ was least in abundance.

Table 19 gives catch rate by station number and species. Table 20 shows catch rate by statistical area and species. Brown shrimp were most abundant in statistical area 20 and least abundant in statistical area 19. White shrimp were most abundant in statistical area 19 and least abundant in statistical area 21.

Table 21 gives catch rate by depth zone and species. Brown shrimp were most abundant at 27.5 meters, and least abundant at 7.3 meters. White shrimp were most abundant at 13.7 meters and did not occur in samples taken beyond the 45.8-meter depth zone.

Table 22 shows catch rate by species, statistical area and depth zone.

Table 23 summarizes the annual commercial shrimp catch (pounds, heads-off) and its value (U.S. dollars at first sale) by statistical area, depth zone (offshore vs. inshore)[1/] and calendar year (1970-1974). Catches also are shown by species. The bulk of the annual catch is taken offshore and is dominated by brown shrimp. In 1970-1973, the total annual catch (all species combined) was highest in statistical area 19, but in 1974 it was highest in statistical area 18. This agrees for the most part with Table 10 in which catch rate was shown to be highest in statistical area 19.

1/ The distinction between inshore and offshore is somewhat arbitrary. Inshore areas generally are represented by the estuarine zone composed of bays and lagoons. Offshore areas are generally those extending seaward of barrier islands or sea rims.

Table 10

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by statistical area.

Statistical Area	Number of tows	G	A
18	360	42.8	178.9
19	114	54.3	164.4
20	387	49.7	175.4
21	131	42.7	158.6

Table 11

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by depth zone.

Depth Zone (Meters)	Number of tows	G	A
7.3	142	29.1	101.7
13.7	189	73.4	178.6
22.9	24	127.7	289.5
27.5	191	141.5	326.5
45.8	193	75.1	218.2
64.0	62	28.2	103.4
73.2	48	8.8	25.6
82.3	72	14.0	44.4
109.8	71	4.5	19.2

Table 12

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by year.

Year	Number of tows	G	A
1961	126	89.9	279.4
1962	330	30.8	132.8
1963	217	40.5	161.2
1964	191	56.4	170.2
1965	128	67.3	197.7

Table 13

Geometric (G) and arithmetic (A) mean catch (number individuals) per hour by month of year.

Month	Number of tows	G	A
January	65	101.6	231.5
February	68	56.3	137.3
March	86	44.6	96.9
April	88	34.2	78.8
May	85	36.6	215.0
June	93	38.1	184.8
July	73	38.7	218.4
August	94	32.2	217.5
September	65	44.4	147.8
October	92	41.9	183.8
November	86	58.9	181.9
December	97	76.2	187.1

Table 14

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by hour of day.

Hour of day	Number of tows	G	A
0000-0100	30	80.9	318.8
0100-0200	40	99.1	221.0
0200-0300	35	54.3	192.0
0300-0400	29	68.5	282.9
0400-0500	35	104.2	284.1
0500-0600	29	38.5	132.7
0600-0700	39	31.4	137.8
0700-0800	32	16.1	49.2
0800-0900	51	17.8	74.2
0900-1000	36	17.7	58.4
1000-1100	34	34.6	113.3
1100-1200	45	20.3	68.4
1200-1300	55	24.2	68.1
1300-1400	49	22.8	112.7
1400-1500	44	16.6	83.8
1500-1600	37	27.3	63.2
1600-1700	42	37.6	107.5
1700-1800	51	31.8	113.7
1800-1900	53	110.2	201.2
1900-2000	52	139.5	388.0
2000-2100	47	102.7	213.9
2100-2200	44	157.9	381.7
2200-2300	41	115.0	291.1
2300-2400	42	82.5	230.6

Table 15

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by statistical area, and depth zone.

Depth Zone (Meters)	Number of Tows	Statistical Area 18		Number of Tows	Statistical Area 19	
		G	A		G	A
7.2	60	37.2	111.5	28	32.7	88.2
13.7	78	108.1	181.6	58	63.2	189.1
22.9	0	-	-	0	-	-
27.5	77	122.4	344.4	14	125.8	263.2
45.8	59	86.9	272.3	14	34.1	115.3
64.0	12	5.5	8.8	0	-	-
73.2	22	6.7	16.7	0	-	-
82.3	23	5.3	13.9	0	-	-
109.8	29	1.9	5.7	0	-	-
		20			21	
		G	A		G	A
7.3	29	24.4	127.7	25	17.2	63.2
13.7	42	70.6	194.5	11	11.5	40.9
22.9	0	-	-	24	127.7	289.5
27.5	89	161.2	315.5	11	158.0	370.6
45.8	86	77.5	208.0	34	74.3	192.3
64.0	40	37.9	137.4	10	55.1	81.0
73.2	26	11.0	33.1	0	-	-
82.3	40	23.8	64.8	9	13.4	31.8
109.8	35	8.5	31.9	7	3.9	12.0

Table 16

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by statistical area and year.

Year	Number of Tows	Statistical Area 18		Number of Tows	Statistical Area 19	
		G	A		G	A
1961	93	75.3	237.9	11	410.5	593.5
1962	72	25.6	152.2	45	48.8	148.6
1963	80	30.5	157.3	19	23.9	67.6
1964	72	40.1	160.3	22	59.8	119.1
1965	43	61.6	167.4	17	42.1	95.2
		20			21	
		G	A		G	A
1961	22	88.3	297.7	0	-	-
1962	154	30.1	119.6	59	29.1	131.2
1963	92	52.9	179.8	26	55.2	175.9
1964	66	84.5	220.6	31	49.9	122.0
1965	53	77.5	223.0	15	88.8	311.5

Table 17

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by statistical area and month.

Month	Number of Tows	Statistical Area 18 G	Statistical Area 18 A	Number of Tows	Statistical Area 19 G	Statistical Area 19 A
January	28	87.3	284.2	8	85.1	222.8
February	25	58.5	158.2	4	97.2	192.0
March	31	32.9	77.0	12	63.2	118.5
April	29	21.6	61.2	10	27.9	40.2
May	39	15.1	92.0	10	137.4	241.7
June	38	36.9	210.8	9	17.7	63.8
July	28	25.7	204.3	8	34.0	73.4
August	37	51.1	276.1	8	26.8	147.5
September	21	92.2	213.7	9	34.4	124.6
October	30	42.9	123.7	12	56.4	266.2
November	27	68.5	230.9	11	102.3	188.5
December	27	104.3	235.6	13	82.3	247.5
		20 G	**20 A**		**21 G**	**21 A**
January	24	121.4	187.3	5	133.7	163.0
February	32	53.0	127.3	7	46.9	77.6
March	32	53.5	109.3	11	41.9	93.4
April	34	38.4	85.6	15	71.9	123.1
May	30	53.5	289.1	6	169.0	598.5
June	33	47.3	195.9	13	40.7	164.3
July	27	50.6	237.1	10	64.9	323.7
August	35	29.7	247.7	14	12.8	26.9
September	26	29.0	120.6	9	35.0	96.1
October	38	37.8	203.3	12	40.8	189.9
November	36	51.0	149.5	12	38.5	162.6
December	40	88.5	161.7	17	30.4	123.8

Table 18

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by species.

Species	Number of tows	G	A
Penaeus aztecus (Brown Shrimp)	992	12.3	69.9
Penaeus setiferus (White Shrimp)	992	2.2	27.4
Penaeus duorarum (Pink Shrimp)	992	0.5	4.8
Xiphopeneus kroyeri (Seabob)	992	0.1	1.7
Sicyonia brevirostris (Rock Shrimp)	992	1.3	21.8
Sicyonia dorsalis	992	0.9	20.7
Sicyonia stimpsoni	992	0.01	0.01
Solenocera vioscai	992	0.3	2.8
Sicyonia atlantidus	992	0.001	0.003
Trachypeneus similis	992	2.2	23.6
Trachypeneus constrictus	992	0.1	0.5
Parapenaeus longirostris	992	0.01	0.01

Table 19

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by station number, station code, period, and species.

ation mber	Station Code	Period	Number of tows	Penaeus aztecus (Brown Shrimp) G	Penaeus aztecus (Brown Shrimp) A	Penaeus setiferus (White Shrimp) G	Penaeus setiferus (White Shrimp) A	Penaeus duorarum (Pink Shrimp) G	Penaeus duorarum (Pink Shrimp) A
1	W01	1961-65	61	7.2	67.5	30.5	80.4	0.4	0.9
2	W02	1961-65	60	74.2	174.3	0.3	3.0	1.8	7.0
3	W03	1961-65	59	30.8	78.7	0.04	0.2	0.1	0.8
4	W04	1961-62	12	1.7	3.6	0.0	0.0	0.0	0.0
5	W05	1961-62	23	4.6	11.1	0.0	0.0	0.0	0.0
6	W06	1961-65	29	1.8	5.2	0.0	0.0	0.0	0.0
7	W07	1961-62	13	3.7	39.8	0.0	0.0	0.0	0.0
8	W08	1961-62	15	15.7	30.7	0.0	0.0	0.0	0.0
9	W09	1961-62	15	22.6	68.7	0.0	0.0	0.0	0.0
10	W10	1961-62	14	23.2	71.2	0.0	0.0	0.0	0.0
11	W11	1961-62	14	27.6	82.9	0.8	4.3	1.6	4.8
12	W12	1961-62	13	3.9	31.0	14.5	57.9	0.9	6.1
13	W13	1961-62	15	8.0	58.9	24.7	277.7	2.7	13.9
14	W14	1961-62	14	40.6	190.5	3.7	30.6	0.2	0.4
5	W15	1961-62	14	48.1	62.8	0.0	0.0	0.0	0.0
6	W16	1961-62	14	36.1	62.5	0.0	0.0	0.0	0.0
7	W17	1961-62	14	26.0	62.6	0.0	0.0	0.0	0.0
8	W18	1961-62	12	8.9	22.4	0.0	0.0	0.0	0.0
9	W19	1961-62	10	5.2	12.6	0.0	0.0	0.0	0.0
0	W20	1961-62	11	17.7	33.9	0.0	0.0	0.0	0.0
1	W21	1961-62	11	15.1	28.3	0.0	0.0	0.0	0.0
2	W22	1961-62	11	28.6	56.6	0.0	0.0	0.0	0.0
3	W23	1961-62	11	44.1	137.9	2.3	8.1	0.0	0.0
4	W24	1961-62	11	4.1	70.2	13.7	36.7	4.9	11.8
5	W25	1961-62	11	2.1	26.1	3.1	6.4	1.4	4.2
6	W26	1961-62	11	58.0	243.7	2.4	17.0	0.2	0.5
7	W27	1961-62	11	22.0	76.1	0.0	0.0	0.3	0.6
8	W28	1961-62	10	48.6	68.5	0.0	0.0	0.0	0.0
9	W29	1961-62	9	10.5	25.9	0.0	0.0	0.0	0.0
0	W30	1961-62	7	2.1	8.7	0.0	0.0	0.0	0.0
1	W53	1963-65	28	1.2	5.1	19.1	68.4	0.2	0.3
2	W54	1963-65	22	4.5	7.5	0.0	0.0	0.0	0.0
3	W55	1963-65	32	2.2	27.8	26.6	99.5	0.4	0.8
4	W56	1963-65	28	2.1	20.5	18.9	61.5	0.9	4.4
5	W57	1963-65	12	5.0	16.7	0.0	0.0	0.0	0.0
[illegible]	W58	1963-65	14	14.0	26.4	0.0	0.0	0.0	0.0
7	W59	1963-65	29	0.9	5.1	13.8	105.8	1.8	10.9
[illegible]	W60	1963-65	25	0.7	5.8	6.0	31.5	2.8	11.0
[illegible]	W61	1963-65	24	26.1	166.3	3.1	12.5	6.0	23.2
[illegible]	W62	1963-64	23	42.5	80.9	0.0	0.0	0.3	0.8
[illegible]	W63	1961-62	17	8.0	43.1	49.3	96.9	0.2	0.3
[illegible]	W64	1961-62	17	8.8	39.1	0.0	0.0	0.7	1.9
[illegible]	W13	1963-65	30	4.2	32.0	17.1	38.5	2.3	11.2
[illegible]	W14	1963-65	32	87.9	178.3	0.7	3.1	0.2	0.6
[illegible]	W15	1963-65	31	45.7	124.0	0.0	0.0	0.0	0.0
	W22	1963-65	30	39.4	85.9	0.1	0.1	0.0	0.0
	W23	1963-65	32	41.8	136.1	4.4	22.5	0.2	0.4
	W24	1963-65	31	7.7	92.2	17.9	41.7	5.3	63.3

Table 19 (Continued)

Station Number	Station Code	Period	Number of tows	*Xiphopeneus kroyeri* (Seabob)		*Sicyonia brevirostris* (Rock Shrimp)		*Sicyonia dorsali*	
				G	A	G	A	G	A
1	W01	1961-65	61	0.3	1.1	0.1	0.1	0.1	0.
2	W02	1961-65	60	0.0	0.0	11.6	45.5	10.0	85.
3	W03	1961-65	59	0.0	0.0	35.8	184.2	0.2	0.
4	W04	1961-62	12	0.0	0.0	2.6	5.2	0.0	0.
5	W05	1961-62	23	0.0	0.0	0.7	2.7	0.0	0.
6	W06	1961-65	29	0.0	0.0	0.0	0.0	0.0	0.
7	W07	1961-62	13	0.0	0.0	0.0	0.0	0.0	0.
8	W08	1961-62	15	0.0	0.0	1.1	4.2	0.0	0.
9	W09	1961-62	15	0.0	0.0	22.9	70.2	0.1	0.
10	W10	1961-62	14	0.0	0.0	5.8	41.9	0.2	0.
11	W11	1961-62	14	0.0	0.0	1.8	9.8	7.3	99.
12	W12	1961-62	13	0.1	0.2	0.0	0.0	0.3	0.
13	W13	1961-62	15	1.5	74.0	0.0	0.0	0.1	0.
14	W14	1961-62	14	0.1	0.1	0.2	0.3	7.2	263.
15	W15	1961-62	14	0.0	0.0	0.3	1.2	7.7	70.
16	W16	1961-62	14	0.0	0.0	0.1	0.2	1.0	107.
17	W17	1961-62	14	0.0	0.0	0.7	6.8	0.5	23.
18	W18	1961-62	12	0.0	0.0	0.0	0.0	0.0	0.
19	W19	1961-62	10	0.0	0.0	0.0	0.0	0.0	0.
20	W20	1961-62	11	0.0	0.0	1.6	4.9	0.0	0.
21	W21	1961-62	11	0.0	0.0	0.4	0.6	0.3	1.
22	W22	1961-62	11	0.0	0.0	0.5	0.6	5.5	47.
23	W23	1961-62	11	0.0	0.0	0.1	0.2	6.1	89.
24	W24	1961-62	11	0.4	3.9	0.4	0.2	0.1	0.
25	W25	1961-62	11	0.4	2.6	0.4	0.7	0.0	0.
26	W26	1961-62	11	0.0	0.0	9.6	16.0	6.5	79.
27	W27	1961-62	11	0.0	0.0	7.0	90.9	1.0	4.
28	W28	1961-62	10	0.0	0.0	2.4	7.8	0.0	0.0
29	W29	1961-62	9	0.0	0.0	1.2	3.7	0.0	0.0
30	W30	1961-62	7	0.0	0.0	0.0	0.0	0.0	0.0
31	W53	1963-65	28	0.5	0.9	0.0	0.0	0.0	0.0
32	W54	1963-65	22	0.0	0.0	1.8	9.2	0.0	0.0
33	W55	1963-65	32	0.8	0.6	0.02	0.03	0.1	0.1
34	W56	1963-65	28	0.1	0.4	0.0	0.0	0.0	0.0
35	W57	1963-65	12	0.0	0.0	0.9	12.4	0.0	0.0
36	W58	1963-65	14	0.0	0.0	0.8	1.6	0.2	0.6
37	W59	1963-65	29	0.1	0.1	0.02	0.04	0.0	0.0
38	W60	1963-65	25	0.1	0.6	0.3	0.9	0.1	0.2
39	W61	1963-65	24	0.0	0.0	7.1	34.5	0.9	2.5
40	W62	1963-65	23	0.0	0.0	3.8	21.1	8.1	40.4
41	W63	1961-62	17	0.5	8.9	0.04	0.1	0.3	0.7
42	W64	1961-62	17	0.0	0.0	24.0	156.2	0.0	0.0
13	W13	1963-65	30	0.4	2.2	0.0	0.0	0.02	0.0
14	W14	1963-65	32	0.0	0.0	0.3	0.5	1.9	32.3
15	W15	1963-65	31	0.0	0.0	0.7	3.6	7.7	37.6
22	W22	1963-65	30	0.0	0.0	0.3	0.5	13.2	54.2
23	W23	1963-65	32	0.04	0.1	0.3	0.5	0.9	5.5
24	W24	1963-65	31	0.1	0.3	0.2	0.4	0.1	0.2

Table 19 (Continued)

ation Number	Station Code	Period	Number of tows	Sicyonia stimpsoni		Solenocera vioscai		Sicyonia atlantidus	
				G	A	G	A	G	A
1	W01	1961-65	61	0.0	0.0	0.0	0.0	0.0	0.0
2	W02	1961-65	60	0.0	0.0	0.01	0.02	0.02	0.1
3	W03	1961-65	59	0.01	0.02	0.1	0.2	0.0	0.0
4	W04	1961-62	12	0.0	0.0	0.0	0.0	0.0	0.0
5	W05	1961-62	23	0.0	0.0	0.1	0.1	0.0	0.0
6	W06	1961-65	29	0.0	0.0	0.2	0.6	0.0	0.0
7	W07	1961-62	13	0.0	0.0	1.0	2.3	0.0	0.0
8	W08	1961-62	15	0.0	0.0	0.3	0.5	0.0	0.0
9	W09	1961-62	15	0.0	0.0	0.0	0.0	0.0	0.0
10	W10	1961-62	14	0.0	0.0	0.1	0.1	0.0	0.0
11	W11	1961-62	14	0.0	0.0	0.0	0.0	0.0	0.0
12	W12	1961-62	13	0.0	0.0	0.0	0.0	0.0	0.0
13	W13	1961-62	15	0.0	0.0	0.0	0.0	0.0	0.0
14	W14	1961-62	14	0.0	0.0	0.0	0.0	0.0	0.0
15	W15	1961-62	14	0.0	0.0	1.0	26.2	0.0	0.0
16	W16	1961-62	14	0.0	0.0	1.5	22.4	0.0	0.0
17	W17	1961-62	14	0.0	0.0	2.7	10.5	0.0	0.0
18	W18	1961-62	12	0.0	0.0	2.5	5.8	0.0	0.0
19	W19	1961-62	10	0.0	0.0	4.1	10.1	0.0	0.0
20	W20	1961-62	11	0.0	0.0	1.5	11.6	0.0	0.0
21	W21	1961-62	11	0.0	0.0	0.9	4.0	0.0	0.0
22	W22	1961-62	11	0.0	0.0	0.8	4.8	0.0	0.0
23	W23	1961-62	11	0.0	0.0	0.0	0.0	0.0	0.0
24	W24	1961-62	11	0.0	0.0	0.0	0.0	0.0	0.0
25	W25	1961-62	11	0.0	0.0	0.0	0.0	0.0	0.0
26	W26	1961-62	11	0.0	0.0	0.0	0.0	0.0	0.0
27	W27	1961-62	11	0.1	0.1	1.0	5.4	0.0	0.0
28	W28	1961-62	10	0.0	0.0	1.5	4.2	0.0	0.0
29	W29	1961-62	9	0.0	0.0	0.8	2.1	0.0	0.0
30	W30	1961-62	7	0.0	0.0	0.9	3.3	0.0	0.0
31	W53	1963-65	28	0.0	0.0	0.0	0.0	0.0	0.0
32	W54	1963-65	22	0.0	0.0	0.0	0.0	0.0	0.0
33	W55	1963-65	32	0.0	0.0	0.1	0.2	0.0	0.0
34	W56	1963-65	28	0.0	0.0	0.0	0.0	0.0	0.0
35	W57	1963-65	12	0.0	0.0	0.1	0.3	0.0	0.0
36	W58	1963-65	14	0.0	0.0	1.7	7.6	0.0	0.0
37	W59	1963-65	29	0.0	0.0	0.0	0.0	0.0	0.0
38	W60	1963-65	25	0.0	0.0	0.0	0.0	0.0	0.0
39	W61	1963-65	24	0.0	0.0	0.0	0.0	0.0	0.0
40	W62	1963-65	23	0.1	0.4	1.8	7.7	0.0	0.0
41	W63	1961-62	17	0.0	0.0	0.0	0.0	0.0	0.0
42	W64	1961-62	17	0.0	0.0	0.0	0.0	0.0	0.0
13	W13	1963-65	30	0.02	0.03	0.0	0.0	0.0	0.0
14	W14	1963-65	32	0.0	0.0	0.0	0.0	0.0	0.0
15	W15	1963-65	31	0.02	0.03	2.8	21.4	0.0	0.0
22	W22	1963-65	30	0.0	0.0	1.2	11.2	0.0	0.0
23	W23	1963-65	32	0.04	0.1	0.0	0.0	0.0	0.0
24	W24	1963-65	31	0.0	0.0	0.0	0.0	0.0	0.0

Table 19 (Continued)

Station Number	Station Code	Period	Number of tows	Trachypeneus similis G	Trachypeneus similis A	Trachypeneus constrictus G	Trachypeneus constrictus A	Parapenaeus longirostris G	Parapenaeus longirostris A
1	W01	1961-65	61	5.2	30.9	0.1	0.4	0.0	0.0
2	W02	1961-65	60	14.8	67.9	0.1	2.4	0.0	0.0
3	W03	1961-65	59	0.9	7.8	0.1	0.2	0.0	0.0
4	W04	1961-62	12	0.0	0.0	0.0	0.0	0.0	0.0
5	W05	1961-62	23	0.0	0.0	0.0	0.0	0.0	0.0
6	W06	1961-65	29	0.0	0.0	0.0	0.0	0.0	0.0
7	W07	1961-62	13	0.0	0.0	0.0	0.0	0.1	0.2
8	W08	1961-62	15	0.0	0.0	0.0	0.0	0.0	0.0
9	W09	1961-62	15	0.0	0.0	0.0	0.0	0.0	0.0
10	W10	1961-62	14	0.6	1.6	0.0	0.0	0.0	0.0
11	W11	1961-62	14	5.5	61.5	0.0	0.0	0.0	0.0
12	W12	1961-62	13	1.5	10.0	0.0	0.0	0.0	0.0
13	W13	1961-62	15	1.8	11.5	0.1	0.1	0.0	0.0
14	W14	1961-62	14	13.8	44.2	0.0	0.0	0.0	0.0
15	W15	1961-62	14	2.2	9.9	0.1	0.1	0.0	0.0
16	W16	1961-62	14	1.0	22.6	0.0	0.0	0.0	0.0
17	W17	1961-62	14	0.5	4.6	0.0	0.0	0.0	0.0
18	W18	1961-62	12	0.0	0.0	0.0	0.0	0.1	0.1
19	W19	1961-62	10	0.0	0.0	0.0	0.0	0.0	0.0
20	W20	1961-62	11	0.0	0.0	0.0	0.0	0.0	0.0
21	W21	1961-62	11	0.6	1.3	0.0	0.0	0.0	0.0
22	W22	1961-62	11	3.7	38.7	0.0	0.0	0.0	0.0
23	W23	1961-62	11	4.3	30.8	0.0	0.0	0.0	0.0
24	W24	1961-62	11	0.5	1.5	0.6	2.1	0.0	0.0
25	W25	1961-62	11	0.4	0.7	0.1	0.2	0.0	0.0
26	W26	1961-62	11	4.3	14.0	0.0	0.0	0.0	0.0
27	W27	1961-62	11	1.4	7.3	0.0	0.0	0.0	0.0
28	W28	1961-62	10	0.3	0.5	0.0	0.0	0.0	0.0
29	W29	1961-62	9	0.0	0.0	0.1	0.1	0.0	0.0
30	W30	1961-62	7	0.0	0.0	0.0	0.0	0.0	0.0
31	W53	1963-65	28	0.8	2.6	0.3	0.5	0.1	0.4
32	W54	1963-65	22	0.0	0.0	0.0	0.0	0.0	0.0
33	W55	1963-65	32	1.1	5.8	0.3	0.6	0.02	0.03
34	W56	1963-65	28	0.3	1.1	0.2	0.2	0.0	0.0
35	W57	1963-65	12	0.0	0.0	0.0	0.0	0.0	0.0
36	W58	1963-65	14	0.0	0.0	0.0	0.0	0.0	0.0
37	W59	1963-65	29	0.4	2.3	0.7	3.5	0.0	0.0
38	W60	1963-65	25	0.8	12.8	0.2	0.4	0.0	0.0
39	W61	1963-65	24	9.1	50.3	0.1	0.1	0.0	0.0
40	W62	1963-65	23	7.7	44.4	0.0	0.0	0.0	0.0
41	W63	1961-62	17	5.0	31.7	0.0	0.0	0.0	0.0
42	W64	1961-62	17	1.2	3.5	0.0	0.0	0.0	0.0
13	W13	1963-65	30	2.9	16.7	0.4	1.1	0.0	0.0
14	W14	1963-65	32	23.4	86.6	0.0	0.0	0.0	0.0
15	W15	1963-65	31	7.8	54.6	0.0	0.0	0.0	0.0
22	W22	1963-65	30	8.0	61.2	0.0	0.0	0.0	0.0
23	W23	1963-65	32	19.1	87.3	0.1	0.3	0.0	0.0
24	W24	1963-65	31	1.8	17.7	0.6	2.2	0.0	0.0

Table 20

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by statistical area and species.

atistical Area	Number of Tows	Penaeus aztecus (Brown Shrimp) G	Penaeus aztecus (Brown Shrimp) A	Penaeus setiferus (White Shrimp) G	Penaeus setiferus (White Shrimp) A	Penaeus duorarum (Pink Shrimp) G	Penaeus duorarum (Pink Shrimp) A	Xiphopeneus kroyeri (Seabob) G	Xiphopeneus kroyeri (Seabob) A
18	360	9.5	61.8	2.8	32.9	0.4	1.6	0.2	1.2
19	114	6.3	43.7	9.0	68.9	1.3	7.1	0.3	10.4
20	387	18.9	81.0	1.2	15.8	0.4	6.3	0.03	0.2
21	131	12.3	82.3	1.3	10.3	1.1	6.9	0.1	0.3

		Sicyonia brevirostris (Rock Shrimp) G	Sicyonia brevirostris (Rock Shrimp) A	Sicyonia dorsalis G	Sicyonia dorsalis A	Sicyonia stimpsoni G	Sicyonia stimpsoni A	Solenocera vioscai G	Solenocera vioscai A
18	360	2.7	46.1	0.6	14.3	0.002	0.003	0.04	0.1
19	114	0.4	6.3	0.4	12.4	0.01	0.01	0.01	0.02
20	387	0.5	4.3	1.3	31.1	0.01	0.01	0.6	6.1
21	131	2.5	20.1	1.1	14.7	0.02	0.1	0.5	2.5

		Sicyonia atlantidus G	Sicyonia atlantidus A	Trachypeneus similis G	Trachypeneus similis A	Trachypeneus constrictus G	Trachypeneus constrictus A	Parapenaeus longirostris G	Parapenaeus longirostris A
18	360	0.004	0.01	2.1	20.2	0.01	0.6	0.01	0.03
19	114	0.0	0.0	1.6	15.1	0.2	0.4	0.0	0.0
20	387	0.0	0.0	2.5	30.1	0.1	0.5	0.01	0.01
21	131	0.0	0.0	2.2	21.3	0.1	0.1	0.0	0.0

Table 21

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by depth zone and species

Depth Zone (Meters)	Number of Tows	Penaeus aztecus (Brown Shrimp)		Penaeus setiferus (White Shrimp)		Penaeus duorarum (Pink Shrimp)		Xiphopeneus kroyeri (Seabob)	
		G	A	G	A	G	A	G	A
7.3	142	1.3	13.4	15.8	75.2	1.0	5.3	0.3	1.7
13.7	189	5.9	58.3	21.0	76.1	1.5	14.9	0.4	7.8
22.9	24	26.5	166.3	3.1	12.5	6.0	23.2	0.0	0.0
27.5	191	49.1	152.9	1.1	9.2	0.7	2.9	0.01	0.02
45.8	193	35.0	84.2	0.02	0.1	0.1	0.4	0.0	0.0
64.0	62	17.1	47.5	0.0	0.0	0.0	0.0	0.0	0.0
73.2	48	6.5	15.3	0.0	0.0	0.0	0.0	0.0	0.0
82.3	72	11.6	30.5	0.0	0.0	0.0	0.0	0.0	0.0
109.8	71	3.3	15.8	0.0	0.0	0.0	0.0	0.0	0.0

Depth Zone (Meters)	Number of Tows	Sicyonia brevirostris (Rock Shrimp)		Sicyonia dorsalis		Sicyonia stimpsoni		Solenocera vioscai	
		G	A	G	A	G	A	G	A
7.3	142	0.1	0.2	0.03	0.1	0.0	0.0	0.01	0.04
13.7	189	0.1	0.3	0.1	0.2	0.004	0.01	0.0	0.0
22.9	24	7.1	34.5	0.9	2.5	0.0	0.0	0.0	0.0
27.5	191	3.1	30.0	3.9	69.4	0.01	0.01	0.004	0.01
45.8	193	4.5	67.8	3.0	27.6	0.02	0.1	0.9	8.6
64.0	62	2.6	19.4	0.3	24.7	0.0	0.0	0.6	6.5
73.2	48	1.2	7.8	0.01	0.2	0.0	0.0	0.4	2.3
82.3	72	1.0	4.3	0.1	4.5	0.0	0.0	0.7	4.2
109.8	71	0.0	0.0	0.0	0.0	0.0	0.0	1.0	3.4

Depth Zone (Meters)	Number of Tows	Sicyonia atlantidus		Trachypeneus similis		Trachypeneus constrictus		Parapenaeus longirostris	
		G	A	G	A	G	A	G	A
7.3	142	0.0	0.0	0.7	4.8	0.3	1.1	0.02	0.1
13.7	189	0.0	0.0	2.8	20.1	0.2	0.8	0.0	0.0
22.9	24	0.0	0.0	9.1	50.3	0.1	0.1	0.0	0.0
27.5	191	0.01	0.02	11.2	61.1	0.1	0.8	0.0	0.0
45.8	193	0.0	0.0	3.1	29.4	0.02	0.1	0.0	0.0
64.0	62	0.0	0.0	0.3	5.4	0.0	0.0	0.0	0.0
73.2	48	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
82.3	72	0.0	0.0	0.1	0.9	0.01	0.01	0.0	0.0
109.8	71	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.04

Table 22

Geometric (G) and arithmetic (A) mean catch (number of individuals) per hour by species, statistical area, and depth zone. Data resulted from monthly sampling in 1961-1965.

Penaeus aztecus (brown shrimp)

	STATION DEPTHS (Meters)																	
istical	7.3		13.7		22.9		27.5		45.8		64.0		73.2		82.3		109.8	
rea	G	A	G	A	G	A	G	A	G	A	G	A	G	A	G	A	G	A
18	(60)[1]		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	1.7	17.2	7.4	62.2	-	-	47.0	144.5	30.8	78.7	1.7	3.6	4.5	7.5	4.6	11.1	1.8	5.2
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	2.1	20.5	4.9	38.7	-	-	27.6	82.9	23.2	71.2	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	0.9	5.0	6.5	86.4	-	-	54.8	160.1	41.2	92.1	23.9	55.4	8.8	21.9	19.4	42.8	5.5	26.1
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	0.7	5.8	2.1	26.1	26.1	166.3	58.0	243.7	34.4	79.4	48.6	68.5	-	-	10.5	25.9	2.1	8.7

Penaeus setiferus (white shrimp)

18	(60)		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	22.8	85.0	33.9	84.0	-	-	0.2	2.3	0.04	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	18.9	61.5	18.2	104.7	-	-	0.8	4.3	0.0	0.0	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	13.9	105.8	16.7	40.4	-	-	2.2	15.0	0.02	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	6.0	31.5	3.1	6.4	3.1	12.5	2.4	17.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0

Penaeus duorarum (pink shrimp)

18	(60)		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	0.3	0.6	0.3	0.7	-	-	1.5	5.9	0.1	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	0.9	4.4	2.0	10.7	-	-	1.6	4.8	0.0	0.0	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	1.8	10.9	5.2	49.8	-	-	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	2.7	11.0	1.4	4.2	5.9	23.2	0.2	0.5	0.3	0.7	0.0	0.0	-	-	0.0	0.0	0.0	0.0

Table 22 (Continued)

<u>Xiphopeneus kroyeri</u> (seabob)

atistical area	STATION DEPTHS (Meters) 7.3 G	7.3 A	13.7 G	13.7 A	22.9 G	22.9 A	27.5 G	27.5 A	45.8 G	45.8 A	64.0 G	64.0 A	73.2 G	73.2 A	82.3 G	82.3 A	109.8 G	109.8 A
18	(60)		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	0.6	3.6	0.3	2.8	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	0.1	0.4	0.5	20.3	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	0.1	0.1	0.2	1.3	-	-	0.02	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	0.1	0.6	0.4	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0

<u>Sicyonia brevirostris</u> (rock shrimp)

atistical area	7.3 G	7.3 A	13.7 G	13.7 A	22.9 G	22.9 A	27.5 G	27.5 A	45.8 G	45.8 A	64.0 G	64.0 A	73.2 G	73.2 A	82.3 G	82.3 A	109.8 G	109.8 A
18	(60)		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	0.01	0.02	0.1	0.1	-	-	13.7	70.0	35.8	184.2	2.6	5.2	1.8	9.2	0.7	0.3	0.0	0.0
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	0.0	0.0	0.0	0.0	-	-	1.8	9.8	5.8	41.9	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	0.02	0.04	0.2	0.7	-	-	0.3	0.4	0.5	1.7	2.7	26.6	0.9	6.6	1.1	5.3	0.0	0.0
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	0.3	0.9	0.4	0.7	7.1	34.5	9.6	16.0	4.7	43.7	2.4	7.8	-	-	1.2	3.7	0.0	0.0

<u>Sicyonia dorsalis</u>

atistical area	7.3 G	7.3 A	13.7 G	13.7 A	22.9 G	22.9 A	27.5 G	27.5 A	45.8 G	45.8 A	64.0 G	64.0 A	73.2 G	73.2 A	82.3 G	82.3 A	109.8 G	109.8 A
18	(60)		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	0.03	0.01	0.1	0.3	-	-	5.5	66.2	0.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	0.0	0.0	0.1	0.2	-	-	7.3	99.9	0.2	0.4	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	0.0	0.0	0.1	0.2	-	-	2.3	66.1	8.9	50.0	0.4	38.2	0.1	0.3	0.2	8.1	0.0	0.0
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	0.1	0.2	0.0	0.0	0.9	2.5	6.5	79.4	4.5	28.9	0.0	0.0	-	-	0.0	0.0	0.0	0.0

Table 22 (Continued)

Sicyonia stimpsoni

tistical area	7.3 G	7.3 A	13.7 G	13.7 A	22.9 G	22.9 A	27.5 G	27.5 A	45.8 G	45.8 A	64.0 G	64.0 A	73.2 G	73.2 A	82.3 G	82.3 A	109.8 G	109.8 A
18	(60)		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	0.0	0.0	0.01	0.02	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	0.0	0.0	0.0	0.0	-	-	0.01	0.02	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	-	-	0.0	0.0	0.0	0.0

Solenocera vioscai

tistical area	7.3 G	7.3 A	13.7 G	13.7 A	22.9 G	22.9 A	27.5 G	27.5 A	45.8 G	45.8 A	64.0 G	64.0 A	73.2 G	73.2 A	82.3 G	82.3 A	109.8 G	109.8 A
18	(60)		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	0.03	0.1	0.0	0.0	-	-	0.01	0.01	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.6
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.1	0.1	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	0.0	0.0	0.0	0.0	-	-	0.0	0.0	1.6	16.5	0.6	9.0	0.8	4.3	1.2	7.0	2.2	5.7
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	7.0	1.5	4.2	-	-	0.8	2.1	0.9	3.3

Sicyonia atlantidus

tistical area	7.3 G	7.3 A	13.7 G	13.7 A	22.9 G	22.9 A	27.5 G	27.5 A	45.8 G	45.8 A	64.0 G	64.0 A	73.2 G	73.2 A	82.3 G	82.3 A	109.8 G	109.8 A
18	(60)		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	0.0	0.0	0.0	0.0	-	-	0.02	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0

Table 22 (Continued)

	STATION DEPTHS (Meters)																	
atistical	7.3		13.7		22.9		27.5		45.8		64.0		73.2		82.3		109.8	
area	G	A	G	A	G	A	G	A	G	A	G	A	G	A	G	A	G	A
	Trachypeneus similis																	
18	(60)		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	1.0	4.3	5.2	31.0	-	-	9.2	53.7	1.0	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	0.3	1.1	2.3	13.8	-	-	5.5	61.5	0.6	1.6	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	0.4	2.4	1.4	13.5	-	-	16.4	73.3	6.0	47.6	0.4	8.3	0.0	0.0	0.2	1.6	0.0	0.0
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	0.8	12.8	0.4	0.7	9.1	50.3	4.3	14.0	4.8	32.4	0.3	0.5	-	-	0.0	0.0	0.0	0.0
	Trachypeneus constrictus																	
18	(60)		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	0.3	0.6	0.1	0.3	-	-	0.1	1.8	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	0.2	0.2	0.2	0.6	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	0.7	3.5	0.6	2.2	-	-	0.03	0.1	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	0.2	0.4	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.1	0.1	0.0	0.0
	Parapenaeus longirostris																	
18	(60)		(78)		(0)		(77)		(59)		(12)		(22)		(23)		(29)	
	0.1	0.2	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	(28)		(58)		(0)		(14)		(14)		(0)		(0)		(0)		(0)	
	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	-	-	-	-	-	-
20	(29)		(42)		(0)		(89)		(86)		(40)		(26)		(40)		(35)	
	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
21	(25)		(11)		(24)		(11)		(34)		(10)		(0)		(9)		(7)	
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0

Number of tows.

Table 23

Commercial shrimp catch (pounds, heads-off) by statistical area, depth zone (offshore vs. inshore), year, and species, and value of catch by year, and statistical area.

tatistical Area	Depth Zone	*Penaeus aztecus* (Brown Shrimp)	*Penaeus setiferus* (White Shrimp)	*Penaeus duorarum* (Pink Shrimp)	1/ Other	$ Value of Catch
			1970			
18	Offshore	2,849,580	2,483,781	2,065	-	4,891,854
	Inshore	966,459	2,351,060	-	-	1,894,112
19	Offshore	13,501,560	3,364,992	7,976	-	15,321,439
	Inshore	384,031	2,605,868	-	-	1,616,055
20	Offshore	7,738,469	373,277	3,423	-	7,213,606
	Inshore	86,300	134,300	-	-	91,872
21	Offshore	7,244,012	257,721	33,102	-	6,736,808
	Inshore	-	-	-	-	-
			1971			
18	Offshore	7,227,439	2,503,552	655	-	11,391,345
	Inshore	1,273,372	1,923,925	-	-	2,054,770
19	Offshore	14,637,968	2,269,283	2,335	-	20,376,910
	Inshore	342,113	1,238,741	-	-	1,425,575
20	Offshore	6,187,231	233,239	980	-	8,180,227
	Inshore	12,000	54,600	-	-	63,552
21	Offshore	4,292,696	179,093	785	-	5,744,902
	Inshore	-	-	-	-	-
			1972			
18	Offshore	4,230,678	2,088,123	-	-	8,964,462
	Inshore	902,461	2,070,394	-	-	2,749,743
19	Offshore	17,434,436	2,929,785	5,063	-	27,101,266
	Inshore	290,300	2,159,735	-	-	2,534,288
20	Offshore	10,133,341	562,913	25	-	14,042,866
	Inshore	33,200	257,787	-	-	347,789
21	Offshore	4,745,720	135,312	-	-	6,044,757
	Inshore	-	-	-	-	-

Table 23 (Continued)

Statistical Area	Depth Zone	*Penaeus aztecus* (Brown Shrimp)	*Penaeus setiferus* (White Shrimp)	*Penaeus duorarum* (Pink Shrimp)	1/ Other	$ Value of Catch
			1973			
18	Offshore	1,854,800	2,643,913	1,105	14,120	8,575,490
	Inshore	593,411	2,647,870	-	-	3,342,482
19	Offshore	5,834,492	3,269,298	-	2,941	17,282,760
	Inshore	1,495,278	3,115,167	-	-	4,645,789
20	Offshore	8,549,667	1,032,545	775	-	17,335,532
	Inshore	481,300	581,400	-	-	1,075,269
21	Offshore	6,993,975	254,207	-	-	13,088,088
	Inshore	-	-	-	-	-
			1974			
18	Offshore	8,086,470	3,280,142	-	46,882	15,244,581
	Inshore	883,640	1,553,479	-	80	1,811,311
19	Offshore	4,779,471	2,301,099	-	472,266	10,900,640
	Inshore	464,484	1,909,295	-	-	2,324,618
20	Offshore	7,938,888	801,981	3,137	16,790	12,940,509
	Inshore	96,200	208,000	-	-	350,338
21	Offshore	5,502,797	155,011	-	-	7,617,973
	Inshore	-	-	-	-	-

1/ Other: Includes all other commercially valuable species of shrimp.

B. COMMERCIAL LANDINGS OF TEXAS FINFISH, BLUE CRAB AND SQUID

INTRODUCTION

Gulf of Mexico waters over the continental shelf of south Texas support a variety of finfish populations. General information on many of the demersal species present, i.e., their seasonal and areal distribution and abundance, is provided by Gunter, 1945; Hildebrand, 1954; Springer and Bullis, 1956; Hoese, 1958; Miller, 1965; Bullis and Thompson, 1965; Hoese et al, 1968; and Moore, Brusher, and Trent, 1970.

Prior to 1952 the finfish stocks in the Gulf of Mexico could generally be categorized as a natural resource that was unexploited. In 1952, however, an industrial bottom fishery was initiated (primarily for petfoods) and landings increased markedly during the next decade. Concurrently, because of the increasing demand for seafood, many finfish taken incidentally by the extensive and expanding shrimp fishery were marketed, thus increasing an already expanding industry.

Many of the fish and shellfish harvested from south Texas Gulf waters now enter the commercial landings, and it is the objective of this report to identify those species involved and the amount and value of the harvest over a 10-year period.

MATERIALS AND METHODS

In 1955, the Department of Interior, Fish and Wildlife Service established a detailed shrimp statistical program for the systematic collection of data to be used in economic and biological research as well as marketing purposes (Snow, 1969). Although the matrix of fishing grid zones (Figure 17 , p. 45) was designed for shrimp, it has also been used to report landings of finfish and other shellfish. These data are published monthly in Current Fisheries Statistics, Texas Landings (1965-1974) by the Department of Commerce in cooperation with the Texas Parks and Wildlife Department. The information presented herein was derived from these sources, but reflect cumulative catches from statistical areas 19, 20 and 21 (Figure 17 , p. 45), and not the entire Texas coast. No measure of total effort is available.

RESULTS

Over the 10-year period from 1965 to 1975, total commercial landings of finfish, blue crabs and squid from south Texas Gulf of Mexico waters fluctuated between 0.8 and 1.5 million pounds with no distinct trend apparent (Figure 18). Lowest total catches were made in 1968 (792,400 lbs.), and highest total catches occurred in 1965 (1,554,200 lbs.). Values of the landings ranged from a low of $219,224 in 1968 to a high of $481,596 in 1974. Values dropped sharply in 1968, but then increased markedly from 1969 on, reflecting in all probability the inflationary trend of the U.S. economy (Figure 18).

Thirteen finfish and two shellfish made up the bulk of the harvest from the Gulf of Mexico waters. Yearly landings in pounds (Table 24) and yearly values in dollars (Table 25) for each species show the fluctuating trends for the 10-year period. Of the finfish, the most valuable was the red snapper despite the fact that pounds harvested decreased approximately 50% from 1965 to 1974. In contrast, the landings of redfish, flounder, and spotted seatrout has increased markedly over the 10-year period with a concurrent increase in value.

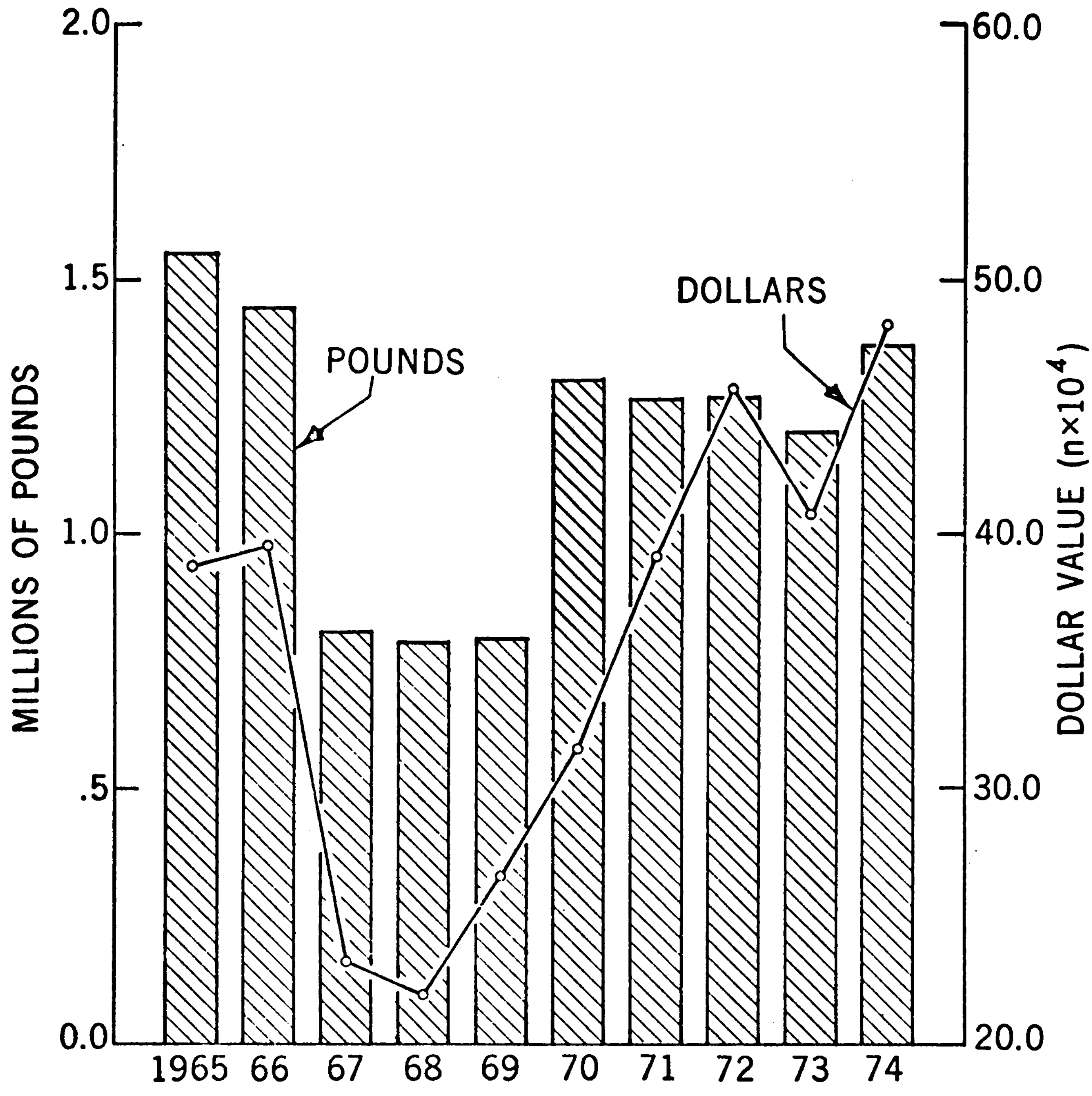

Fig. 18. Yearly landings and dollar value of 13 species of finfish taken in statistical areas 19, 20, & 21 off the Texas Coast.

Only minimal amounts of crab and squid were harvested from this area. Highest landings of blue crab occurred in 1971 (24,400 lbs.) and for squid in 1965 (8,600 lbs.). Monetary value for this part of the fishery has remained low.

Table 24. Yearly landings of 15 species of marine organisms from south Texas waters[1/]

Species	Pounds									
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
Fish										
Cobia (Ling)	7,400	3,503	7,700	19,600	10,100	14,800	13,900	22,400	15,900	19,000
Croaker	[2/]	-	3,700	1,900	1,000	37,500	7,400	3,400	13,300	62,900
Drum: Black	11,300	20,176	10,900	20,700	13,100	65,300	66,700	14,500	43,400	53,900
Drum: Red (Redfish)	10,000	47,043	2,500	16,000	30,800	103,700	177,900	66,200	119,300	103,000
Flounders	49,900	89,100	88,000	117,800	111,900	111,900	96,200	211,000	189,800	260,900
Groupers	96,100	57,000	28,000	33,000	17,000	27,600	99,800	51,700	59,000	48,700
King Whiting (Kingfish)	25,300	26,400	8,200	7,100	20,800	18,200	13,500	28,000	25,400	67,300
Mullet, Black	-	900	5,100	4,000	20,500	-	22,700	9,600	42,500	44,100
Pompano	5,500	18,200	2,100	800	1,000	700	1,300	1,200	100	1,600
Sea Catfish (Gafftopsail)	11,800	6,200	20,700	6,100	6,100	5,500	3,000	300	8,300	9,900
Seatrout (Spotted)	40,500	91,100	113,400	55,100	71,300	109,300	138,800	101,500	126,300	137,700
Sheepshead (Salt-water)	7,100	19,900	11,300	2,900	6,200	28,600	8,500	11,400	28,000	21,400
Snapper, Red	1,280,200	1,067,000	511,300	507,200	483,300	559,900	613,400	743,200	532,500	543,200
Sub-Total	1,545,100	1,446,522	812,900	792,200	793,100	1,304,300	1,263,100	1,264,400	1,203,800	1,373,600
Shellfish										
Crabs, Blue	500	100	-	-	-	500	24,400	-	1,000	-
Squid	8,600	4,300	-	200	1,100	200	900	200	1,800	300
Sub-Total	9,100	4,400	-	200	1,100	700	25,300	200	2,800	300
Total	1,554,200	1,450,922	812,900	792,400	794,200	1,305,000	1,288,400	1,264,600	1,206,000	1,373,900

1/ To convert pounds to kilograms, multiply pounds by .454.

2/ No landings reported.

Table 25. Yearly value of 15 species of marine organisms from south Texas waters

Species	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974
	Dollars									
Fish										
Cobia (Ling)	592	328	873	2,420	1,297	1,586	1,503	2,616	2,418	2,829
Croaker	-[1]	-	185	96	92	2,160	380	257	791	3,292
Drum: Black	902	1,703	1,090	3,151	1,203	6,369	6,263	1,703	5,537	6,321
Drum: Red (Redfish)	2,408	11,489	680	4,160	6,382	22,661	41,360	17,828	38,297	33,166
Flounders	11,821	21,760	21,714	25,824	23,265	23,446	21,029	53,715	53,080	67,724
Groupers	9,680	5,700	2,984	3,425	1,696	2,600	8,876	6,123	8,930	6,524
King Whiting (Kinfish)	1,290	1,583	530	378	444	1,255	1,085	2,642	2,769	6,696
Mullet, Black	-	27	411	195	707	-	745	416	2,382	2,791
Pompano	1,805	7,260	865	553	456	346	631	461	43	742
Sea Catfish (Gafftopsail)	938	476	1,532	407	698	350	322	25	1,237	1,351
Seatrout (Spotted)	11,517	25,888	29,837	14,454	15,368	24,973	32,619	27,834	51,485	44,849
Sheepshead (Salt-water)	590	1,688	914	284	632	2,272	590	1,253	1,543	1,504
Snapper, Red	344,570	317,661	170,588	163,845	177,864	228,179	275,717	341,695	238,831	303,738
Sub-Total	386,113	395,563	232,203	219,192	266,344	316,197	391,120	456,568	407,343	481,527
Shellfish										
Crabs, Blue	35	8	-	-	-	32	2,039	-	138	-
Squid	860	430	-	32	94	27	141	27	263	69
Sub-Total	895	438	-	32	94	59	2,180	27	401	69
Total	387,008	396,001	232,203	219,224	266,438	316,256	393,300	456,595	407,744	481,596

1/ No landings reported.

C. ASSESSMENT OF NEAR-SURFACE PELAGIC FISHES

INTRODUCTION

Two excellent reviews are available on the effects of oil on the marine ecosystem (Evans and Rice, 1974; Rose, 1974) but the impact of oil, or of oil exploration and development, on pelagic fishes is not dealt with specifically. Alterations of the environment resulting from oil exploration and development affect pelagic fish populations. Permanent structures built in the water column in offshore areas attract and concentrate pelagic fishes (Wickham, Watson, and Ogren, 1973). The structures are considered by man to be beneficial in many ways (protection from predators, concentration of prey species, food production, etc.) to pelagic fish populations. Other alterations resulting from oil development, however, can have negative effects on pelagic fishes. Crude oil, resulting from oil spills or seepage, is often toxic to marine organisms, including the pelagic fishes and the organisms upon which they feed (Evans and Rice, 1974). The effects of chronic low-level oil pollution on marine organisms is less understood but could have more deleterious effects on the biotic community than do the high levels.

Large populations of pelagic fish species exist in nearshore and offshore areas of the Gulf of Mexico adjacent to the South Texas coast from Port Aransas to Port Isabel (Gunter, 1945; Rivas and Pristas, 1975; Pristas, Lopez, and Nakamura, 1976; Trent and Arnold, 1976). Species groups (represented by one or more species) especially abundant in the area during parts of the year include sharks, tarpon, ladyfish, herrings, anchovies, needlefishes, silversides, mullets, barracudas, mackerels, jacks, cutlassfishes, bluefish, dolphin, and billfish.

Several types of gear, or methods, have been used to capture, or determine the abundance of pelagic fishes in offshore areas. These methods include purse seines, gill nets, hook and line (longline, handline, and rod and reel), midwater and surface trawls, SCUBA and observations from submarines, areal observation and photograph, and hydro-acoustical devices. All of these techniques are limited in one way or another in respect to estimating the abundance and distribution of all components of the pelagic fish community. Each type of gear, or method of observation, is selective in that only a part of the species complex (often only two or three species), and only certain sizes within the species will be sampled or observed. Each gear type or method is usually restricted to sampling fishes from a small part of the water column.

For the pelagic fish surveys in South Texas, personnel of the National Marine Fisheries Service considered the following techniques as having potential, with the budgetary constraints, for monitoring pelagic fish populations in the study area. These methods were: areal surveys, recreational fish surveys, hydro-acoustical surveys, and gill net surveys. Two recreational fish surveys and a hydro-acoustical survey were conducted and the results are given in other sections of this report.

1/ The distinction between inshore and offshore is somewhat arbitrary. Inshore areas generally are represented by the estuarine zone composed of bays and lagoons. Offshore areas are generally those extending seaward of barrier islands or sea rims.

Of the methods considered, gill nets were selected as being potentially the best gear to use for capturing and measuring the abundance and size of the pelagic fish species in offshore waters. Reasons for obtaining gill net data to supplement the data being gathered in the recreational fisheries and hydro-acoustical surveys, were: prey species (herrings, mullets, etc.) are not caught by hook and line and hydro-acoustic surveys do not yield information on species, sizes of the individuals, or on species that are not tightly schooled.

The objectives of this study were to determine species composition, size, relative abundance, and seasonal distribution of near-surface pelagic fishes in the study area.

STUDY AREA AND METHODS

The areas where gill nets were set and fished for one night each are shown in Figure 19 (area 7 was fished four nights). The sampling areas ranged in water depths from 5.4 m at areas 1 and 7 to 108 m at area 6.

Methods of setting, anchoring, and retrieving gill nets were tested off Panama City, Florida, in March 1975 at a water depth of 23.4 m. The net was 300 m long, 3.3 m deep, and was set to fish the top 3.3 m of the water column. Mesh sizes in the net were 5.1, 6.3, 7.6, 8.9, 10.2, and 11.4 cm stretched mesh. The net was fished from 1700 hr on March 25 to 0700 hr on March 26. No fish were caught.

Each gill net used in the Texas survey was 197 m long, 3.3 m deep, and composed of six 32.8-m long panels of #208 monofilament nylon webbing. Each panel in each net was of a different mesh size, and the panels were randomly located within each float and leadline frame. Stretched mesh sizes were 5.1, 6.3, 7.6, 8.9, 10.2 and 11.4 cm.

From one to four nets were set at each designated area on different dates between 1600-1700 hr and retrieved between 0600-0900 hr the following day (Figure 19). Fishes caught were identified, counted, and the lengths measured. Lengths of bony fishes were measured horizontally from the most anterior projection of the head to the tip of the middle caudal ray. Sharks were measured horizontally from tip of snout to tip of upper caudal lobe. The nets were attached to oil platforms and anchored at the other end (area 1), attached to an anchored vessel and stretched out by the current (areas 2-5), let drift (area 6), or anchored at both ends (area 7). The nets were set and fished from the "Tammy Gal", a 68-foot shrimp trawler (chartered), in areas 2-6 and from the "Rachel Carson", a 42-foot research vessel (NMFS), in areas 1 and 7.

RESULTS

Initial plans were to set four gill nets at a nearshore area and fish these nets for five consecutive nights. This fishing would, if conducted, provide baseline data from a nearshore area and permit refinement of techniques prior to chartering a large vessel and beginning offshore sampling.

The four nets were set at the surface in water depths of 7.2 to 16.2 m off Port Aransas in area 1 on 12 June 1975 (Figure 19). During this night, 345 individuals consisting of 14 species were caught (Tables 22 and 23). Catch per net ranged from 25 to 192 individuals. This was a distinctly different species-complex

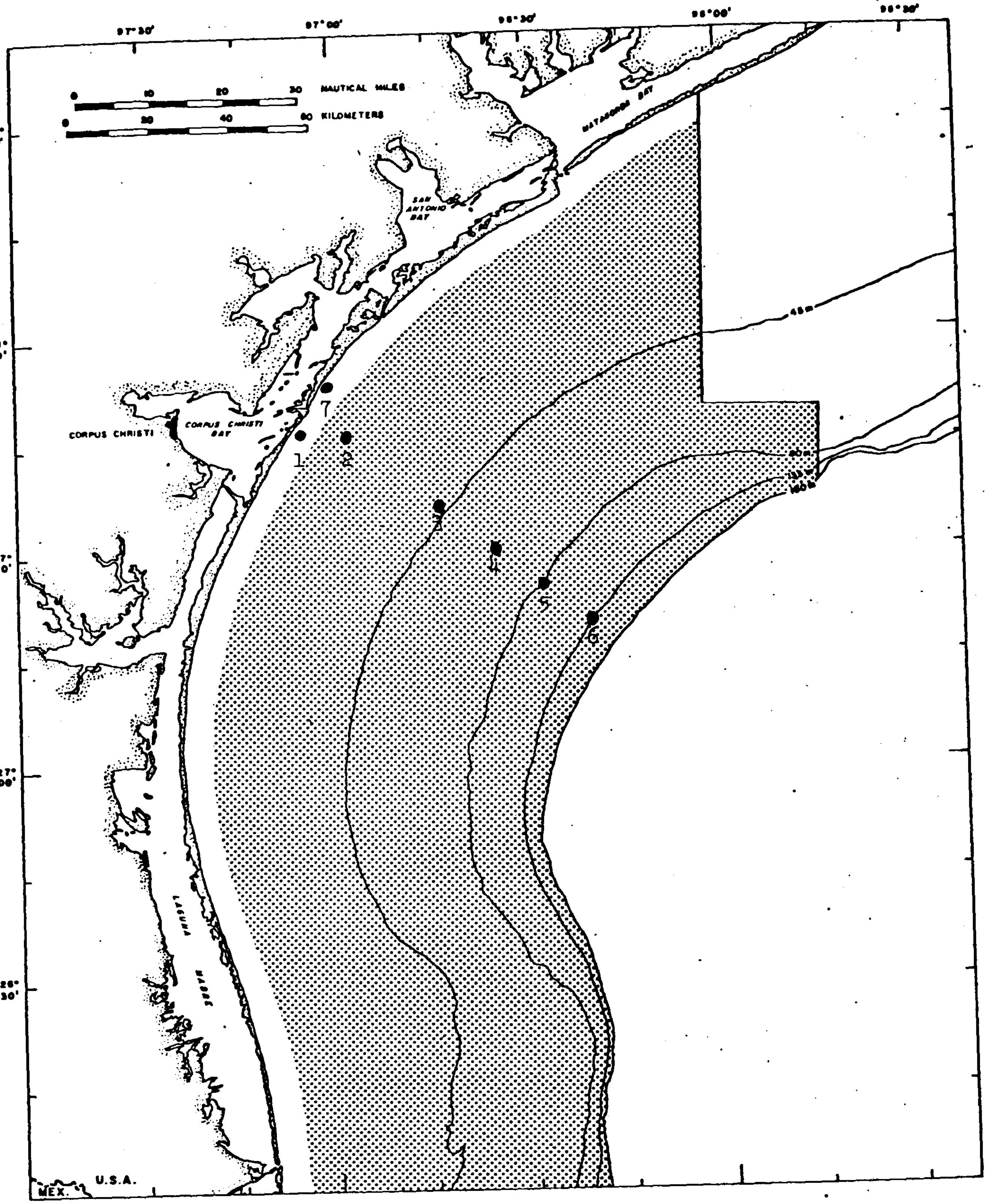

Figure 19. South Texas OCS lease area and gill net station locations.

compared with those obtained by trawling. Only one of these species, the sand seatrout, was caught in abundance with trawls, based on studies conducted by the Bureau of Commercial Fisheries (presently NMFS) in 1962-64 (Moore, Brusher, and Trent, 1970).

On 13 June the winds picked up and remained high enough to prevent checking the nets. When the nets were salvaged (22 June), 60% of the equipment was lost or destroyed.

Based on the catch rate during the one night of sampling at area 1, it was concluded that the fishing power of gill nets was sufficient to obtain baseline data in nearshore areas under favorable weather conditions.

The second phase of the plan was to set the nets in offshore waters and begin obtaining baseline data. By September the gill nets had been repaired and replaced and a vessel had been chartered. During the period 19-27 September 2-4 gill nets were set at each of 5 areas (areas 2-6) with the nets fishing overnight at each area. Only 10 Atlantic sharpnose sharks, 2 little tunny, and 1 Atlantic blackfin tuna were caught during the five nights of fishing. Following this cruise, it was decided that surface gill nets were not efficient enough for obtaining baseline data on near-surface pelagic fishes in clear offshore waters.

The remainder of the sampling occurred in nearshore area 7 just northeast of the Port Aransas tidal pass in water depths of 5-7 m. The purpose of this sampling was to obtain baseline data in nearshore areas during the autumn (Table 26).

Overall, the number of species caught remained about the same, ranging from 8 to 11, from early October to early November at area 7 in the nearshore region (Table 27). The number of species caught dropped to two, however, by early December. During this period, eight species of prey animals, mostly clupeids, were caught. These were Atlantic thread herring, Gulf and finescale menhaden, Atlantic bumper, scaled sardine, leatherjacket, Atlantic threadfin herring, and skipjack herring. During this same period 13 species of predator animals, mostly pelagic, were caught.

The number of individuals caught at area 7 ranged from 79 to 243 cm from early October to early November and then increased to 423 cm in December. Gulf menhaden accounted for most of the individuals caught in November and December.

The most notable changes in the sizes of the fish caught in relation to time were: Gulf menhaden increased in length from a mean of 14.7 cm in June to 19.9-28.3 cm during the autumn, and sand seatrout increased in length from a mean of 22.2 cm in June to 36.9 cm in October.

CONCLUSIONS

1. Surface gill nets did not provide sufficient data during our five net-nights of sampling in clear offshore waters to warrant continuation of this type of sampling for obtaining baseline data on near-surface pelagic fishes. We caught only three species, and a total of 13 individuals, during the five nights.

2. The gill nets were effective in capturing near-surface pelagic fishes adjacent to oil drilling or recovery platforms in shallow near-shore areas based

Table 26. Species, numbers, and mean lengths of fishes caught by gill nets in relation to area and date.

Areas	1		2-6		7		7		7		7	
Dates	June 12-13		Sept 19-27		Oct 7-8		Oct 20-21		Nov 6-7		Dec 9-10	
Depth (meters)	7.3-16.5		21.9-109.7		5.5-7.3		5.5-7.3		5.5-7.3		5.5-7.3	
No. nets set/night	4		2-4		1		1		1		1	
	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)
Atlantic thread herring *Opisthonema oglinum*	99	15.3			3	20.5						
Gulf menhaden *Brevoortia patronus*	63	14.7					3	28.3	203	19.9	422	20.7
Atlantic sharpnose shark *Rhizoprionodon terraenovae*	39	83.4	10	78.2	6	117.8			4	63.0		
Blue runner *Caranx crysos*	27	21.0										
Atlantic bumper *Chloroscombrus chrysurus*	25	21.9			42	19.2			1	23.0		
Sand seatrout *Cynoscion arenarius*	24	22.2			4	36.9						
Scaled sardine *Harengula pensacolae*	24	14.7			30	16.7	17	18.0				
Spanish mackerel *Scomberomorus maculatus*	15	37.5			66	43.7	36	53.6	4	47.7		
Bluefish *Pomatomus saltatrix*	10	24.8			3	47.9	2	45.0	22	33.0		
Greater amberjack *Seriola dumerili*	9	27.5										

Table 26. (Continued)

Areas	1		2-6		7		7		7		7	
Dates	June 12-13		Sept 19-27		Oct 7-8		Oct 20-21		Nov 6-7		Dec 9-10	
Depth (meters)	7.3-16.5		21.9-109.7		5.5-7.3		5.5-7.3		5.5-7.3		5.5-7.3	
No. nets set/night	4		2-4		1		1		1		1	
	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)
Leatherjacket *Oligoplites saurus*	3	19.7										
Atlantic threadfin *Polydactylus octonemus*	3	16.5										
Houndfish *Tylosurus crocodilus*	3	78.2										
Dolphin *Coryphaena hippurus*	1	29.0										
Ladyfish *Elops saurus*					5	35.0	1	34.5				
Silver perch *Bairdiella chrysura*					4	17.2						
King mackerel *Scomberomorus cavalla*					3	41.3						
Finescale menhaden *Brevoortia gunteri*					1	18.0						
Gafftopsail catfish *Bagre marinus*							14	58.1	2	32.5		
Spinner shark *Carcharhinus maculipinnis*							5	131.6	2	87.0		

Table 26 , (Continued)

Areas	1		2-6		7		7		7		7	
Dates	June 12-13		Sept 19-27		Oct 7-8		Oct 20-21		Nov 6-7		Dec 9-10	
Depth (meters)	7.3-16.5		21.9-109.7		5.5-7.3		5.5-7.3		5.5-7.3		5.5-7.3	
No. nets set/night	4		2-4		1		1		1		1	
	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)	No.	Mean length (cm)
Scalloped hammerhead <u>Sphyrna lewini</u>							1	188.0				
Spot <u>Leiostomus xanthurus</u>									1	17.0		
Little tunny <u>Euthynnus alletteratus</u>			2	54.0					1	66.0		
Atlantic croaker <u>Micropogon undulatus</u>									3	28.3		
Skipjack herring <u>Alosa chrysochloris</u>											1	34.0
Blackfin tuna <u>Thunnus atlanticus</u>			1	32.5								
TOTAL	345		13		167		79		243		423	

Table 27. Lengths of individuals of each species caught in relation to stretched mesh size and date caught.

Species	Mesh size (cm)	Date	Lengths (cm)
Atlantic thread herring	5.1	Jun 12-13	16.0, 15.5, 15.0, 17.5, 16.5, 17.0, 16.0, 17.0, 16.0, 16.0, 14.5, 16.0, 17.0, 18.0, 16.5, 18.0, 15.0, 15.0, 15.0, 15.5, 16.0, 15.5, 18.0, 15.0, 15.5, 16.5, 15.0, 15.0, 16.5, 14.0, 16.0, 17.5, 16.5, 16.0, 16.0, 16.5, 15.0, 16.0, 17.5, 17.0, 16.0, 16.0, 17.0, 16.5, 17.0, 18.0, 16.0, 15.5, 16.5, 16.0, 15.0, 18.0, 15.0, 17.0, 14.5, 17.0, 18.5,
	5.1	Jun 12-13	16.5, 15.0, 14.5, 16.0, 17.0, 16.0, 15.0, 15.0, 15.5, 14.5, 15.0, 14.0, 17.0, 16.5, 15.5, 15.0, 14.0, 15.5, 16.0, 15.0, 16.5, 13.5, 15.0
		Oct 7-8	20.0
	6.3	Jun 12-13	18.0, 18.5, 18.5, 17.5, 18.0
		Oct 7-8	21.5, 20.0
Gulf menhaden	5.1	Jun 12-13	15.0, 14.0, 13.5, 15.0, 14.5, 14.0 14.5, 14.5, 14.5, 14.0, 15.0, 14.0, 14.0, 15.0, 14.5, 14.5, 13.5, 15.0, 14.5, 15.5, 14.5, 15.2
		Nov 6-7	15.0, 15.0, 15.0, 15.0, 15.0, 14.0
		Dec 8-9	13.0, 13.0, 13.0, 13.0, 13.0, 13.0, 14.0, 14.0, 14.0, 14.0, 14.0, 14.0, 14.0, 14.0, 14.0, 15.0, 16.0, 17.0, 17.0, 17.0, 17.0, 17.0, 17.0, 17.0, 17.0, 18.0, 18.0, 18.0, 18.0, 18.0, 19.0, 19.0, 19.0, 19.0, 19.0, 19.0, 20.0, 20.0

Table 27. (Continued)

Species	Mesh size (cm)	Date	Lengths (cm)
Gulf menhaden	6.3	Jun 12-13	15.5, 14.5, 15.0, 14.5, 15.0
		Oct 20-21	30.0
		Nov 6-7	20.0, 19.0, 18.0, 18.0, 18.0, 18.0, 18.0, 18.0, 18.0, 18.0, 18.0, 18.0, 21.0, 22.0, 22.0, 22.0, 22.0, 23.0, 23.0, 25.0, 27.0, 17.0
		Dec 8-9	13.0, 14.0, 15.0, 15.0, 16.0, 17.0, 17.0, 17.0, 17.0, 17.0, 17.0, 18.0, 19.0,

Table 27. (Continued)

Species	Mesh size (cm)	Date	Lengths (cm)
Gulf menhaden	6.3	Dec 8-9	19.0, 20.0, 21.0, 21.0, 21.0, 21.0, 21.0, 21.0, 21.0, 24.0, 25.0
	7.6	Oct 20-21	27.5, 28.0
		Nov 6-7	19.0, 23.0, 25.0, 20.0, 24.0, 26.0, 20.0, 24.0, 26.0, 20.0, 25.0, 27.0, 21.0, 25.0, 29.0, 22.0, 25.0, 23.0, 25.0
		Dec 8-9	23.0, 23.0, 23.0, 23.0, 24.0, 24.0, 24.0, 24.0, 24.0, 25.0, 26.0, 26.0, 26.0, 26.0, 26.0
	8.9	Nov 6-7	25.0, 26.0, 28.0, 29.0, 30.0, 31.0
		Dec 8-9	17.0, 20.0, 25.0, 25.0, 27.0, 28.0, 28.0, 28.0, 29.0, 29.0, 29.0, 30.0, 30.0, 31.0, 31.0, 31.0, 31.0, 32.0, 33.0, 3310, 34.0

Table 27 . (Continued)

Species	Mesh size (cm)	Date	Lengths (cm)
Gulf menhaden	10.2	Jun 12-13	16.0
		Nov 6-7	33.0, 31.0, 32.0, 33.0
		Dec 8-9	18.0, 30.0, 30.0, 30.0, 31.0, 31.0, 31.0, 31.0, 31.0, 31.0, 31.0, 31.0, 32.0, 32.0, 32.0, 32.0, 32.0, 32.0, 32.0, 32.0, 32.0, 33.0, 33.0, 33.0, 33.0, 33.0, 33.0, 34.0, 34.0, 34.0, 34.0, 35.0, 35.0, 35.0, 31.0, 32.0, 32.0, 32.0, 32.0, 32.0, 33.0, 33.0, 33.0, 33.0, 33.0, 33.0, 34.0, 34.0, 34.0, 34.0, 34.0,
Atlantic sharpnose shark	5.1	Jun 12-13	37.0, 37.5, 89.0
		Sep 19-27	70.0
	6.3	Oct 7-8	119.0, 108.0
		Nov 6-7	56.0
	7.6	Jun 12-13	97.0, 95.0, 98.5
		Sep 19-27	80.5, 99.0
		Oct 7-8	50.0, 44.0
		Nov 6-7	84.0
	8.9	Jun 12-13	89.0, 99.0, 103.0, 89.0, 99.0, 94.0
		Sep 19-27	77.0, 80.5
		Nov 6-7	48.0
	10.2	Jun 12-13	98.0, 74.0, 103.0, 90.0, 86.0, 105.0, 102.0, 97.5, 99.0, 89.0, 101.0, 102.0, 90.5, 98.0, 94.0, 94.5, 97.5, 89.5, 95.0, 91.0, 96.0, 97.0, 95.0, 89.5, 98.0, 95.0, 98.0
		Sep 19-27	78.5, 70.5, 72.5, 73.0, 83.0
		Oct 7-8	108.5, 74.0
		Nov 6-7	69.0

Table 27. (Continued)

Species	Mesh size (cm)	Date	Lengths (cm)
Blue runner	6.3	Jun 12-13	22.5
Atlantic bumper	5.1	Jun 12-13	17.5, 15.5, 15.0, 15.0, 15.8
		Oct 7-8	16.0, 17.0, 17.0, 17.0, 17.5, 17.5, 17.5, 17.5, 17.5, 17.5, 18.0, 18.0, 18.0, 18.0, 18.0, 18.0, 18.5, 20.0, 20.5, 21.5, 21.5
	6.3	Jun 12-13	16.0, 15.5, 17.5, 19.5, 17.0, 16.0, 16.0, 15.0, 15.5, 17.0, 17.5, 16.5, 16.0, 14.5, 15.5, 16.0,
		Oct 7-8	17.5, 17.5, 17.5, 18.5, 18.5, 18.5, 18.5, 19.0, 19.0, 19.5, 19.5, 19.5, 20.5, 20.5, 20.5, 21.5, 21.5, 21.5, 22.0, 23.0
		Nov 6-7	23.0
	7.6	Oct 7-8	22.0, 24.5
Sand seatrout	5.1	Jun 12-13	22.5, 23.0, 22.5, 22.5, 22.0, 21.5, 22.0, 21.5, 22.0, 23.0, 21.6, 23.0, 21.5, 22.0, 23.0, 22.0, 24.0, 21.5
		Oct 7-8	22.0, 23.0
	6.3	Jun 12-13	20.0, 13.0, 14.5, 16.0
		Oct 7-8	33.0
	11.4	Oct 7-8	23.0
Scaled sardine	5.1	Jun 12-13	15.0, 15.0, 14.5, 14.5, 14.5, 14.5, 14.5, 15.0, 15.0, 15.5, 14.0, 14.5, 13.0, 15.5, 15.5, 15.0, 14.5
		Oct 7-8	16.5, 16.5, 17.0, 17.0, 17.5, 16.5, 16.5, 17.0, 17.0, 17.5, 16.5, 16.5, 17.0, 17.0, 18.5, 16.5, 15.5, 17.0, 17.0, 18.0, 15.5, 17.0, 16.0, 16.5, 15.5, 17.0, 16.0, 16.5, 15.5, 17.0
		Oct 20-21	18.0, 17.0, 17.5, 16.5, 18.5, 16.0, 16.5, 16.0, 17.0, 14.5, 18.0, 16.0, 16.0

Table 27 (Continued)

Species	Mesh size (cm)	Date	Lengths (cm)
Scaled sardine	6.3	Oct 20-21	17.5, 18.0, 17.0, 19.5
	8.9	Jun 12-13	14.0, 15.0, 15.0, 14.5
Spanish mackerel	5.1	Jun 12-13	32.5
		Oct 7-8	34.0, 34.0, 34.5
		Nov 6-7	44.0
	6.3	Jun 12-13	43.0, 31.5
		Oct 7-8	32.5, 45.0, 42.5, 32.5, 37.0, 45.5 34.0, 37.5, 45.5, 34.5, 37.0, 36.0, 37.0, 45.0, 37.5, 45.0, 44.0
		Oct 20-21	39.5, 45.0, 45.0, 40.5, 54.5, 58.0, 43.0
		Nov 6-7	44.0
	7.6	Oct 7-8	38.0, 43.0, 46.0, 53.5, 37.5, 43.0, 47.5, 57.0, 39.5, 43.0, 46.5, 39.5, 44.5, 48.0, 41.0, 45.0, 49.0, 42.0, 46.0, 50.0
		Oct 20-21	49.0, 43.5, 45.0, 54.0, 41.0, 43.0, 42.5, 37.0, 53.0, 34.5, 50.0, 45.0, 48.5, 46.0
		Nov 6-7	49.0
	8.9	Jun 12-13	35.0, 35.0, 36.5, 37.0, 49.0, 35.0, 41.0
		Oct 7-8	42.0, 49.5, 57.5, 42.0, 49.5, 58.5, 45.5, 49.5, 60.0, 46.0, 49.5, 65.0, 47.0, 50.0, 47.0, 51.0
		Oct 20-21	45.0, 42.0, 50.5, 53.5, 51.0, 43.0, 46.5, 50.0
	10.2	Oct 7-8	48.5, 53.0, 33.0, 40.5, 56.5
		Oct 20-21	50.0, 44.0, 56.0, 52.5
		Nov 6-7	54.0

Table 27. (Continued)

Species	Mesh size (cm)	Date	Lengths (cm)
Bluefish	5.1	Jun 12-13	20.0, 24.0, 21.5, 22.0, 22.5, 24.0
	6.3	Jun 12-13	19.5, 33.0, 26.0
		Nov 6-7	29.0, 31.0, 34.0, 30.0, 32.0, 34.0, 30.0, 32.0, 35.0, 31.0, 33.0, 35.0, 31.0, 33.0, 37.0, 31.0, 34.0, 31.0, 34.0
	7.6	Oct 7-8	39.5, 42.0
		Nov 6-7	31.0, 34.0, 44.0
	8.9	Jun 12-13	35.5
		Oct 7-8	42.5
		Oct 20-21	43.0, 47.0
Greater amberjack	5.1	Jun 12-13	16.0
	10.2	Jun 12-13	31.0, 27.0, 31.5, 29.5, 30.0
Leatherjacket	5.1	Jun 12-13	18.0, 19.5
	6.3	Jun 12-13	21.5
Houndfish	6.3	Jun 12-13	85.0, 77.0, 72.5
Dolphin	6.3	Jun 12-13	29.0
Ladyfish	5.1	Oct 7-8	30.0, 31.0, 31.5, 32.5
	10.2	Oct 7-8	50.0
Silver perch	5.1	Oct 7-8	18.0, 17.0, 17.0, 18.0
King mackerel	5.1	Oct 7-8	37.0
	7.6	Oct 7-8	49.0, 38.0
Finescale menhaden	5.1	Oct 7-8	18.0
Gafftopsail catfish	7.6	Nov 6-7	33.0, 32.0
	8.9	Oct 20-21	44.5, 47.0, 37.0, 46.5, 44.5, 46.0
	10.2	Oct 20-21	39.5, 44.0, 46.0, 49.5, 44.0, 44.0, 43.0, 44.5

Table 27. (Continued)

Species	Mesh size (cm)	Date	Lengths (cm)
Spinner shark	7.6	Oct 20-21	104.0
		Nov 6-7	97.0
	8.9	Oct 20-21	137.0, 137.5
	10.2	Oct 20-21	140.0, 139.5
		Nov 6-7	75.0
Scalloped hammerhead	7.6	Oct 20-21	188.0
Spot	5.1	Nov 6-7	17.0
Little tunny	5.1	Sep 19-27	56.5, 51.5
	8.9	Nov 6-7	66.0
Atlantic croaker	8.9	Nov 6-7	27.0, 27.0, 31.0
Skipjack herring	5.1	Oct 20-21	34.5
	7.6	Dec 8-9	34.0
Blackfin tunny	5.1	Sep 19-27	32.5

on four net-nights of fishing. A total of 345 individuals consisting of 14 species were caught during the night of June 12-13 in water depths ranging from 7 to 16 m. This catch was composed mostly of pelagic fishes that are not caught efficiently by trawling. Much more data would have have obtained during June from the platform area, but severe wind and wave conditions prevented the fishing or recovery of the gill nets.

3. The gill nets were also effective in capturing pelagic fishes along the beach and adjacent to the OCS lease area. During the autumn catch per net night ranged from 2 to 11 species and from 79 to 423 individuals.

D. ICHTHYOFAUNA OF THE 7-110 METER BATHYMETRIC CONTOURS[1/]

INTRODUCTION

The continental shelf of the northwestern Gulf of Mexico (Gulf) supports a large and diverse ichthyofauna. Much work has been published on fishes inhabiting the northwestern Gulf including Gunter (1938, 1941, 1945, 1958), Baughman (1950a, b), Hildebrand (1954), Springer and Bullis (1956), Hoese (1958), McFarland (1963), Copeland (1964), Miller (1965), Bullis and Carpenter (1968), Hoese et al. (1968), Moore, Brusher and Trent (1970), and Bright and Cashman (1974), among others. Despite these studies, the composition of the fish communities and the life histories and population dynamics of even the most common fishes are poorly known except in general terms. This is especially true for fishes that typically inhabit water deeper than about 27 m, a depth which approximately represents the transition between two dominant and distinct fish communities in the northern Gulf (Hildebrand, 1954; Chittenden and McEachran, 1975a, b, c, d, unpublished MS). These communities are an inshore (0-27 m) white shrimp grounds fauna and an offshore (29-90 m) brown shrimp grounds fauna.

The general lack of knowledge on Gulf fishes is unfortunate. Because of the energy crisis, extensive oil resource development is occurring on the continental shelf, and several superports, including one off Texas, are projected. Informed assessment of the potential impact of these developments is difficult, however, because published knowledge on Gulf fishes is inadequate.

Graphically, the most comprehensive survey of fishery resources in the northwestern Gulf was undertaken off Texas and Louisiana by personnel of the U.S. Bureau of Commercial Fisheries (now the National Marine Fisheries Service) during the years 1962-1964. Moore et al. (1970) described the distribution of fish biomass based upon those studies, and they reported certain data on the composition of the fish catch. The present report summarizes the composition of the fish fauna in much greater detail than Moore et al. were able to do. Emphasis herein is placed on the fauna of the South Texas Outer Continental Shelf Study Area (hereinafter referred to as Study Area). An exception to this statement is the fish fauna inhabiting the 110-m bathymetric contour. For reasons which follow, all available data on that fauna were analyzed.

The fish fauna found deeper than about 90 m has not been described. The only published work on these deeper waters includes Springer and Bullis (1956), Nelson and Carpenter (1968), Moore et al. (1970) and Bright and Cashman (1974). The work by Springer and Bullis (1956), although valuable, is essentially a qualitative compendium of raw data. Nelson and Carpenter (1968) dealt only with some fishes captured by handlining along the outer edge of the continental shelf. Bright and Cashman (1974) described the fauna of broken relief areas, but this differs from the demersal fauna of the surrounding soft bottom areas. Virtually the only usable information extant describing the soft-bottom demersal fish fauna of the continental shelf deeper than 90 m is that of Moore et al. (1970). However, Moore et al. reported only a few of the most common fishes there. All available data from the Mississippi River delta to the Rio Grande were analyzed in the present report to describe the fish fauna found at 110 m. Analyzed in this fashion, the limited data available to describe this fauna in the Study Area receive additional support and corroboration.

[1/] All tables identified with an asterisk (*) in this section of the report are found in Appendix D.

MATERIALS AND METHODS

Sampling stations, sampling procedures in the field and methods of processing the catch are described in detail by Moore et al. (1970). Briefly, samples were taken monthly from January 1962 through December 1964 from the Mississippi River delta to the Rio Grande (Figure 20) using a 14-m wide flat trawl equipped with rollers. The nets had a 6-cm stretched mesh and were towed at a speed of about 3.0 knots. Tows were about 1 hour in duration and were made during day or night, depending upon when the vessel arrived on station. Each catch was emptied on deck and a subsample of 1.8 kg in 1962 or 3.5 kg thereafter was taken to determine the average weight and relative abundance of each species. These subsamples were preserved in formalin or by freezing and were taken to the laboratory for processing. Fish were usually identified to species. Each species in a subsample was counted and total weights were recorded to the nearest 5 grams (g)..

Original data sheets describing the numbers and weights of each individual species in each subsample and the total numbers and weights in each subsample were made available by the Natonal Marine Fisheries Service. Species identifications on the original data sheets were updated to correspond with subsequent changes in nomenclature and generally follow Baily et al. (1970).

Available information (Moore et al., 1970; Chittenden and McEachran, unpublished MS) indicated that the fauna could be adequately described by analysis of data on a relatively limited number of species that comprised most (98-99%) of the fauna. This approach was taken with data collected in the 7-82 m bathymetric contour to reduce the enormous mass of numbers to a manageable quantity of raw data. For each tow in that depth range, the numbers and weights in the subsamples of 40 species of fishes were tabulated and keypunched on IBM cards for summarization. These 40 species of fishes (see Table 28 for a listing of the species) included all those that Moore et al. (1970) and Chittenden and McEachran (unpublished MS) found abundant. Final summarization of these data (Tables 28, 1*-11*) includes relative biomass and relative abundance expressed as the mean percentages that each of the 40 species comprised of the total weight and total numbers, respectively. Percentages were calculated for each subsample by dividing the total number of individuals of all species and the total weight of individuals of all species into the number of individuals of a given species and the weight of individuals of a given species, respectively. Arithmetic mean percentages were then calculated.

Analyses of data describing the fish fauna found along the 110-m contour (Tables 33, 12*, 13*) were based on every species collected and all available data. This approach was taken because the fauna had not previously been described, and no guidelines existed to simplify data analyses. Using this approach, data from the Study Area were supported and corroborated by data from outside the Study Area. The weights and numbers of each species in the subsamples collected at 110 m were pooled over time and totaled for each station and were then combined into the following categories: 1) within the Study Area (stations W-7, W-18, W-19, W-30); 2) outside the Study Area (stations W-6, E-6, E-7, E-18, E-19, E-30); and 3) overall pooled data based upon all stations occupied at the 110-m depth. Final summarization of the data in each of these three categories (Table 33, 12*, 13*) includes relative biomass and relative abundance expressed as the percentages that each taxon comprised of the total weight and total numbers, respectively.

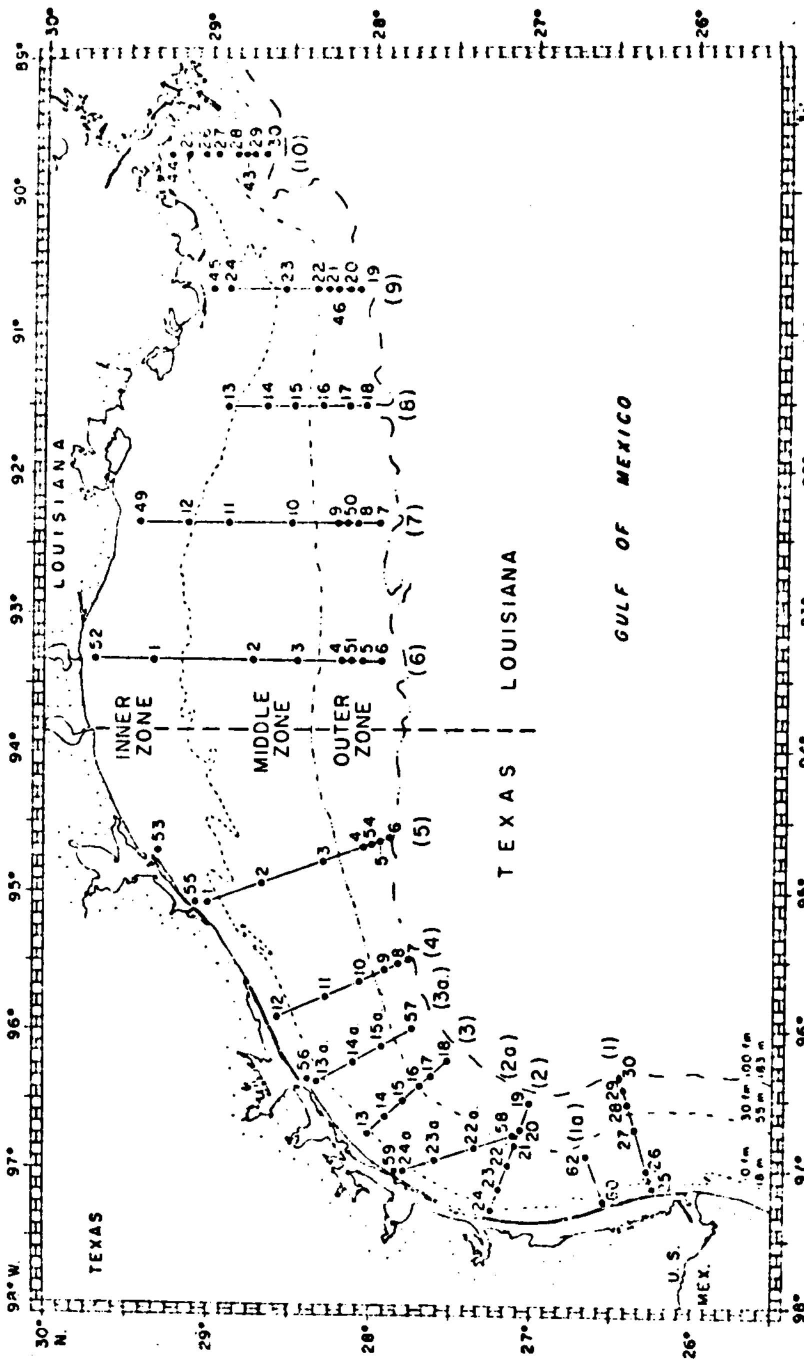

Figure 20. Locations of stations at which samples were taken during at least 1 year, 1962-64 (transect numbers in parentheses).

Table 28. Overall composition of the fish fauna, 7-82 meters, by percentage weight (gms) and percentage number

Taxon	Weight (gms)	% by Weight (gm)	Number	% by Number
Clupeidae - Herrings				
Opisthonema oglinum	0.49	0.02	0.01	0.02
Synodontidae - Lizardfishes				
Saurida brasiliensis	1.05	0.04	0.17	0.19
Synodus foetens (Inshore l.)	193.08	9.82	1.99	4.66
S. poeyi	0.26	0.01	0.03	0.03
Arridae - Sea catfishes				
Arius felis (Sea c.)	35.28	1.61	0.64	0.97
Batachoididae - Toadfishes				
Porichthys porosissimus	5.84	0.36	0.20	0.42
Ogcocephalidae - Batfishes				
Halieutichthys aculeatus	2.63	0.14	0.36	0.72
Ophidiidae - Cusk-eels and brotulas				
Lepophidium sp.	5.12	0.27	0.12	0.29
Serranidae - Sea basses				
Centropristis philadelphica (Rock s.b.)	77.79	4.01	1.38	2.96
Serranus atrobranchus (Blackear bass)	33.12	1.80	2.16	4.49
Carangidae - Jacks and pompanos				
Chloroscombrus chrysurus (Atlantic bumper)	12.33	0.69	0.57	0.99
Trachurus lathami (Rough scad)	9.46	0.61	0.43	0.96
Vomer setapinnis (Atlantic moon fish)	15.52	0.81	0.52	0.89
Lutjanidae - Snappers				
Lutjanus campechanus	13.60	0.65	0.26	0.59
Pristipomoides aquilonaris (Wenchman)	75.97	4.21	0.85	2.64
Pomadasyidae - Grunts				
Orthopristis chrysoptera (Pigfish)	13.57	0.71	0.39	0.61
Sparidae - Porgies				
Lagodon rhomboides (Pinfish)	25.92	1.40	0.81	1.49
Stenotomus caprinus (Longspine porgy)	248.21	12.24	7.05	15.72
Sciaenidae - Drums				
Cynoscion arenarius (Sand seatrout)	103.79	5.26	2.28	3.65
C. nothus (Silver seatrout)	112.96	5.99	6.14	7.28
Larimus faciatus	5.75	0.29	0.23	0.30

Table 28. (Continued)

Taxon	Weight (gms)	% by Weight (gms)	Number	% by Number
Sciaenidae (Continued)				
Leiostomus xanthurus (Spot)	56.75	2.51	1.21	1.67
Menticirrhus americanus (Southern kingfish)	88.39	4.42	1.66	2.21
Micropogon undulatus (Atlantic croaker)	130.47	6.14	3.41	5.49
Stellifer lanceolatus (Star d.)	25.87	1.50	2.46	2.45
Mullidae - Goatfishes				
Mullus auratus (Red g.)	18.24	0.96	0.36	0.92
Upeneus parvus (Dwarg g.)	17.35	0.91	0.56	1.36
Polynemidae - Threadfins				
Polydactylus octonemus	9.19	0.38	0.18	0.30
Trichiuridae - Cutlassfishes)				
Trichiurus lepturus (Atlantic c.)	26.07	1.23	0.95	1.24
Stromateidae - Butterfishes				
Peprilus burti (Gulf b.)	53.25	2.88	1.91	3.11
P. paru	6.37	0.29	0.22	0.29
Scorpaenidae - Scorpion fishes				
Scorpaena calcarata	2.31	0.16	0.07	0.18
Triglidae - Searobins				
Bellator militaris (Horned s.)	2.99	0.16	0.19	0.44
Prionotus paralatus (Mexican s.)	54.13	3.02	1.71	4.59
P. rubio (Blackfin s.)	23.46	1.28	0.64	1.48
P. stearnsi (Shortwing s.)	5.87	0.31	0.63	1.20
Bothidae - Lefteye flounders				
Cyclopsetta chittendeni (Mexican f.)	18.26	0.99	0.59	0.99
Engyophrys senta	0.01	0.00	0.00	0.00
Syacium gunteri (Shoal f.)	103.54	5.50	5.51	8.48

RESULTS

Analyses of the data describing the ichthyofauna is herein presented in two sections: 1) an analysis of the composition of the fish fauna inhabiting the 7-82 m bathymetric contour of the Gulf in the south Texas Study Area, and 2) an analysis of the composition of the fish fauna inhabiting the 110-m bathymetric contour of the Gulf from the Mississippi River delta to the Rio Grande.

1. Ichthyofauna of the 7-82 Meter Bathymetric Contour

Data presented in this section are based on a total of about 24,000 fish captured in 425 tows. The number of fish in a subsample ranged from a minimum of 12 fish to a maximum of 289. The average number was 56 fish, so that small sampling biases due to non-random sampling from the main catch could cause large errors in the percentage compositions and species numbers.

Composition of the Fauna:

The most abundant species overall in the Study Area by number (Table 28) included *Stenotomus caprinus* (16%), *Syacium gunteri* (8%), *Cynoscion nothus* (7%), and *Micropogon undulatus* (6%). By weight (Table 28) the most abundant species were *Stenotomus caprinus* (12%), *Synodus foetens* (10%), *Micropogon undulatus* (6%), *Cynoscion nothus* (6%), *Syacium gunteri* (6%) and *Cynoscion arenarius* (5%). These fishes have repeatedly been listed among the most common species in the northwestern Gulf (Hildebrand, 1954; Chittenden and McEachran, unpublished MS).

Seasonal Composition:

A tabulated summarization of the composition of the dominant fish fauna by number and weight follows according to season. Seasons are defined as 1) winter--January, February, March, 2) spring--April, May, June, 3) summer--July, August, September, and 4) fall--October, November, December (Table 29).

Composition by Depth:

The overall composition of the demersal ichthyofauna in the Study Area drastically changed with depth. The pattern of change with depth was similar to that described for the northwestern Gulf by Hildebrand (1954) and Chittenden and McEachran (unpublished MS). These authors described an inshore (0-27 m) white shrimp grounds community and an offshore (27-90 m) brown shrimp grounds community. Analyses presented later in this report establish that the fish fauna typical of the brown shrimp grounds community extends to a depth range of at least 110 m.

The inshore white shrimp grounds fish community was dominated by species of the Family Sciaenidae including: *Cynoscion arenarius*, *Cynoscion nothus*, *Menticirrhus americanus*, *Micropogon undulatus* and *Stellifer lanceolatus*. The ofshore brown shrimp grounds fish community was dominated by the Family Sparidae as represented by *Stenotomus caprinus*. Other important fishes typical of the brown shrimp grounds included *Syacium gunteri*, *Serranus atrobranchus*, *Synodus foetens*, *Centropristis philadelphica*, *Prionotus paralatus*, *Upeneus parvus* and *Pristipomoides aquilonaris*. These two faunas overlapped in a depth range of about 18-36 m as Chittenden and McEachran (unpublished MS) reported.

A tabulated description of the overall composition of the dominant fish fauna by number and weight follows according to bathymetric contours (Table 30).

Table 29. Composition of the dominant fish fauna by number and weight according to season.

Species	Winter	Spring	Summer	Fall
	Number (%) per Season			
Inshore lizardfish	--	6	5	--
Blackear bass	--	--	6	--
Longspine porgy	16	13	17	17
Sand seatrout	8	--	--	--
Silver seatrout	9	10	--	8
Atlantic croaker	--	--	10	6
Star drum	5	--	--	--
Mexican searobin	5	--	5	--
Shoal flounder	9	8	6	11
	Weight (%) per Season			
Inshore lizardfish	8	13	11	8
Rock sea bass	--	5	--	--
Longspine porgy	14	11	12	13
Sand seatrout	9	--	--	6
Silver seatrout	5	9	--	7
Southern kingfish	9	--	--	--
Atlantic croaker	--	--	10	8
Shoal flounder	5	6	--	6

Table 30. Composition of the dominant fish fauna by number and weight according to bathymetric contours (meters).

Species	Number (%) per Depth (meters)						
	7	14	27	46	64	73	82
Inshore lizardfish			5	7	9	9	6
Sea catfish	6						
Rock sea bass					5		
Blackear bass				9		7	5
Wenchman							7
Pinfish	5						
Longspine porgy			10	22	34	38	28
Sand seatrout		6	6				
Silver seatrout	15	18	10				
Spot	6						
Southern kingfish	8	6					
Atlantic croaker	12	13					
Star drum	7	8					
Dwarf goatfish						6	
Mexican searobin					10	6	13
Shoal flounder		7	28	8			
	Weight (%) per Depth (meters)						
Inshore lizardfish				17	17	18	14
Sea catfish	7						
Rock sea bass				7	7	8	7
Wenchman							12
Longspine porgy			6	17	30	35	23
Sand seatrout		6		6			
Silver seatrout	10	12					
Spot	8						
Southern kingfish	14	13					
Atlantic croaker	10	13	6	5			
Star drum		6					
Mexican searobin					6		9
Shoal flounder			10				

Composition by Depth by Season:

The most important changes in species composition, in general, were related to depth as previously noted. A tabulation of the dominant seasonal faunal composition at each bathymetric contour follows. The basic data that this summarization is based upon are contained in a large series of tables which are filed at the Gulf Fisheries Center and are available upon request (Table 31 and 32).

2. Fish Fauna Inhabiting the 110-m Bathymetric Contour of the Gulf From the Mississippi River Delta to the Rio Grande

Data presented in this section are based upon a total of 3,662 fishes collected in 109 tows, so that the average subsample included about 34 fish. Therefore, small sampling biases due to non-random sampling from the main catch could easily cause large errors in the percentage compositions and species numbers. However, the compositions reported herein do seem to agree closely with findings of other workers.

Species Richness:

A diverse ichthyofauna occurs at depths of 110 m, but species richness apparently decreased off south Texas. Overall, at least 69 species representing 31 families were identified (Table 33). Unidentified fishes comprised 3.4% and 2.7% of the overall total biomass and numbers, respectively. Within the Study Area, only 45 species representing 23 families were identified (Table 12*) in contrast to 64 species representing 30 families outside the Study Area (Table 13*). Species richness was apparently reduced off south Texas despite the fact that only 1% and 1.7% of the total biomass and numbers, respectively, were unidentified within the Study Area in contrast to 4.3% and 3.0% of the total biomass and numbers, respectively, unidentified outside the Study Area.

Composition of the Fauna:

Overall (Table 34), 15 families comprised about 97% of the biomass and 95% of the numbers of fishes. The Sparidae (25%), Lutjanidae (20%), Triglidae (13%), Synodontidae (8%), and Serranidae (7%) comprised about 73% of the biomass. The Sparidae (30%), Triglidae (18%), Lutjanidae (12%), Serranidae (11%) and Bothidae (5%) represented about 77% of the numbers of fishes. Percentage compositions were very similar for both biomass and numbers. Stenotomus caprinus, the dominant species, made up about 25-30% of the catch by biomass or numbers and was followed in importance by Pristipomoides aquilonaris (12-20%) and Prionotus paralatus (8-12%) (Table 35). Only Synodus foetens and Serranus atrobranchus also made up 5% or more of the catch by biomass or numbers. A rich variety of less important families comprised 1% or more of the catch by biomass or numbers including the Ogcocephalidae, Gadidae, Macrouridae, Carangidae, Mullidae, Labridae, Stromateidae, and Scorpaenidae. Species in this latter category included Halieutichthys aculeatus, Urophysis floridanus, Nezumia bairdi, Centropristes philadelphica, Trachurus lathami, Cynoscion arenarius, Mullus auratus, Upeneus parvus, Hemipteronotus novacula, Peprilus burti, Prionotus rubio, Prionotus stearnsi and Trichopsetta ventralis.

Within the Study Area (Table 12*), 14 familes made up about 97% of the biomass and 96% of the numbers of fishes. The Lutjanidae (34%), Triglidae (14%), Sparidae (11%), Serranidae (9%), Synodontidae (6%), Sciaenidae (5%), Bothidae (5%), and Gadidae (5%) comprised about 89% of the biomass. The Lutjanidae (20%), Triglidae

Table 31. Overall composition of the dominant fish fauna by percent number, 7-82 meters, by depth, and season; winter (W) - January, February, March; spring (S) - April, May, June; summer (Su) - July, August, September; fall (F) - October, November, December.

Number (%) by Depth (meters) by Seasons

	7				14				27				46				64				73				82			
Species	W	S	Su	F	W	S	Su	F	W	S	Su	F	W	S	Su	F	W	S	Su	F	W	S	Su	F	W	S	Su	F
Inshore lizardfish										8	8			10	8	6	9	6	11	9	30	8	9		5	6	7	6
Sea catfish		5	6	8																								
Rock sea bass													6	6			8			6			8			5		6
Blackear bass													7	10	11	8						10	9	6			8	
Atlantic bumper		7		5																						6		
Rough scad															5													
Wenchman																									18	6		6
Pigfish				6																								
Pinfish		7													6													
Longspine porgy							6	8		7	21	9	42	18	16	20	30	41	34	33	56	34	33	39	24	22	26	37
Sand seatrout					14			7	14		9	10	9			9	7											
Silver seatrout	24	20		15	17	32	9	15	11	11		13																
Spot	6		11																									
Southern kingfish	20	6		7	10			9																				
Atlantic croaker		29	21				39	8				9				8												
Star drum	17			9	16			8																				
Red goatfish																			7					5				
Dwarf goatfish																							6	8			8	5
Gulf butterfish				10						6	7	5		9												11		
Horned searobin																				5								
Mexican searobin													6		5		12	13	7	10		7		6	9	7	18	12
Blackfin searobin																		5							8			
Shortwing searobin														6								6						
Shoal flounder						9	6	12	38	24	15	33	9	7	7	10												

Table 32. Overall composition of the dominant fish fauna by percent weight for 7-82 meters depth and seasons; winter (W) - January, February, March; spring (S) - April, May, June; summer (Su) - July, August, September; fall (F) - October, November, December.

	Weight (%) by Depth (meters) by Season																											
	7				14				27				46				64				73				82			
Species	W	S	Su	F	W	S	Su	F	W	S	Su	F	W	S	Su	F	W	S	Su	F	W	S	Su	F	W	S	Su	F
Inshore lizardfish									12	14	10	5	9	27	18	13	17	10	18	20	38	22	15	11	14	14	15	13
Sea catfish		7	7	10																								
Rock sea bass										6			9	8	6		7	8		12		8	11	7		7	8	9
Blackear bass														5	6													
Atlantic bumper																										6		
Wenchman																							6			12	9	9
Pigfish				7																								
Pinfish		6													7													
Longspine porgy								6			9	6	37	15	11	13	30	39	29	45	50	31	27	37	10	16	22	33
Sand seatrout					11			7	14		9	10	9			9	7											
Silver seatrout	9	17		10	9	27	8	7	13	13	5	14				6												
Spot	7	10	12		6											6												
Southern kingfish	37	11		11	20	7		18																				
Atlantic croaker		16	17	6			36	12			7	15				12												
Star drum	8			5	9																							
Red goatfish																			7					6				
Dwarf goatfish																											6	
Atlantic cutlassfish										5																		
Gulf butterfish				8						5	7			8												11		
Mexican searobins																	6	9	5	6							14	8
Blackfin searobins																		6										
Mexican flounder																							8					
Shoal flounder						6		7	24	20	13	21																

Table 33. Composition of the fish fauna collected at a depth of 110 m based on all stations

Taxon	Weight (gms)	% by Weight (gms)	Number	%by Number
Rajidae - Skates	555	.29	4	.11
Raja laevis	55	.03	1	.03
Raja olseni	155	.08	1	.03
Raja texana	345	.18	2	.05
Congridae - Conger eels	83	.04	5	.14
Neoconger mucronatus	16	.01	1	.03
Neoconger sp.	67	.03	3	.08
Uroconger syringinus	0	0	1	.03
Synodontidae - Lizardfishes	16,420	8.37	105	2.87
Synodus foetens	16,420	8.37	105	2.87
Ariidae - Sea catfishes	375	.19	3	.08
Arius felis	375	.19	3	.08
Batrachoididae - Toad fishes	282	.14	14	.38
Proichthys porosissimus	282	.14	14	.38
Antennariidae - Frog fishes	82	.94	1	.03
Antennarius radiosus	82	.04	1	.03
Ogcocephalidae - Batfishes	1,442	.73	116	3.17
Halieutichthys aculeatus	655	.33	89	2.43
Ogcocephalus sp.	787	.40	27	.74
Gadidae - Codfishes	5,819	2.96	59	1.61
Urophycis cirratus	1,748	.89	18	.49
U. floridanus	2,769	1.41	28	.76
Urophycis sp.	1,302	.66	13	.36
Ophidiidae - Cusk eels and brotulas	550	.28	9	.25
Lepophidium sp.	550	.28	9	.25
Macrouridae - Grenadiers	557	.28	34	.93
Nezumia bairdi	557	.28	34	.93
Serranidae - Sea basses	113,190	6.74	404	11.03
Centropristis philadelphica	6,878	3.51	83	2.27
Centropristis striata	70	.04	1	.03
Diplectrum bivittatum	6	.01	1	.03
Deplectrum formosum	160	.08	2	.05
Epinephelus flavolimbatus	42	.02	1	.03
Pikea mexicana	168	.09	6	.16
Serranus atrobranchus	5,866	2.99	310	8.46

Table 33. (Continued)

Taxon	Weight (gms)	% by Weight (gms)	Number	% by Number
Priacanthidae - Bigeyes	550	.28	4	.11
Priacanthus arenatus	550	.28	4	.11
Branchiostegidae - Tilefishes	1,699	.87	17	.46
Caulolatilis cyanops	745	.38	6	.16
Caulolatilis sp.	954	.49	11	.30
Carangidae - Jacks and pompanos	3,223	1.64	54	1.48
Chloroscombrus chrysurus	548	.28	7	.19
Trachurus lathami	2,577	1.31	46	1.26
Vomer setapinnis	98	.05	1	.03
Lutjanidae - Snappers	39,007	19.89	437	11.93
Lutjanus campechanus	483	.25	5	.14
Ocyurus chrysurus	94	.05	1	.03
Pristipomoides aquilonaris	38,430	19.59	431	11.76
Sparidae - Porgies	49,340	25.15	1,103	30.11
Stenotomus caprinus	49,340	25.15	1,103	30.11
Pomodasyidae - Grunts	45	.02	1	.03
Orthopristis chrysopterus	45	.02	1	.03
Sciaenidae - Drums	7,841	4.00	64	1.74
Cynoscion arenarius	5,045	2.57	25	.68
Cynoscion nothus	472	.24	3	.08
Equetus acuminatus	251	.13	5	.14
Equetus umbrosus	220	.11	2	.05
Equetus spp.	356	.18	6	.16
Leiostomus xanthurus	268	.14	3	.08
Menticirrhus americanus	250	.13	2	.05
Micropogon undulatus	979	.50	18	.50
Mullidae - Goatfishes	4,055	2.06	106	2.89
Mullus auratus	2,144	1.09	37	1.01
Upeneus parvus	1,911	.97	69	1.88
Labridae - Wrasses	2,182	1.11	18	.49
Hemipteronotus novacula	2,182	1.11	18	.49
Percophididae - Flatheads	58	.03	1	.03
Bembrops gobiodes	58	.03	1	.03
Uranoscopidae - Stargazers	243	.12	4	.11
Katehtostoma albigutta	243	.12	4	.11
Trichiuridae - Cutlassfishes	348	.18	3	.08
Trichiurus lepturus	348	.18	3	.08

Table 33. (Continued)

Taxon	Weight (gms)	% by Weight (gms)	Number	% by Number
Stromateidae - Butterfishes	4,624	2.36	48	1.31
Peprilus alepidotus	1,285	.66	8	.22
Peprilus burti	3,339	1.70	40	1.09
Scorpaenidae - Scorpionfishes	1,946	.99	60	1.64
Scopaena calcarata	347	.18	12	.33
Scorpaena sp.	376	.19	13	.36
Pontinus longispinis	1,178	.60	33	.90
Pontinus sp.	45	.02	2	.05
Triglidae - Searobins	26,369	13.43	671	18.33
Bellator militaris	565	.29	14	.38
Peristedion miniatum	614	.31	19	.52
Peristidion sp.	478	.24	16	.44
Prionotus martis	18	.01	1	.03
Prionotus paralatus	16,082	8.20	434	11.85
Prionotus salmonicolor	24	.01	1	.03
Prionotus rubio	7,816	3.98	120	3.28
Prionotus stearnsi	772	.39	66	1.80
Bothidae - Lefteye flounders	7,922	4.04	201	5.49
Ancylopsetta dilecta	1,566	.80	22	.60
Ancylopsetta quadrocellata	265	.14	2	.05
Cyclopsetta chittendeni	1,767	.90	11	.30
Etropus crossotus	246	.13	9	.25
Syacium gunteri	572	.29	22	.60
Trichopsetta ventralis	3,506	1.77	135	3.69
Soleidae - Soles	56	.03	3	.08
Achirus lineatus	56	.03	3	.08
Cynoglossidae - Tonguefishes	85	.05	4	.11
Symphurus diomedianus	35	.02	1	.03
Symphurus plagiusa	50	.03	3	.08
Balistidae - Triggerfishes and filefishes	109	.06	3	.08
Balistes capriscus	57	.03	1	.03
Monacanthus hispidus	52	.03	2	.05
Tetradontidae - Puffers	547	.28	9	.25
Lagocephalus laevigatus	402	.21	5	.14
Sphoeroides dorsalis	145	.07	4	.11
Unidentified	6,605	3.37	97	2.65
Totals	196,209	100	3,662	100

Table 34. Overall composition of the dominant fish fauna for 110 meter depth by percent (%) number for seasons; winter (W) - January, February, March; Spring (S) - April, May, June; summer (Su) - July, August, September; fall (F) - October, November, December.

	Number (%) by Depth (meters) by Season			
		110		
Species	W	S	Su	F
Blackear bass	15	8	13	19
Wenchman	21	24	11	29
Longspine porgy	11	12	18	11
Mexican searobin	15	18	19	17

Table 35. Overall composition of the dominant fish fauna for 110 meter depth by percent (%) weight for seasons; winter (W) - January, February, March; Spring (S) - April, May, June; summer (Su) - July, August, September; fall (F) - October, November, December.

	Weight (%) by Depth (meters) by Season			
		110		
Species	W	S	Su	F
Inshore lizardfish	8	8	9	
Rock sea bass			5	
Blackear bass	6		6	7
Wenchman	38	34	19	41
Longspine porgy	9	10	17	11
Sand seatrout	7			
Mexican searobins	9	11	16	12

(20%), Serranidae (19%), Sparidae (12%), and Bothidae (7%) represented about 78% of the numbers of fishes. Pristipomoides aquilonaris, the dominant species, comprised about 20-33% of the catch in biomass or numbers and was followed in importance by Prionotus paralatus (12-18%), Stenotomus caprinus (11-12%), and Serranus atrobranchus (7-17%). Only Synodus foetens also represented 5% or more of the catch by biomass or numbers. Several of the less important species in the overall combined data were not important within the Study Area, including Nezumia bairdi, Prionotus rubio and Prionotus stearnsi.

Outside the Study Area (Table 13*), 15 identified families made up about 93% of the biomass and 95% of the numbers of fishes. The Apridae (30%), Lutjanidae (15%), Triglidae (14%), Synodontidae (9%), and Serranidae (6%) represented about 74% of the biomass. The Sparidae (37%), Triglidae (18%), Lutjanidae (9%), Serranidae (8%), and Bothidae (5%) comprised about 77% of the numbers of fishes. Stenotomus caprinus, the dominant species, made up about 30-37% of the catch in biomass or numbers and was followed in importance by Pristipomoides aquilonaris (9-15%), and Prionotus paralatus (7-9%). Synodus foetens, Serranus atrobranchus, and Prionotus rubio also made up 5% or more of the catch in biomass or numbers. Pontinus longispinis appeared as a less important species in addition to those species listed in the overall combined data for this category.

DISCUSSION

For the ichthyofauna found at depths of 7-82 meters, changes in overall composition with season were small in comparison to the drastic changes in overall composition with depth. The inshore (0-27 m) white shrimp grounds fish community was dominated by species of the Family Sciaenidae (drums) including: Cynoscion arenarius (sand seatrout), Cynoscion nothus (silver seatrout), Menticirrhus americanus (southern kingfish), Micropogon undulatus (Atlantic croaker) and Stellifer lanceolatus (star drum).

The offshore (27-90 m) brown shrimp grounds fish community was dominated by the Family Sparidae (porgies) as represented by Stenotomus caprinus (longspine porgy). Other important fishes typical of this area were Syacium gunteri (shoal flounder), Serranus atrobranchus (blackear bass), Synodus foetens (inshore lizardfish), Centropristis philadelphica (rock sea bass), Prionotus paralatus (mexican searobin), Upeneus parvus (dwarf goatfish) and Pristipomoides aquilonaris (wenchman). The fish faunas of the white and brown shrimp grounds overlapped in a depth range of approximately 18-36 meters.

The ichthyofauna found at depths of 110 m was extremely diverse, although species richness decreased off south Texas. At least 69 species were identified in only 3,662 specimens examined. In contrast, Chittenden and McEachran (1975a, d, unpublished MS) collected only 83 species in 14,894 specimens examined from samples taken on the brown shrimp grounds; and they found only 63 species in 11,703 specimens examined from samples taken on the white shrimp grounds.

The dominant taxa in water 110 m deep were the Families Sparidae (porgies), Lutjanidae (snappers), Triglidae (searobins), and Serranidae (sea basses) with the longspine porgy, wenchman, mexican searobin and blackear bass being the important species in those families, respectively. Faunal percentage compositions were very similar along the entire 110 m bathymetric contour from the Mississippi River delta to the Rio Grande except for large changes in the abundance of longspine porgy, wenchman and blackear bass. The longspine porgy comprised about 30-35% of the faunal biomass and numbers outside the Study Area but only about 10-12% within the

Study Area. The change in abundance of this species proceeding westerly may be real. Hildebrand (1954) reported similar observations in water 33-40 m deep: this species was very abundant off Matagorda Island but uncommon 160 km to the west. The wenchman and blackear bass greatly increased in importance proceeding westerly and apparently replaced the longspine porgy off south Texas. The wenchman comprised 20-33% of the faunal biomass and volume off south Texas but only 9-15% outside the Study Area. Similarly, the blackear bass made up 9-17% of the fauna off south Texas but only 2-8% outside the Study Area. Important supporting fauna included species of the families Synodontidae (lizardfishes), Sciaenidae (drums), Ogcocephalidae (batfishes), Gadidae (codfishes), Macrouridae (grenadiers), Carangidae (jacks and pompanos), Mullidae (goatfishes), Labridae (wrasses, Stromateidae (butterfishes), and Scorpaenidae (scorpionfishes).

The ichthyofauna and their percentage compositions at 110 m are very similar to the faunal composition found on the brown shrimp grounds by Chittenden and McEachran (1975a, b, c, d, unpublished MS) so that the fish community typical of the brown shrimp grounds extends to water at least 110 m deep. The longspine porgy (dominant species in both areas) comprised 39% of the numbers of fishes on the brown shrimp grounds and 37% at 110 m outside the Study Area. The searobins comprised 17-18% of the fauna in these two areas. The wenchman made up 9% of the numbers of fishes at 110 m outside the Study Area but only 1% on the brown shrimp grounds. This species is apparently found primarily on the outer continental shelf and upper slope. Compton (unpublished MS) found it abundant at 145-275 m, but Hildebrand (1954) found only 76 specimens of this species among more than 400,000 fish that he collected in water primarily about 18-44 m deep.

E. EVALUATION OF THE MARINE RECREATIONAL FISHERIES[1]

INTRODUCTION

Alterations of the environment resulting from oil exploration and development have both positive and negative effects on recreational fisheries. The ability of fishermen to catch fish can be greatly improved as a result of building permanent structures in the water column in offshore areas (Wickham, Watson, and Ogren, 1973). These structures serve to attract and congregate fish in localities that are easily found by the fishermen. Other alterations resulting from oil development, however, can have negative effects on recreational fisheries. Pipelines and storage tanks are often constructed in estuarine areas. These alterations destroy, or decrease, the productivity in the area or make the area undesirable for recreational fishing. Crude oil, resulting from oil spills or seepage, is often toxic to marine organisms, including the recreational fish species and the organisms upon which they feed (Evans and Rice, 1974). The effects of chronic low-level oil pollution on marine organisms is less understood but could have more deleterious effects on the biotic community than do the high levels. Oil spills can seriously damage recreational fisheries without causing harm to the fish populations. If, as a result of a serious environmental modification, the aesthetic appeal of an area is reduced or destroyed, the amount of fishing effort will be reduced. Thus, the resource becomes less valuable and the incomes of people, dependent upon income from services provided to recreational fishermen, are decreased.

Important marine recreational fisheries exist along the South Texas coast from Port Aransas to Port Isabel. These fisheries can be classified as: inshore where fishing occurs in bays, marshes, and rivers shoreward of tidal inlets; onshore where fishing occurs from jetties, piers, and the beach in shallow waters; and offshore where fishing occurs from boats in water depths of 1.8-182.9 m. This study deals only with the onshore and offshore fisheries.

Some data on recreational fisheries in the South Texas study area (including inshore) are available from: creel censuses taken by Springer and Pirson (1958), and the Texas Parks and Wildlife Department (Robert Stevens, personal communication); research conducted on artificial reefs (Martinez, 1963; Stevens, 1963; Texas Coastal and Marine Council, 1974); national surveys (Clark, 1962; Deuel and Clark, 1968; U.S. Department of Interior, 1972; Deuel, 1973); billfish surveys by the NMFS (Rivas, 1973; Rivas and Pristas, 1973; Paul Pristas, personal communication); and from economic surveys (Grubb, 1969; Kitchen and James, 1970, Texas Game and Fish Commission, 1958, 1960). The value of the fisheries in the study area in terms of fishing effort expended, fishes caught, and dollars to the local economies, has not, however, been determined in much detail. The need for, and uses of, information of this type for the Texas coast is documented in detail in a proposal by Ditton and Jarmon (1974).

The objectives were to estimate for the daytime onshore and offshore fisheries from May 1975 through April 1976 (1) seasonal and total fishing effort by recreational fishermen, (2) total numbers of, and catch per unit effort for, the dominant species caught in each fishery, and (3) to approximate the value of

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[1] All tables and figures identified with an asterisk (*) in this section of the report are found in Appendix E.

these fisheries to the local economy and discuss the need for more precise studies for documenting the recreational fishery values. This report includes only the first 6 months (28 April-9 November 1975) of the data collected in this study. The final 6 months (10 November 1975-30 April 1976) will be reported on either as an addendum to this report or in the 1976 final report.

STUDY AREA

The study area in regard to where fishing occurs can be precisely delineated for the onshore fishery (jetty, pier, and beach) but not for the offshore fishery (Figure 21). For the onshore fishery, the study area extends from and includes the south jetty at Port Aransas to and including the north jetty at Port Isabel on the beach side of the islands. Included are two piers on Mustang Island and one pier on Lower Padre Island. For the offshore fishery, the study area is defined as the area fished by boats that depart and return during the same day through the channels at Port Aransas and Port Isabel. Most of this fishing effort, with the exception of the larger boats, is expended within a 37 km radius of one of the channels. The larger boats usually fish within a 93 km radius of one of the channels.

SAMPLING METHODS

All sampling was done by three survey technicians through direct observation and personal interview. Each technician on any given workday either counted the number of fishing units (boats or people), or interviewed people to determine the length of time they had been fishing and what they had caught, or both. Two survey technicians were located at Port Aransas and one at Port Isabel. We were not able to begin the survey at Port Isabel until 20 May, because we were unable to hire and train a technician for this area until this date. The survey technician manpower was allocated in an attempt to obtain maximum information for a fixed manpower budget.

A stratified random sampling scheme was used to estimate the total amount of fishing effort expended in the study area. Strata, and the number of units in each, were: 2 week periods (14), regions (2), sections (4), types of fishing platforms (6), and times of week (2). Regions and sections are shown in Figure 21. Types of fishing platforms were: head or party boats, inboard boats, ouboard boats, jetties, piers, and beaches. Times of week were weekdays (WD), except holidays, and weekend days (WED) including holidays. Days for sampling within each stratum complex were selected at random with the only restrictions on randomization being in those situations where two or three jobs were selected on the same day and only one (Port Isabel) or two (Port Aransas) technicians were available to perform these jobs.

Fishing effort (number of boats going or returning from fishing, or number of people fishing) was determined as follows by a single survey technician on a given randomly selected day. Jetty fishermen, and the number of fishing boats, were counted by a technician located at the jetty (Mustang Island or Lower Padre Island section) from 7 a.m. to 7 p.m. Boats were identified, using binoculars, and recorded as they exited or entered each tidal pass and the numbers of people fishing on the jetty were counted at 2 hour intervals. The survey technician had to classify the boat, at the time of sighting, using his best judgement as to

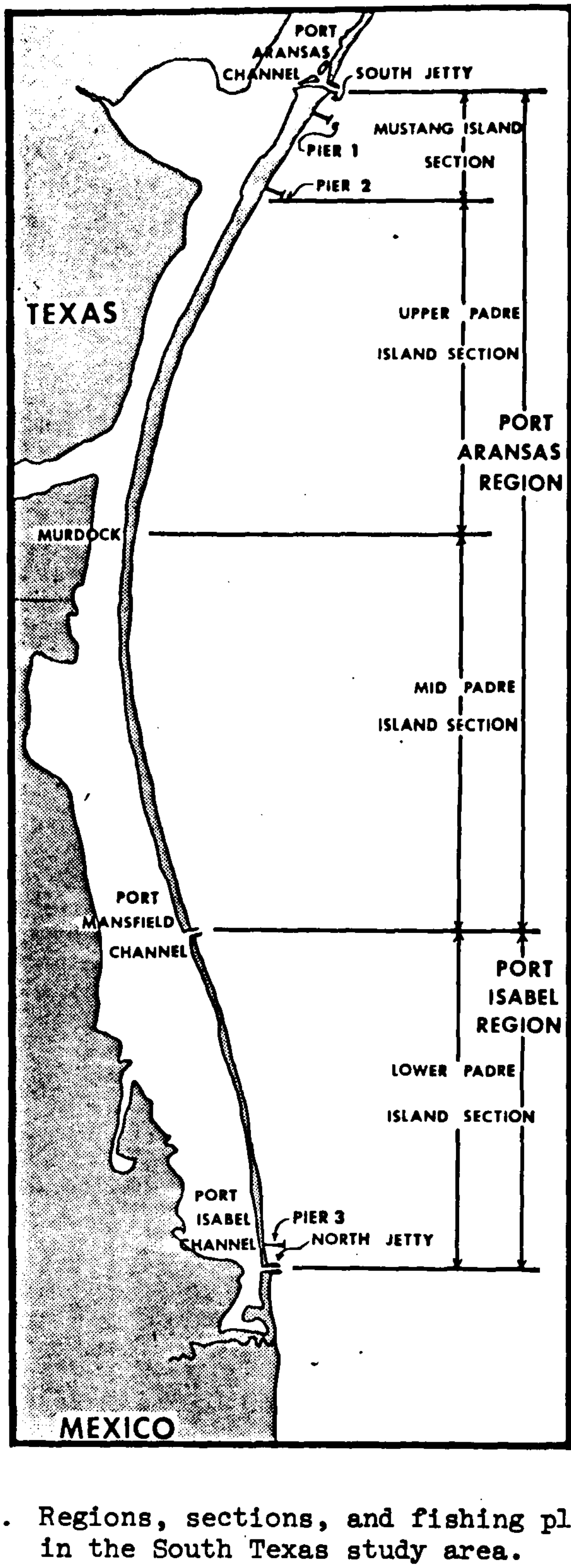

Figure 21. Regions, sections, and fishing platforms in the South Texas study area.

whether it was or was not a recreational fishing boat. On other days: the number of beach and pier fishermen were counted in the morning and in the afternoon (Mustang Island or Lower Padre Island section); the number of beach fishermen were counted during the morning and afternoon (Upper Padre or Mid Padre Island section). This cycle was repeated during each 2 week period within each time of week with two exceptions. Occasionally, sampling days were missed because of sickness or more pressing assignments. The Mid Padre Island section was not surveyed on a regular schedule until late August and was surveyed only half as frequently as the other sections during the latter part of the survey.

Catch-effort data were obtained by asking fishermen or boat captains the number of hours fished and the number of each species caught during the respective time period. For boats, the number of people aboard during the particular trip was also determined. As many interviews as possible were obtained during the allotted times at boat landings and docking sites; care was taken to obtain information about each boat type. Catch-effort data were obtained from jetty, beach, and pier fishermen during the time that effort counts were made, whereas these data were obtained from boat fishermen usually on days other than those that effort counts were made.

The basic unit of fishing effort was defined as one person fishing during 1 day. This was defined as a man-day of fishing. The boats were counted going or coming from fishing, and people in the act of fishing, during daylight hours only. The following methods were used to convert the effort counts to man-days of fishing. For boats, it was assumed that all were counted that went fishing on a particular day based on the assumption that all boats entering the Gulf before 7 a.m. returned after 7 p.m. and that all boats that returned after 7 p.m. entered the Gulf before 7 a.m. Based on this assumption the total number of boats exiting or entering the Gulf was used, whichever was higher. By using the estimates of the total number of boats fishing during a particular day, and determining the average number of people that fished on a particular boat type, the total number of man-days of fishing on the sampling dates was estimated. For jetty, pier, or beach platforms, the counts of fishermen for a particular day were averaged, assuming that the average count represented an instantaneous count during daylight hours (12). The average length of a fishing trip was determined, then divided into 12, and multiplied by the number of fishermen counted on the particular day.

These estimates of the number of man-days fishing on the sampling days were then used to expand over monthly or greater periods of time within the various strata.

SEASONAL ASPECTS OF FISHING EFFORT

The amount of fishing effort exerted in coastal areas is often closely related to seasons. In Gulf coast areas, fishing occurs throughout the year but the amount of effort exerted at different times of the year varies in relation to fishermen's desire to fish, the species of fish sought, and the platform used. This report covers a 28 week period (28 April-9 November) that includes the time interval of the year when the highest amount of fishing effort occurs from most fishing platforms in the study area. The seasonal (late spring, summer, and early autumn) aspects of fishing effort from each platform and section are shown in Figures 22-27. The data from which these figures were produced are provided in Tables 1 and 2.*

The greatest amount of fishing effort from boat platforms occurred from late May through late September in both Port Aransas and Port Isabel (Figures 22-23). For outboard and inboard boats the mean numbers of fishermen increased and decreased more gradually for weekday periods than for weekend-day periods. In Port Aransas, the headboat platform showed less seasonal change in the amount of fishing effort than did the other two boat platforms. In Port Isabel the headboat fishery did not begin until mid-June. The low estimate of effort shown by outboard and inboard boats at Port Aransas (Figure 22) during weekends in the late July-early August period is not representative of the period and was probably caused by the count being made on only 1 day (Table 1*), a day which was characterized by extremely bad weather.

Until this study is completed (in April 1976), it is difficult to determine what the seasonal patterns of fishing effort are in the onshore fisheries (jetty, pier, and beach platforms). Fishing effort was high from the jetty platform for both the weekday or weekend-day periods in Port Aransas as well as in Port Isabel when the study started (Figures 24-25) and, in general, remained relatively high throughout the study period. Fishing effort from the piers at Port Aransas was relatively high throughout the 28 week period and effort from the pier at Port Aransas was too low to show any type of seasonal pattern. Although highly variable, the amount of effort by beach fishermen appeared to be increasing throughout the 28 week period in the Mustang Island and Upper Padre Island sections (Figures 24 and 26). Data for the Mid Padre Island section were not available prior to mid-August (Figure 26).

The estimated numbers of total man-days of fishing in the study area by platform, and for platforms combined, by 4-week periods are shown in Figure 27. The highest amount of fishing effort occurred in late June-early July but a surprisingly high amount occurred in October.

ESTIMATES OF TOTAL EFFORT

Estimates of the mean daily effort, and the total effort, in man-days of fishing for the 6 month period in relation to section and fishing platform are shown in Table 36.

The average amount of effort per day was greater on weekend days than weekdays for each platform and section except headboats in the Lower Padre Island section. The daily intensity of fishing effort on weekend-days was more than wtwice that on weekdays for: outboard, inboard, jetty, and beach platforms in the Mustang Island section; the beach platform in Upper and Mid Padre Island sections; and outboard, inboard, and beach platforms in the Lower Padre Island section.

Total effort between weekdays and weekend days varied between platforms and sections. Overall, a slightly larger amount (51%) of the total effort was expended during weekdays (175,928 versus 168,527 man-days).

By far the greatest amount of fishing effort occurred in the Mustang Island section of the study area. Percents of the total fishing effort in relation to section were: Mustang Island, 68.2%; Upper Padre, 8.2%; Mid Padre, 1.8%; and Lower Padre, 21.8%. The amount of effort expended in the Mid Padre section may be seriously underestimated, because counts were not made in this section until late August.

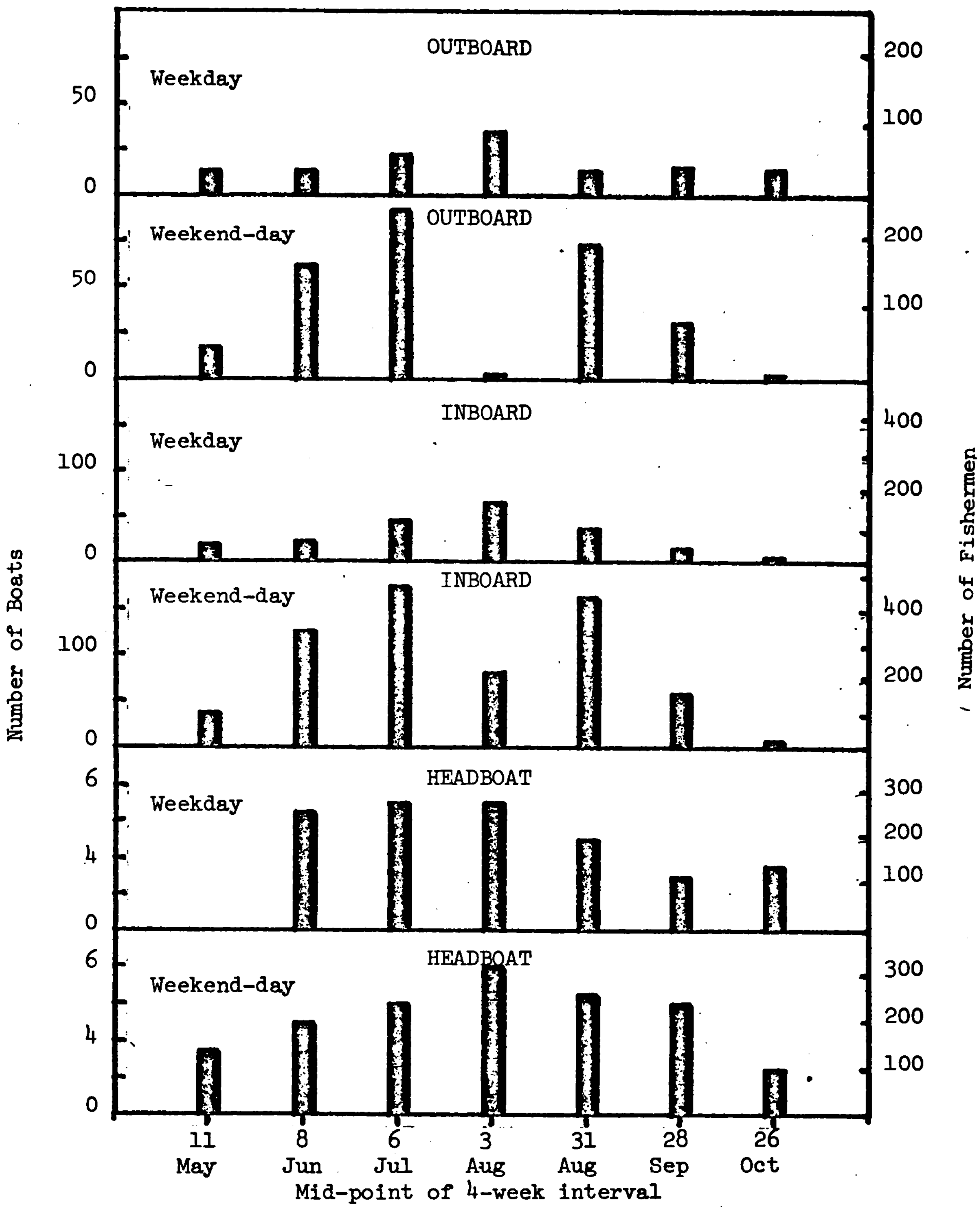

Figure 22. Mean number of recreational fishing boats, and estimated mean daily number of fishermen, at the Port Aransas tidal pass by time of week, boat type, and 4-week interval.

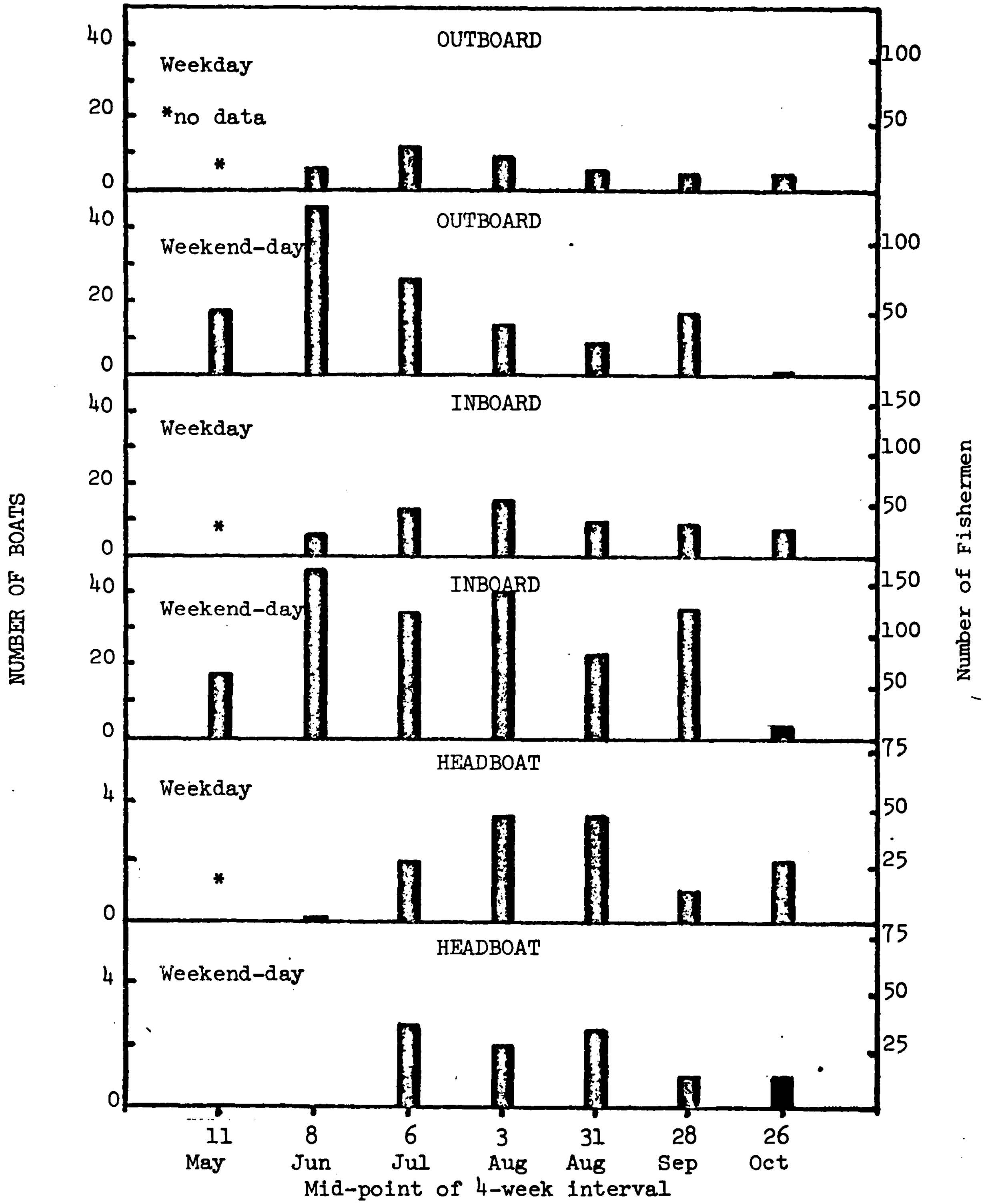

Figure 23. Mean number of recreational fishing boats, and estimated mean daily number of fishermen, at the Port Isabel tidal pass by time of week, boat type, and 4-week interval.

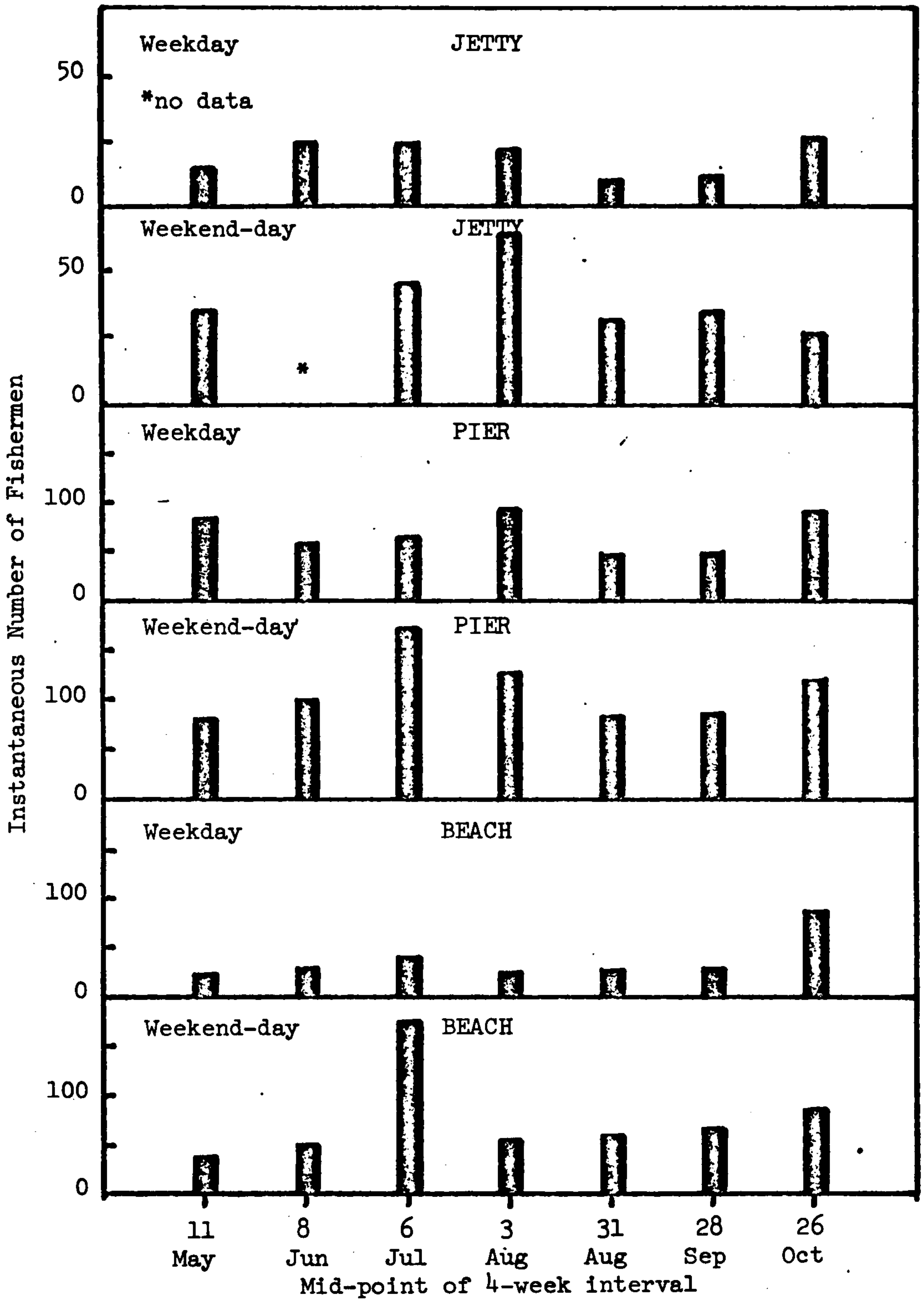

Figure 24. Mean instantaneous numbers of people fishing in the Mustang Island section by time of week, platform, and 4-week interval.

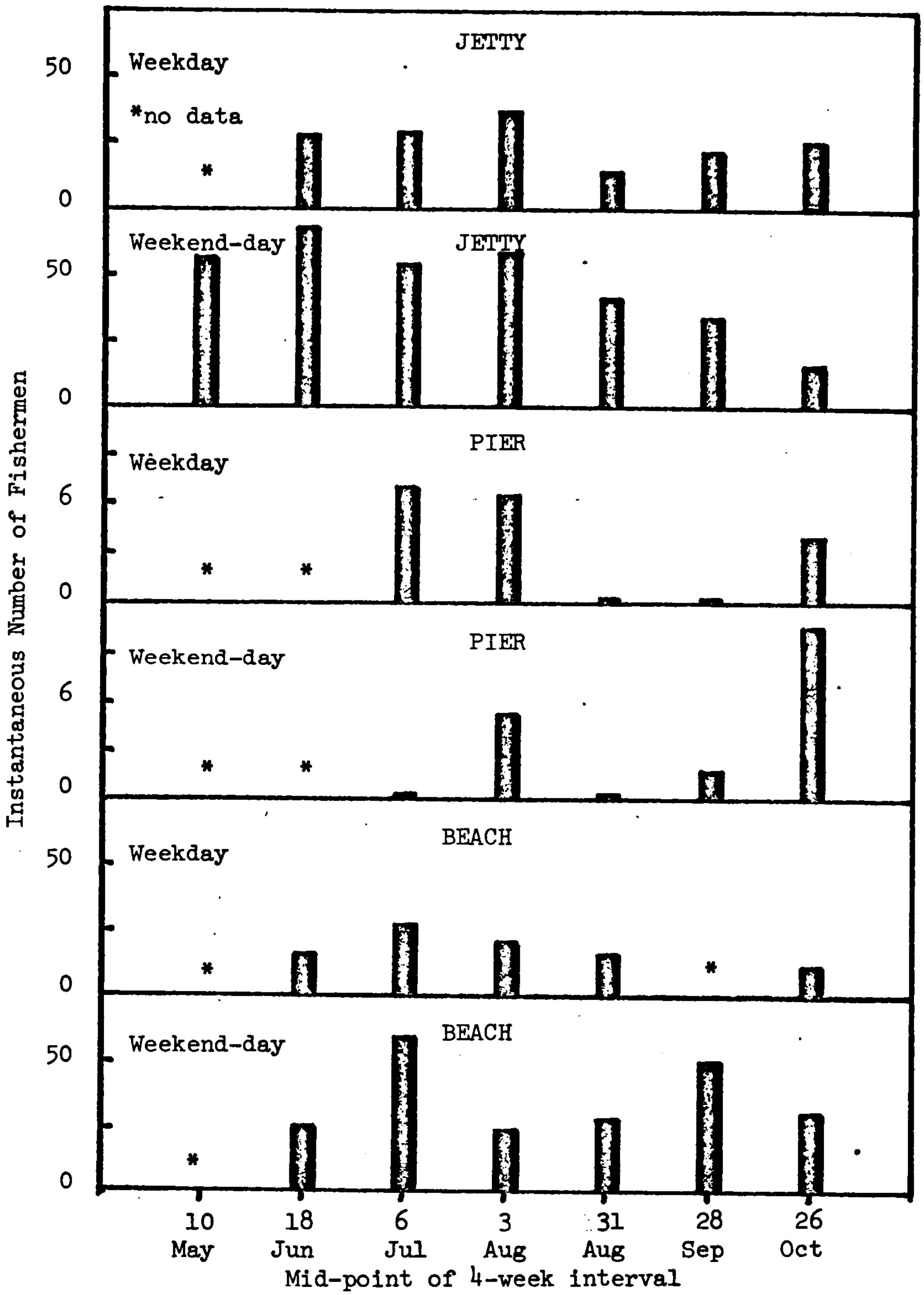

Figure 25. Mean instantaneous numbers of people fishing in the Lower Padre Island section by time of week, platform, and 4-week interval.

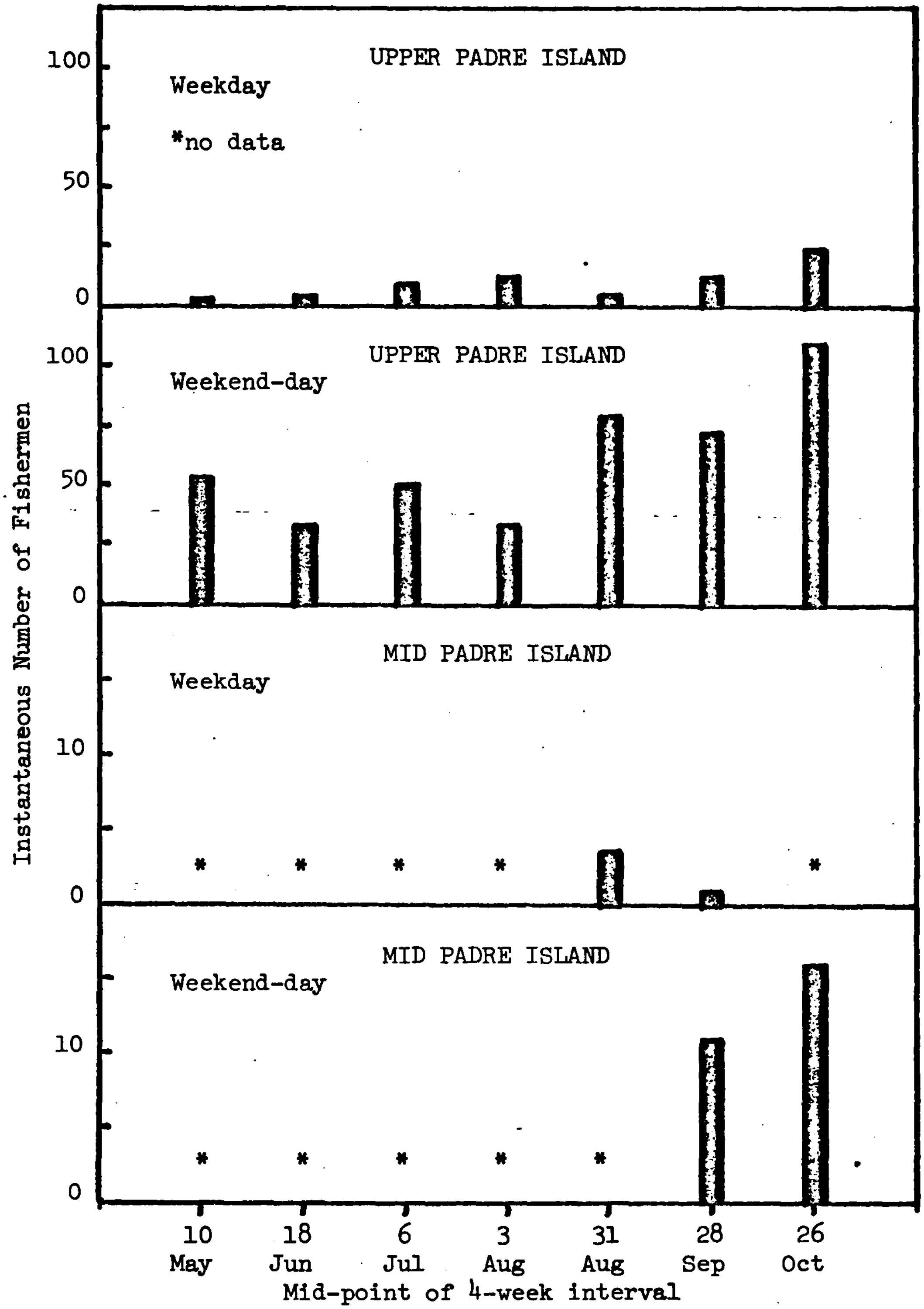

Figure 26. Mean instantaneous numbers of people fishing on the beach in the Upper and Mid Padre Island sections by time of week and 4-week interval.

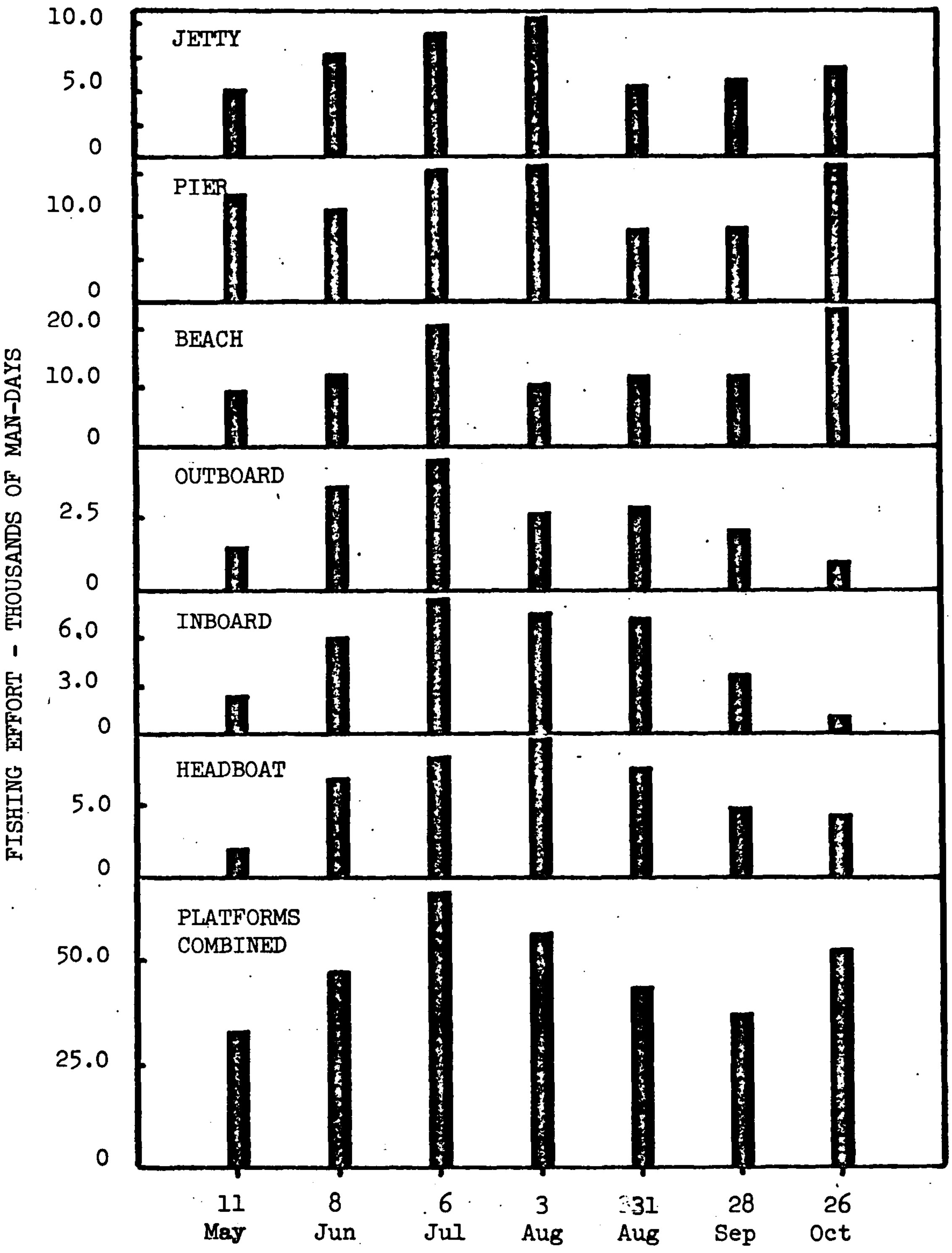

Figure 27. Estimated numbers of total man-days of fishing in the study area by platform and 4-week period.

Table 36. Estimates of mean daily effort and total effort by section, fishing platform, and time of week in the study area, 28 April-9 November, 1975.

Section and Fishing Platform	Weekday Mean Daily Effort	Weekday Total Effort	Weekend-day Mean Daily Effort	Weekend-day Total Effort	Total Effort Weekday and Weekend-day	Percent of Total
	---------------- Man-days of fishing				------------------	
Mustang Island						
Outboard	45.46	6,091	102.59	6,361	12,452	3.61
Inboard	78.50	10,519	243.16	15,076	25,595	7.43
Headboat	184.86	24,771	216.81	13,442	34,213	11.09
Jetty	96.37	12,913	213.11	13,213	26,126	7.58
Pier	178.43*	47,819**	289.23*	35,864**	83,683	24.29
Beach	185.67	24,880	387.26	24,010	48,890	14.19
Upper Padre						
Beach	55.69	7,462	332.75	20,630	28,092	8.16
Mid Padre						
Beach	12.76	1,710	72.36	4,486	6,196	1.80
Lower Padre						
Outboard	19.81	2,655	52.52	3,256	5,911	1.72
Inboard	35.99	4,823	101.67	6,303	11,126	3.23
Headboat	26.72	3,580	20.44	1,267	4,847	1.41
Jetty	117.08	15,689	216.31	13,411	29,100	8.45
Pier	16.11	2,159	16.21	999	3,158	0.92
Beach	81.02	10,857	164.66	10,209	21,066	6.12
TOTAL		175,928		168,527		
GRAND TOTAL					344,455	100.00

*Per pier
**Both piers

Of the two general types of fishing platforms (shore and boat), the shore platforms accounted for 71.5% of the total effort expended in the study area. Within the Mustang Island and Lower Padre Island sections, the shore platforms accounted for 68% and 71%, respectively, of the total fishing effort.

In the Mustang Island section, the two piers accounted for the most and outboards accounted for the least amount of fishing effort. The estimated total man-days of fishing in relation to platform were: pier, 83,683; beach, 48,890; headboat, 38,213; jetty, 26,126; inboard, 25,595; and outboard, 12,452.

The order of importance of the platforms in the Lower Padre Island section was quite different from that in the Mustang Island section. The estimated total man-days of fishing were: jetty, 29,100; beach, 21,066; inboard, 11,126; outboard, 5,911; headboat, 4,847; and pier, 3,158.

The beach was the most important fishing platform in terms of man-days of fishing in the entire study area. Percents of the total fishing effort in relation to platform were: beach, 30.3%; pier, 25.2%; jetty, 16.0%; headboat, 12.5%; inboard, 10.7% and outboard, 5.3%.

VALUE OF THE FISHERIES

Conceptual problems involved in defining and estimating the values of recreational fisheries are complex and generally similar to the difficulties encountered in the estimation of the value of outdoor recreation (Gordon, Chapman, and Bjornn, 1973). Three types of estimates are frequently used to determine the value of recreational fisheries. These are gross expenditures, net economic values, and capitalized values.

Gross expenditures include the monies spent by anglers in connection with fishing and are categorized into transfer and durable costs. Transfer costs include expenses such as transportation, food, and lodging incurred while traveling to, using, and returning home from, the fishing area. Durable costs are those for fishing equipment such as tackle, boats, and special clothing that can be used over a period of months or years.

Net economic value for marketed goods is generally defined as the difference between total income and total costs. For recreational fisheries it is difficult to establish a "net" value because the "price" or cost to the fishermen is usually minimal and does not reflect the real value placed on the resource. Thus, it is necessary to formulate a basis of comparison between "net" values of marketed goods and services and non-market recreation associated activities. The principal difference between outdoor recreation and marketed goods and services is the pricing mechanism. To provide a basis for evaluating the "price" or cost of using outdoor recreational resources, Clawson (1959) simulated a market using transfer costs. In sport fisheries where license fees are non-existent or usually a negligible part of total costs, most expenditures are transfer costs. Gordon et al. (1973) used transfer costs as a basis for estimating the net economic value of an Idaho sport fishery resource.

Capitalized values can be determined using the relation $V = N/i$ where V = present capitalized value, N = annual return, as measured by net value (see above), and i = interest rate.

The above two paragraphs are academic and were included to define the methods, other than the gross expenditure method, available to estimate values of recreational fisheries. Data was obtained on the amount of fishing effort in the study area but not expenditure data. To estimate the value of the fisheries, estimates of effort, and expenditure estimates from the 1970 National Survey of Fishing and Hunting (U.S. Dept. of Interior, 1972) were used. In the 1970 survey it was estimated that, along the Gulf coast, each man-day of saltwater fishing cost $11.36 (gross expenditure). This cost was multiplied times the effort estimates shown in Table 36 and the value estimates of the fisheries in the study area are shown in Table 37. Some, if not all, of the values in column 3 are grossly conservative, and are used as minimum estimates of the value of the fishery.

The estimates (column 3) of the value of recreational fisheries in the South Texas study area are extremely conservative, because (1) the expenditure value was determined in 1970 and has not been adjusted for inflation, (2) the fishing effort that occurred at night was not estimated, and (3) the non-user fishery values were not estimated. Inflation rate since 1970 has averaged about 8% per year. This means that, if direct expenditures in recreational fisheries have increased at the same rate, then the estimate of $3.91 million in the study area could be adjusted upward to $5.75 million (column 4). The amount of fishing effort that occurred at night was not estimated, but considerable effort is expended at night from the jetties, piers, and beaches; if night-time effort on these platforms was 40% of the day-time effort, then the estimate of the total value would be $7.40 million (column 5). Non-user values of fishery resources have not been estimated in terms of dollars in any fishery, but the values nevertheless exist. Many citizens who will never fish place value on the fisheries and the fish. In some instances, such as on fishing piers, non-fishermen will actually pay to merely observe fishing activity.

The estimates of the amount of fishing effort, and the amount of money spent in the study area, are difficult to compare with the most recent data base that completely covers the study area. The 1970 National Survey of Fishing and Hunting provides salt water recreational fishing effort and expenditure data for the entire U.S. Gulf of Mexico coastline for 1970. The 1970 Survey reported 35.62 million recreational fishing days expended, and $404.65 million spent, in the U.S. Gulf of Mexico salt water fishery. This value of $404.65 million, after adjustment for inflation, becomes $594.76 million. The 1970 Survey included estuarine as well as onshore and offshore fishing. Based on a study conducted in St. Andrew Bay, Florida (Doyle Sutherland, personal communication), it was estimated that 63.8% of the effort recorded in the National Survey occurred in inshore waters. The values in the National Survey were therefore adjusted downward (36.2% of the totals) to 12.9 million man-days and $215.3 million. For the 6 months in this study it was estimated that 0.34 million man-days of effort were expended and that the fishery was valued at between $3.9 and $7.4 million. Assuming that the latter 6 months of the study will produce 50% of the effort expended during the first 6 months, then the estimates of annual effort and expenditure in the study area would be 0.52 million man-days and $5.8 to $11.1 million. The area from Port Aransas to Port Isabel includes about 10% of the Gulf coastline and the population in counties adjacent to the study area represents about 10% of the population of the Gulf coastal counties. Based on the above estimates and assumption, and not accounting for changes that possibly occurred in the amount of fishing effort during the past 5 years, it is estimated that about 4% of the total fishing effort, and 2.7% to 5.2% of the total recreational fishery values in the U.S. Gulf of Mexico are generated in the study area.

Table 37. Estimates of the values of the fisheries by section, fishing platform, and time of week in the study area, 28 April - 9 November, 1975.

Section and Fishing Platform	Weekday	Weekend-day	Total-weekday and weekend-day	Total expanded for inflation (8%/year)	Total* expanded for night fishing
	Gross Expenditures (in thousands of dollars)				
Mustang Island					
Outboard	69.2	72.3	141.4	207.9	207.9
Inboard	119.5	171.3	290.7	427.3	427.3
Headboat	281.4	152.7	434.1	638.1	638.1
Jetty	146.7	150.1	296.8	436.3	610.8
Pier	543.2	407.4	950.6	1,397.4	1,956.4
Beach	282.6	272.7	555.4	816.4	1,143.0
Subtotal	1,442.6	1,226.5	2,669.0	3,923.4	4,983.5
Upper Padre					
Beach	84.8	234.4	319.1	469.1	656.7
Mid Padre					
Beach	19.4	51.0	70.4	103.5	144.9
Lower Padre					
Outboard	30.2	37.0	67.1	98.6	98.6
Inboard	54.8	71.6	126.4	185.8	185.8
Headboat	40.7	14.4	55.1	81.0	81.0
Jetty	178.2	152.3	330.6	486.0	680.4
Pier	24.5	11.3	35.9	52.8	73.9
Beach	123.3	116.0	239.3	351.8	492.5
Subtotal	451.7	402.6	854.4	1,256.0	1,612.2
TOTAL	1,998.5	1,914.5	3,912.9	5,752.0	7,397.3

*After expansion for inflation.

CATCH PER UNIT EFFORT

A total of 62 species was caught by fishermen and identified by field personnel during the first 6 months of the survey (Table 38). In addition, several other species (at least 10) were caught, but identification to species or genus was not obtained for these catches.

There are at least two ways to evaluate the importance of a particular fish species to a recreational fishery. One way is to ask the fisherman what he or she is fishing for and obtain this type of information from a large number of fishermen. When the results are tabulated, one then determines the relative value of each species based on the percents of the fishermen that fish for each species. A second way is to evaluate the catches by fishermen and list the species in order of decreasing catch per unit effort. The second method was used.

Listed in Table 39 are the species (or species groups) which comprised the 10 most abundantly caught species from each platform within each section. Only the top five species within each platform and section will be discussed.

In the Mustang Island boat fishery, king mackerel and crevalle jack were among the top five species caught from each boat type. The other species comprising the top five, in relation to boat type, were: outboard - Spanish mackerel, spotted seatrout, and sand seatrout; inboard - Spanish mackerel, red snapper, and dolphin; and headboat - red snapper, sandbar shark and blacktip shark.

In the Mustang Island shore fishery, sand seatrout, Atlantic croaker, and southern kingfish were among the top five species caught from each shore platform. The other species comprising the top five, in relation to platform, were: jetty - gafftopsail catfish and pinfish; pier - sea catfish and pinfish; and beach - sea catfish and Gulf kingfish.

From the beach in the Upper and Mid Padre Island sections, three species (Spanish mackerel, ladyfish, and bluefish) were among the top five caught in both sections. Others among the top five were southern kingfish and Gulf kingfish along Upper Padre and crevalle jack and sea catfish along Mid Padre.

In the Lower Padre Island section the same species comprised the top five in both the outboard and inboard platforms. These species were king mackerel, Spanish mackerel, crevalle jack, red snapper, and little tunny. The top five species caught from headboats were king mackerel, red snapper, dolphin, little tunny, and grouper.

The five species caught in highest abundance from the shore platforms in the Lower Padre Island section were: jetty - spotted seatrout, sand seatrout, sea catfish, Atlantic croaker, and southern kingfish; pier - king mackerel, spotted seatrout, sea catfish, pigfish, and Atlantic spadefish; Beach - sea catfish, southern kingfish, Gulf kingfish, ladyfish, and Gulf flounder.

The seasonal abundance, as indicated by catch per unit effort estimates, of the five most abundant species within each platform and section are shown in Figures 28-36. These estimates could not be made for the Mid Padre Island section, and for the outboard, headboat, pier, and beach platforms in the Lower Padre Island section, because the data were insufficient.

Table 38. Common and scientific names of species caught and identified in this study.

Common name	Scientific name
Spotted seatrout	*Cynoscion nebulosus*
Sand seatrout	*Cynoscion arenarius*
Atlantic croaker	*Micropogon undulatus*
Spot	*Leiostomus xanthurus*
Red drum	*Sciaenops ocellata*
Black drum	*Pogonias cromis*
Gafftopsail catfish	*Bagre marinus*
Sea catfish	*Arius felis*
Gulf flounder	*Paralichthys albigutta*
Southern flounder	*Paralichthys lethostigma*
Florida pompano	*Trachinotus carolinus*
Spanish mackerel	*Scomberomorus maculatus*
King mackerel	*Scomberomorus cavalla*
Bluefish	*Pomatomus saltatrix*
Cobia	*Rachycentron canadum*
Crevalle jack	*Caranx hippos*
Blue runner	*Caranx crysos*
Dolphin	*Coryphaena hippurus*
Atlantic spadefish	*Chaetodipterus faber*
Little tunny	*Euthynnus alletteratus*
Wahoo	*Acanthocybium solanderi*
Great barracuda	*Sphyraena barracuda*
Sandbar shark	*Carcharhinus milberti*
Red snapper	*Lutjanus campechanus*
Blacktip shark	*Carcharhinus limbatus*
Greater amberjack	*Seriola dumerili*
Bull shark	*Carcharhinus leucas*
Sheepshead	*Archosargus probatocephalus*
Scamp	*Mycteroperca phenax*
Pinfish	*Lagodon rhomboides*
Tripletail	*Lobotes surinamensis*
Lemon shark	*Negaprion brevirostris*
Mako shark	*Isurus oxyrinchus*
Bonnethead shark	*Sphyrna tiburo*
Smooth puffer	*Lagocephalus laevigatus*
Jewfish	*Epinephelus itajara*
Horse-eye jack	*Caranx latus*
Ladyfish	*Elops saurus*
Tarpon	*Megalops atlantica*
Blue marlin	*Makaira nigricans*
Sailfish	*Istiophorus platypterus*
Gulf kingfish	*Menticirrhus littoralis*
Blackfin tuna	*Thunnus atlanticus*

Table 38. (Continued)

Common name	Scientific name
Tiger shark	Galeocerdo cuvieri
Pigfish	Orthopristis chrysoptera
Southern kingfish	Menticirrhus americanus
Barred grunt	Conodon nobilis
Warsaw grouper	Epinephelus nigritus
White marlin	Tetrapturus albidus
Sharksucker	Echeneis naucrates
Yellowtail snapper	Ocyurus chrysurus
Lookdown	Selene vomer
Atlantic cutlassfish	Trichurus lepturus
Atlantic threadfin	Polydactylus octonemus
Atlantic guitarfish	Rhinobatos lentiginosus
Cero mackerel	Scomberomorus regalis
Almaco jack	Seriola rivoliana
Gray snapper	Lutjanus griseus
Gulf toadfish	Opsanus beta
Silver perch	Bairdiella chrysura
Smooth dogfish	Mustelus canis
Cownose ray	Rhinoptera bonasus
Hammerhead shark	Sphyrna sp.
Stingray	Dasyatis sp.
Snook	Centropomus sp.
Skate	Raja sp.
Squirrelfish	Holocentrus sp.
Grouper	?
Triggerfish	?
Mojarra	?
Blenny	?
Stargazer	?

Table 39. Listing of the species comprising the 10 most abundantly caught, and the respective catches per hour, within each section and platform.

Most Abundant Species	Mustang Island Section						Upper Padre Section	Mid Padre Section
	Outboard	Inboard	Headboat	Jetty	Pier	Beach	Beach	Beach*
	Mean Number Caught Per Fisherman Hour							
King mackerel	.2416	.3740	.0520					
Spanish mackerel	.0866	.0389	.0017	.0420			.1806	.1394
Crevalle jack	.0645	.0422	.0148	.0222			.0395	.1569
Spotted seatrout	.0460				.0890	.0941	.0479	.0087
Sand seatrout	.0437		.0009	.3852	.3770	.1070		
Sandbar shark	.0127	.0146	.0061			.0269		
Cobia	.0122	.0163	.0014					
Sea catfish	.0121				.6644	.2066	.0926	.1046
Gafftopsail catfish	.0092			.0991				
Blacktip shark	.0077	.0089	.0051					
Red snapper		.0377	.1114					
Dolphin		.0338	.0013					
Little tunny		.0104						
Greater amberjack		.0047	.0049					
Pinfish				.3820	.6690	.0617		
Atlantic croaker				.1086	.5846	.2384	.0343	
Southern kingfish				.0538	.2397	.2311	.1528	
Pigfish				.0288				
Atlantic cutlassfish				.0250				
Southern flounder				.0217				
Atlantic spadefish					.2262			
Gulf kingfish					.2234	.2659	.1890	
Atlantic threadfin					.0612			
Ladyfish					.0487	.0507	.1851	.1046
Bluefish						.0465	.1735	.2527
Red drum							.0588	.0436
Tarpon								
Florida pompano								.0174

Table 39. (Continued)

Most Abundant Species	Mustang Island Section Outboard	Inboard	Headboat	Jetty	Pier	Beach	Upper Padre Section Beach	Mid Padre Section Beach*
	Mean Number Caught Per Fisherman Hour							
Snook**								.0087
Bluerunner								
Grouper**								
Squirrelfish**								
Scamp								
Triggerfish**								
Blackfin tuna								
Mojarra**								
Sheepshead								
Gulf flounder								
Stingray**								

* Only 9 species reported
**1 or more species

Table 39. (Continued)

Most Abundant Species	Lower Padre Section					
	Outboard*	Inboard	Headboat	Jetty	Pier	Beach
	Mean Number Caught Per Fisherman Hour					
King mackerel	.0882	.1142	.0187	.0144	.2296	.0832
Spanish mackerel	.0882	.0281		.0250		
Crevalle jack	.0235	.0277				
Spotted seatrout				.0638	.0417	.0246
Sand seatrout			.0074	.2691		
Sandbar shark						
Cobia	.0029	.0082				
Sea catfish				.0501	.0706	.0766
Gafftopsail catfish						
Blacktip shark	.0029	.0044				
Red snapper	.1176	.0423	.7628			
Dolphin	.0147	.0048	.0074			
Little tunny	.0706	.0630	.0526			
Greater amberjack						
Pinfish						
Atlantic croaker				.1101	.0139	
Southern kingfish				.1033		.2100
Pigfish					.0626	
Atlantic cutlassfish						
Southern flounder						
Atlantic spadefish					.2017	
Gulf kingfish						.1286
Atlantic threadfin						
Ladyfish				.0351	.0278	.1097
Bluefish				.0476		.0123
Red drum						.0123
Tarpon	.0029	.0052				
Florida pompano				.0370	.0209	

Table 39. (Continued)

Most Abundant Species	Lower Padre Section					
	Outboard*	Inboard	Headboat	Jetty	Pier	Beach
Snook**						
Bluerunner		.0026				
Grouper**			.0090			
Squirrelfish**			.0057			
Scamp			.0045			
Triggerfish**			.0040			
Blackfin tuna			.0023			
Mojarra**					.0139	
Sheepshead					.0139	
Gulf flounder						.0331
Stingray**						.0132

* Only 9 species reported
**1 or more species

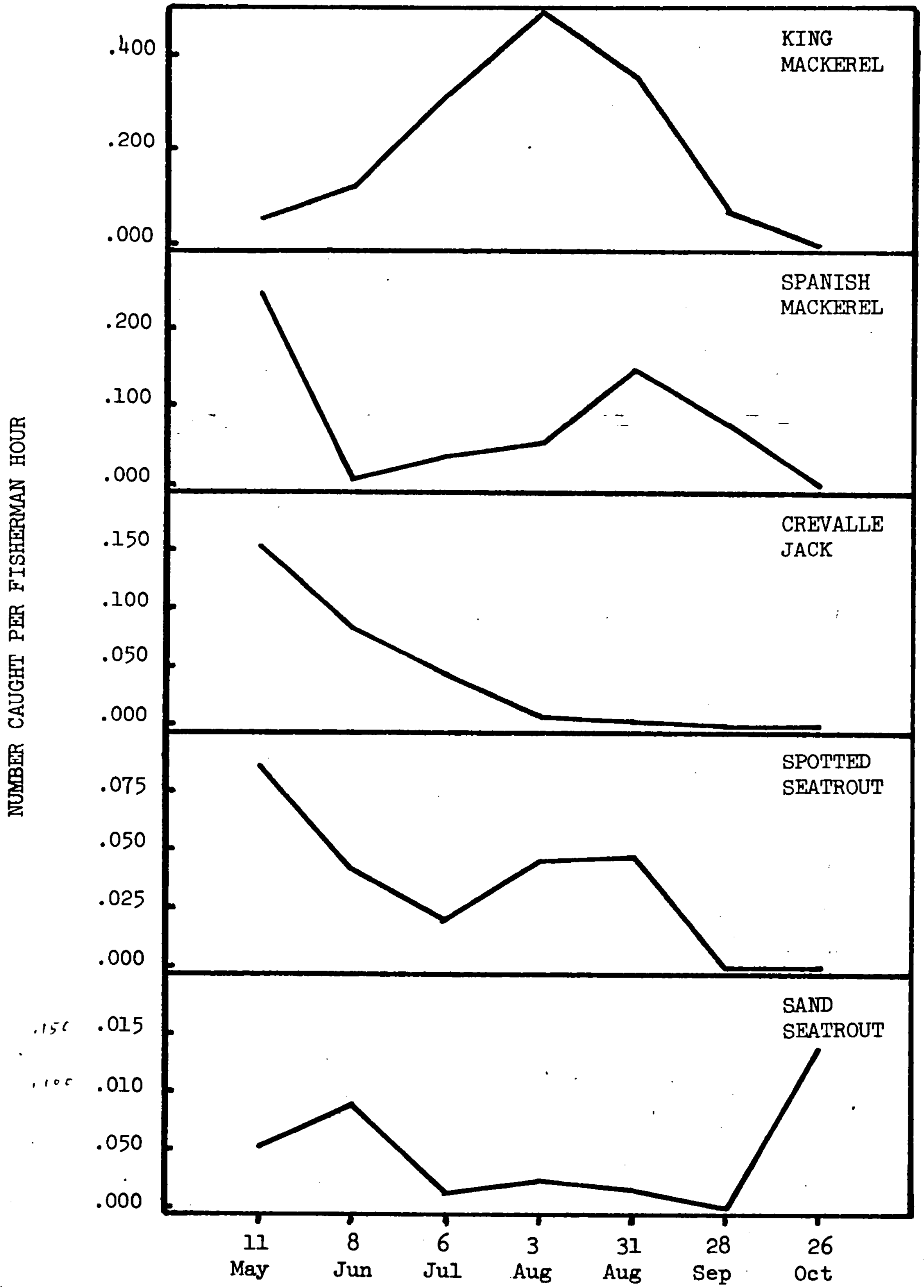

Figure 28. Mean number, by species, of fish caught per fisherman hour from outboard boats in the Mustang Island section during each 4-week interval.

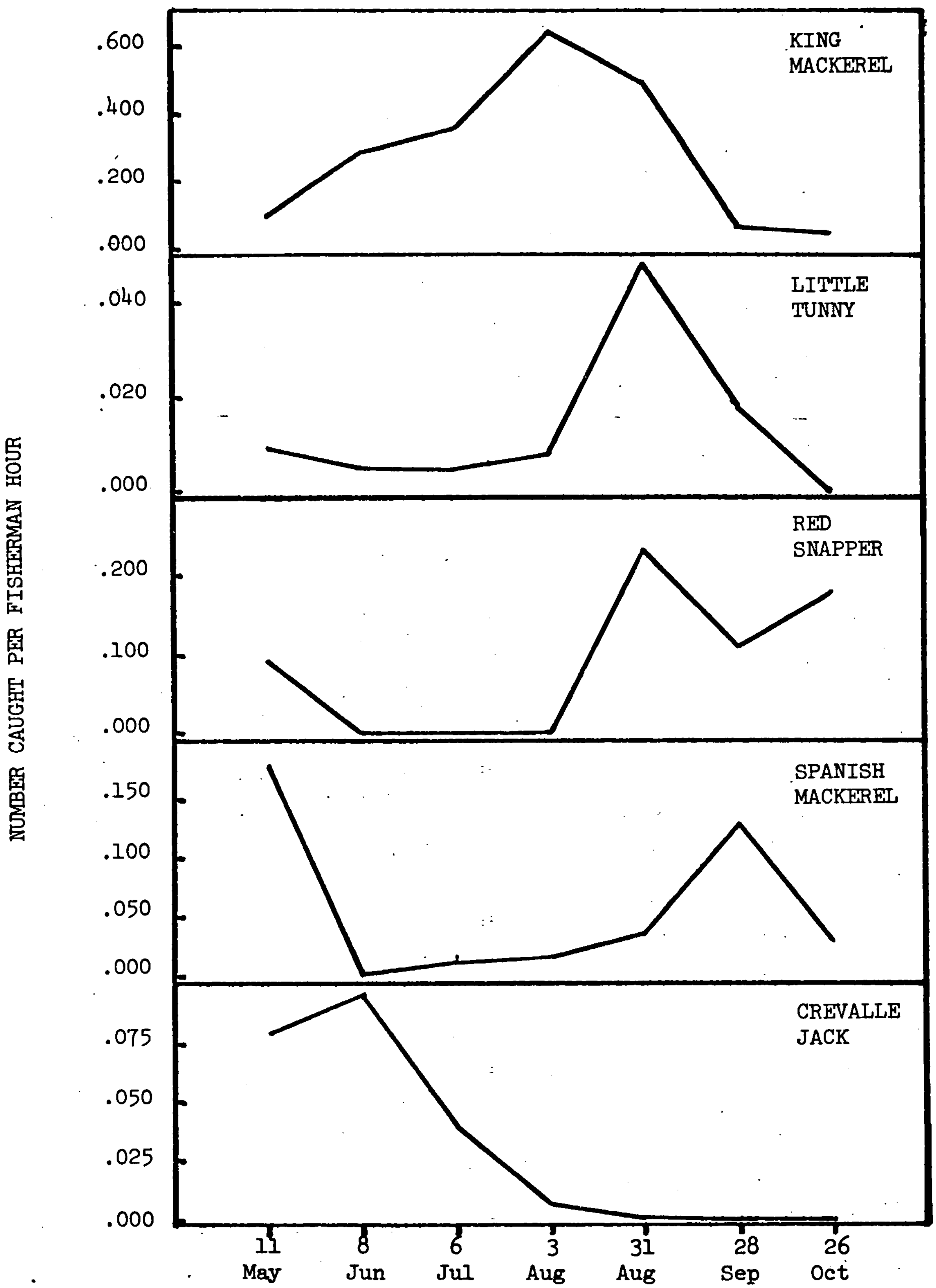

Figure 29. Mean number, by species, of fish caught per fisherman hour from inboard boats in the Mustang Island section during each 4-week interval.

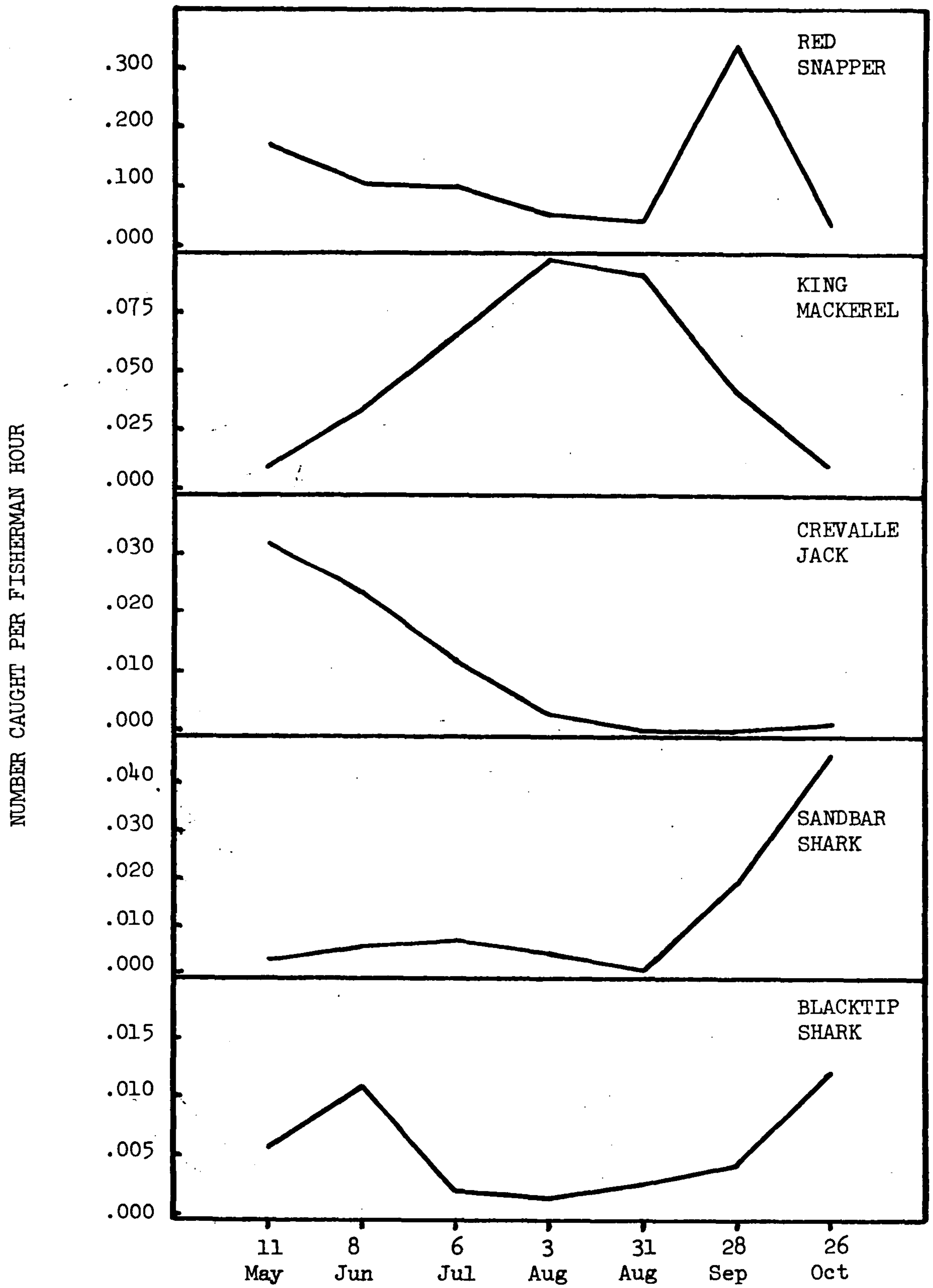

Figure 30. Mean number, by species, of fish caught per fisherman hour from headboats in the Mustang Island section during each 4-week interval.

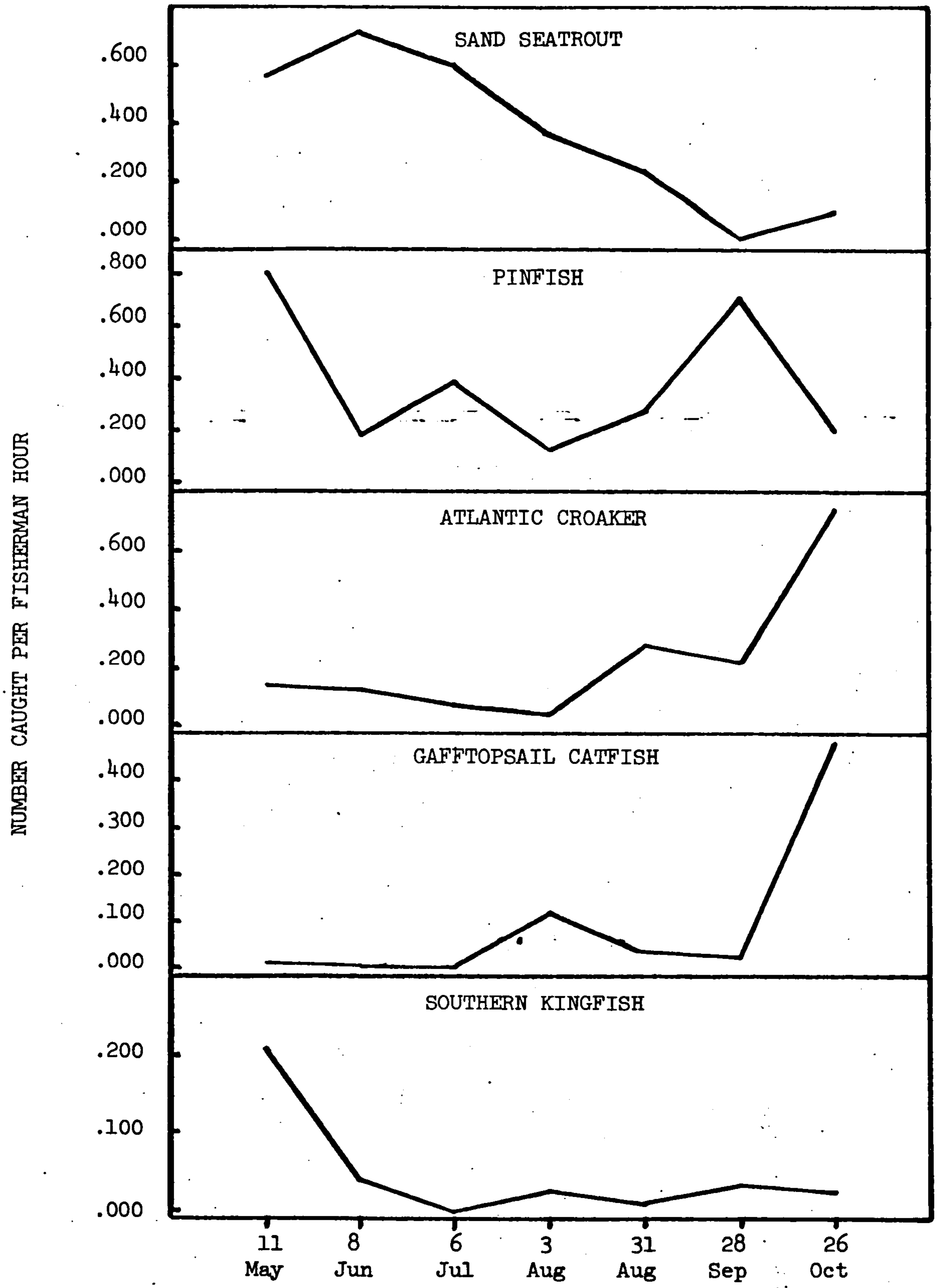

Figure 31. Mean number, by species, of fish caught per fisherman hour from the jetty in the Mustang Island section during each 4-week interval.

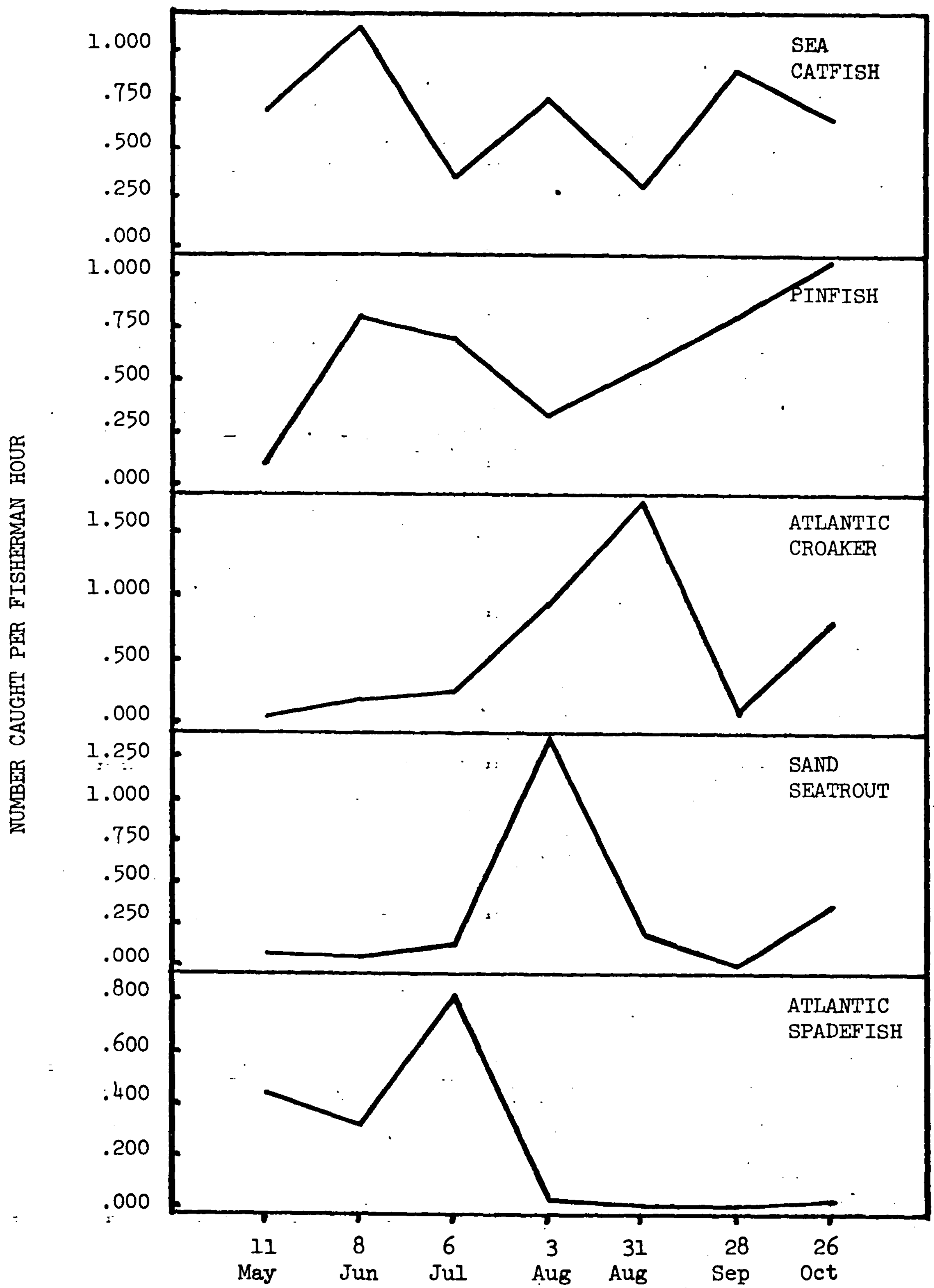

Figure 32. Mean number, by species, of fish caught per fisherman hour from piers in the Mustang Island section during each 4-week interval.

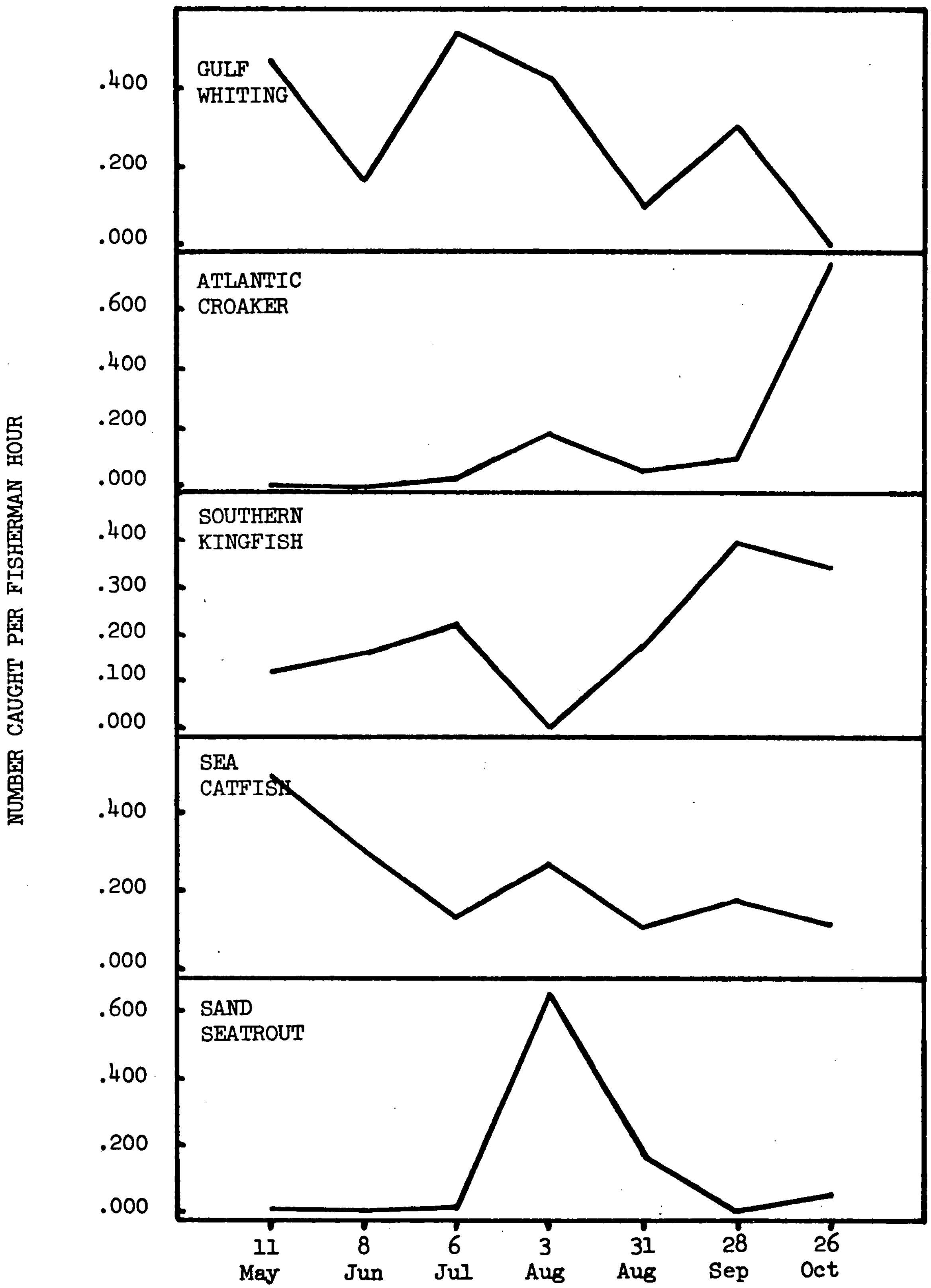

Figure 33. Mean number, by species, of fish caught per fisherman hour from the beach in the Mustang Island section during each 4-week interval.

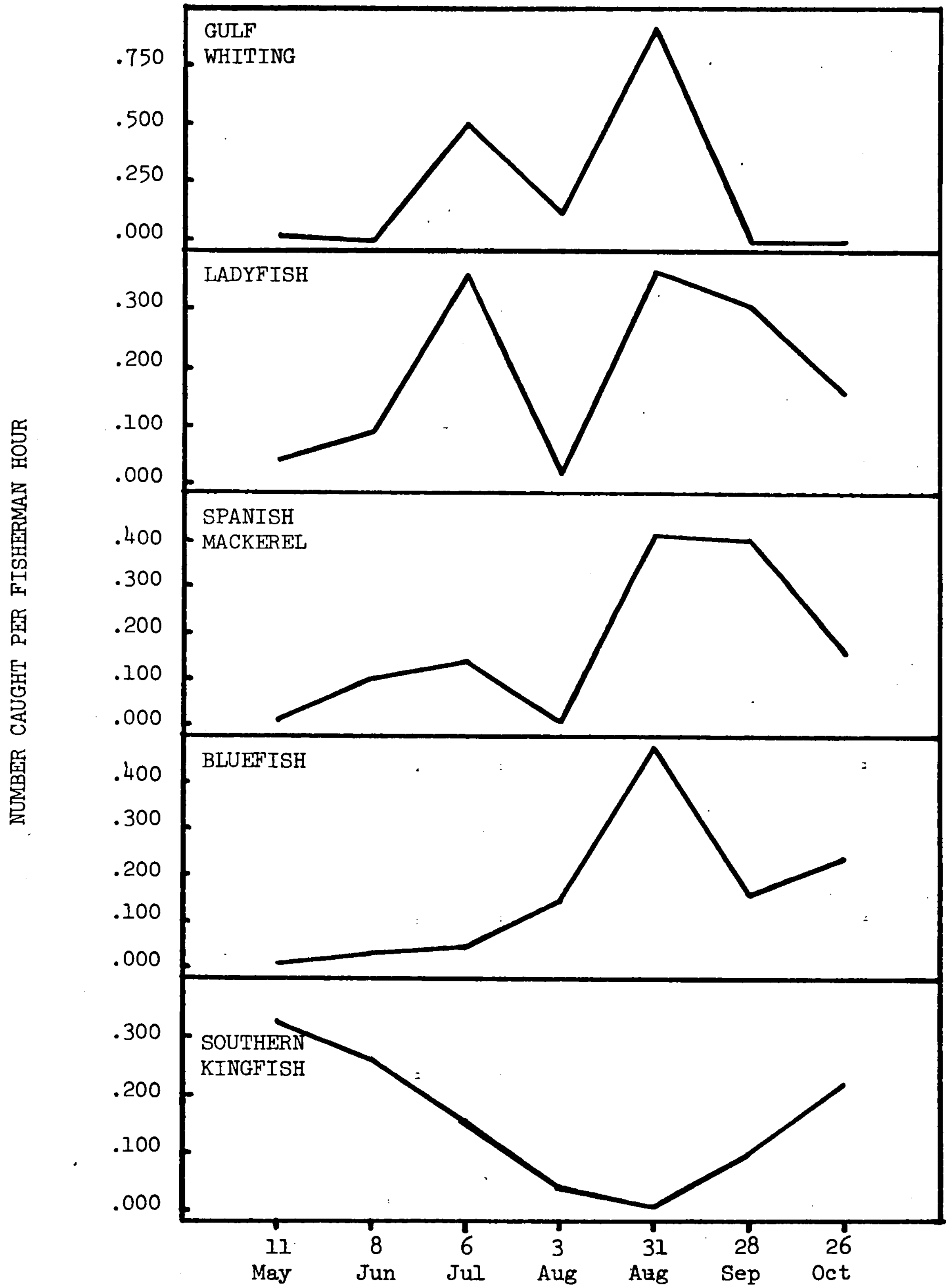

Figure 34. Mean number, by species, of fish caught per fisherman hour from the beach in the Upper Padre Island section during each 4-week interval.

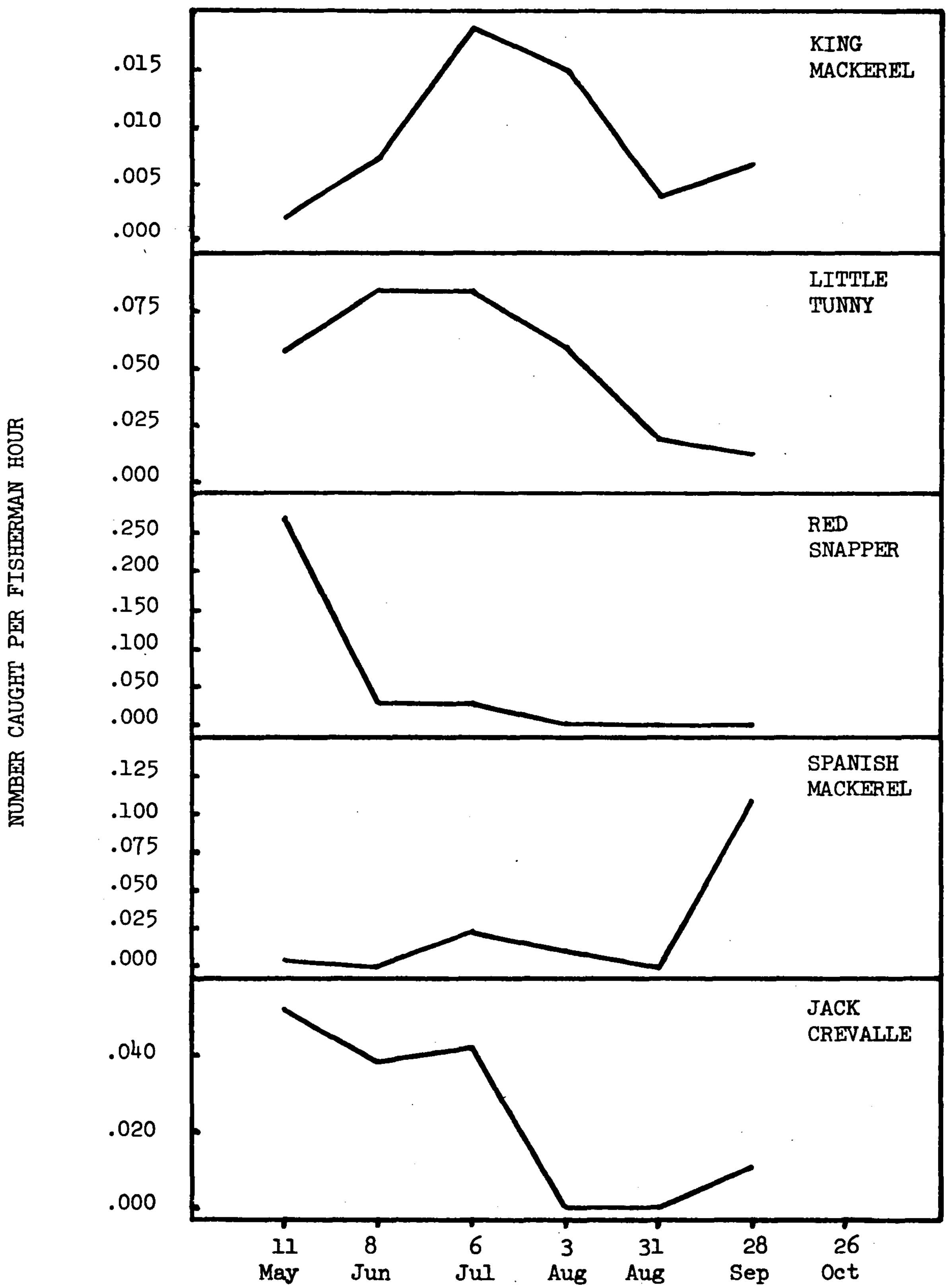

Figure 35. Mean number, by species, of fish caught per fisherman hour from inboard boats in the Lower Padre Island section during each 4-week interval.

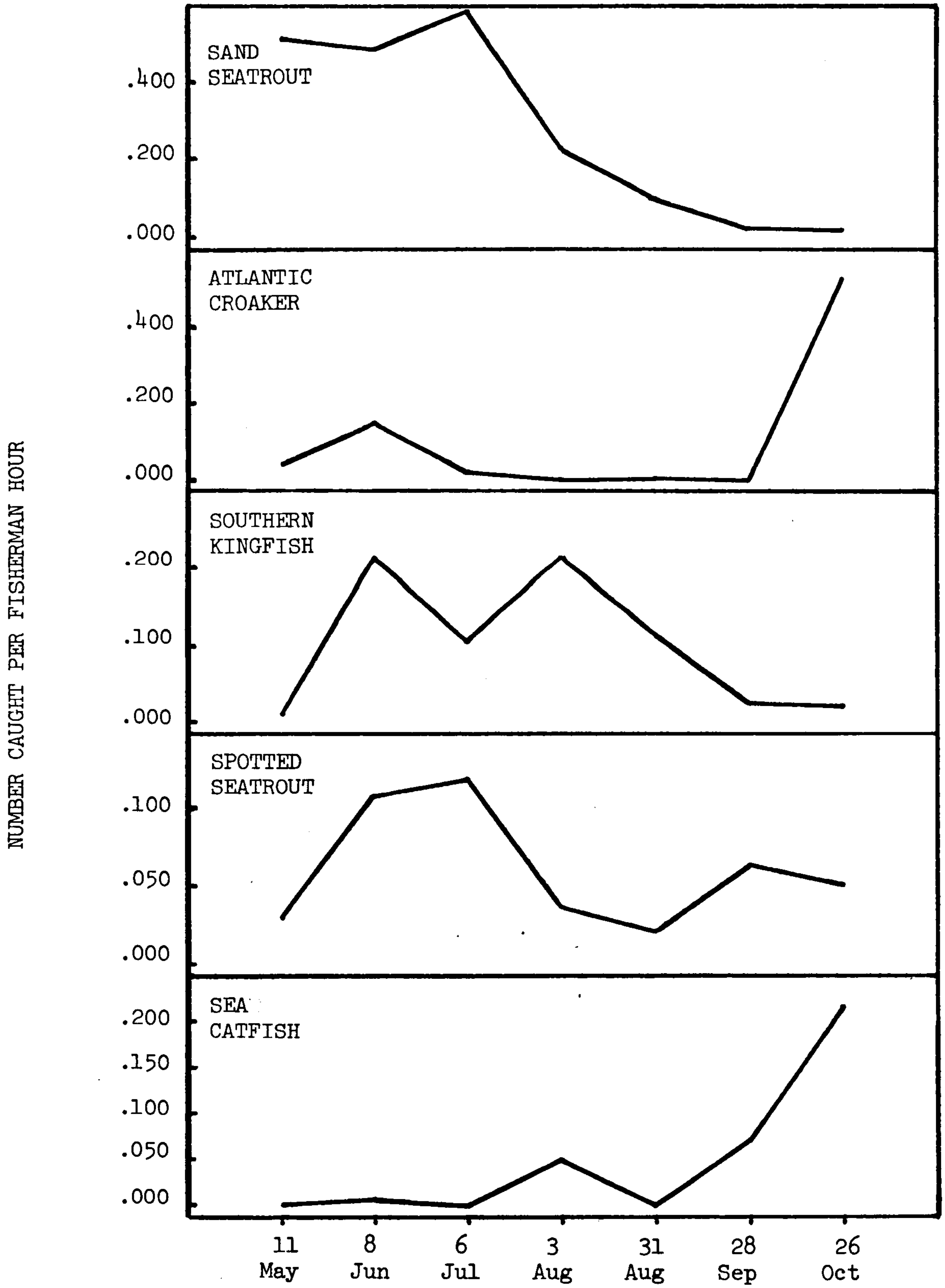

Figure 36. Mean number, by species, of fish caught per fisherman hour from the jetty in the Lower Padre Island section during each 4-week interval.

Catch rates were distinctly seasonal for some of the 18 species shown in Figures 28-36. Usually caught in highest abundance during the spring was crevalle jack; spring or summer were spotted seatrout and little tunny; summer were king mackerel, bluefish, ladyfish, spadefish, and Gulf whiting; fall were Atlantic croaker, gafftopsail catfish, and sandbar shark; and spring or fall were Spanish mackerel, red snapper, southern kingfish, sea catfish, blacktip shark, and pinfish. Sand seatrout were caught in greatest abundance in different seasons depending upon the platform used.

SUMMARY AND CONCLUSIONS

1. This report includes data from the first 28 weeks (28 April-9 November 1975) of the ongoing 1 year study.

2. During the above period the greatest amount of fishing effort from boats occurred from late May through late September in the Port Aransas to Port Isabel area. The amount of fishing effort remained relatively high through October from the jetty, pier, and beach platforms.

3. The intensity of fishing effort was over twice as great on weekend days as weekdays.

4. A slightly larger amount (51%) of the total effort was expended during weekdays.

5. Percents of total fishing effort in relation to section were: Mustang Island, 68.2%; Upper Padre, 8.2%; Mid Padre, 1.8%; and Lower Padre, 21.8%.

6. The estimated total man-days of fishing in relation to platform in the study area were: beach, 104,370 (30.3%); pier, 86,803 (25.2%); jetty, 55,113 (16.0%); headboat, 43,057 (12.5%); inboard, 36,857 (10.7%); and outboard, 18,256 (5.3%).

7. The estimated total number of man-days of fishing during the 6 month period was 344,455.

8. The total value (gross expenditure method) of the fisheries in the study area during the 6 month period was estimated between $3.9 and $7.4 million. These values were derived from the estimates of effort, and from gross expenditure values taken from other studies.

9. Detailed studies are needed to estimate accurately the value of the fisheries in the study area.

10. A total of 39 species was included when the species were ranked, based on catch per unit effort, from 1 to 10 within each platform and section.

11. The three species caught in greatest abundance, in relation to platform, were: outboard - king mackerel, Spanish mackerel, and crevalle jack; inboard - king mackerel, Spanish mackerel, and crevalle jack; inboard - king mackerel, red snapper, and little tunny; headboat - red snapper, king mackerel, and little tunny; jetty - sand seatrout, Atlantic croaker, and pinfish; pier - pinfish, sea catfish, and Atlantic croaker; and beach - southern kingfish, Gulf kingfish, and bluefish.

12. Catch rates were distinctly seasonal for several of the species. Caught in highest abundance during the spring was jack crevalle; summer were king mackerel, bluefish, ladyfish, spadefish, and Gulf whiting; fall were Atlantic croaker, gafftopsail catfish, and sandbar shark.

F. THE SPORTFISHERY FOR BILLFISHES[1]

INTRODUCTION

Sportfishing for billfishes along the southern coast of Texas occurs mainly in the area between latitudes 28° 30'N and 27° 00' N and longitudes 95° oo' W and 97° 10' W (Figure 1). This is the area fished principally by fishermen in the Port Aransas area, and also by visitors who charter sportboats from Port Aransas and nearby ports.

Billfish fishing has also been conducted from ports south of Port Aransas. A billfish tournament was conducted at Port Mansfield for the first time in 1975, while annual tournaments have been held at Port Isabel for many years. The areas fished in these tournaments do not extend eastward beyond 96°00' S. The Port Mansfield tournament is generally confined to the north and south by latitudes 27° 00' N and 26° 10' N and the Port Isabel tournament by 26° 30' N and 25° 20' N.

Detailed data on the sport fishery for billfishes off the southern coast of Texas have been collected by the National Marine Fisheries Service since 1972. Because much of these fishing areas coincide with BLM's South Texas OCS region, the historical data for the years 1972-74 plus available data for 1975 have been summarized in this report for the BLM. This report has been prepared at no cost to BLM.

The boats used in fishing for billfishes are between 6 and 17 m long and are powered either by gasoline or diesel engines.

Anglers use rods and reels and generally troll four lines, two from outriggers and two from the stern. Trolling is conducted at the surface of the water. Dead mullet is the most commonly used bait.

The principal species of billfishes sought and caught are the blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*), and sailfish (*Istiophorus platypterus*). An occasional longbill spearfish (*Tetrapturus pfluegeri* or swordfish (*Xiphias gladius*) may be caught, but these two species are uncommon.

METHODS

Data were collected by interviewing anglers and boat captains. The types of data included name and length of boat; areas fished; date; weather conditions (wind, sea, sky cover); times of fishing; number of fish raised, hooked, boated or released by species; location of raises, hook-ups, and boatings or releases by species; environmental data; and biological data.

The fishing area off Port Aransas was divided into 10-minute squares (charts 72-1 to 74-4*). Each square was given an alpha-numeric code. This permitted easy and ready identification of squares.

Analyses of the data were made of the three principal billfishes, namely, the blue marlin, white marlin, and sailfish.

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[1] All tables and figures identified with an asterisk (*) in this section of the report are found in Appendix F.

The events occurring during fishing may be categorized into three parts. One, a fish is raised; that is, a fish swims to the bait either from below or from the side, and it may or may not take the bait. Second, a fish is hooked; it may be fought for varying lengths of time and subsequently may be lost or brought to the boat. Third, the fish may be either boated or intentionally released.

For determinations of relative abundance of billfishes, the number of fish raised per hour of fishing (raises-per-hour) was used as an index. This measure was used rather than the number of fish hooked per hour or number caught per hour, because the skill of an angler was less important in raising a fish than in hooking and boating a fish. If hook-ups-per-hour were used, a fish that rose to bait but did not bite or that did bite but was not hooked would not be counted. Similarly, if a hooked fish were fought and lost, it would not be counted if we were using boatings-per-hour. Thus, in addition to being less affected by the skill of an angler, raises-per-hour provided much more data. The disadvantages of using raises-per-hour were: one, a fish may be raised, and therefore counted, more than once; and two, the identification of the species might be mistaken. In our judgement, the advantages outweighed the disadvantages.

Effort was expressed as the number of hours actually fished. In determining this number, the time spent fighting a hooked fish was not included, because when a fish is hooked all lines other than the one with the hooked fish are immediately reeled in. Thus, when a hooked fish is being fought, fishing is actually not occurring. For example, if a boat placed its lines in the water at 0800 hours and pulled them in at the end of the day, say at 1500 hours, to return to port, the total fishing time would have been 7 hours. However, if a fish had been hooked at 1000 hours and finally boated at 1145 hours, then 1.75 hours would have been deducted from the 7 hours, and thus, total fishing time would have been 5.25 hours.

Additional details of the sources and treatments of data may be obtained from a publication by Nakamura and Rivas (1974).

RESULTS

The data from 1972-74 were obtained from reports by Rivas (1973, 1974) and Rivas and Pristas (1975). At the time of the preparation of this report, analyses of the 1975 data were partially completed. Available 1975 results have been included in the tables.

The amount of effort (2,389.7 hours) expended in 1975 was the highest of the 4 years of data (Table 1*). Also, the number of months during which fishing occurred was greater in 1975 than any of the previous years.

The year 1975 was exceptionally good for sailfish. The number caught that year exceeded the combined catches of the preceding 3 years (Table 2*). Catch-per-hour (Table 3*) also reflected the high abundance of sailfish in 1975.

Sizes of the captured billfishes and available information on sex ratios are shown in Tables 4* and 5*. A noteworthy item in Table 4* was the 43 kilogram sailfish caught in 1972. Sailfish caught in the Atlantic seldom attain weights over 41 kilograms, whereas, in the Pacific, sailfish over 45 kilograms are commonly caught. Sex ratios, shown in Table 5*, show a preponderance of females over males. Since female billfishes grow larger than males, the greater proportion of females should be looked upon favorably by anglers.

Abundance of billfishes by time of day was computed for the 1972 data (Table 6*). The hours of greatest abundance for billfishes (three species combined) apeared to be between 10:00 a.m. and noon and again in the afternoon after 2:00 p.m.

For the 1973 and 1974 data, numbers-hooked-per-hour were calculated for each hour of the day. It was reasoned that numbers-hooked-per-hour gave a better measure to the angler of the availability of billfish. If billfish were abundant but did not bite, they would not be available to the angler. The data for 1973 and 1974 are presented in Table 7*. The hour of highest availability was 5:00 p.m. for both years; however, owing to the low effort (1.5 hours in 1973 and 6.5 hours in 1974) caution is dictated and generalizations or conclusions should await additional data from subsequent years.

Comparisons of the relative abundances of billfish in 1972, 1973, 1974, and 1975 are shown in Table 40. Blue marlin and white marlin were most abundant in 1974, whereas, sailfish were most abundant in 1975. Because of the great abundance of sailfish in 1975, billfish fishing in general was better that year than any previous year.

Results of analyses of abundance and availability in relation to environmental factors are presented in Tables 8* and 9*. Computation of raises-per-hour for each environmental category was not possible. Therefore, percentages were used to determine relative abundance. The data indicate clearly that open, blue water is preferred by all three species of billfishes.

Data on bait preferences are presented in Table 10*. Number-hooked-per-day was used for this analysis. Conclusions on bait preference by billfishes are difficult to draw owing to the preference of anglers to use mullet.

Tables 11*, 12*, and 13* summarize the numbers of raises, hook-ups, and captures by biweekly periods. Although the periods of greatest numbers of raises can be easily discerned in the tables, these numbers need to be divided by the amounts of effort in each period to determine the periods when fish were most abundant. Of interest are the percentages at the bottoms of each of these tables. They indicate that a greater percentage of hooked white marlin and sailfish are boated than are blue marlin. Blue marlin apparently put up a greater fight and therefore are more difficult to catch.

The 1974 annual billfish tournament in Port Isabel was held on August 8, 9, and 10. The amount of data obtained at this tournament was limited. About 20 boats participated, but owing to extremely unfavorable weather, only about 10 boats fished on each of the 3 days. A total of 115 hours of fishing was spent by the boats during the tournament. Four blue marlin and seven sailfish were caught. No white marlin were landed.

In 1975, data were obtained from the tournaments held at Port Isabel and at Port Mansfield. Sailfish were especially abundant during the tournament held at Port Isabel (Table 14*).

Relative abundances of blue marlin, white marlin, sailfish, and total billfish by 10-minute squares in the area fished off Port Aransas in 1972, 1973, and 1974 are shown in the 12 charts. No particular 10-minute square was consistently high in abundance for any of the billfishes.

Table 40--Relative abundance of billfishes off Port Aransas.

	No. of hours trolled	No. of fish raised	No. of fish raised per hr. of trolling	Hours trolled to raise 1 fish
1972	1,482.4			
Blue Marlin		73	.049	20.4
White Marlin		30	.020	50.0
Sailfish		133	.090	11.1
Unidentified Billfish		1	.001	1,000.0
All Billfish		237	.160	6.3
1973	810.9			
Blue Marlin		35	.043	23.3
White Marlin		8	.010	100.0
Sailfish		47	.058	17.2
Unidentified Billfish		2	.002	500.0
All Billfish		92	.113	8.8
1974	1,298.3			
Blue Marlin		107	.082	12.2
White Marlin		34	.026	38.5
Sailfish		182	.140	7.1
Unidentified Billfish		11	.008	125.0
All Billfish		334	.257	3.9
1975	2,389.7			
Blue Marlin		90	.038	26.3
White Marlin		27	.011	90.9
Sailfish		620	.259	3.9
Unidentified Billfish		1	<.001	2,500.0
All Billfish		738	.309	3.2

SUMMARY

The areas fished by billfish anglers off the southern coast of Texas overlap the BLM South Texas OCS region. Data on the sportfishery for billfishes in these areas have been obtained since 1972 by the National Marine Fisheries Service. Results of the analyses of the data showing catch, effort, relative abundance by time and geography and certain environmental factors, availability, size and sex ratio, and bait preference are summarized in 14 tables and 12 charts.

The following results were notable:

1. Anglers expended more effort over a longer season in 1975 than in previous years.

2. Sailfish were most abundant in 1975, whereas blue marlin and white marlin were most abundant in 1974.

3. Females outnumber males for all species of billfishes.

4. Peaks of abundance for total billfishes (all species combined) appear to exist in mid-morning and mid-afternoon.

5. More billfishes are caught in open, blue waters than in other surface conditions and water color.

6. Blue marlin appear to be more difficult to catch, for a greater percentage of this species is lost after being hooked than is the case for white marlin and sailfish.

7. No particular 10-minute square off Port Aransas appears to be consistently high in abundance of billfishes.

G. HYDROACOUSTIC SURVEY

INTRODUCTION

The objectives of this activity were to develop baseline assessment information on pelagic fish stocks in the coastal waters adjacent to Laguna Madre, Texas, and to develop a resource monitoring strategy to enable future determinations of the effect of proposed oil exploration and production on resident and migratory pelagic fish communities.

The area of principal concern extended between the 9.1 and 182.9 m depth curves and covered approximately 14,500 square kilometers (5600 square miles). Historical information relative to coastal pelagics in the survey areas was obtained from the Pascagoula exploratory fishing data base; also, from the Texas A&M data bank. The following considerations were included in assembling and analyzing the historical data:

1. The approximate study areas was delineated as 26° 00'-28° 30 N latitude, 95° oo'-96°50' W longitude. Depth - 9.1-182.9 m.

2. A species list was obtained based on those species which occurred most frequently in records from the study area.

3. Seasonal occurrence and depth ranges for each species selected were obtained.

4. Schooling characteristics for each species were obtained where possible.

5. Fishing effort was based on number of cruises, stations, and fishing hours expended in the study area. Attention was also given to types of gear used.

6. Weight records for each of the selected species were reviewed, however, due to the sparsity of such records definite conclusions could not be drawn using weight of fish taken as an indicator of abundance of fish in the area.

7. Cards were compiled to obtain a position plotting showing area where fishing efforts have been conducted.

Table 41 is a compilation of coastal pelagic species shown by historical data to occur in the survey area. Table 42 delineates the available data related to catch information during exploratory fishing operations. Figure 37 indicates depth records, seasonal occurrences and schooling characteristics.

FIELD OPERATIONS

FRS Oregon II Cruise No. 60A, Part II

Objectives were to:

- Provide pelagic fish stock assessment data for the development of baseline definition of living marine resources in the BLM study area.

Table 41 Coastal Pelagic Species Occurring in Survey Area

Family Carangidae:	
Decapterus punctatus	Round scad
Vomer setapinnis	Atlantic moonfish
Trachurus lathami	Rough scad
Chloroscombrus chrysurus	Bumper
Family Clupeidae:	
Ophistonema oglinum	Thread herring
Harengula pensacolae	Scaled sardine
Etrummeus teres	Round herring
Brevoortia patronus	Gulf Menhaden
Family Engraulidae:	
Anchoa hepsetus	Striped anchovy
Family Scombridae:	
Scomber japonicus	Chub mackerel
Scomberomorus maculatus	Spanish mackerel
Family Stromateidae:	
Peprilus alepidotus	Harvestfish
Peprilus burti	Butterfish

Table 42 Catch Information and Weight Records From Exploratory Fishing Data Base

Species	Month	Position N. Lat.	Position W. Long.	Bottom Depth (m)	Gear	Wgt/kg
Decapterus punctatus	2	27°44'	96°04'	78.6	FT	68.0
	8	28°35'	94°34'	31.1	ST	57.0
	8	28°19'	95°20'	36.6	ST	11.4
	8	27°56'	95°10'	82.3	ST	9.0
Vomer setapinnis		(NO WEIGHT RECORDS)				
Trachurus lathami	3	27°52'	94°59'	18.3	FT	11.4
	3	27°26'	96°14'	179.2	FT	11.7
	3	29°24'	94°25'	12.8	FT	22.8
	3	26°49'	96°38'	93.3	ST	27.0
	3	27°20'	96°51'	153.6	FT	10.4
Chloroscombrus chrysurus	3	26°05'	96°35'		SN	17.2
	3	26°05'	96°35'		SN	16.0
	10	26°52'	97°17'		ST	18.2
	10	27°24'	97°15'		FT	18.2
Opisthonema oglinum	4	27°25'	97°05'	12.8	MT	18.2
	4	26°45'	97°12'	23.8	MT	34.0
	8	28°29'	95°56'	23.8	FT	150.2
Harengula pensacolae		(NO WEIGHT RECORDS)				
Etrumeus teres	4	27°27'	97°04'	25.6	MT	9.0
	4	26°45'	97°12'	23.8	MT	11.4
	4	27°53'	96°41'	23.8	MT	11.4
	3	27°20'	96°15'	153.6	FT	11.4
	3	27°26'	96°14'	179.2	FT	11.4
	3	27°25'	96°35'	23.8	MT	16.0
Brevoortia patronus	8	*29°34'	93°52'	11.0	FT	45.0
	8	*29°33'	94°03'	11.0	FT	45.0
	8	*29°31'	94°10'	12.8	FT	450.0
		(* Out of Study Area)				
Anchoa hepsetus	7	26°45'	97°12'	23.8	MT	11.4
Scomber japonicus	3	27°52'	94°59'	171.9	FT	12.2
	2	27°44'	96°08'	78.6	FT	27.0
	3	27°26'	96°14'	179.2	FT	31.8
Scomberomorus maculatus		(NO WEIGHT RECORDS)				
Peprilus alepidotus	3	27°59'	94°49'	76.8	FT	22.8
	8	29°24'	94°25'	12.8	FT	85.0

Species	Bottom Depth - Meters 9 37 55 73 91 130 183	Seasonal Occurrence (Month Most Frequently Caught)	Frequency in Records	Schooling Behavior
B. patronus (6-12)		August	34	Large dense schools
A. hepsetus (5-27)		August	49	Small schools
O. oglinum (5-36)		August, October	68	Small schools, sporadic appearance
H. pensacolae (5-56)		August, October	58	
C. chrysurus (5-38)		August, October	69	
S. maculatus (5-48)		August, October	45	
D. punctatus (5-52)		August, September, October	135	Small schools
V. setapinnis (5-69)		August, October	91	
P. burti (5-84)		August, October	90	
P. alepidotus (5-94)		August, October	138	
E. teres (8-98)		April	37	
T. lathami (6-100)		September	72	
S. japonicus		March, September	48	

All depth records and seasonal occurrences based on Pascagoula data records.
NOTE: Most of these fishes are concentrated in schools during the day and dispersed in scattering layers at night.

Figure 37 Depth Records, Seasonal Occurrences and Schooling Behavior for Coastal Pelagic Species - Texas Coast

- Provide data to establish design limitation of the ELAC Super Lodar Sonar System as an assessment technique to locate and quantify shallow water pelagic fish schools.

- Provide background data to be used in the development of a hydroacoustic system specifically designed for shallow water assessment.

The FRS OREGON II proceeded to Panama City, Florida, on July 28, 1975, and docked at the U.S. Coast Guard Station where personnel from the Naval Coastal Systems Laboratory made calibration measurements of the ship's ELAC Super Lodar Sonar System. In transit to Panama City an acoustical target was deployed and field determination of the ELAC System Transducer characteristics was made. On August 1, 1975 the FRS OREGON II departed Panama City, Florida and proceeded to the Texas Coast.

The sonar survey commenced on August 3, 1975 at the 182.9 m contour east of Brownsville, Texas and terminated 72 hours later, on August 6, 1975, east of Matagorda Bay, Texas. Fourteen transect lines (Figure 38) covering approximately 1297 kilometers, were covered during the 3 day survey. Transect information is found in Table 43. The FRS OREGON II steamed along the preselected transect lines at 10 knots, operating the ELAC System in a scanning mode from 60 degrees port to 60 degrees starboard. The transducer was pointed 3 degrees from horizontal, looking down. Because of marginal performance characteristics ascertained during calibration, it was determined that operation in Range II would provide the best results. Twenty-seven school targets were recorded by the ELAC System including one school of porpoise, one school of little tuna, six schools identified only as baitfish and nineteen unidentified schools.

Table 43 Transect Information

Transect No.	Position at Start		Position at Finish		Depth In	
	N. Lat.	W. Long.	N. Lat	W. Long.	Start	End
1	26°05'	96°20'	26°15'	97°08'	182.9	9.1
2	26°15'	97°08'	26°20'	96°17'	9.1	182.9
3	26°20'	96°17'	26°35'	97°15'	182.9	9.1
4	26°35'	97°15'	26°45'	96°26'	9.1	182.9
5	26°45'	96°26'	27°05'	97°21'	182.9	9.1
6	27°05'	97°21'	27°05'	96°26'	9.1	182.9
7	27°05'	96°26'	27°33'	97°12'	182.9	9.1
8	27°33'	97°12'	27°25'	96°10'	9.1	182.9
9	27°25'	96°10'	28°00'	96°53'	182.9	9.1
10	28°00'	96°53'	27°35'	95°55'	9.1	182.9
11	27°35'	95°55'	28°16'	96°26'	182.9	9.1
12	28°16'	96°26'	27°56'	95°30'	9.1	64.0
13	27°56'	95°30'	28°28'	96°12'	64.0	9.1
14	28°28'	96°12'	28°28'	95°30'	9.1	27.4

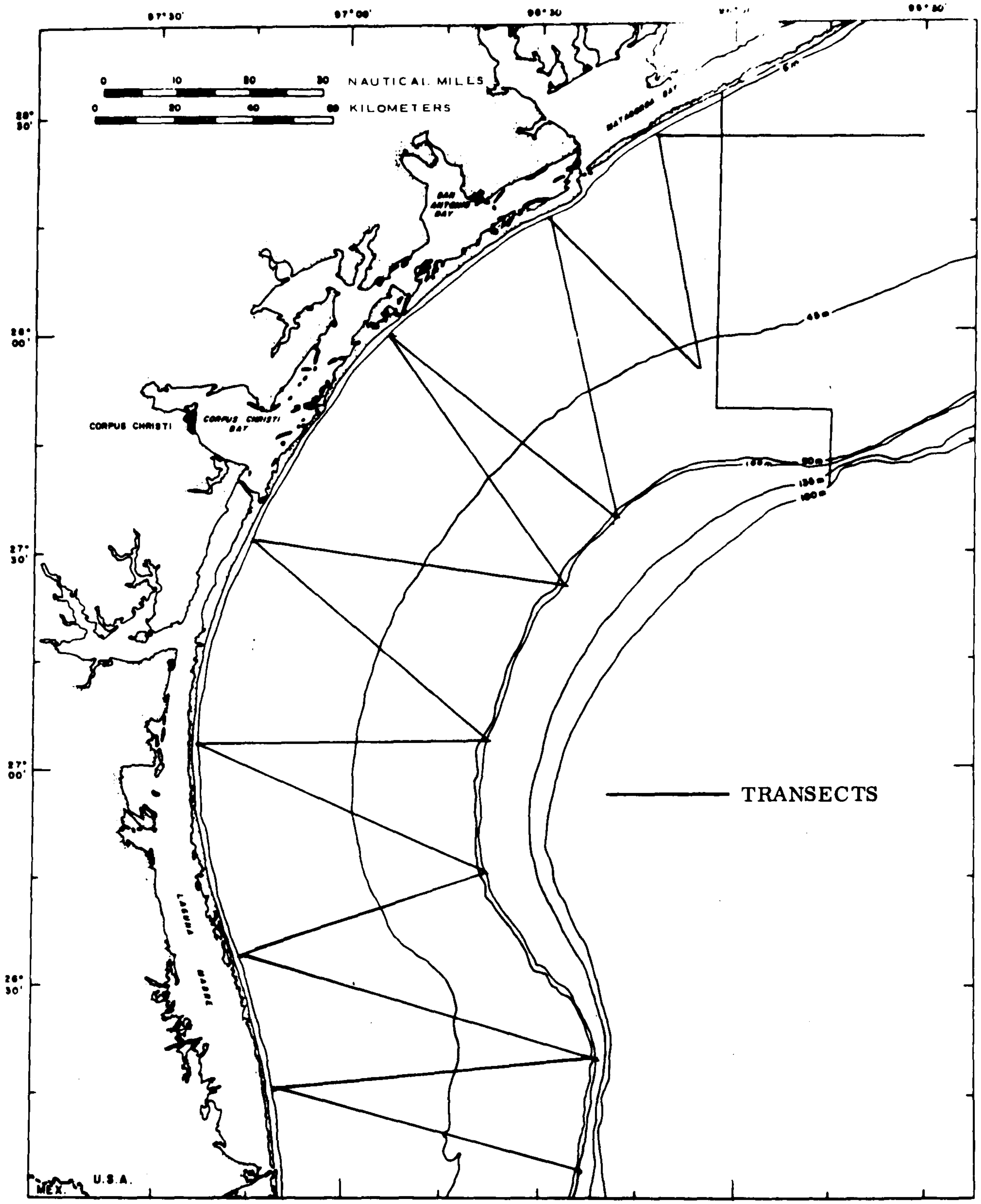

Figure 38 OREGON II Cruise #60A Part II Sonar Cruise Track.

FRS Oregon II Cruise No. 63

The second hydroacoustic survey in the south Texas Bureau of Land Management (BLM) Study Area was conducted from December 1 through December 4, 1975. The study area was transected along the same cruise path as was the first survey (Cruise No. 60A), commencing at the 182.9 meter contour east of Brownsville, Texas and terminating east of Matagorda Bay, Texas.

Objectives were to:

- Provide pelagic fish stock assessment data for the development of baseline definition of living marine resources in the BLM study area.

- Provide data to establish design limitations of the ELAC Super Lodar Sonar System as an assessment technique to locate and quantify shallow water pelagic fish schools.

- Provide background data to be used in development of a hydroacoustic system specifically designed for shallow water assessment.

The sonar survey operations were the same as the first survey conducted August 3-6, 1975 with the exceptions that the ELAC Super Lodar Sonar System was operated on Range III, providing a larger sample area than Range II used during the first survey. Range III could be used because of extensive maintenance performed on the system during a dry-dock period resulting in bringing the system within design specifications. Fourteen transect lines covering approximately 1297 kilometers were covered during the 72-hour survey. Transect information is the same as first survey.

Only seven school targets were recorded by the ELAC System during this survey with no surface observations for species identification.

Targets detected on the Ross Fineline vertical sounder (used for verification of specified ELAC targets) were also scarce and suggest few near bottom schools. The low density of targets are expected for the winter months in the shallow, 9- to 183-m areas of the Gulf of Mexico.

DATA ANALYSIS

A tabulation of fish school targets detected with the ELAC Super Lodar Sonar System on the two cruises in the survey area is contained in Tables 44 and 45. The distributions are plotted in Figures 39 and 40. Targets were also detected by direct surface observations from the vessel bridge and by Ross Fineline. Fathometer recordings, however, were not considered in the analysis because of possible duplication.

Table 44. FRS OREGON II Cruise #60A, Part II
ELAC Super Lodar Sonar Fish School Target Data

Fish School Target No.	Position		Bottom Depth (m)	Time
	N. Lat.	W. Long.		
1	26°11.5'	97°05'	18.3	2150
2	26°11.5'	97°06'	14.6	2153
3	26°11.5'	97°07'	14.6	2155
4	26°11'	97°08'	14.6	2156
5	26°32'	97°10'	32.9	0755
6	26°34'	97°13'	18.3	0810
7	26°35'	97°13.5'	18.3	0815
8	26°35'	97°16'	9.1	0828
9	26°35'	97°12.5'	16.5	0836
10	26°35.5'	97°10.5'	21.9	0840
11	26°35'	97°10'	21.9	0846
12	27°03'	97°02'	38.4	1920
13	27°25'	96°21'	109.7	0930
14	27°38.5'	96°04'	107.9	2027
15-25	27°37'	96°00'	140.8	2055
26	27°58'	95°32'	62.2	0815
27	28°28'	95°41'	23.8	1615

Table 45. FRS OREGON II Cruise #63A ELAC Super Lodar
Sonar Fish School Target Data

Fish School Target No.	Position		Time
	N. Lat.	W. Long.	
1	96°12.5'	27°57'	0840
2	96°14.0'	27°59'	0855
3	95°41.0'	28°05'	1820
4	95°41.2'	28°05.1'	1822
5	95°41.5'	28°05.2'	1825
6	95°41.6'	28°05.5'	1828
7	95°42.0'	28°06.0'	1830

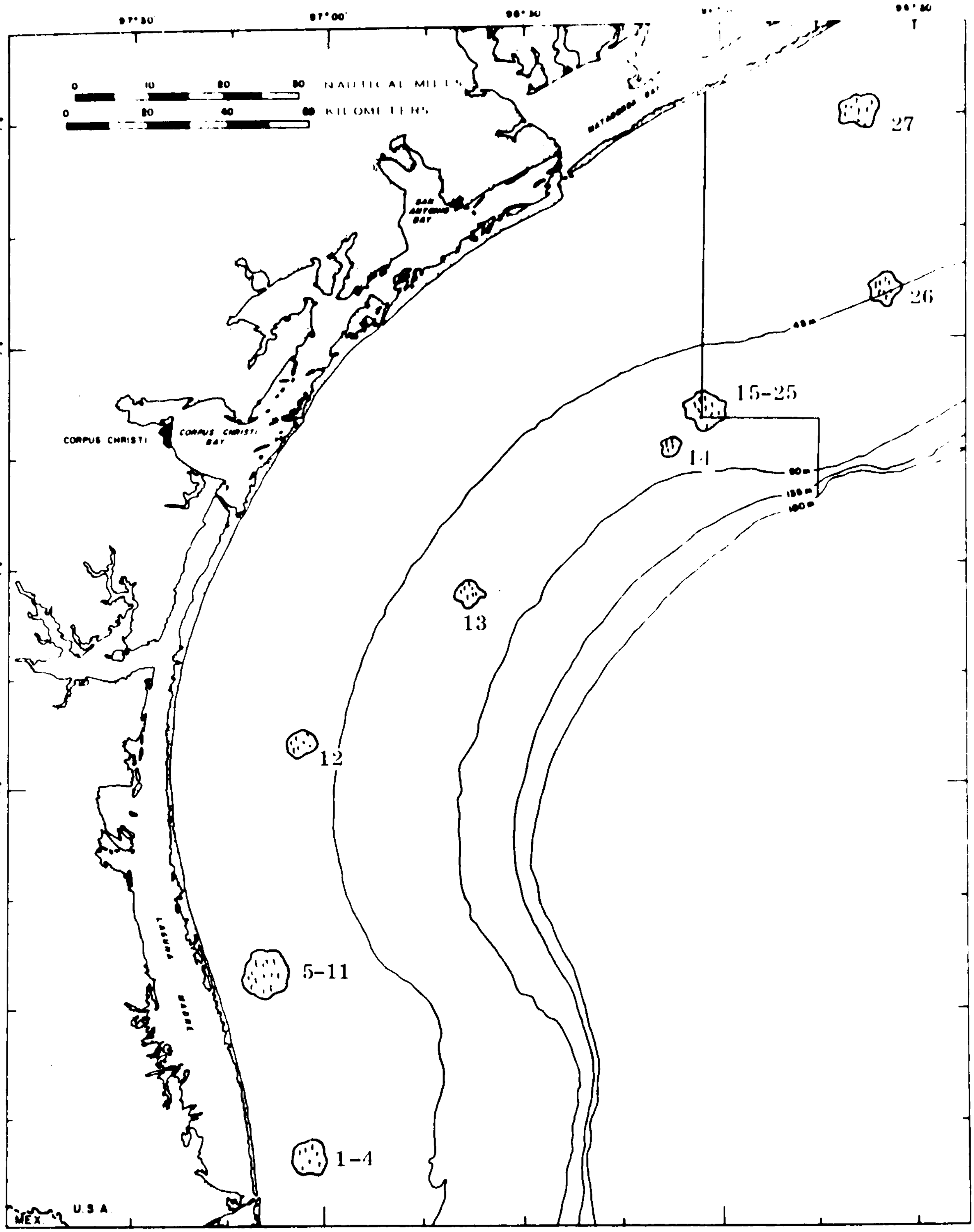

Figure 39.Distribution of Fish School Target Data for FRS OREGON II Cruise #60A.

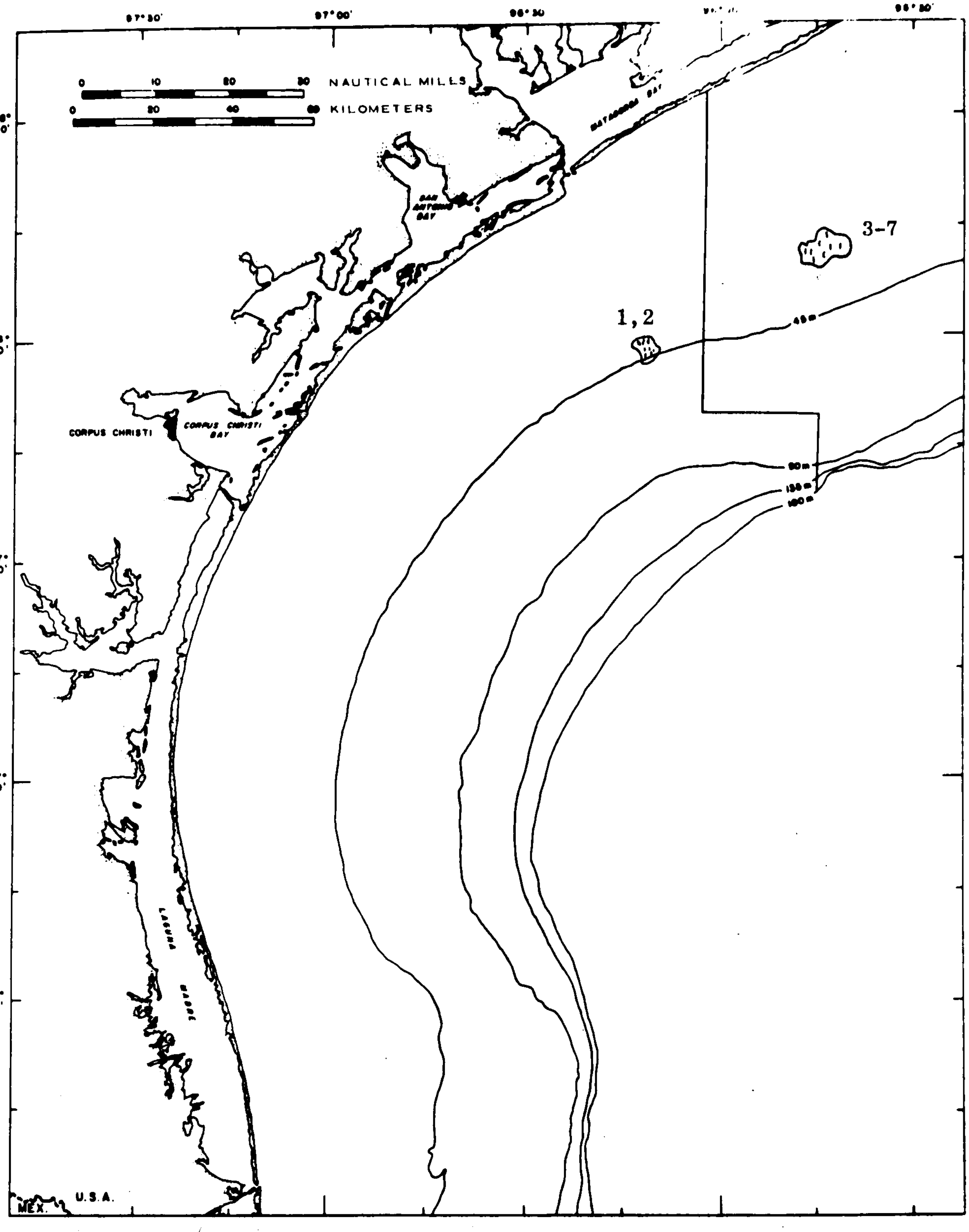

Figure 40. Distribution of Fish School Target Data for FRS OREGON II Cruise #63A.

The total survey area is 15,076 km^2. It lies between the 9.1-m and 182.9-m contours with the southern and northern limits being 25°00' N latitude and 95°30' W longitude, respectively. Actual coverage occurred along a 1,297-kilometer cruise tract. Swath width of the ELAC System was 200 m during Cruise #60A and 3,745 m during Cruise #63A.

As a result of a system calibration conducted at the Naval Coastal Systems Laboratory Panama City, Florida it was determined that source level and receiving voltage response were well below the optimum system performance. Measures of the minimum detectable signal level dictated that a lesser range must be used if one was to expect total coverage of the swath width of 200 m.

The results of repairs and refurbishing of the ELAC transducer and housing during FRS Oregon II dry docking prior to Cruise #63A brought the system up to design levels and allowed greater range setting (Range III) and produced better system performance during this survey. The effective swath of 3,745 m during the second survey was based on optimum range values and operational procedures.

Sample size or area insonified was obtained by multiplying the effective swath of acoustic detection by the cruise tract length, i.e.,

$$\frac{\text{swath in meters} \quad \times \quad \text{cruise tract (1,297 kilometers)}}{\text{Meters in one nautical mile}} = \text{Sample size}$$

The sample size was 136.2 km^2 for Cruise #60A (1st survey) and 2,623.2 km^2 for Cruise #63A (2nd survey). Therefore, using straight linear extrapolation

$$\frac{\text{Targets detected} \times \text{total area of BLM study site}}{\text{Area of Sample}} = \text{Total targets available}$$

The estimates of total fish school targets available were 2,906 targets during the first survey and 40 targets during the second survey.

The extreme difference in number of targets between the two cruises indicates the apparent seasonal fluctuation in abundance in coastal pelagic fishes. It appears that during the winter (Cruise No. 63A) these fishes move offshore, disperse and/or concentrate near the bottom strata, where they are difficult to detect.

CONCLUSIONS AND RECOMMENDATIONS

Limited Baseline Data

Available historical data associated with seasonal variations of the pelagic marine resource near the survey area is limited. This data base must be expanded if one is to develop an effective survey program.

Equipment Variations

The hydroacoustic equipment used in this survey was designed for the location of fish schools in deep water (1372 m). Due to the surface and bottom reverberations associated with a wide beam hydroacoustic system a significant amount of signal noise was experienced. Future surveys of this type should be conducted with narrow beam high resolution systems.

Quality Data Limitations

Because of the limited amount of survey area and the limited amount of survey time, no hard conclusions can be drawn. The data are only representative of what one might expect to find with a more comprehensive assessment technique.

Equipment Improvement

The industrially important fisheries in the northern Gulf of Mexico occupy shallow waters ranging in depth from 9.1 to 91.4 m. Conventional wide beach hydroacoustic assessment systems cannot operate effectively in these waters.

The development of a narrow beam shallow water assessment system; possibly based on finite amplitude beam forming techniques, should be considered.

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APPENDIX A

Historical Zooplankton

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TABLE 1-1.

SAMPLING DATA AT STATION W22

Cruise No.	Date	Net In (Local Time)	Tow Duration (Min. & Sec.)	Vol. of Water Filtered (m^3)	Subsample Size	Number per Subsample
G-2	3-9-63	05:35	19'41"	44	1/8	2668
G-3	4-4-63	13:25	14'30"	49	1/64	1487
G-4	5-5-63	18:05	18'58"	50	1/16	2857
G-5	5-21-63	13:00	20'04"	61	1/16	2809
G-6	6-27-63	15:20	19'45"	56	1/16	2911
G-7	7-15-63	10:45	20'01"	110	1/64	2242
G-8	8-29-63	19:10	19'50"	100	1/32	1669
G-9	10-4-63	13:45	20'29"	92	1/64	2575
G-10	11-4-63	06:05	22'29"	130	1/64	2124
G-11	12-1-63	22:15	20'25"	137	1/32	2819
G-12	12-21-63	15:15	13'13"	88	1/32	4266
G-13	1-29-64	09:20	20'18"	84	1/32	2875
G-14	2-20-64	02:25	22'03"	101	1/32	2804
G-15	3-19-64	14:35	22'44"	64	1/32	1185
G-16	4-16-64	12:15	22'44"	93	1/64	2296
G-17	5-23-64	21:45	19'38"	60	1/128	2357
G-18	6-26-64	07:55	20'46"	107	1/64	2700
G-19	7-17-64	13:50	21'35"	86	1/64	2607
G-20	8-30-64	23:10	21'01"	182	1/128	1812
G-21	9-19-64	10:10	10'47"	92	1/32	1324

TABLE 1-1. (continued)

G-22	10-29-64	16:40	21'00"	71	1/64	2688
G-23	11-23-64	22:10	21'02"	106	1/32	2673
G-24	12-17-64	08:20	20'14"	127	1/64	2344
G-25	1-8-65	12:50	19'09"	144	1/64	2321
G-26	2-28-65	03:50	19'59"	116	1/64	1851
G-27	3-22-65	13:20	21'12"	87	1/8	1798
G-28	4-24-65	14:00	20'23"	90	1/128	1964
G-30	6-13-65	05:10	21'38"	105	1/64	2451
G-32	8-12-65	22:35	21'50"	160	1/16	2039
G-33	9-11-65	16:15	21'33"	144	1/64	3058
G-35	12-10-65	22:10	19'36"	115	1/128	2436

TABLE 1-2.

SAMPLING DATA AT STATION W23

Cruise No.	Date	Net In (Local Time)	Tow Duration (Min. & Sec.)	Vol. of Water Filtered (m^3)	Subsample Size	Number per Subsample
G-3	4-4-63	11:00	19'55"	63	1/64	1508
G-4	5-5-63	14:10	18'20"	38	1/16	2354
G-5	5-21-63	09:30	20'15"	50	1/32	1765
G-6	6-27-63	13:00	20'00"	56	1/32	887
G-7	7-15-63	22:20	18'50"	104	1/64	3200
G-8	8-29-63	22:00	20'12"	91	1/32	1702
G-9	10-4-63	17:15	19'42"	58	1/32	2020
G-10	11-1-63	06:40	19'41"	109	1/128	1445
G-11	12-1-63	19:15	20'37"	108	1/64	1687
G-12	12-21-63	12:55	No data	No data	1/64	2639
G-15	3-19-64	11:30	21'51"	84	1/128	1158
G-16	4-16-64	08:35	22'05"	51	1/64	2296
G-17	5-23-64	18:40	18'51"	75	1/128	2357
G-18	6-26-64	05:00	21'00"	123	1/64	2700
G-19	7-17-64	10:43	19'41"	86	1/64	2607
G-20	8-30-64	19:10	19'10"	160	1/128	1812
G-20	8-30-64	21:10	No data	No data	1/128	1162
G-22	10-29-64	12:45	20'30"	96	1/128	1173
G-23	11-23-64	19:00	21'35"	114	1/256	1357
G-24	12-17-64	06:05	20'15"	101	1/128	1374
G-25	1-8-65	08:55	18'51"	73	1/64	978

TABLE 1-2. (continued)

G-26	2-28-65	12:40	19'15"	90	1/128	956
G-27	3-22-65	09:15	20'29"	162	1/64	3050
G-28	4-24-65	11:05	19'19"	86	1/128	1087
G-29	5-30-65	00:25	19'50"	65	1/128	1079
G-30	6-13-65	01:50	21'23"	67	1/128	1146
G-32	8-12-65	18:30	No data	155	1/128	775
G-33	9-11-65	19:00	20'00"	161	1/128	1586
G-35	12-10-65	19:00	20'29"	97	1/128	1677

TABLE 1-3.

SAMPLING DATA AT STATION W24

Cruise No.	Date	Net In (Local Time)	Tow Duration (Min. & Sec.)	Vol. of Water Filtered (m^3)	Subsample Size	Number per Subsample
G-3	4-6-63	13:30	19'45"	54	1/128	1060
G-4	5-3-63	23:45	16'15"	48	1/64	902
G-5	5-22-63	03:10	20'03"	51	1/32	2680
G-6	6-27-63	09:50	20'40"	57	1/32	992
G-7	7-15-63	19:00	16'00"	41	1/128	1947
G-8	8-28-63	16:30	19'41"	63	1/128	1245
G-9	10-3-63	05:10	19'55"	39	1/64	3832
G-10	11-3-63	11:30	10'25"	103	1/128	1404
G-11	12-1-63	09:30	21'13"	200	1/64	1266
G-15	3-20-64	11:00	20'03"	64	1/64	683
G-16	4-17-64	23:05	19'33"	55	1/64	800
G-17	5-25-64	00:25	19'12"	56	1/128	963
G-18	6-27-64	07:35	20'30"	68	1/128	1403
G-19	7-18-64	09:40	19'45"	134	1/32	1084
G-20	8-31-64	22:20	19'58"	122	1/128	966
G-21	9-25-64	14:30	20'07"	119	1/256	1766
G-22	10-30-64	19:45	21'18"	94	1/256	977
G-23	11-19-64	20:10	20'11"	105	1/256	1770
G-24	12-18-64	03:35	20'42"	148	1/128	1320
G-25	1-9-65	17:20	16'44"	58	1/64	978

TABLE 1-3. (continued)

G-26	2-28-65	17:20	20'37"	116	1/128	956
G-27	3-23-65	13:00	25'48"	194	1/64	3050
G-28	4-24-65	08:20	20'07"	67	1/128	1078
G-29	5-29-65	19:50	20'18"	90	1/128	1079
G-30	6-14-65	06:40	19'50"	87	1/128	1146
G-32	8-12-65	15:40	19'57"	112	1/128	775
G-33	9-11-65	22:00	20'30"	101	1/128	1586
G-35	12-10-65	15:45	20'07"	77	1/128	1677

TABLE 1-4.

SAMPLING DATA AT STATION W58

Cruise No.	Date	Net In (Local Time)	Tow Duration (Min. & Sec.)	Vol. of Water Filtered (m^3)	Subsample Size	Number per Subsample
G-2	3-9-63	09:45	20'00"	50	1/16	2610
G-3	4-4-63	18:10	20'15"	63	1/128	2183
G-4	5-5-63	22:00	19'00"	52	1/8	2361
G-5	5-21-63	17:30	20'05"	61	1/16	3082
G-6	6-27-63	18:45	19'56"	117	1/64	1591
G-7	7-15-63	05:30	20'35"	118	1/64	2180
G-8	8-29-63	16:10	20'03"	81	1/64	1944
G-9	10-11-63	09:30	21'30"	102	1/64	1453
G-10	11-4-63	01:04	21'20"	133	1/32	2401
G-11	12-2-63	01:00	20'57"	138	1/32	2980
G-12	12-21-63	18:50	21'30"	161	1/32	1420
G-13	1-29-64	07:00	23'02"	109	1/64	1933
BT-33	2-18-64	23:50	24'23"	58	1/16	1368
G-15	3-19-64	17:15	21'48"	92	1/64	1059
G-16	4-16-64	18:05	22'58"	108	1/128	1737
G-17	5-24-64	02:40	23'02"	143	1/128	1625
G-18	6-26-64	11:10	22'05"	129	1/64	1483
G-19	7-17-64	17:00	21'55"	90	1/64	1382
G-20	8-31-64	02:15	21'11"	82	1/64	1130
G-21	9-26-64	06:10	20'50"	191	1/128	1708
G-22	10-29-64	19:35	22'58"	167	1/128	1491

TABLE 1-4. (continued)

G-23	11-24-64	01:30	23'55"	138	1/128	1789
G-24	12-17-64	10:40	30'00"	148	1/128	1619
G-25	1-8-65	16:15	21'21"	130	1/16	1103
G-26	2-28-65	07:00	20'05"	190	1/32	1239
G-28	4-24-65	16:50	21'10"	147	1/256	1502
G-29	5-30-65	07:40	20'50"	95	1/64	1442
G-30	6-13-65	08:10	20'51"	144	1/128	1683
G-32	8-13-65	-	22'50"	134	1/64	1419
G-33	9-11-65	14:10	22'35"	170	1/128	977
G-35	12-11-65	06:35	20'48"	142	1/32	1899

TABLE 2-1.

NUMERICAL ABUNDANCE OF ZOOPLANKTON PER M^3 AT W22

	3-9-63	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-4-63	11-4-63	12-1-63	12-21-63
No. of Zoopl./m^3	485	1942	914	737	831	1304	534	1791	1046	658	1551
Copepoda	272	1489	512	434	522	678	319	951	602	355	618
Others:	213	453	402	303	309	626	215	840	444	303	933
Cladocera											
Evadne	0	0	0.6	0.5	128.0	0	17.9	0.7	0	0	0
Penilia	0	0	101.4	2.9	43.4	17.5	31.0	1.4	1.0	0.5	0.7
Ostracoda											
Euconchoecia	75.8	131.9	32.6	150.3	14.0	4.1	2.2	0.7	89.6	84.6	225.1
Conchoecia	0	0	0	0.5	0	0	0	0	0	0	0
Other ostracods	39.8	15.7	25.9	0.3	70.9	1.2	1.0	0	46.3	22.4	487.6
Mysidacea	0	0	0	0	0	0	0.3	0	0	0.2	0
Amphipoda	1.6	20.9	1.6	7.3	4.9	4.1	1.6	1.4	4.9	1.6	2.2
Lucifer	0.2	2.6	0.6	1.1	0.3	0	1.3	2.8	6.4	29.0	4.0
Other crustaceans	0	0	0	0	0	0	0.3	0	0	0	0.4
Barnacle nauplii	0.4	1.3	4.5	0	0.9	0	0	17.4	1.0	0.9	0.7
Barnacle cypris	1.1	13.1	1.0	0.3	0	0	1.6	0	0	0	0
Other nauplii	1.3	1.3	4.5	0.5	0.6	1.2	0.6	20.2	1.0	2.3	8.0
Decapod zoea	0	6.5	1.6	1.1	1.1	1.2	0.6	23.7	23.1	46.7	10.6
Decapod megalopa	0.4	0	0	0	0	0	0	0	0.5	0.5	0
Stomatopod larvae	0	7.8	0	0	0	2.9	0.3	2.1	2.0	0.5	0
Other crustacean larvae	0.2	2.6	9.0	4.5	2.6	5.2	2.9	58.4	38.9	19.6	8.7
Medusae	10.7	41.8	13.8	13.1	13.1	58.2	9.6	43.8	53.7	11.2	19.6
Polychaeta	1.1	0	2.6	1.6	0	5.8	5.1	34.8	15.8	1.4	12.4
Mollusca	0.5	23.5	58.6	27.5	0.9	20.4	13.4	145.4	36.9	13.1	71.3
Chaetognatha	12.2	116.2	24.0	64.8	5.1	47.1	17.0	50.8	63.0	28.0	69.8
Larvacea	62.2	56.2	118.7	24.4	24.0	449.7	74.6	423.7	42.3	35.0	5.1
Doliolum	5.3	11.8	1.3	2.6	0	7.0	6.1	1.4	17.2	5.4	0
Salpa	0	0	0	0	0	1.2	27.5	0	0	0	0
Echinoderm larvae	0	0	0	0	0	0	0	11.1	0	0.2	6.9
Others	0	0	0	0	0	0	0	0	0	0	0

TABLE 2-1. (continued)

	1-29-64	2-20-64	3-19-64	4-16-64	5-23-64	6-26-64	7-17-64	8-30-64	9-19-64	10-29-64	11-23-64
No. of Zoopl./m^3	1095	888	592	1580	5028	1615	1940	1274	460	2423	807
Copepoda	609	465	283	719	1640	951	1140	965	342	1590	547
Others:	486	423	309	861	3388	664	800	309	118	833	260
Cladocera											
Evadne	0	0	2.0	0.7	6.4	215.9	74.4	59.1	7.3	0	0
Penilia	0.4	1.6	1.5	26.8	61.9	13.8	151.8	7.7	3.8	2.7	11.8
Ostracoda											
Euconchoecia	53.3	30.1	14.5	44.7	1109.3	98.1	35.7	4.2	16.7	251.5	67.3
Conchoecia	1.1	0	0	0	0	0	0	0	0	0	0
Other ostracods	20.6	18.1	14.5	24.8	315.7	12.6	9.7	0.7	4.5	46.9	44.4
Mysidacea	0	0	0	0.7	0	0	0	0	0	0	0
Amphipoda	1.1	2.2	1.0	6.2	49.1	12.0	2.2	2.1	2.8	3.6	3.6
Lucifer	0	0.3	0	0	6.4	0	0	0.7	2.4	1.8	0.6
Other crustaceans	0	0.3	0	0	0	0	0	0	0	0	0.3
Barnacle nauplii	8.8	0	1.0	5.5	2.1	0	0	1.4	0.4	0	0
Barnacle cypris	0	0	1.0	3.4	19.2	3.0	0	0	0	0.9	0
Other nauplii	19.8	56.1	0	0.7	21.3	4.2	0	1.4	1.4	3.6	6.3
Decapod zoea	2.3	0.3	0	0.7	8.5	0	3.0	2.8	7.3	14.4	12.1
Decapod megalopa	0	0	0	0	0	0.6	0	0	0	0	0
Stomatopod larvae	2.3	0	0	0	6.4	0.6	0	2.8	0.4	3.6	0.6
Other crustacean larvae	1.5	0.3	18.0	0	32.0	9.0	0	0	24.3	11.7	5.4
Medusae	68.6	13.0	38.5	57.8	72.5	11.4	25.3	31.0	6.6	54.1	13.0
Polychaeta	9.1	9.5	1.5	9.0	19.2	5.4	2.2	12.0	1.7	15.3	3.0
Mollusca	24.4	41.2	11.5	156.2	337.1	43.7	66.2	43.6	6.3	37.0	12.7
Chaetognatha	22.1	7.6	53.5	84.0	605.9	52.0	8.9	26.7	20.5	83.8	56.2
Larvacea	217.5	68.1	99.0	375.7	654.9	168.7	400.4	111.1	10.4	291.2	18.7
Doliolum	32.0	174.3	52.0	64.0	59.7	7.2	19.3	1.4	0.7	10.8	4.2
Salpa	0.8	0.3	0	0	0	4.8	0.7	0	0	0	0
Echinoderm larvae	0.4	0	0	0	0	1.2	0	0.7	0.4	0	0
Others	0	0	0	0	0	0	0	0	0	0	0

TABLE 2-1. (continued)

	12-17-64	1-8-65	2-28-65	3-22-65	4-24-65	6-13-65	8-12-65	9-11-65	12-10-65
No. of Zoopl./m^3	1181	1031	1021	165	2793	1494	204	1359	2711
Copepoda	635	481	709	82	1020	762	105	643	962
Others:	546	550	312	83	1773	732	99	716	1749
Cladocera									
Evadne	0	0	0	0	2.8	8.5	0.1	2.2	0
Penilia	16.6	0.4	0	0.4	1.4	0	0	2.2	0
Ostracoda									
Euconchoecia	128.5	378.7	118.6	10.0	645.7	23.8	43.9	18.2	528.7
Conchoecia	0	0	0.5	0	0	0	0	0	2.2
Other ostracods	12.1	28.4	48.6	1.5	142.2	11.6	11.3	4.0	634.4
Mysidacea	0	0	2.8	0.1	0	0	0.1	0	1.1
Amphipoda	1.0	6.7	4.4	0.4	25.6	17.7	4.1	48.4	62.3
Lucifer	4.5	0.4	0	0.2	1.4	5.5	1.2	0.9	5.6
Other crustaceans	0	0	0	0.1	0	0	0	0	0
Barnacle nauplii	1.5	0	0	0.6	18.5	0	0	0.4	0
Barnacle cypris	0.5	0	1.7	0	41.2	32.3	0	1.3	2.2
Other nauplii	20.2	0.4	0	0.5	8.5	28.0	0.1	1.3	6.7
Decapod zoea	99.8	5.8	0	0.2	7.1	1.2	1.0	4.4	118.0
Decapod megalopa	0	0.4	0	0	0	0	0.3	0	1.1
Stomatopod larvae	0	0.4	0.5	0.1	2.8	0	0.1	0.4	0
Other crustacean larvae	13.1	4.0	2.8	0.4	18.5	361.5	1.7	3.6	15.6
Medusae	35.8	19.6	4.4	1.9	15.6	28.0	4.3	60.4	49.0
Polychaeta	4.0	3.6	1.7	1.7	5.7	2.4	0.5	460.0	2.2
Mollusca	40.3	12.9	41.4	1.0	395.4	59.7	15.8	16.9	140.2
Chaetognatha	104.3	68.4	25.9	2.5	226.1	76.2	6.1	57.8	156.9
Larvacea	61.0	12.9	56.8	33.1	190.6	56.7	2.7	31.6	14.5
Coliolum	3.0	7.1	1.1	28.4	24.2	18.9	1.5	1.3	8.9
Salpa	0	0	0	0	0	0	3.6	0	0
Echinoderm larvae	0	0	0.5	0	0	0	0	0.4	0
Others	0	0	0	0	0	0	0.1	0	0

TABLE 2-2.

NUMERICAL ABUNDANCE OF ZOOPLANKTON PER M^3 AT W23

	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-4-63	11-1-63	12-1-63	3-19-64	4-16-64	5-23-64
No. of Zoopl./m^3	1532	991	1130	507	1969	598	1114	1697	1000	1765	2826	4268
Copepoda	1228	430	865	349	1157	325	719	530	710	951	979	1172
<u>Others</u>:	304	561	265	158	812	273	395	1167	290	814	1847	3096
Cladocera												
<u>Evadne</u>	2.0	0	4.5	18.3	16.0	9.1	0	0	0	0	5.0	83.6
<u>Penilia</u>	45.7	18.1	9.0	0	34.5	14.1	0	7.0	1.2	1.5	7.5	35.8
Ostracoda												
<u>Euconchoecia</u>	79.2	0	100.5	0.6	0	0	0	2.3	34.4	125.0	0	425.0
Other ostracods	4.1	0.4	5.1	0	0	0	0	8.2	28.4	24.4	0	85.3
Mysidacea	0	0	0	0	0	0	0	0	0	0	0	0
Amphipoda	1.0	7.2	12.2	9.7	1.8	0.4	0	8.2	1.8	13.7	0	41.0
Lucifer	0	0	1.3	0	0	0	2.2	9.4	1.8	0	0	3.4
Other crustaceans	0	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplii	6.1	0	0.6	0	0	0.4	0	0	0	1.5	2.5	8.5
Barnacle cypris	1.0	0	0	0	0.6	0.7	0	0	0.6	0	5.0	6.8
Other nauplii	0	0	0	0	0.6	0	0	2.3	0	6.1	0	37.5
Decapod zoea	3.0	5.1	1.9	10.3	4.3	0.7	0	18.8	0.6	0	0	10.2
Decapod megalopa	0	0	0	0.6	0	0.4	0	0	0	0	0	1.7
Stomatopod larvae	0	2.5	0.6	0	0	0.4	0.6	0	0	1.5	0	1.7
Other crustacean larvae	3.0	9.7	2.6	0.6	1.2	3.5	9.4	45.8	11.3	1.5	0	13.6
Medusae	34.5	90.5	16.6	11.4	17.2	14.8	12.7	35.2	28.4	38.1	77.8	42.7
Polychaeta	6.1	5.9	0.6	2.9	14.1	0	13.2	14.1	10.7	6.1	5.0	22.2
Mollusca	28.4	333.0	17.9	18.3	48.0	32.0	13,8	634.1	83.0	131.0	193.2	1530.9
Chaetognatha	3.0	47.2	21.1	30.9	32.6	15.1	26.5	165.6	62.2	21.3	2.5	505.2
Larvacea	50.8	32.4	65.3	43.4	636.9	160.0	316.1	102.2	16.6	269.7	1423.1	213.3
Doliolum	35.6	1.7	4.5	10.3	3.7	17.6	0	109.2	8.3	170.7	120.5	27.3
Salpa	0	0	0	0	0	0	0	0	0	0	0	0
Echinoderm larvae	0	6.0	0	1.1	0	4.6	0.6	4.7	0	0	5.0	0
Others	0	2.1	0	0	0	0	0	0	0	1.5	0	0

TABLE 2-2. (continued)

	6-26-64	7-17-64	8-30-64	10-29-64	11-23-64	12-17-64	1-8-65	2-28-65	3-22-65	4-24-65	5-30-65	6-13-65
No. of Zoopl./m^3	1036	1204	1218	1564	3047	1741	857	1360	1205	1604	2125	2189
Copepoda	312	676	754	1043	2095	817	515	924	476	784	1847	1047
Others:	724	528	464	521	952	924	342	436	729	820	278	1142
Cladocera												
Evadne	4.7	9.7	31.2	4.0	0	0	0	0	0.4	23.8	0	5.7
Penilia	2.6	2.2	62.4	4.0	11.2	0	3.5	0	0	1.5	0	0
Ostracoda												
Euconchoecia	0.5	3.7	4.8	5.3	65.1	0	9.6	39.8	24.9	16.4	0	21.0
Other ostracods	0	0.7	3.2	1.3	89.8	25.3	11.4	19.9	20.5	3.0	0	3.8
Mysidacea	0	0	0	0	2.2	0	0	0	0	0	0	0
Amphipoda	0	3.0	1.6	0	33.7	2.5	3.5	136.5	3.6	7.4	13.8	32.5
Lucifer	0.5	0	2.4	6.7	6.7	0	0	0	0	0	0	0
Other crustaceans	0	0	0	0	0	0	0	0	0	0	2.0	0
Barnacle nauplii	0	0	1.6	0	0	0	0	11.4	0.8	0	0	0
Barnacle cypris	2.1	0	0	0	0	1.3	0.9	4.3	0	5.9	0	1.9
Other nauplii	0	0	0	52.0	44.9	0	0	0	0	0	0	0
Decapod zoea	2.1	0.7	7.2	0	0	2.5	0	0	0.4	5.9	0	0
Decapod megalopa	0	0	6.4	0	0	0	0	0	0	0	0	0
Stomatopod larvae	0	0	0	0	0	0	0	0	0.8	1.5	0	1.9
Other crustacean larvae	18.2	0.7	5.6	16.0	24.7	2.5	0.9	1.4	0.4	8.9	29.5	244.5
Medusae	0.5	16.4	10.4	112.0	92.1	60.8	8.8	0	47.0	38.7	7.9	9.6
Polychaeta	0	4.5	7.2	8.0	6.7	11.4	7.9	10.0	26.9	0	2.0	3.8
Mollusca	20.8	171.2	66.4	45.3	224.6	157.1	240.2	1.4	502.1	226.2	19.7	135.6
Chaetognatha	6.2	41.7	68.8	57.3	323.4	271.2	23.7	48.4	35.6	61.0	187.1	301.9
Larvacea	663.9	264.9	185.6	193.3	22.5	385.3	27.2	162.1	64.4	360.2	15.8	326.7
Doliolum	0	1.5	0	13.3	4.5	0	0	0	1.2	59.5	0	53.5
Salpa	0	7.4	0	0	0	0	0	0	0	0	0	0
Echinoderm larvae	1.6	0	0	2.7	0	0	5.3	0	0	0	0	0
Others	0	0	0	0	0	3.8	0	0	0	0	0	0

TABLE 2-2. (continued)

	8-12-65	9-11-65	12-10-65
No. of Zoopl./m^3	640	1261	2213
Copepoda	338	889	1634
Others:	302	372	580
Cladocera			
Evadne	0	1.6	0
Penilia	1.7	0.8	4.0
Ostracoda			
Euconchoecia	0	4.8	13.2
Other ostracods	0	1.6	25.1
Mysidacea	0	0.8	6.6
Amphipoda	1.7	22.3	21.1
Lucifer	13.2	1.6	0
Other crustaceans	0	0.8	2.6
Barnacle nauplii	0	0	0
Barnacle cypris	0	3.2	0
Other nauplii	0	49.3	83.1
Decapod zoea	2.5	0.8	0
Decapod megalopa	0	0	0
Stomatopod larvae	0	0	0
Other crustacean larvae	10.7	43.7	66.0
Medusae	49.5	23.9	56.7
Polychaeta	0	0	0
Mollusca	189.9	128.8	118.8
Chaetognatha	19.8	35.0	155.7
Larvacea	8.3	53.3	26.4
Doliolum	1.7	0	0
Salpa	4.1	0	0
Echinoderm larvae	0	0	0
Others	0	0	0

TABLE 2-3.

NUMERICAL ABUNDANCE OF ZOOPLANKTON PER M^3 AT W24

	4-6-63	5-3-63	5-22-63	6-27-63	7-15-63	8-28-63	10-3-63	11-3-63	12-1-63	3-20-64	4-17-64	5-25-64
No. of Zoopl./m^3	2513	1203	1682	557	6078	2529	6288	1745	405	683	931	2201
Copepoda	2254	512	1331	299	3456	1063	4385	599	349	351	720	1054
Others:	259	691	351	258	2622	1466	1903	1146	56	332	211	1147
Cladocera												
Evadne	0	1.3	1.3	0.6	49.9	6.1	0	0	0	0	0	109.7
Penilia	7.1	117.3	115.4	0	284.1	495.7	0	16.2	0	0	0	13.7
Ostracoda												
Euconchoecia	0	1.3	1.9	0.6	3.1	0	0	0	0	3.0	0	0
Other ostracods	0	1.3	0.6	0	6.2	0	0	0	0	0	0	0
Mysidacea	0	0	3.1	0	0	0	0	0	0	0	0	0
Amphipoda	0	2.7	3.1	1.1	3.1	2.0	0	3.7	0.3	0	0	2.3
Lucifer	0	1.3	1.3	13.5	31.2	8.1	4.9	5.0	0	0	0	41.1
Other crustaceans	0	0	1.3	0	6.2	0	0	0	0.3	0	0	0
Barnacle nauplii	0	0	0	~0	0	0	0	0	0.3	2.0	1.2	0
Barnacle cypris	0	0	0	0	0	0	0	0	0	0	0	0
Other nauplii	0	0	0	10.7	65.6	2.0	0	0	2.9	0	2.3	0
Decapod zoea	0	0	6.3	6.7	15.6	12.2	0	1.2	0.6	1.0	0	0
Decapod megalopa	0	0	0	0	0	0	0	0	0	0	0	0
Stomatopod larvae	0	0	0	0	0	0	0	0	0	0	0	0
Other crustacean larvae	23.7	8.0	11.3	18.0	171.7	20.3	19.7	9.9	1.0	2.0	0	118.9
Medusae	4.7	305.3	16.9	7.3	849.2	32.5	14.8	0	7.7	17.0	12.8	6.9
Polychaeta	7.1	13.3	6.9	0	9.4	54.9	59.1	11.2	0	14.0	0	9.1
Mollusca	21.3	153.3	22.6	186.4	939.7	623.7	78.8	963.1	9.9	7.0	39.6	285.7
Chaetognatha	11.8	5.3	27.0	2.8	106.1	83.3	78.8	59.7	30.1	1.0	0	107.4
Larvacea	182.5	80.0	130.5	9.5	81.2	73.1	1647.5	74.6	3.2	281.0	146.6	365.7
Doliolum	0	0	1.3	0.6	0	40.6	0	1.2	0	4.0	8.1	82.3
Echinoderm larvae	0	0	0	0	0	12.2	0	0	0	0	0	4.6

TABLE 2-3. (continued)

	6-27-64	7-18-64	8-31-64	9-25-64	10-30-64	11-19-64	12-18-64	1-9-65	2-28-65	3-23-65	4-24-65	5-29-65
No. of Zoopl./m^3	2641	259	1013	3799	2661	4315	1142	1399	444	1477	2875	279
Copepoda	1570	118	617	2878	1906	3711	719	744	332	1236	449	137
Others:	1071	141	396	921	755	604	423	655	112	241	2426	142
Cladocera												
Evadne	32.0	0	19.9	0	0	0	0	0	0	0	9.6	0
Penilia	99.8	1.4	110.2	0	0	0	0	0	0	2.6	1.9	1.4
Ostracoda												
Euconchoecia	233.4	0	2.1	0	0	0	0	0	0	0	1.9	0
Other ostracods	3.8	0	1.0	0	0	0	0	0	0	0	1.9	0
Mysidacea	0	0	1.0	0	2.7	2.4	0	0	0.6	6.6	0	0
Amphipoda	15.1	0	3.1	0	0	0	0.9	0	1.1	0	3.8	0
Lucifer	18.8	8.4	6.3	4.3	5.4	48.8	0	0	0	0	1.9	0
Other crustaceans	0	0.2	12.6	0	0	2.4	0	0	1.1	2.6	0	0
Barnacle nauplii	0	0.5	0	0	0	0	0.9	0	0	0	3.8	0
Barnacle cypris	1.9	0	0	0	0	0	0	2.2	18.8	11.9	0	0
Other nauplii	0	0	11.5	0	0	0	9.5	0	0	1.3	7.6	0
Decapod zoea	1.9	1.0	2.1	0	0	4.9	0	0	0	0	0	0
Decapod megalopa	0	0	0	0	0	0	0	0	0	0	0	0.7
Stomatopod larvae	0	0	0	0	0	0	0	0	0	0	5.7	0
Other crustacean larvae	99.8	93.1	26.2	316.2	19.1	19.6	0.9	0	0	9.2	61.1	5.7
Medusae	1.9	0	26.2	15.1	0	0	45.0	0	0	0	5.7	0
Polychaeta	9.4	0.5	5.2	17.2	10.9	9.7	2.6	8.8	6.6	19.8	13.4	0
Mollusca	135.5	25.3	38.8	316.2	198.8	60.9	281.1	39.7	53.5	23.7	825.3	5.0
Chaetognatha	41.4	8.6	38.8	161.3	337.7	190.2	70.1	4.4	13.2	50.1	21.0	81.8
Larvacea	368.9	2.1	90.2	90.4	177.0	265.8	12.1	600.3	17.1	112.2	823.4	47.6
Doliolum	7.5	0	1.0	0	0	0	0	0	0	0	638.1	0
Echinoderm larvae	0	0	0	0	2.7	0	0	0	0	0	0	0

TABLE 2-3. (continued)

	6-14-65	8-12-65	9-11-65	12-10-65
No. of Zoopl./m^3	299	1763	820	1222
Copepoda	148	937	525	631
Others:	151	826	295	591
Cladocera				
Evadne	0	0	2.5	0
Penilia	2.9	4.6	0	0.8
Ostracoda				
Euconchoecia	0	0	0	0
Other ostracods	0	0	0	0.8
Mysidacea	0	0	0	0
Amphipoda	0	0	0	0.8
Lucifer	5.1	40.0	43.1	0
Other crustaceans	0	0	2.5	0
Barnacle nauplii	0	0	0	4.2
Barnacle cypris	5.1	1.1	0	0.8
Other nauplii	0	0	2.5	69.0
Decapod zoea	8.1	0	2.5	2.5
Decapod megalopa	0	0	1.3	0
Stomatopod larvae	0	0	0	0
Other crustacean larvae	49.3	253.7	60.8	0.8
Medusae	0	0	12.7	0
Polychaeta	0.7	1.1	0	7.5
Mollusca	2.2	48.0	46.9	210.3
Chaetognatha	30.2	44.6	7.6	280.9
Larvacea	45.6	433.1	112.8	12.5
Doliolum	0	0	0	0
Echinoderm larvae	1.5	0	0	0

TABLE 2-4.

NUMERICAL ABUNDANCE OF ZOOPLANKTON PER M^3 AT W58

	3-9-63	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-11-63	11-4-63	12-2-63	12-21-63
No. of Zoopl./m^3	835	4435	363	808	870	1182	1536	912	578	691	282
Copepoda	374	2379	264	476	760	859	766	618	333	422	176
Others:	461	2056	99	333	111	324	770	294	245	269	106
Cladocera											
Evadne	0	0	0.5	4.7	1.6	16.8	45.0	1.9	0.5	0	0
Penilia	0.6	0	0.8	55.3	0	0.5	534.1	23.8	1.4	5.3	0.4
Ostracoda											
Euconchoecia	291.8	1365.3	26.2	71.3	1.6	21.2	6.3	22.0	24.3	88.1	19.7
Conchoecia	0.3	0	0.5	0.5	0.5	3.2	3.2	0	0.2	0	1.8
Other ostracods	0	213.3	3.1	0	0	0	0	0	0	0	0
Mysidacea	1.0	0	0	0	0	0	0	0	0.2	0.9	0.2
Amphipoda	5.1	24.4	3.1	3.9	8.2	2.2	0.8	1.3	0	1.9	0.6
Euphausiacea	0	0	0	0	0	0	0	0	0	0	0
Lucifer	0	0	0.3	1.1	0	0	0.8	0	0.2	0.2	0
Other crustaceans	10.6	0	0	0	0	0	0	0	0	0	0
Barnacle nauplii	8.6	2.0	0.2	0	0	0.5	0.8	0	0	0.2	0
Other nauplii	0	0	0.8	0	2.7	0.5	0	0	0	0	0
Decapod zoea	1.6	8.1	1.8	0.3	1.6	1.6	0	1.9	0	4.9	0
Decapod megalopa	0	0	0	0	0.5	0.5	0	0	0	0	0
Stomatopod larvae	0	0	0	0	1.1	0	0	0	0	0	0
Other crustacean larvae	1.0	16.2	1.2	8.7	3.8	4.9	4.0	10.0	0.5	9.0	3.0
Medusae	19.8	24.4	3.4	3.9	16.4	14.6	7.1	2.5	5.1	36.4	6.6
Polychaeta	3.8	2.0	0.8	0.8	6.6	3.8	8.7	6.3	0	0	0
Mollusca	4.8	95.5	15.5	12.9	20.2	31.5	26.1	32.6	11.1	31.5	7.4
Chaetognatha	18.2	117.8	11.2	56.7	18.1	53.7	35.6	11.9	18.8	31.1	18.7
Larvacea	73.0	182.9	28.2	98.4	18.1	160.5	69.5	177.6	175.6	55.0	45.3
Doliolum	20.5	4.1	0.9	13.1	3.8	1.6	4.7	1.9	6.5	4.6	1.8
Salpa	0	0	0.5	1.1	4.4	1.6	21.3	0	0.7	0	0.4
Echninoderm larvae	0	0	0.1	0	1.6	4.3	2.4	0	0	0.2	0.2

TABLE 2-4. (continued)

	1-29-64	2-18-64	3-19-64	4-16-64	5-24-64	6-26-64	7-17-64	8-31-64	9-26-64	10-29-64	11-24-64
No. of Zoopl./m^3	1135	377	737	2059	1455	736	983	882	1145	1143	1659
Copepoda	560	125	283	949	767	381	677	545	838	727	1133
Others:	536	252	454	1109	687	355	306	337	306	416	527
Cladocera											
Evadne	0	0	0	8.3	6.3	45.1	29.9	7.8	0	1.5	0.9
Penilia	0	0.6	1.4	40.3	6.3	19.3	5.0	41.4	18.8	1.5	12.1
Ostracoda											
Euconchoecia	257.8	5.2	39.7	297.5	56.4	22.3	2.8	6.2	70.4	88.9	63.1
Conchoecia	0	0.6	0.7	13.0	4.5	0	0.7	0	0.7	0	3.7
Other ostracods	0	0	1.4	0	0	0	1.4	0	8.7	3.1	19.5
Mysidacea	2.3	0	0	0	0.9	0	0	0.8	0.7	0.8	0
Amphipoda	4.1	2.8	4.9	8.3	26.8	7.4	2.1	2.3	4.7	4.6	3.7
Euphausiacea	0	0.3	0	0	0	0.5	0	0	0	0	0
Lucifer	0	0	2.8	0	0	0	1.4	0.8	1.3	0	0
Other crustaceans	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplii	0	0	0	0	0.9	0	0	0	0	0	0
Other nauplii	0	0	0	0	0	0	0	0	0	0	0
Decapod zoea	2.3	0.6	3.5	8.3	0	0.5	0.7	0	4.0	3.8	9.3
Decapod megalopa	0	0.3	0	0	0	0	2.8	0	0	0	0
Stomatopod larvae	0	0	0	0	0	0	0	0	0	0	0
Other crustacean larvae	2.3	3.3	7.7	1.2	4.5	5.0	4.3	3.1	14.7	6.1	6.4
Medusae	53.4	26.8	8.3	71.1	3.6	19.8	12.1	21.1	12.1	19.2	23.2
Polychaeta	0	1.9	4.2	0	12.5	0	4.3	0	19.4	0	0
Mollusca	37.6	8.8	27.1	147.0	110.1	77.9	37.7	28.1	52.3	42.2	29.7
Chaetognatha	25.8	14.9	108.5	188.4	247.0	45.6	32.7	42.9	42.2	13.8	100.2
Larvacea	133.9	73.1	240.0	257.2	145.9	102.7	162.8	174.0	56.3	210.8	231.9
Doliolum	14.1	112.8	3.5	68.7	61.8	5.0	3.6	5.5	0	19.9	22.3
Salpa	0	0.3	0	0	0	2.5	1.4	3.1	0	0	0.9
Echinoderm larvae	1.8	0	0	0	0	1.0	0	0	0	0	0

TABLE 2-4. (continued)

	12-17-64	1-8-65	2-28-65	4-24-65	5-30-65	6-13-65	8-13-65	9-11-65	12-11-65
No. of Zoopl./m^3	1400	136	209	2616	971	1496	678	736	428
Copepoda	1092	94	133	1522	515	707	541	477	348
<u>Others</u>:	309	42	76	1094	457	789	137	258	80
Cladocera									
Evadne	0	0	0	0	0	37.3	0	64.7	0
Penilia	12.1	0.5	0	0	0.7	0	0	0.8	0
Ostracoda									
Euconchoecia	111.6	8.9	5.9	189.8	2.0	7.1	6.7	18.1	4.5
Conchoecia	0	0.5	0.5	1.7	0	1.8	1.4	2.3	1.1
Other ostracods	12.1	3.7	11.1	231.6	8.1	0	0	0	2.7
Mysidacea	0	0	0	0	0.7	0.9	0	0	0
Amphipoda	3.5	0.4	1.2	7.0	6.7	14.2	5.2	1.5	0.9
Euphausiacea	0	0.5	0.2	0	0	0	0.5	0	0
Lucifer	13.0	0.1	0	1.7	3.4	2.7	1.0	0	0.7
Other crustaceans	0	0	0	0	0	0	0	0	0
Barnacle nauplii	0	0	0	3.5	0.7	0	0	0	0
Other nauplii	0	0	0	0	0	0	0	0	0
Decapod zoea	29.4	0.7	0.2	1.7	5.4	45.3	2.4	10.5	10.1
Decapod megalopa	0	0.3	0.2	0	0	7.1	0	0	0.5
Stomatopod larvae	0	0	0	0	0	0	0	0	0
Other crustacean larvae	6.0	1.0	1.2	19.2	12.1	6.2	0.5	0.8	2.9
Medusae	1.7	0.6	0.8	0	76.8	0.9	1.0	0.8	1.1
Polychaeta	6.9	0.9	0.5	15.7	0	1.8	6.2	0.8	0.9
Mollusca	35.5	2.0	18.2	299.5	119.2	42.7	11.0	24.1	6.1
Chaetognatha	37.2	15.9	5.4	226.4	134.7	541.3	54.9	83.6	20.3
Larvacea	36.3	2.3	29.5	92.3	78.1	56.9	35.3	50.4	22.3
Doliolum	3.5	3.4	0.7	3.5	7.4	23.1	0.5	0	6.1
Salpa	0	0	0	0	0.7	0	10.5	0	0.2
Echinoderm larvae	0	0	0	0	0	0	0	0	0

TABLE 3-1.

PERCENTAGE COMPOSITION OF ZOOPLANKTON AT W22

	3-9-63	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-4-63	11-4-63	12-1-63	12-21-63	1-29-64	2-20-64	3-19-64	4-16-64
Copepoda %	56.1	76.7	56.0	58.8	62.8	52.0	59.7	53.1	57.6	54.0	39.8	55.6	52.3	47.8	45.5
Others %	43.9	23.3	44.0	41.2	37.2	48.0	40.3	46.9	42.4	46.0	60.2	44.4	47.7	52.2	54.5
Percentage Composition of Zooplankton other than Copepods (100%)															
Cladocera															
Evadne	0	0	0.2	0.2	41.3	0	8.3	0.1	0	0	0	0	0	0.7	0.1
Penilia	0	0	25.2	1.0	14.0	2.8	14.4	0.2	0.2	0.1	0.1	0.1	0.4	0.5	3.1
Ostracoda															
Euconchoecia	35.6	29.1	8.1	49.6	4.5	0.7	1.0	0.1	20.2	27.9	24.1	11.0	7.1	4.7	5.2
Conchoecia	0	0	0	0.2	0	0	0	0	0	0	0	0.2	0	0	0
Other ostracods	18.7	3.5	6.4	0.1	22.9	0.2	0.4	0	10.4	7.4	52.3	4.2	4.3	4.7	2.9
Mysidacea	0	0	0	0	0	0	0.2	0	0	0.1	0	0	0	0	0.1
Amphipoda	0.8	4.6	0.4	2.4	1.6	0.7	0.7	0.2	1.1	0.5	0.2	0.2	0.5	0.3	0.7
Lucifer	0.1	0.6	0.2	0.3	0.1	0	0.6	0.3	1.4	9.6	0.4	0	0.1	0	0
Other crustaceans	0	0	0	0	0	0	0.2	0	0	0	0.1	0	0.1	0	0
Barnacle nauplii	0.2	0.3	1.1	0	0.3	0	0	2.1	0.2	0.3	0.1	1.8	0	0.3	0.6
Barnacle cypris	0.5	2.9	0.2	0.1	0	0	0.7	0	0	0	0	0	0	0.3	0.4
Other nauplii	0.6	0.3	1.1	0.2	0.2	0.2	0.3	2.4	0.2	0.8	0.9	4.1	13.2	5.8	0.1
Decapod zoea	0	1.4	0.4	0.3	0.4	0.2	0.3	2.8	5.3	15.4	1.1	0.5	0.1	0	0.1
Decapod megalopa	0.2	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0
Stomatopod larvae	0	1.7	0	0	0	0.5	0.2	0.2	0.4	0.1	0	0.5	0	0	0
Other crustacean larvae	0.1	0.6	2.2	1.5	0.8	0.8	1.3	7.0	8.8	6.5	0.9	0.3	0.1	0	0
Medusae	5.0	9.2	3.4	4.3	4.2	9.3	4.5	5.2	12.1	3.7	2.1	14.1	3.1	12.4	6.7
Polychaeta	0.5	0	0.6	0.5	0	0.9	2.4	4.1	3.6	0.5	1.3	1.9	2.2	0.5	1.0
Mollusca	0.3	5.2	14.6	9.1	0.3	3.2	6.3	17.3	8.3	4.3	7.6	5.0	9.7	3.7	18.2
Chaetognatha	5.7	25.7	6.0	21.4	1.7	7.5	7.9	6.1	14.2	9.2	7.5	4.5	1.8	17.3	9.7
Larvacea	29.2	12.4	29.5	8.0	7.7	71.8	34.7	50.5	9.5	11.6	0.6	44.8	16.1	32.0	43.7
Doliolum	2.5	2.6	0.3	0.9	0	1.1	2.8	0.2	3.9	1.8	0	6.6	41.2	16.8	7.4
Salpa	0	0	0	0	0	0.2	12.8	0	0	0	0	0.2	0.1	0	0
Echinoderm larvae	0	0	0	0	0	0	0	1.3	0	0.1	0.7	0.1	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 3-1. (continued)

Percentage Composition of Zooplnakton other than Copepods (100%)

	5-23-64	6-26-64	7-17-64	8-30-64	9-19-64	10-29-64	11-23-64	12-17-64	1-8-65	2-28-65	3-22-65	4-24-65	6-13-65	8-12-65	9-11-65	12-10-65
Copepoda %	32.6	58.9	58.8	75.7	74.4	65.6	67.8	53.8	46.7	69.5	49.8	36.5	51.0	51.7	47.3	35.5
Others %	67.4	41.1	41.2	24.3	25.6	34.4	32.2	46.2	53.3	30.5	50.2	63.5	49.0	48.3	52.7	64.5
Cladocera																
Evadne	0.2	32.5	9.3	19.1	6.2	0	0	0	0	0	0	0.2	1.2	0.1	0.3	0
Penilia	1.8	2.1	19.0	2.5	3.2	0.3	4.5	3.0	0.1	0	0.4	0.1	0	0	0.3	0
Ostracoda																
Euconchoecia	32.8	14.8	4.5	1.4	14.2	30.2	25.9	23.5	68.8	38.1	12.1	36.4	3.2	44.6	2.5	30.2
Conchoecia	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0.1
Other ostracods	9.3	1.9	1.2	0.2	3.8	5.6	17.1	2.2	5.2	15.6	1.8	8.0	1.6	11.5	0.6	36.3
Mysidacea	0	0	0	0	0	0	0	0	0	0.9	0.1	0	0	0.1	0	0.1
Amphipoda	1.4	1.8	0.3	0.7	2.4	0.4	1.4	0.2	1.2	1.4	0.4	1.4	2.4	4.2	6.8	3.6
Lucifer	0.2	0	0	0.2	2.1	0.2	0.2	0.8	0.1	0	0.2	0.1	0.8	1.2	0.1	0.3
Other crustaceans	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0
Barnacle nauplii	0.1	0	0	0.5	0.3	0	0	0.3	0	0	0.8	1.0	0	0	0.1	0
Barnacle cypris	0.6	0.5	0	0	0	0.1	0	0.1	0	0.5	0	2.3	4.4	0	0.2	0.1
Other nauplii	0.6	0.6	0	0.5	1.2	0.4	2.4	3.7	0.1	0	0.6	0.5	3.8	0.1	0.2	0.4
Decapod zoea	0.3	0	0.4	0.9	6.2	1.7	4.6	18.3	1.1	0	0.2	0.4	0.2	1.0	0.6	6.7
Decapod megalopa	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0	0.3	0	0.1
Stomatopod larvae	0.2	0.1	0	0.9	0.3	0.4	0.2	0	0.1	0.2	0.1	0.2	0	0.1	0.1	0
Other crustacean larvae	0.9	1.4	0	0	20.7	1.4	2.1	2.4	0.7	0.9	0.4	1.0	49.4	1.7	0.5	0.9
Medusae	2.1	1.7	3.2	10.0	5.6	6.5	5.0	6.5	3.6	1.4	2.3	0.9	3.8	4.4	8.4	2.8
Polychaeta	0.6	0.8	0.3	3.9	1.5	1.8	1.2	0.7	0.7	0.5	2.0	0.3	0.3	0.5	64.2	0.1
Mollusca	9.9	6.6	8.3	14.1	5.3	4.4	4.9	7.4	2.3	13.3	1.2	22.3	8.2	16.0	2.4	8.0
Chaetognatha	17.9	7.8	1.1	8.6	17.4	10.1	21.6	19.1	12.4	8.3	3.0	12.8	10.4	6.2	8.1	9.0
Larvacea	19.3	25.4	50.0	35.9	8.8	35.0	7.2	11.2	2.3	18.2	39.9	10.7	7.7	2.7	4.4	0.8
Doliolum	1.8	1.1	2.4	0.5	0.6	1.3	1.6	0.6	1.3	0.4	34.3	1.4	2.6	1.5	0.2	0.5
Salpa	0	0.7	0.1	0	0	0	0	0	0	0	0	0	0	3.7	0	0
Echinoderm larvae	0	0.2	0	0.2	0.3	0	0	0	0	0.2	0	0	0	0	0.1	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0

TABLE 3-2.

PERCENTAGE COMPOSITION OF ZOOPLANKTON AT W23

	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-4-63	11-1-63	12-1-63	12-21-63	3-19-64	4-16-64	5-23-64	6-26-64	7-17-64
Copepoda %	80.2	43.3	76.6	68.8	58.8	54.3	64.6	31.2	71.1	22.4	53.4	34.6	27.5	30.1	56.1
Others %	19.8	56.7	23.4	31.2	41.2	45.7	35.4	68.8	28.9	77.6	46.6	65.4	72.5	69.9	43.9
Percentage Composition of Zooplankton other than Copepods (100%)															
Cladocera															
Evadne	0.7	0	1.7	11.5	2.0	3.3	0	0	0	0	0	0.3	2.7	0.6	1.8
Penilia	15.0	3.2	3.4	0	4.2	5.1	0	0.6	0.4	0.2	0.2	0.4	1.2	0.4	0.4
Ostracoda															
Euconchoecia	26.1	0	38.0	0.4	0	0	0	0.2	11.9	14.4	15.4	0	13.7	0.1	0.7
Other ostracods	1.3	0.1	1.9	0	0	0	0	0.7	9.8	43.4	3.0	0	2.8	0	0.1
Mysidacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphipoda	0.3	1.3	4.6	6.1	0.2	0.1	0	0.7	0.6	0.5	1.7	0	1.3	0	0.6
Lucifer	0	0	0.5	0	0	0	0.6	0.8	0.6	0.1	0	0	0.1	0.1	0
Other crustaceans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barnacle nauplii	2.0	0	0	0	0	0.1	0	0.2	0	0	0.2	0.1	0.3	0	0
Barnacle cypris	0.3	0	0	0	0.1	0.3	0	0	0.2	0	0	0.3	0.2	0.3	0
Other nauplii	0	0	0.2	0	0.1	0	0	0	0	0.6	0.7	0	1.2	0	0
Decapod zoea	1.0	0.9	0.7	6.5	0.5	0.3	0	1.6	0.2	0.1	0	0	0.3	0.3	0.1
Decapod megalopa	0	0	0	0.4	0	0.1	0	0	0	0	0	0	0.1	0	0
Stomatopod larvae	0	0.4	0.2	0	0	0.1	0.1	0.1	0.2	0	0.2	0	0.1	0	0
Other crustacean larvae	1.0	1.7	1.0	0.4	0.1	1.3	2.4	3.8	3.7	0.1	0.2	0	0.4	2.5	0.1
Medusae	11.4	16.1	6.3	7.2	2.1	5.4	3.2	3.0	9.8	7.0	4.7	4.2	1.4	0.1	3.1
Polychaeta	2.0	1.0	0.2	1.8	1.7	0	3.4	1.2	3.7	2.3	0.8	0.3	0.7	0	0.8
Mollusca	9.4	59.3	6.8	11.6	5.9	11.7	3.5	54.3	28.7	26.6	16.1	10.5	49.4	2.9	32.4
Chaetognatha	1.0	8.4	8.0	19.5	4.0	5.5	6.7	14.2	21.5	4.5	2.6	0.1	16.3	0.9	7.9
Larvacea	16.7	5.8	24.7	27.4	78.5	58.5	80.0	8.7	5.7	0	33.1	77.0	6.9	91.7	50.2
Doliolum	11.7	0.3	1.7	6.5	0.5	6.4	0	9.4	2.9	0.1	21.0	6.5	0.9	0	0.3
Salpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.4
Echinoderm larvae	0	1.0	0	0.7	0	1.7	0.1	0.4	0	0	0	0.3	0	0.2	0
Others	0	0.4	0	0	0	0	0	0	0	0.2	0.2	0	0	0	0

TABLE 3-2. (continued)

	8-30-64	8-30-64	10-29-64	11-23-64	12-17-64	1-8-65	2-28-65	3-22-65	4-24-65	5-30-65	6-13-65	8-12-65	9-11-65	12-10-65
Copepoda %	61.9	53.1	66.7	68.7	46.9	60.0	68.0	39.5	48.9	86.9	47.8	52.8	70.5	73.8
Others %	38.1	46.9	33.3	31.3	53.1	40.0	32.0	60.5	51.1	13.1	52.2	47.2	29.5	26.3
Percentage Composition of Zooplankton other than Copepods (100%)														
Cladocera														
<u>Evadne</u>	6.7	7.2	0.8	0	0	0	0	0.1	2.9	0	0.5	0	0.4	0
<u>Penilia</u>	13.4	1.3	0.8	1.2	0	1.0	0	0	0.2	0	0	0.6	0.2	0.7
Ostracoda														
<u>Euconchoecia</u>	1.0	0.7	1.0	6.8	0	2.8	9.2	3.4	2.0	0	1.8	0	1.3	2.3
Other ostracods	0.7	0.2	0.3	9.4	2.7	3.3	4.6	2.8	0.4	0	0.3	0.3	0.4	4.3
Mysidacea	0	0	0	0.2	0	0	0	0	0	0	0	0	0.2	1.1
Amphipoda	0.3	1.1	0	3.5	0.3	1.0	31.4	0.5	0.9	5.0	2.8	0.3	6.0	3.6
Lucifer	0.5	0.2	1.3	0.7	0	0	0	0	0	0	0	4.4	0.4	0
Other crustaceans	0	0	0	0	0	0	0	0	0	0.7	0	0	0.2	0.5
Barnacle nauplii	0.3	0	0	0	0	0	2.6	0.1	0	0	0	0	0	0
Barnacle cypris	0	0	0	0	0.1	0.3	1.0	0	0.7	0	0.2	0	0.9	0
Other nauplii	0	0	10.0	4.7	0	0	0	0	0	0	0	0	13.2	14.4
Decapod zoea	1.6	3.7	0	0	0.3	0	0	0.1	0.7	0	0	0.8	0.2	0
Decapod megalopa	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0
Stomatopod larvae	0	0.2	0	0	0	0	0	0.1	0.2	0	0.2	0	0	0
Other crustacean larvae	1.2	1.1	3.1	2.6	0.3	0.3	0.3	0.1	1.1	10.6	21.4	3.6	11.7	11.4
Medusae	2.2	5.3	21.5	9.7	6.6	2.6	0	6.4	4.7	2.8	0.8	16.3	6.5	9.8
Polychaeta	1.6	4.8	1.5	0.7	1.2	2.3	2.3	3.7	0	0.7	0.3	0	0	0
Mollusca	14.3	32.7	8.7	23.6	17.0	70.1	0.3	68.9	27.6	7.1	11.9	62.8	34.6	20.5
Chaetognatha	14.8	18.7	10.9	34.0	29.4	6.9	11.1	4.9	7.4	67.4	26.4	6.6	9.4	26.9
Larvacea	39.9	20.0	37.1	2.4	41.7	7.9	37.3	8.8	43.9	5.7	28.6	2.7	14.3	4.6
Doliolum	0	1.1	2.6	0.5	0	0	0	0.2	7.3	0	4.7	0.3	0	0
Salpa	0	0	0	0	0	0	0	0	0	0	0	1.4	0	0
Echinoderm larvae	0	1.8	0.5	0	0	1.5	0	0	0	0	0	0	0	0
Others	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0

TABLE 3-3.

PERCENTAGE COMPOSITION OF ZOOPLANKTON AT W24

	4-6-63	5-3-63	5-22-63	6-27-63	7-15-63	8-28-63	10-3-63	11-3-63	12-1-63	3-20-64	4-17-64	5-25-64	6-27-64	7-18-64
Copepoda %	89.7	42.6	79.1	53.7	56.9	42.0	69.7	34.3	86.1	51.4	77.4	47.9	59.4	45.5
Others %	10.3	57.4	20.9	46.3	43.1	58.0	30.3	65.7	13.9	48.6	22.6	52.1	40.5	54.5
Percentage Composition of Zooplankton other than Copepods (100%)														
Cladocera														
Evadne	0	0.2	0.4	0.2	1.9	0.4	0	0	0	0	0	9.6	3.0	0
Penilia	2.7	17.0	32.9	0	10.8	33.8	0	1.4	0	0	0	1.2	9.3	1.0
Ostracoda														
Euconchoecia	0	0.2	0.5	0.2	0.1	0	0	0	0	0.9	0	0	21.8	0
Other ostracods	0	0.2	0.2	0	0.2	0	0	0	0	0	0	0	0.3	0
Mysidacea	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0
Amphipoda	0	0.4	0.9	0.4	0.1	0.1	0	0.3	0.6	0	0	0.2	1.4	0
Lucifer	0	0.2	0.4	5.2	1.2	0.6	0.3	0.4	0	0	0	3.6	1.8	5.9
Other crustaceans	0	0	0.4	0	0.2	0	0	0	0.6	0	0	0	0	0.2
Barnacle nauplii	0	0	0	0	0	0	0	0	0.6	0.6	0.5	0	0	0.3
Barnacle cypris	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
Other nauplii	0	0	0	4.1	2.5	0.1	0	0	5.1	0	1.1	0	0	0
Decapod zoea	0	0.2	1.8	3.0	0.6	0.8	0	0.1	1.1	0.3	0	0.4	0.2	0.7
Decapod megalopa	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stomatopod larvae	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other crustacean larvae	9.2	1.0	3.2	6.9	6.5	1.4	1.0	0.9	1.7	0.6	0	10.0	9.3	66.0
Medusae	1.8	44.2	4.8	2.8	32.4	2.2	0.8	0	13.6	5.1	6.1	0.6	0.2	0
Polychaeta	2.7	1.9	2.0	0	0.4	3.7	3.1	1.0	0	4.2	18.8	0.8	0.9	0.3
Mollusca	8.3	22.2	6.4	72.3	35.8	42.5	4.1	84.1	17.6	2.1	69.6	24.9	12.6	17.9
Chaetognatha	4.6	0.8	7.7	1.1	4.0	5.7	4.1	5.2	53.4	0.6	0	9.4	3.9	6.1
Larvacea	70.6	11.6	37.2	3.7	3.2	5.0	86.6	6.5	5.7	84.6	0	31.9	34.4	1.5
Doliolum	0	0	0.4	0.2	0	2.8	0	0.1	0	1.2	3.9	7.2	0.7	0
Echinoderm larvae	0	0	0	0	0	0.8	0	0	0	0	0	0.3	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 3-3. (continued)

		8-31-64	9-25-64	10-30-64	11-19-64	12-18-64	1-9-65	2-28-65	3-23-65	4-24-65	5-29-65	6-14-65	8-12-65	9-11-65	12-10-65
Copepoda %		60.9	75.8	71.6	86.0	62.9	53.1	74.7	83.7	15.6	49.1	49.5	53.1	64.0	51.6
Others %		39.1	24.2	28.4	14.0	37.0	46.8	25.3	16.3	84.4	50.9	50.5	46.9	36.0	48.4
Percentage Composition of Zooplankton other than Copepods (100%)	Cladocera														
	<u>Evadne</u>	5.0	0	0	0	0	0	0	0	0.4	0	0	0	0.9	0
	<u>Penilia</u>	27.8	0	0	0	0	0	0	1.1	0.1	1.0	1.9	0.6	0	0.1
	Ostracoda														
	<u>Euconchoecia</u>	0.5	0	0	0	0	0	0	0	0.1	0	0	0	0	0
	Other ostracods	0.3	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1
	Mysidacea	0.3	0	0.4	0.4	0	0	0.5	2.7	0	0	0	0	0	0
	Amphipoda	0.8	0	0	0	0.2	0	1.0	0	0.2	0	0	0	0	0.1
	Lucifer	1.6	0.5	0.7	8.1	0	0	0	0	0.1	0	3.4	4.8	14.6	0
	Other crustaceans	3.2	0	0	0.4	0	0	1.0	1.1	0	0	0	0	0.9	0
	Barnacle nauplii	0	0	0	0	0.2	0	0	0.5	0.2	0	0	0	0	0.7
	Barnacle cypris	0	0	0	0	0	0.3	16.7	4.9	0	0	3.4	0.1	0	0.1
	Other nauplii	2.9	0	0	0	2.2	0	0	0	0.3	0	0	0	0.9	11.7
	Decapod zoea	0.5	0	0	0.8	0	0	0	0	0	0	5.4	0	0.9	0.4
	Decapod megalopa	0	0	0	0	0	0	0	0	0	0.5	0	0	0.4	0
	Stomatopod larvae	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0
	Other crustacean larvae	6.6	34.3	2.5	3.2	0.2	0	0	3.8	2.5	4.0	32.7	30.7	20.6	0.1
	Medusae	6.6	1.6	0	0	10.6	0	0	0	0.2	0	0	0	4.3	0
	Polychaeta	1.3	1.9	1.4	1.6	0.6	1.3	5.9	8.3	0.6	0	0.5	0.1	0	1.3
	Mollusca	9.8	34.3	26.3	10.1	66.5	6.1	47.8	9.9	34.0	3.5	1.5	5.8	15.9	35.7
	Chaetognatha	9.8	17.5	44.8	31.4	16.6	0.7	11.8	20.9	0.9	57.5	20.0	5.4	2.6	47.5
	Larvacea	22.7	9.8	23.5	43.9	2.9	91.6	15.3	46.7	33.9	33.5	30.2	52.4	38.2	2.1
	Doliolum	0.3	0	0	0	0	0	0	0	26.3	0	0	0	0	0
	Echinoderm larvae	0	0	0.4	0	0	0	0	0	0	0	1.0	0	0	0
	Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 3-4.

PERCENTAGE COMPOSITION OF ZOOPLANKTON AT W58

	3-9-63	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-11-63	11-4-63	12-2-63	12-21-63	1-29-64	2-18-64	3-19-64	4-16-64
Copepoda %	44.8	53.6	72.8	58.8	87.2	72.6	49.9	67.8	57.6	61.0	62.5	52.8	33.2	38.4	46.1
Others %	52.2	46.4	27.2	41.2	12.8	27.4	50.1	32.2	42.4	39.0	37.5	47.2	66.8	61.6	53.9
Percentage Composition of Zooplankton other than Copepods (100%)															
Cladocera															
<u>Evadne</u>	0	0	0.5	1.4	1.5	5.2	5.8	0.6	0.2	0	0	0	0	0	0.7
<u>Penilia</u>	0.1	0	0.8	16.6	0	0.2	69.3	8.1	0.6	2.0	0.4	0	0.2	0.3	3.6
Ostracoda															
<u>Euconchoecia</u>	63.4	66.4	26.4	21.4	1.5	6.5	0.8	7.5	9.9	32.7	18.6	48.1	2.1	8.7	26.8
<u>Conchoecia</u>	0.1	0	0.5	0.2	0.5	1.0	0.4	0	0.1	0	1.7	0	0.2	0.2	1.2
Other ostracods	0	10.4	3.1	0	0	0	0	0	0	0	0	0	0	0.3	0
Mysidacea	0.2	0	0	0	0	0	0	0	0.1	0.3	0.2	0.4	0	0	0
Amphipoda	1.1	1.2	3.1	1.2	7.4	0.7	0.1	0.4	0	0.7	0.6	0.8	1.1	1.1	0.7
Euphausiacea	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Lucifer	0	0	0.3	0.3	0	0	0.1	0	0.1	0.1	0	0	0	0.6	0
Barnacle nauplii	1.9	0.1	0.2	0	0	0.2	0.1	0	0	0.1	0	0	0	0	0
Other nauplii	0	0	0.8	0	2.5	0.2	0	0	0	0	0	0	0	0	0
Decapod zoea	0.3	0.4	1.9	0.1	1.5	0.5	0	0.6	0	1.8	0	0.4	0.2	0	0.7
Decapod megalopa	0	0	0	0	0.5	0.2	0	0	0	0	0	0	0.1	0	0
Stomatopod larvae	0	0	0	0	1.0	0	0	0	0	0	0	0	0	0	0
Other crustacean larvae	2.5	0.8	1.3	2.7	3.5	1.5	0.5	3.4	0.2	3.3	2.8	0.4	1.3	2.5	0.1
Medusae	4.3	1.2	3.4	1.2	14.7	4.5	0.9	0.9	2.1	13.5	6.2	10.0	10.6	1.8	6.4
Polychaeta	0.8	0.1	0.8	0.2	5.9	1.2	1.1	2.1	0	0	0	0	0.8	0.9	0
Mollusca	1.0	4.6	15.7	3.9	18.2	9.7	3.4	11.1	4.5	11.7	6.9	7.0	3.5	6.0	13.3
Chaetognatha	4.0	5.7	11.3	17.0	16.3	16.6	4.6	4.1	7.6	11.5	17.6	4.8	5.9	23.9	17.0
Larvacea	15.8	8.9	28.5	29.5	16.3	49.6	9.0	60.5	71.6	20.4	42.8	25.0	29.0	52.9	23.2
Doliolum	4.4	0.2	0.9	3.9	3.4	0.5	0.6	0.6	2.6	1.7	1.7	2.7	44.7	0.8	6.2
Salpa	0	0	0.5	0.3	3.9	0.5	2.8	0	0.3	0	0.4	0	0.1	0	0
Echinoderm larvae	0	0	0.1	0	1.5	1.3	0.3	0	0	0.1	0.2	0.3	0	0	0

TABLE 3-4. (continued)

	5-24-64	6-26-64	7-17-64	8-31-64	9-26-64	10-29-64	11-24-64	12-17-64	1-8-65	2-28-65	4-24-65	5-30-65	6-13-65	8-13-65	9-11-65	12-11-65
Copepoda %	52.7	51.8	68.9	61.8	73.2	63.6	68.2	77.9	69.1	63.8	58.2	53.0	47.2	79.8	64.7	81.2
Others %	47.3	48.2	31.1	38.2	26.7	36.4	31.7	22.0	30.8	36.2	41.8	47.0	52.8	20.2	35.3	18.8
Percentage Composition of Zooplankton other than Copepods (100%)																
Cladocera																
Evadne	0.9	12.7	9.8	2.3	0	0.4	0.2	0	0	0	0	0	4.7	0	25.1	0
Penilia	0.9	5.4	1.6	12.3	6.1	0.4	2.3	3.9	1.2	0	0	0.2	0	0	0.3	0
Ostracoda																
Euconchoecia	8.2	6.3	0.9	1.9	23.0	21.4	12.0	36.1	21.5	8.0	17.4	0.4	0.9	4.9	7.0	5.6
Conchoecia	0.7	0	0.2	0	0.2	0	0.7	0	1.2	0.7	0.2	0	0.2	1.0	0.9	1.4
Other ostracods	0	0	0.5	0	2.8	0.7	3.7	3.9	8.8	14.7	21.2	1.8	0	0	0	3.4
Mysidacea	0.1	0	0	0.2	0.2	0.2	0	0	0	0	0	0.2	0.1	0	0	0
Amphipoda	3.9	2.1	0.7	0.7	1.5	1.1	0.7	1.1	0.9	1.6	0.6	1.5	1.8	3.8	0.6	1.1
Euphausiacea	0	0.1	0	0	0	0	0	0	1.2	0.2	0	0	0	0.3	0	0
Lucifer	0	0	0.5	0.2	0.4	0	0	4.2	0.3	0	0.2	0.7	0.3	0.7	0	0.8
Barnacle nauplii	0.1	0	0	0	0	0	0	0	0	0	0.3	0.2	0	0	0	0
Other nauplii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Decapod zoea	0	0.1	0.2	0	1.4	0.9	1.8	9.5	1.8	0.2	0.2	1.2	5.7	1.7	4.1	12.6
Decapod megalopa	0	0	0.9	0	0	0	0	0	0.6	0.2	0	0	0.9	0	0	0.6
Stomatopod larvae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other crustacean larvae	0.7	1.4	1.4	0.9	4.8	1.5	1.2	2.0	2.4	1.6	1.7	2.6	0.8	0.4	0.3	3.6
Medusae	0.5	5.6	3.9	6.3	3.9	4.6	4.4	0.6	1.5	1.1	0	16.8	0.1	0.7	0.3	1.4
Polychaeta	1.8	0	1.4	0	6.3	0	0	2.2	2.1	0.7	1.4	0	0.2	4.5	0.3	1.1
Mollusca	16.0	22.0	12.3	8.3	17.1	10.1	5.6	11.5	4.7	24.1	27.4	26.1	5.5	8.0	9.3	7.6
Chaetognatha	35.9	12.9	10.7	12.7	13.8	3.3	19.0	12.0	38.1	7.1	20.7	29.5	68.6	40.1	32.4	25.2
Larvacea	21.2	28.9	53.3	51.6	18.4	50.6	44.0	11.8	5.6	39.0	8.4	17.1	7.2	25.8	19.5	27.7
Doliolum	9.0	1.4	1.2	1.6	0	4.8	4.2	1.1	8.2	0.9	0.3	1.6	2.9	0.3	0	7.6
Salpa	0	0.7	0.5	0.9	0	0	0.2	0	0	0	0	0.2	0	7.7	0	0.3
Echinoderm larvae	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 4-1.

NUMERICAL ABUNDANCE OF COPEPODS PER M^3

AT STATION W22

Date	No. of Copepods Per M^3	Calanoida	Adult Females	Adult Males	Immature	Cyclopoida	Adult Females	Adult Males	Immature	Harpacticoida	Adult Females	Adult Males	Immature	Benthic
3-29-63	272.4	171.5	46.4	12.9	112.2	63.4	21.1	10.5	31.8	37.4	0.7	0.4	0	36.4
4-4-63	1489.0	1124.6	449.3	78.4	596.9	335.7	168.5	104.5	62.7	28.7	2.6	5.2	3.9	17.0
5-5-63	512.0	370.6	61.4	17.9	291.2	122.9	69.8	19.2	33.9	18.6	1.3	0.6	0	16.6
5-21-63	433.6	274.9	133.8	27.0	114.1	156.8	82.1	30.4	44.3	1.8	0.8	0	0.3	0.8
6-27-63	522.0	377.1	122.0	39.4	215.7	144.3	82.9	39.7	21.7	0.6	0	0	0	0.6
7-15-63	677.8	525.4	329.9	44.2	151.3	149.5	76.2	57.6	15.7	2.9	2.3	0.6	0	0
8-29-63	319.0	223.0	94.4	9.3	119.4	92.5	37.4	34.6	20.5	3.5	0	0	0	3.5
10-4-63	951.7	644.9	128.0	29.9	487.0	277.6	86.3	73.7	117.6	29.2	0.7	0	0	28.5
11-4-63	602.1	362.3	150.6	32.0	179.7	216.1	102.4	32.5	81.2	23.6	1.0	0.5	0	22.2
12-1-63	355.3	197.1	102.1	19.6	75.4	133.1	55.6	53.5	24.1	25.0	3.7	9.3	1.9	10.0
12-21-63	618.2	435.6	165.8	27.3	242.5	157.4	74.5	45.5	37.4	25.1	4.4	2.5	0.7	17.4
1-29-64	609.1	410.3	167.6	17.1	225.5	160.8	86.5	30.1	44.2	38.1	0.4	0.4	0	37.3
2-20-64	465.1	186.9	65.6	9.2	112.2	254.4	36.1	21.5	196.7	23.8	0.9	0.9	0	21.9
3-19-64	283.0	129.0	82.0	4.5	42.5	140.5	48.0	47.0	45.5	13.5	0	0	0	13.5
4-16-64	719.1	377.8	108.7	25.5	243.6	323.4	156.9	58.5	108.0	17.9	0	0	0	17.9

TABLE 4-1. (continued)

5-23-64	1640.5	1228.8	558.9	204.8	465.1	390.4	149.3	130.1	110.9	21.3	2.1	0	0	19.2
6-26-64	951.0	501.8	212.9	32.9	256.0	447.4	169.3	113.0	165.1	1.8	1.2	0.6	0	0
7-17-64	1140.1	617.7	161.5	35.0	421.2	519.4	268.7	142.1	108.7	3.0	1.5	0.7	0.7	0
8-30-64	964.9	496.5	228.6	30.9	237.0	464.9	196.9	28.8	239.1	3.5	1.4	1.4	0.7	0
9-19-64	342.6	145.0	32.3	5.2	107.5	190.6	75.5	47.0	68.2	7.0	0.7	0.3	0	5.9
10-29-64	1590.1	993.3	406.5	47.8	539.0	552.6	241.6	209.1	101.9	44.2	11.7	5.4	0.9	26.1
11-23-64	546.7	362.3	156.4	39.2	166.6	175.1	81.8	49.5	43.8	9.4	3.6	2.7	0.6	2.4
12-17-64	635.0	396.6	135.6	26.2	234.8	179.4	79.1	46.9	53.4	59.0	9.1	9.1	1.0	40.8
1-8-65	481.3	298.7	130.7	35.1	132.9	171.1	90.7	49.8	30.7	11.6	4.0	4.9	0	2.7
2-28-65	709.5	637.8	373.0	36.4	228.4	56.8	30.3	13.2	13.2	14.9	6.1	0.6	0	8.3
3-22-65	82.4	63.4	22.2	3.8	37.3	16.4	8.6	6.4	1.4	2.7	0.3	0	0	2.4
4-24-65	1019.7	597.3	201.9	62.6	332.8	396.8	236.1	122.3	38.4	25.6	1.4	1.4	0	22.8
6-13-65	761.9	505.9	189.6	76.8	239.5	218.2	78.0	67.7	72.5	37.8	0.6	0.6	0	36.6
8-12-65	105.4	72.6	29.0	4.9	38.7	31.6	10.3	6.7	14.6	1.2	0.7	0.4	0.1	0
9-11-65	643.1	271.6	116.9	3.6	151.1	363.1	200.0	116.0	47.1	8.4	5.3	3.1	0	0
12-10-65	961.7	701.2	371.8	94.6	234.8	240.4	124.7	96.8	18.9	20.0	7.8	5.6	1.1	5.6

TABLE 4-2.

NUMERICAL ABUNDANCE OF COPEPODS PER M^3

AT STATION W23

Date	No. of Copepods Per M^3	Calanoida	Adult Females	Adult Males	Immature	Cyclopoida	Adult Females	Adult Males	Immature	Harpacticoida	Adult Females	Adult Males	Immature	Benthic
4-4-63	1228.2	770.0	90.4	38.6	641.0	442.9	49.8	42.7	350.5	15.2	2.0	3.0	0	10.2
5-5-63	429.5	254.7	66.5	33.7	154.5	112.4	37.9	25.7	48.8	62.3	2.1	1.7	0	58.5
5-21-63	865.3	675.8	277.1	44.2	354.6	165.1	112.0	33.3	19.8	24.3	0	0	0	24.3
6-27-63	348.6	294.3	122.9	14.3	157.1	54.3	25.7	17.7	10.9	0	0	0	0	0
7-15-63	1157.5	780.3	241.8	93.5	444.9	358.1	157.5	147.7	52.9	19.1	1.2	0	0	17.8
8-29-63	324.9	208.2	108.7	19.0	80.5	116.4	29.2	76.7	10.5	0.4	0	0	0	0.4
10-4-63	719.4	462.3	110.3	25.4	326.6	230.6	34.8	12.7	183.2	26.5	0	0	0	26.5
11-1-63	529.6	272.4	52.8	8.2	211.4	219.6	125.7	55.2	38.8	37.6	1.2	0	0	36.4
12-1-63	710.5	565.3	197.9	20.7	346.7	131.0	62.2	38.5	30.2	14.2	0	3.0	0	11.3
3-19-64	950.9	304.8	74.7	16.8	213.3	533.3	85.3	62.5	385.5	112.8	0	3.0	0	109.7
4-16-64	978.8	870.9	271.1	148.1	451.8	82.8	27.6	7.5	47.7	25.1	0	0	0	25.1
5-23-64	1172.5	679.3	266.2	46.1	366.9	479.6	83.6	157.0	238.9	13.6	3.4	0	0	10.2
6-26-64	312.2	217.0	102.0	21.9	93.1	77.0	45.8	14.0	17.2	18.2	0	0	0	18.2
7-17-64	675.7	275.3	155.5	13.4	106.4	395.9	169.7	191.3	35.0	4.5	0	0	0	4.5

TABLE 4-2. (continued)

8-30-64	753.6	547.2	260.8	40.8	245.6	201.6	97.6	71.2	32.8	4.8	0.8	1.6	0	2.4
10-29-64	1042.7	412.0	77.3	12.0	322.7	602.7	218.7	90.7	293.3	28.0	1.3	1.3	1.3	24.0
11-23-64	2095.2	1322.7	516.5	130.2	675.9	669.2	276.2	217.8	175.2	103.3	20.2	22.5	0	60.6
12-17-64	817.4	381.5	112.8	39.3	229.4	387.8	231.9	73.5	82.4	48.2	2.5	1.3	0	44.4
1-8-65	514.6	250.7	107.8	19.3	123.6	220.9	121.0	55.2	44.7	43.0	0	0	0	43.0
2-28-65	924.4	799.3	320.0	72.5	406.8	105.2	37.0	29.9	38.4	19.9	2.8	0	0	17.1
3-22-65	476.1	170.7	127.2	11.5	32.0	85.3	52.9	19.0	13.4	220.1	0.4	0	0	219.7
4-24-65	784.4	601.3	195.0	83.3	323.0	163.7	102.7	32.7	28.3	19.3	1.5	0	1.5	16.4
5-30-65	1847.1	1677.8	573.0	206.8	898.0	157.5	51.2	55.1	51.2	11.8	0	0	0	11.8
6-13-65	1046.9	876.9	345.8	89.8	441.3	154.7	68.8	40.1	45.8	15.3	0	0	0	15.3
9-11-65	888.8	769.6	364.1	45.3	360.1	108.1	37.4	24.6	46.1	11.1	4.0	0	0.8	6.4
12-10-65	1633.6	1235.1	611.0	89.7	534.4	341.8	232.2	55.4	54.1	56.7	2.6	5.3	1.3	47.5

TABLE 4-3.

NUMERICAL ABUNDANCE OF COPEPODS PER M^3

AT STATION W24

Date	No. of Copepods Per M^3	Calanoida	Adult Females	Adult Males	Immature	Cyclopoida	Adult Females	Adult Males	Immature	Harpacticoida	Adult Females	Adult Males	Immature	Benthic
4-6-63	2254.2	2230.5	860.4	500.1	869.9	23.7	4.7	4.7	14.2	0	0	0	0	0
5-3-63	512.0	433.3	126.7	80.0	226.7	38.7	20.0	4.0	14.7	40.0	0	0	1.3	38.7
5-22-63	1330.8	1026.5	325.0	102.3	599.2	193.2	124.9	26.3	42.0	111.1	0	0.6	0	110.4
6-27-63	299.2	238.6	35.4	21.9	181.3	55.6	20.8	15.2	19.6	5.0	0	0	0	5.0
7-15-63	3456.0	2778.5	393.4	87.4	2297.8	533.9	252.9	106.1	174.8	143.6	6.2	0	0	137.4
8-28-63	1062.6	796.4	138.2	168.6	489.7	227.6	105.6	34.5	87.4	38.6	0	4.1	0	34.5
10-3-63	4384.8	3687.4	272.4	47.6	3367.4	621.9	226.5	34.5	361.0	75.5	0	0	0	75.5
11-3-63	599.0	437.4	129.2	79.5	228.7	133.0	54.7	49.7	28.6	28.6	0	1.2	0	27.3
12-1-63	348.8	272.0	94.4	29.4	148.2	70.4	50.2	14.7	5.4	6.4	0	0	0	6.4
3-20-64	351.0	265.0	172.0	6.0	87.0	68.0	6.0	12.0	50.0	18.0	0	0	0	18.0
4-17-64	720.3	715.6	62.8	142.0	510.8	3.5	1.2	0	2.3	1.2	0	0	0	1.2
5-25-64	1053.7	811.4	381.7	157.7	272.0	185.1	68.6	82.3	34.3	57.1	0	0	0	57.1
6-27-64	1569.9	1353.4	530.8	156.2	666.3	152.5	94.1	35.8	22.6	64.0	1.9	1.9	0	60.2
7-18-64	117.7	84.1	1.0	1.7	81.4	23.6	5.7	3.8	14.1	10.0	0	0.2	0	9.8
8-31-64	616.9	463.7	189.9	48.3	225.6	140.6	59.8	55.6	25.2	12.6	0	0	0	12.6

TABLE 4-3. (continued)

9-25-64	2878.4	2149.1	346.3	99.0	1703.8	654.0	273.2	232.3	148.4	75.3	0	0	0	75.3
10-30-64	1906.4	1258.2	122.5	65.4	1070.3	539.2	269.6	32.7	236.9	108.9	0	0	0	108.9
11-19-64	3710.8	2813.6	1026.4	438.9	1348.3	848.5	380.3	336.5	131.7	48.8	0	2.4	0	46.3
12-18-64	718.7	598.5	281.1	38.0	279.3	70.0	40.6	10.4	19.0	50.2	0.9	0	0	49.3
1-9-65	743.7	710.6	348.7	26.5	335.4	33.1	28.7	2.2	2.2	0	0	0	0	0
2-28-65	331.6	283.6	102.6	23.2	157.8	11.6	7.2	1.7	2.8	36.4	0.6	0	0	35.9
3-23-65	1236.4	877.5	409.1	130.6	337.8	345.7	71.2	128.0	146.5	13.2	0	1.3	0	11.9
4-24-65	449.0	357.2	187.2	17.2	152.8	84.1	42.0	9.6	32.5	7.6	1.9	3.8	0	1.9
5-29-65	137.2	130.8	14.2	7.8	108.8	6.4	5.0	0.7	0.7	0	0	0	0	0
6-14-65	147.9	140.5	33.8	13.2	93.4	6.6	2.2	2.9	1.5	0.7	0	0	0	0.7
8-12-65	937.1	798.9	166.9	46.9	585.1	137.1	42.3	40.0	54.9	1.1	0	1.1	0	0
9-11-65	524.7	458.8	157.1	57.0	244.6	52.0	10.1	22.8	19.0	13.9	0	0	0	13.9
12-10-65	630.9	487.9	69.0	29.9	389.0	106.4	64.0	10.0	32.4	36.6	0	0	0	36.6

TABLE 4-4.

NUMERICAL ABUNDANCE OF COPEPODS PER M^3

AT STATION W58

Date	No. of Copepods Per M^3	Calanoida	Adult Females	Adult Males	Immature	Cyclopoida	Adult Females	Adult Males	Immature	Harpacticoida	Adult Females	Adult Males	Immature	Benthic
3-9-63	374.4	204.8	78.4	9.3	117.1	122.9	49.9	26.2	46.7	46.7	0.6	2.2	1.0	42.9
4-4-63	2379.2	1653.8	660.3	119.9	873.6	481.5	186.9	154.4	140.2	243.8	2.0	0	0	241.8
5-5-63	264.3	118.6	49.1	14.8	54.8	142.8	54.0	54.2	34.6	2.9	0.5	0	0	2.5
5-21-63	475.5	292.7	100.2	28.3	164.2	180.7	77.1	59.0	44.6	2.1	1.0	0	0	1.0
6-27-63	759.2	223.7	81.5	10.4	131.8	490.7	207.3	198.0	85.3	44.8	25.2	7.1	12.6	0
7-15-63	858.6	463.2	148.1	30.9	284.2	392.7	136.1	141.6	115.0	2.7	1.6	1.1	0	0
8-29-63	765.6	482.0	151.7	22.1	308.1	275.8	99.6	71.9	104.3	7.9	1.6	0	0	6.3
10-11-63	618.0	355.8	152.5	25.7	177.6	250.4	98.5	80.3	71.5	11.9	3.8	0.6	0	7.5
11-4-63	332.5	156.6	60.4	9.6	86.6	169.9	66.2	57.7	46.0	6.0	0.7	0.3	0	5.0
12-2-63	421.6	291.5	93.0	26.4	172.1	106.0	42.2	26.7	37.1	24.1	4.6	3.2	0	16.2
12-21-63	176.3	102.2	40.5	6.4	55.3	69.4	29.4	10.5	29.4	4.8	1.4	0.8	0	2.6
1-29-64	599.5	441.0	166.7	31.1	243.1	123.9	62.2	21.7	39.9	34.6	0.6	1.8	0	32.3
2-18-64	125.1	86.6	25.9	6.9	53.8	34.5	13.8	9.9	10.8	4.1	0.3	0	0	3.9
3-19-64	283.1	134.3	69.6	7.7	57.0	126.6	38.9	20.2	67.5	22.3	0.7	0.7	0	20.9

TABLE 4-4. (continued)

4-16-64	949.3	628.1	156.4	35.6	436.1	309.3	151.7	72.3	85.3	11.9	1.2	1.2	0	9.5
5-24-64	768.9	489.6	188.0	59.1	242.6	259.6	105.6	91.3	62.7	19.7	0.9	0.9	0.9	17.0
6-26-64	381.0	140.9	62.5	16.9	61.5	236.2	90.3	70.9	74.9	4.0	2.5	1.0	0	0.5
7-17-64	677.0	366.2	136.5	19.2	210.5	307.2	157.9	91.7	57.6	3.6	0.7	1.4	0	1.4
8-31-64	544.8	294.2	122.5	14.0	157.7	246.6	121.8	85.1	39.8	3.9	2.3	0.8	0	0.8
9-26-64	838.4	382.7	128.0	24.8	229.9	436.9	239.9	85.1	111.9	18.8	3.4	0	0	15.4
10-29-64	726.6	512.8	220.0	26.8	266.0	190.1	70.5	72.0	47.5	23.8	8.4	3.1	10.7	1.5
11-24-64	1132.5	652.1	299.6	37.1	315.4	458.2	178.1	202.2	77.9	22.3	2.8	7.4	10.2	1.9
12-17-64	1091.5	789.6	460.1	38.0	291.5	253.4	118.5	96.9	38.0	48.4	19.0	17.3	0.9	11.2
1-8-65	94.0	45.8	16.2	4.7	24.9	44.8	19.9	17.5	7.4	3.4	1.1	1.4	0	1.0
2-28-65	133.0	89.9	40.6	3.5	45.8	39.4	16.3	10.3	12.8	3.7	0.7	1.0	0.2	1.8
4-24-65	1522.1	938.7	329.1	55.7	553.8	543.3	369.2	104.5	69.7	40.0	1.7	0	0	38.3
5-30-65	514.7	400.2	96.3	29.0	274.9	111.2	49.8	27.6	33.7	3.4	1.3	0	0	2.0
6-13-65	706.7	430.2	184.9	49.8	195.6	270.2	116.4	56.9	96.9	6.2	0.9	0	0	5.3
8-13-65	540.7	365.8	128.0	28.2	209.7	171.5	65.9	35.3	70.2	3.3	1.4	1.4	0.5	0
9-11-65	477.4	363.7	134.8	7.5	221.4	112.2	45.2	55.0	12.0	1.5	0	0.7	0.7	0
12-11-65	347.5	297.9	115.2	41.2	141.5	36.3	18.7	11.7	5.9	13.3	7.2	5.0	1.1	0

TABLE 5-1.

PERCENTAGE COMPOSITION OF COPEPODS AT STATION W22

Date	Percentage Composition								
	Copepoda 100%			Calanoida 100%			Cyclopoida 100%		
	Calanoida	Cyclopoida	Harpacticoida	Adult Females	Adult Males	Immature	Adult Females	Adult Males	Immature
3-9-63	63.0	23.3	13.7	27.0	7.5	65.4	33.2	16.6	50.1
4-4-63	75.5	22.5	1.9	39.9	7.0	53.1	50.2	31.1	18.7
5-5-63	72.4	24.0	3.6	16.6	4.8	78.6	56.8	15.6	27.6
5-21-63	63.4	36.2	0.4	48.7	9.8	41.5	52.3	19.4	28.3
6-27-63	72.2	27.6	0.1	32.3	10.4	57.2	57.4	27.5	15.0
7-15-63	77.5	22.1	0.4	62.8	8.4	28.8	51.0	38.5	10.5
8-29-63	69.9	29.0	1.1	42.3	4.2	53.5	40.5	37.4	22.1
10-4-63	67.8	29.2	3.1	19.8	4.6	75.5	31.1	26.6	42.4
11-4-63	60.2	35.9	3.9	41.6	8.8	49.6	47.4	15.0	37.6
12-1-63	55.5	37.5	7.0	51.8	9.9	38.3	41.7	40.2	18.1
12-21-63	70.5	25.5	4.1	38.1	6.3	55.7	47.3	28.9	23.8
1-29-64	67.4	26.4	6.2	40.8	4.2	55.0	53.8	18.7	27.5
2-20-64	40.2	54.7	5.1	35.1	4.9	60.0	14.2	8.5	77.3
3-19-64	45.6	49.6	4.8	63.6	3.5	32.9	34.2	33.4	32.4
4-16-64	52.5	45.0	2.5	28.8	6.7	64.5	48.5	18.1	33.4
5-23-64	74.9	23.8	1.3	45.5	16.7	37.8	38.2	33.3	28.4
6-26-64	52.8	47.0	0.2	42.4	6.6	51.0	37.8	25.3	36.9
7-17-64	54.2	45.6	0.3	26.1	5.7	68.2	51.7	27.4	20.9
8-30-64	51.5	48.2	0.4	46.0	6.2	47.7	42.4	6.2	51.4

TABLE 5-1. (continued)

9-19-64	42.3	55.6	2.0	22.3	3.6	74.1	39.6	24.6	35.8
10-29-64	62.5	34.7	2.8	40.9	4.8	54.3	43.7	37.8	18.4
11-23-64	66.3	32.0	1.7	43.2	10.8	46.0	46.7	28.3	25.0
12-17-64	62.5	28.2	9.3	34.2	6.6	59.2	44.1	26.1	29.8
1-8-65	62.0	35.5	2.4	43.7	11.7	44.5	53.0	29.1	17.9
2-28-65	89.9	8.0	2.1	58.5	5.7	35.8	53.4	23.3	23.3
3-22-65	76.9	19.9	3.2	35.1	5.9	58.9	52.2	39.3	8.4
4-24-65	58.6	38.9	2.5	33.8	10.5	55.7	59.5	30.8	9.7
6-13-65	66.4	28.6	5.0	37.5	15.2	47.3	35.7	31.0	33.2
8-12-65	68.9	30.0	1.1	39.9	6.7	53.3	32.6	21.2	46.2
9-11-65	42.2	56.5	1.3	43.0	1.3	55.6	55.1	31.9	13.0
12-10-65	72.9	25.0	2.1	53.0	13.5	33.5	51.8	40.3	7.9

TABLE 5-2.

PERCENTAGE COMPOSITION OF COPEPODS AT STATION W23

Date	Percentage Composition								
	Copepoda 100%			Calanoida 100%			Cyclopoida 100%		
	Calanoida	Cyclopoida	Harpacticoida	Adult Females	Adult Males	Immature	Adult Females	Adult Males	Immature
4-4-63	62.7	36.1	1.2	11.7	5.0	83.2	11.2	9.6	79.1
5-5-63	59.3	26.2	14.5	26.1	13.2	60.7	33.7	22.9	43.4
5-21-63	78.1	19.1	2.8	41.0	6.5	52.5	67.8	20.2	12.0
6-27-63	84.4	15.6	0	41.8	4.9	53.4	47.4	32.6	20.0
7-15-63	67.4	30.9	1.6	31.0	12.0	57.0	44.0	41.2	14.8
8-29-63	64.1	35.8	0.1	52.2	9.1	38.7	25.1	65.9	9.1
10-4-63	64.3	32.1	3.7	23.9	5.5	70.6	15.1	5.5	79.4
11-1-63	51.4	41.5	7.1	19.4	3.0	77.6	57.2	25.1	17.6
12-1-63	79.6	18.4	2.0	35.0	3.7	61.3	47.5	29.4	23.1
12-21-63	42.6	43.3	14.0	47.2	9.1	43.7	63.3	14.8	21.9
3-19-64	32.0	56.1	11.9	24.5	5.5	70.0	16.0	11.7	72.3
4-16-64	89.0	8.5	2.6	31.1	17.0	51.9	33.3	9.1	57.6
5-23-64	57.9	40.9	1.2	39.2	6.8	54.0	17.4	32.7	49.8
6-24-64	69.5	24.7	5.8	47.0	10.1	42.9	59.5	18.2	22.3
7-17-64	40.7	58.6	0.7	56.5	4.9	38.6	42.9	48.3	8.8
8-30-64	72.6	26.8	0.6	47.7	7.5	44.9	48.4	35.3	16.3
8-30-64	75.9	23.5	0.6	40.2	7.9	51.9	37.9	52.4	9.7

TABLE 5-2. (continued)

10-29-64	39.5	57.8	2.7	18.8	2.9	78.3	36.3	15.0	48.7
11-23-64	63.1	31.9	4.9	39.0	9.8	51.1	41.3	32.6	26.2
12-17-64	46.7	47.4	5.9	29.6	10.3	60.1	59.8	18.9	21.2
1-8-65	48.7	42.9	8.3	43.0	7.7	49.3	54.8	25.0	20.2
2-28-65	86.5	11.4	2.1	40.0	9.1	51.0	35.1	28.4	36.5
3-22-65	35.8	17.9	46.2	74.5	6.7	18.8	62.0	22.2	15.7
4-24-65	76.7	20.9	2.5	32.4	13.9	53.7	62.7	20.0	17.3
5-30-65	90.8	8.5	0.6	34.1	12.3	53.5	32.5	35.0	32.5
6-13-65	39.4	10.2	50.3	39.4	10.2	50.3	44.4	25.9	29.6
8-12-65	63.8	34.5	1.7	18.8	0.8	80.5	19.1	31.2	49.6
9-11-65	86.6	12.2	1.3	47.3	5.9	46.8	34.6	22.8	42.6
12-10-65	75.6	20.9	3.5	49.5	7.3	43.3	67.9	16.2	15.8

TABLE 5-3.

PERCENTAGE COMPOSITION OF COPEPODS AT STATION W24

Date	Percentage Composition								
	Copepoda 100%			Calanoida 100%			Cyclopoida 100%		
	Calanoida	Cyclopoida	Harpacticoida	Adult Females	Adult Males	Immature	Adult Females	Adult Males	Immature
4-6-63	98.9	1.0	0	38.6	22.4	39.0	20.0	20.0	60.0
5-3-63	84.6	7.5	7.8	29.2	18.5	52.3	51.7	10.3	37.9
5-22-63	77.1	14.5	8.3	31.7	10.0	58.4	64.6	13.6	21.8
6-27-63	79.7	18.6	1.7	14.8	9.2	76.0	37.4	27.3	35.3
7-15-63	80.4	15.4	4.2	14.1	3.1	82.7	47.4	19.9	32.7
8-28-63	74.9	21.4	3.6	17.3	21.2	61.5	46.4	15.2	38.4
10-3-63	84.1	14.2	1.7	7.4	1.3	91.3	36.4	5.5	58.0
11-3-63	73.0	22.2	4.8	29.5	18.2	52.3	41.1	37.4	21.5
12-1-63	78.0	20.2	1.8	34.7	10.8	54.5	71.4	20.9	7.7
3-20-64	75.5	19.4	5.1	64.9	2.3	32.8	8.8	17.6	73.5
4-17-64	99.3	0.5	0.2	8.8	19.8	71.4	33.3	0	66.6
5-25-64	77.0	17.6	5.4	47.0	19.4	33.5	37.0	44.4	18.5
6-27-64	86.2	9.7	4.1	39.2	11.5	49.2	61.7	23.5	14.8
7-18-64	71.4	20.1	8.5	1.1	2.0	96.9	24.2	16.2	59.6
8-31-64	75.2	22.8	2.0	40.9	10.4	48.6	42.5	39.5	17.9
9-25-64	74.7	22.7	2.6	16.1	4.6	79.3	41.8	35.5	22.7
10-30-64	66.0	28.3	5.7	9.7	5.2	85.1	50.0	6.1	43.9
11-19-64	75.8	22.9	1.3	36.5	15.6	47.9	44.8	39.6	15.5

TABLE 5-3. (continued)

12-18-64	83.3	9.7	7.0	47.0	6.4	46.7	58.0	14.8	27.2
1-9-65	95.5	4.4	0	49.1	3.7	47.2	86.7	6.7	6.7
2-28-65	85.5	3.5	11.0	36.2	8.2	55.6	61.9	14.3	23.8
3-23-65	71.0	28.0	1.1	46.6	14.9	38.5	20.6	37.0	42.4
4-24-65	79.6	18.7	1.7	52.4	4.8	42.8	50.0	11.4	38.6
5-29-65	95.3	4.7	0	10.9	6.0	83.1	77.8	11.1	11.1
6-14-65	95.0	4.5	0.5	24.1	9.4	66.5	33.3	44.4	22.2
8-12-65	85.2	14.6	0.1	20.9	5.9	73.2	30.8	29.2	40.0
9-11-65	87.4	9.9	2.7	34.2	12.4	53.3	19.5	43.9	36.5
12-10-65	77.3	16.9	5.8	14.1	6.1	79.7	60.2	9.4	30.5

TABLE 5-4.

PERCENTAGE COMPOSITION OF COPEPODS AT STATION W58

Date	Percentage Composition								
	Copepoda 100%			Calanoida 100%			Cyclopoida 100%		
	Calanoida	Cyclopoida	Harpacticoida	Adult Females	Adult Males	Immature	Adult Females	Adult Males	Immature
3-9-63	54.7	32.8	12.5	38.3	4.5	57.2	40.6	21.3	38.0
4-4-63	69.5	20.2	10.2	39.9	7.3	52.8	38.8	32.1	29.1
5-5-63	44.9	54.0	1.1	41.4	12.4	46.2	37.8	37.9	24.2
5-21-63	61.6	38.0	0.4	34.2	9.7	56.1	42.7	32.7	24.7
6-27-63	29.5	64.6	5.9	36.4	4.6	58.9	42.2	40.4	17.4
7-15-63	53.9	45.7	0.3	32.0	6.7	61.4	34.7	36.0	29.3
8-29-63	62.9	36.0	1.0	31.5	4.6	63.9	36.1	26.1	37.8
10-11-63	57.6	40.5	1.9	42.9	7.2	49.9	39.3	32.1	28.6
11-4-63	47.1	51.1	1.8	38.6	6.1	55.3	39.0	34.0	27.0
12-2-63	69.1	25.1	5.7	31.9	9.1	59.0	39.8	25.2	35.0
12-21-63	57.9	39.3	2.7	39.7	6.2	54.1	42.4	15.2	42.4
1-29-64	73.6	20.7	5.8	37.8	7.1	55.1	50.2	17.5	32.2
2-18-64	69.2	27.5	3.3	29.9	8.0	62.1	40.0	28.8	31.2
3-19-64	47.4	44.7	7.9	51.8	5.7	42.5	30.8	16.0	53.3
4-16-64	66.2	32.6	1.3	24.9	5.7	69.4	49.0	23.4	27.6
5-24-64	63.7	33.8	2.4	38.3	12.1	49.6	40.7	35.2	24.1
6-26-64	37.0	62.0	1.0	44.4	12.0	43.7	38.2	30.0	31.7

TABLE 5-4. (continued)

7-17-64	54.1	45.4	0.5	37.3	5.2	57.5	51.4	29.9	18.7
8-31-64	54.0	45.3	0.7	41.6	4.8	53.6	49.4	34.5	16.1
9-26-64	45.6	52.1	2.2	33.4	6.5	60.0	54.9	19.5	25.6
10-29-64	70.6	26.2	3.3	42.9	5.2	51.9	37.1	37.9	25.0
11-24-64	57.6	40.5	2.0	45.9	5.7	48.4	38.9	44.1	17.0
12-17-64	72.3	23.2	4.4	58.3	4.8	36.9	46.8	38.2	15.0
1-8-65	48.7	47.6	3.7	35.5	10.2	54.3	44.5	39.0	16.5
2-28-65	67.6	29.6	2.8	45.1	3.9	50.9	41.4	26.1	32.5
4-24-65	61.7	35.7	2.6	35.1	5.9	59.0	67.9	19.2	12.8
5-30-65	77.7	21.6	0.6	24.1	7.2	68.7	44.8	24.8	30.3
6-13-65	60.9	38.2	0.9	43.0	11.6	45.4	43.1	21.0	35.9
8-13-65	67.7	31.7	0.6	35.0	7.7	57.3	38.4	20.6	41.0
9-11-65	76.2	23.5	0.3	37.1	2.1	60.9	40.3	49.0	10.7
12-11-65	85.7	10.4	3.8	38.6	13.8	47.5	51.5	32.3	16.1

TABLE 6-1-1.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W22 - 1963

	3-9-63	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-4-63	11-4-63	12-1-63	12-21-63
Total No./m^3	68.2	620.4	132.5	216.7	204.9	408.4	131.8	215.0	254.0	161.4	244.7
CALANOIDA											
Acartia danae	0.2	2.6	0	1.8	1.4	0	0.3	0.7	0	0	0
Acartia tonsa	1.1	2.6	0	0.3	0.3	0	0	0	0	0.5	0
Acrocalanus andersoni	0	0	0	0	0	0	0.3	0	0	0	0
Acrocalanus longicornis	0	0	0	0	0.3	4.1	7.0	1.4	1.5	1.2	0.7
Aetideus acutus	0	0	0	0	0	0	0	0	0	0	0
Anomalocera ornata	0.2	0	0	0	0	0	0	0	0	0	0
Calanopia americana	0.2	0	0	0	0	0.6	0	0.7	3.9	1.6	0
Calocalanus elegans	0	0	0	0.5	0	0	0	0	0	0	0
Calocalanus pavo	0	5.2	1.0	1.8	0.3	1.2	3.5	4.2	0	0	0.4
Calocalanus pavoninus	0.4	6.5	0.6	2.9	0	12.8	0.6	0	0	0.9	1.5
Calocalanus styliremis	0.4	3.9	1.9	3.7	0.3	1.7	1.6	1.4	0.5	0.5	1.8
Calocalanus sp.1	0	1.3	0	0.3	0	0.6	0	0	0	0	0.7
Calocalanus sp.2	0.2	0	0	0	0	0	0	0	0	0	0
Calocalanus sp.3	0	0	0	0	0	0	0	0	0	0	0
Calocalanus sp.4	0	0	0.3	0	0	0	1.6	0	0	0	0
Candacia curta	0.2	1.3	0	0.3	0	0	0	0	0	0	0
Candacia pachydactyla	0	0	0	0	0	0	0	0	0	0	0
Centropages caribbeanensis	0	0	0	0.3	0	0	0	0	0	0	0
Centropages hamatus	0.5	0	0	0	0	0	0	0	0	0	0
Centropages velificatus	0.7	2.6	0	1.3	0	2.3	1.3	5.6	1.0	6.3	0.4
Clausocalanus arcuicornis	0	2.6	0	0.8	0	0	0	0	0	0.2	0
Clausocalanus furcatus	2.9	104.5	12.8	17.3	37.4	264.2	27.2	10.4	6.9	45.6	34.9

TABLE 6-1-1. (continued)

Clausocalanus jobei	1.4	53.6	8.6	45.6	0.9	0.6	7.4	0	0	0.2	1.8
Clausocalanus mastigophorus	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus paululus	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus pergens	0	0	0	0	0	0	0	0	0	0	0.4
Ctenocalanus vanus	0.2	0	0.3	0	0	0	0	0	0	0	0.7
Eucalanus monachus	0	0	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	1.1	1.3	0.3	2.6	1.1	1.2	1.0	2.8	2.0	0.5	0.4
Euchaeta marina	0	0	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0	0	0	0.3	0	0	0	0	0	0	0
Ischnocalanus plumulosus	0	2.6	0.3	3.2	0.3	0	0	0	0	0.2	0.7
Labidocera acutifrons	0	0	0	0	0	0	0	0	0	0	0
Labidocera aestiva	0	0	0	0	0	0	0	0	0	0	0
Lucicutia flavicornis	0	0	0	0	0	0	0	0	0	0	0.7
Lucicutia gaussae	0	2.6	0	0.5	0	0	0	0	0	0	0
Lucicutia paraclausi	0	0	0	0.3	0	0	0	0	0	0	0
Mecynocera clausi	0	0	0	1.8	0.3	0	2.2	0	0	0.2	0.7
Nannocalanus minor	2.7	10.4	0	3.7	0.6	10.5	0	0.7	0	0	0
Neocalanus gracilis	0.2	0	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	1.6	14.4	0.3	2.6	19.1	1.7	21.1	21.6	50.7	11.0	7.3
Paracalanus crassirostris	2.0	1.3	1.0	1.3	0	2.3	0	0.7	0	0.2	0
Paracalanus denudatus	0	0	0	0	0	0	1.0	0	0	0	0.7
Paracalanus indicus	11.8	135.8	16.6	1.3	35.7	1.2	2.2	2.1	68.9	3.3	94.2
Paracalanus quasimoto	16.2	86.2	12.2	32.0	13.4	11.6	15.4	61.2	8.4	21.0	16.7
Paracalanus sp.	0	0	0	0.5	0	0	0	0	0	0	0
Paracandacia simplex	0	0	0	0.3	0	0	0	0	0	0	0
Parundinella spinodenticula	0	0	0	0	0	0	0	0	0	0	0

TABLE 6-1-1. (continued)

Rhincalanus cornutus	0	0	0	0	0	0	0	0	0	0	0
Scolecithricella dentata	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix bradyi	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix danae	0	0	0	0	0	0.6	0	0	0	0	0
Stephos deichmannae	0	0	0	0	0	0	0	0	0	0.2	0
Temora stylifera	0.5	1.3	0	0	0	12.8	0.3	1.4	2.0	0.5	0
Temora turbinata	1.6	6.5	5.1	6.3	10.6	0	0.3	13.2	4.9	7.9	1.1
Undinula vulgaris	0	0	0	0.3	0	0	0	0	0	0	0
<u>CYCLOPOIDA</u>											
Copilia mirabilis	0	0	0	0.3	0	0	0	0	0	0	0
Corycaeus amazonicus	0.7	22.2	6.4	1.6	0.9	0	0.3	7.0	9.8	17.8	8.4
Corycaeus americanus	4.0	13.1	1.6	0.5	0.3	0	0	1.4	12.8	3.0	9.5
Corycaeus giesbrechti	0.5	9.1	1.6	4.2	2.0	0.6	1.9	9.0	0	8.4	1.1
Corycaeus latus	0	0	0	0	0	1.7	1.0	0	0	0	0
Corycaeus lautus	0	0	0	0.5	0	0	0	0	0	0	0
Corycaeus limbatus	0	0	0	0	0	0	0	0	0	0	0
Corycaeus speciosus	0.4	1.3	0	0	0	0	0	0	0	0	0
Corycaeus typicus	0	0	0	0	0	0	0	0	0	0	0
Farranula gracilis	0	1.3	0.3	2.6	23.7	32.6	16.3	2.8	0	2.3	0.4
Farranula rostrata	0	0	0.6	0	0	0	0	0	0	0	0.4
Lichomolgus sp.	0.2	3.9	0.6	0	0	0	0	0.7	0.5	0	1.8
Lubbockia squillimana	0	0	0	0	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0	0	0	0	0
Oithona fallax	0	0	0	2.1	0	0	0	0	0	0	0
Oithona nana	0.9	0	5.8	8.4	0	1.7	0	36.2	1.0	0	1.1
Oithona plumifera	1.8	15.7	4.8	18.9	2.0	14.6	7.7	12.5	65.5	13.8	15.3
Oithona setigera	0	0	0	0	0	0	0.3	0	0	0.2	0.4
Oithona similus	0	0	2.6	0.3	0	0	0	0	0	0	0.4

TABLE 6-1-1. (continued)

Oithona simplex	0	0	0	0.3	0	0	0	0	0	0	0
Oithona tenuis	0	0	1.0	6.3	1.4	0	0	0	0	0	0
Oithona vivida	0	0	0	0	0	0	0	0	0	0	0.4
Oithona sp.1	0	0	0.6	0	0	0	0.6	0	0	0	0.4
Oncaea conifera	0	0	0	0	0	0	0	0	0	0	0.4
Oncaea dentipes	0	0	0	0	0	0	0	0	0	0	0
Oncaea media	9.1	47.0	40.3	6.8	36.0	1.7	1.6	1.4	2.5	1.2	18.5
Oncaea mediterranea	1.1	27.4	1.0	22.0	1.1	0	1.3	1.4	0	0.2	6.9
Oncaea ornata	0	0	0	0	0	0	0	0	0	0	0.4
Oncaea venusta	2.4	27.4	2.6	7.1	15.4	23.3	6.4	13.9	10.3	8.6	8.4
Oncaea sp.	0	0	0	0	0	0	0	0	0	0	0
Paroithona pulla	0	0	0	0	0	0	0	0	0	0	0
Paroithona sp.	0	0	0	0	0	0	0	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0	0	0	0.7
Sapphirina auronitens	0	0	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0	0	0	0.3	0	0	0	0	0	0	0
Sapphirina ovatolanceolata	0	0	0	0	0	0	0	0	0	0	0
HARPACTICOIDA											
Clytemnestra rostrata	0.4	0	1.3	0	0	0	0	0	1.0	0	2.5
Clytemnestra scutellata	0	0	0	0	0	0	0	0	0	0	0.7
Macrosetella gracilis	0.2	2.6	0	0.3	0	2.3	0	0.7	0	3.7	0.7
Microsetella norvegica	0	0	0	0	0	0	0	0	0	0	0
Microsetella rosea	0	0	0	0.5	0	0	0	0	0	0	0
Miracia minor	0	0	0	0	0	0	0	0	0	0	0.4
Oculosetella gracilis	0.2	0	0	0	0	0	0	0	0	0	0

TABLE 6-1-2.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W22 - 1964

	1-29-64	2-20-64	3-19-64	4-16-64	5-23-64	6-26-64	7-17-64	8-30-64	9-19-64	10-29-64	11-23-64	12-17-64
Total No./m^3	254.5	102.7	130.0	265.6	710.4	383.4	430.9	426.9	108.5	659.8	241.8	223.7
CALANOIDA												
Acartia danae	0	0	0	0	2.1	0	0	0	0	0	0	0
Acartia tonsa	2.3	1.0	0	4.1	42.7	0	0	0	0	0.9	0	0
Acrocalanus andersoni	0.4	0	0	0	0	0	0	0	0	0	0.6	0
Acrocalanus longicornis	0.4	0	0	0	0	0	0	4.2	0	16.2	2.4	3.0
Aetideus acutus	0	0	1.0	0	0	0	0	0	0	0	0	0
Anomalocera ornata	0	0	0	0	0	0	0	0	0	0	0	0
Calanopia americana	0	0	0	0	2.1	0	0	0	0	0	5.1	1.5
Calocalanus elegans	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus pavo	0	0	0	0	0	9.6	3.7	13.4	0.4	12.6	1.5	0
Calocalanus pavoninus	4.2	0	0	0	0	10.8	3.0	21.8	0	3.6	2.4	0
Calocalanus styliremis	0.8	0	0	0	2.1	4.8	2.2	5.6	0.7	6.3	4.8	1.5
Calocalanus sp.1	0.8	0	0	0	0	0	0	0	0	0.9	0	0
Calocalanus sp.2	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus sp.3	0	0	0	0	0	0	0	0	0	0	0	0
Caolcalanus sp.4	0	0	0.5	0	0	0	0	0	0	0	0.3	0
Candacia curta	0	0	0	0	0	0.6	0	0	0	0	0	0
Candacia pachydactyla	0	0	0	0	0	0	0	0	0	0	0	0
Centropages caribbeanensis	0	0	0	0	0	0	0	0	0	0	0	0
Centropages hamatus	0.8	0	0	0.7	0	0	0	0	0	0	0	0
Centropages velificatus	0.8	0	0	0	19.2	1.8	3.7	0.7	0.4	5.4	16.0	1.5
Clausocalanus arcuicornis	0.4	0	0	0	2.1	0	0	0	0	0	0	0
Clausocalanus furcatus	9.9	5.1	0.5	0	91.7	131.6	75.9	166.7	11.8	185.7	54.9	21.7

TABLE 6-1-2. (continued)

Clausocalanus jobei	1.1	0.3	1.0	0.7	4.3	4.8	39.4	1.4	0.4	0	1.5	0
Clausocalanus mastigophorus	0	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus parapergens	0.4	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus paululus	0.4	0	0	0	0	0	0	0	0	0	0.3	0
Clausocalanus pergens	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus	0.4	0	0	1.4	0	1.2	8.2	0	0	0	0	0
Eucalanus monachus	0	0	0.5	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	2.7	0.6	1.0	0	12.8	3.0	0.7	4.9	0	0	7.9	3.0
Euchaeta marina	0.8	0	0	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0	0	0	0	0	0	0	0	0	0	0	0
Ischnocalanus plumulosus	0.4	0	0.5	0	0	0.6	0.7	0	0	0	0	0
Labidocera acutifrons	0	0	0	0	0	0	0	0	0	0	0	0
Labidocera aestiva	0	0	0	0	2.1	0	0	0	0	0	0	0
Lucicutia flavicornis	0.4	0.3	0.5	0	2.1	0	1.5	0	0	0	0.3	0
Lucicutia gaussae	0	0	0	0	0	0	0	0	0	0	0	0
Lucicutia paraclausi	0	0	0	0	0	0	0	0	0	0	0	0
Mecynocera clausi	0	0	0	0	0	0.6	6.0	0	0	0	0	0
Nannocalanus minor	5.3	0.3	1.0	0	2.1	2.4	0	0	0	0	0	0
Neocalanus gracilis	0	0	0	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	0	0	0.5	0	2.1	7.8	3.0	3.5	6.6	30.7	25.1	12.1
Paracalanus crassirostris	25.9	5.1	0	11.7	0	0	0	0	0	0	0.3	0.5
Paracalanus denudatus	0.8	0	0	0	2.1	0	0.7	0	0	0	0.9	0
Paracalanus indicus	51.8	11.4	7.5	22.7	243.2	0	0.7	2.8	3.8	21.6	17.5	51.4
Paracalanus quasimoto	50.3	40.2	66.0	66.1	125.9	29.3	6.0	1.4	5.6	111.8	6.6	31.2
Paracalanus sp.	0	0	0	0	0	0	0	0	0	0	0	0
Paracandacia simplex	1.1	0	0	0	0	0	0	0	0	0	0	0
Parundinella spinodenticula	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 6-1-2. (continued)

Rhincalanus cornutus	2 3	0	0.5	0	0	0	0	0	0	0	0	0
Scolecithricella dentata	0	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix bradyi	0	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix danae	0.8	0	0	0	0	0	0	0	0	0	0	0
Stephos deichmannae	0	0	0	0	0	0	0	0	0	0	0.9	0.5
Temora stylifera	0.4	0	0	0	0	1.8	2.2	1.4	0	0	0	0.5
Temora turbinata	1.1	1.3	1.0	1.4	0	2.4	3.7	0.7	2.8	10.8	6.9	7.1
Undinula vulgaris	0.8	0	0	0	0	0	0	0	0	0	0	0
<u>CYCLOPOIDA</u>												
Copilia mirabilis	0	0	0	0	0	0	0	0.7	1.4	0	0	0
Corycaeus amazonicus	0.8	0.3	1.0	7.6	40.5	1.8	0	1.4	2.1	1.8	4.2	11.1
Corycaeus americanus	6.1	11.7	15.5	11.7	17.1	1.8	0	0	1.0	0	2.7	2.5
Corycaeus giesbrechti	0.8	0	1.0	0	0	4.8	7.4	1.4	3.8	14.4	4.8	5.0
Corycaeus latus	0.4	0	0	0	2.1	0	0	1.4	0	0.9	0	0
Corycaeus lautus	0	0	0	0	0	0	0	0	0	0	0	0.5
Corycaeus limbatus	0	0	0.5	0	0	0	0	0	0	0	0	0
Corycaeus speciosus	0.4	0	0	0	0	0	0.7	1.4	0.7	1.8	0.3	0
Corycaeus typicus	0	0	0	0	0	0	0	0	0	0	0	0
Farranula gracilis	0.8	0	0	0	0	37.7	24.6	98.5	14.3	104.6	4.2	0.5
Farranula rostrata	0	0	0	0	0	0	1.5	0	0	0	0.3	0
Lichomolgus sp.	1.5	0.3	0	0.7	0	0	0	0	0	0	0.9	1.0
Lubbockia squillimana	0	0	0	0	2.1	0	0.7	0	0	0	0	0
Oithona brevicornis	0	0	0.5	0	0	0	0	0	0	0	0	0
Oithona fallax	0	0	1.0	0	0	0	0.7	0	0	0.9	0.3	0
Oithona nana	31.6	10.8	1.5	1.4	6.4	0.6	0	0.7	0.4	0.9	1.2	1.5
Oithona plumifera	9.9	1.6	2.5	0.7	2.1	81.9	28.3	42.2	50.1	73.9	26.6	21.7
Oithona setigera	0	0	1.0	0	0	0	0	0	0	0	0.3	0
Oithona similus	0	0	3.0	0	0	0	0	0	0	0	0	0

TABLE 6-1-2. (continued)

Oithona simplex	0	0	0	0	0	0	0	0	0	0	0	0
Oithona tenuis	0	0	0	0	0	0	0	0	0	0	0	0
Oithona vivida	0	0	0.5	0	0	0	0	0	0	0	0	0
Oithona sp.1	0	0	4.0	0.7	0	0.6	0	0	0	0	0	0
Oncaea conifera	0.4	0	0	0	0	0	0.7	0	0	0	0	0
Oncaea dentipes	0	0	0.5	0	0	0	0	0	0	0	0	0
Oncaea media	26.3	8.9	12.0	132.1	59.7	6.0	160.0	21.1	0	4.5	9.7	24.7
Oncaea mediterranea	3.4	1.0	2.5	0	0	7.2	27.5	0.7	0	0.9	1.2	0.5
Oncaea ornata	0.4	0	0	0.7	0	0	0	0	0	0	0	0
Oncaea venusta	3.8	1.6	0.5	0.7	19.2	26.9	13.4	26.7	1.7	37.0	25.1	10.1
Oncaea sp.	0	0	0.5	0	0	0	0	0	0	0	0	0
Paroithona pulla	0	0	0	0.7	0	0	0	0	0	0	0	0
Paroithona sp.	0	0	0	0	0	0	2.2	0	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0	0	0	0	0
Sapphirina auronitens	0	0	0	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0	0	0	0	0	0	0	0.7	0	0	0	0
Sapphirina ovatolanceolata	0	0	0	0	0	0	0.7	0	0	0	0	0
HARPACTICOIDA												
Clytemnestra rostrata	0.4	0.6	0	0	2.1	0.6	0.7	0	0.7	0	0.9	4.0
Clytemnestra scutellata	0	0	0	0	0	0	0	0	0	0	0	0
Macrosetella gracilis	0	0.3	0	0	0	0	0	1.4	0	11.7	2.7	5.0
Microsetella norvegica	0	0	0	0	0	0.6	0	0	0	0	0	0
Microsetella rosea	0	0	0	0	0	0	0	0	0	0	0	0
Miracia minor	0	0	0	0	0	0	0	0	0	0	0	0
Oculosetella gracilis	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 6-1-3.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W22 - 1965

	1-8-65	2-28-65	3-22-65	4-24-65	6-13-65	8-12-65	9-11-65	12-10-65
Total No./m^3	225.3	409.4	31.1	439.5	268.2	40.0	322.2	504.2
CALANOIDA								
Acartia danae	0	1.1	0	1.4	0	0	0	0
Acartia tonsa	0	2.8	0	17.1	20.1	0	0	0
Acrocalanus andersoni	1.8	0	0	0	0	0.1	0.4	0
Acrocalanus longicornis	4.9	0.5	0	0	0	0.1	0.9	0
Aetideus acutus	0.4	0	0	0	0	0	0	0
Anomalocera ornata	0	0	0	0	0	0	0	0
Calanopia americana	8.4	2.8	0	0	0	0	0.4	3.3
Calocalanus elegans	0	0	0	0	0	0	0	0
Calocalanus pavo	0.9	0.5	0	0	0.6	0.6	1.3	0
Calocalanus pavoninus	3.1	0.5	0	0	0.6	1.1	0	0
Calocalanus styliremis	5.3	1.1	0.1	0	0.6	0.8	0.9	0
Calocalanus sp.1	0	0	0.1	1.4	0	0	0	0
Calocalanus sp.2	0.9	0.5	0	0	0	0	0	0
Calocalanus sp.3	0	0	0	0	0.6	0	0	0
Calocalanus sp.4	0	0	0	0	0	0	0	0
Candacia curta	0	0	0.2	0	0	0	0	0
Candacia pachydactyla	0	0	0.1	0	0	0	0	0
Centropages caribbeanensis	0	0	0	0	0	0	0	0
Centropages hamatus	0	1.7	0	0	0	0	0	0
Centropages velificatus	4.0	0	0	0	7.3	0	0.9	15.6
Clausocalanus arcuicornis	0	0	0	0	0	0	0	0
Clausocalanus furcatus	32.4	13.2	1.9	2.8	10.4	2.7	3.1	33.4

TABLE 6-1-3. (continued)

Clausocalanus jobei	3.1	1.7	1.0	2.8	3.1	0	0.4	0
Clausocalanus mastigophorus	0	0	0.1	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	0	0
Clausocalanus paululus	0.4	0.5	0	0	0	0	0	0
Clausocalanus pergens	0.4	8.3	0	0	0	0	0	0
Ctenocalanus vanus	0.4	6.6	0.7	1.4	0	0	0	0
Eucalanus monachus	0	0	0	0	0	0	0	0
Eucalanus pileatus	5.3	3.9	0.6	0	25.6	0	3.6	12.2
Euchaeta marina	0	0	0.1	0	0	0	0	0
Euchaeta paraconcinna	0.9	0.5	0	0	0	0	0	0
Ischnocalanus plumulosus	0.9	0.5	0	0	0	0	0	0
Labidocera acutifrons	0	0	0	0	0	0.1	0	0
Labidocera aestiva	0	0	0	0	0	0	0	0
Lucicutia flavicornis	0.4	2.8	0.1	0	0	0	0	21.2
Lucicutia gaussae	0	0.5	0	0	0	0	0	0
Lucicutia paraclausi	0	2.8	0	0	0	0	0	0
Mecynocera clausi	0.4	0.5	0	0	0	0	0.4	0
Nannocalanus minor	5.3	0	0.6	5.7	0.6	0.1	0.4	1.1
Neocalanus gracilis	0	0	0	0	0	0	0	0
Paracalanus aculeatus	14.2	9.9	0.6	0	2.4	0.9	8.4	94.6
Paracalanus crassirostris	0	1.7	0	44.1	3.1	0	0	0
Paracalanus denudatus	0	1.1	0	0	0	0	0.4	0
Paracalanus indicus	8.4	78.3	6.8	35.6	19.5	17.9	18.2	135.8
Paracalanus quasimoto	8.4	220.7	8.0	76.8	54.2	2.0	72.9	12.2
Paracalanus sp.	0	0	0	0	0	0	0	0
Paracandacia simplex	0	0	0	0	0	0	0	0
Parundinella spinodenticula	0	0.5	0	0	0	0	0	0

TABLE 6-1-3. (continued)

Rhincalanus cornutus	0.4	0.5	0.6	7.1	0	0	0	0
Scolecithricella dentata	0	0.5	0	0	0	0	0	0
Scolecithrix bradyi	0	0	0.1	0	0	0	0	0
Scolecithrix danae	0	0.5	0.1	0	0	0	0	0
Stephos deichmannae	0.4	3.3	0.2	0	0	0	0	0
Temora stylifera	2.2	1.1	0.4	1.4	9.7	1.7	1.3	1.1
Temora turbinata	16.4	1.1	0.1	4.3	31.1	0.1	2.2	40.1
Undinula vulgaris	0	0	0	0	0	0.8	0.4	1.1
<u>CYCLOPOIDA</u>								
Copilia mirabilis	0	0	0	0	0	0.1	0	0
Corycaeus amazonicus	3.1	1.7	0.6	22.8	21.9	0.6	2.2	4.5
Corycaeus americanus	3.1	0	0.1	18.5	3.7	0	0.9	2.2
Corycaeus giesbrechti	4.9	0.5	0.3	0	0	0.6	15.6	15.6
Corycaeus latus	0	1.1	0	0	0	0.2	0.4	0
Corycaeus lautus	0	0	0	0	0	0	0	0
Corycaeus limbatus	0	0	0	0	0	0	0	0
Corycaeus speciosus	0	0.5	0	0	0	0.2	0.4	0
Corycaeus typicus	0.4	0	0	0	0	0	0	0
Farranula gracilis	2.7	0.5	0.6	0	0	1.3	124.0	0
Farranula rostrata	0.4	0	0.1	1.4	0	0	0	0
Lichomolgus sp.	0.9	2.2	0.1	0	0	0	1.3	1.1
Lubbockia squillimana	0	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0	0
Oithona fallax	0	0	0.1	4.3	0	0	1.3	0
Oithona nana	0	0	0.3	1.4	29.3	0	0.9	0
Oithona plumifera	16.9	2.8	0.2	24.2	11.0	4.2	13.3	1.1
Oithona setigera	0.4	0	0	0	0	0	0.9	0
Oithona similis	0	2.2	0.1	5.7	0	0	0	0

TABLE 6-1-3. (continued)

Oithona simplex	0	0	0	0	0.6	0	0	1.1
Oithona tenuis	0	0	0	0	0	0	0	0
Oithona vivida	0.4	0	0	0	0	0	0	0
Oithona sp.1	0.9	0	0	10.0	0	0	0.4	0
Oncaea conifera	1.8	0.5	0	2.8	1.2	0	0	0
Oncaea dentipes	0	0	0.1	0	0	0	0	0
Oncaea media	8.0	12.7	3.3	119.5	4.3	0	1.8	69.0
Oncaea mediterranea	24.0	3.9	1.5	14.2	2.4	0	24.0	0
Oncaea ornata	0	0.5	0	0	0	0	0	0
Oncaea venusta	21.8	1.1	1.3	10.0	3.7	3.0	12.0	30.0
Oncaea sp.	0	0	0	0	0	0	0	0
Paroithona pulla	0	0	0	0	0	0	0	0
Paroithona sp.	0	0	0	0	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0
Sapphirina auronitens	0	0	0	0	0	0.1	0	0
Sapphirina nigromaculata	0.9	0	0	1.4	0	0	0.4	0
Sapphirina ovatolanceolata	0	0	0	0	0	0	0	0
<u>HARPACTICOIDA</u>								
Clytemnestra rostrata	0.4	4.4	0.2	1.4	0.6	0	1.3	1.1
Clytemnestra scutellata	0	0.5	0	0	0	0	0	0
Macrosetella gracilis	3.6	0.5	0.1	0	0	0.7	4.0	6.7
Microsetella norvegica	0	0	0	0	0	0	0	0
Microsetella rosea	0	0.5	0	0	0	0	0	0
Miracia minor	0	0	0	0	0	0	0	0
Oculosetella gracilis	0	0	0	0	0	0	0	0

TABLE 6-2-1.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W23 - 1963

	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-4-63	11-1-63	12-1-63
Total No./m^3	142.2	106.5	389.1	148.6	400.6	137.8	145.1	179.7	260.1
CALANOIDA									
Acartia danae	0	0	0	0	0	0	0	0	0
Acartia lilljeborgii	0	0	0	0	0	0	0	0	1.2
Acartia tonsa	3.0	2.1	0	1.1	0	0	0	0	0
Acrocalanus andersoni	0	0	0	0	0	0	0	0	0
Acrocalanus longicornis	0	0	0	0.6	2.5	2.5	0.6	0	0
Aetideus acutus	0	0	0	0	0	0	0	0	0
Calanopia americana	0	0	0	0	2.5	0.7	0	0	0
Calocalanus pavo	0	0	0	0	3.7	3.2	0	0	0
Calocalanus pavoninus	0	0.8	0	0	28.9	5.3	0	0	0
Calocalanus styliremis	0	0	0	0	11.7	8.4	0	0	0
Calocalanus sp.1	0	0	0	0	1.8	0	0	0	0
Candacia curta	0	0	0	0	0	0	0	0	0
Centropages caribbeanensis	0	0	0	0	0.6	0	0	0	0
Centropages hamatus	0	0	0	0	0	0	0	0	0
Centropages velificatus	0	0	0.6	0	0	0	0	7.0	3.6
Clausocalanus furcatus	0	1.3	2.6	81.1	164.3	63.6	0	0	11.3
Clausocalanus jobei	1.0	0	5.1	0	1.8	0	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	0	0.8	0	1.1	0	1.8	2.8	1.2	7.1
Euchaeta marina	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0	0	0	0	0	0	0	0	0

TABLE 6-2-1. (continued)

Labidocera aestiva	0	0	0	0	0	0	0	0	0
Lucicutia flavicornis	0	0	0	0	0	0	0	0	0
Nannocalanus minor	0	0	1.3	0.6	0	0	0	0	0
Paracalanus aculeatus	2.0	0	1.9	30.9	5.5	16.9	5.0	31.7	40.9
Paracalanus crassirostris	3.0	0.8	2.6	0	1.2	0	2.8	0	0
Paracalanus indicus	3.0	18.1	51.8	4.0	8.6	0	28.7	5.9	84.1
Paracalanus quasimoto	75.2	18.9	209.9	3.4	4.3	5.3	59.0	3.5	39.7
Temora stylifera	0	0.4	0	0	1.8	1.0	0	1.2	0
Temora turbinata	3.0	23.2	1.3	0	2.5	0	11.6	2.3	9.5
Undinula vulgaris	0	0	0	0	0	0	0	0	0.6
<u>CYCLOPOIDA</u>									
Copilia mirabilis	0	0	0	0	0.6	0.4	0	0	0
Corycaeus amazonicus	4.1	10.5	3.2	0	6.2	0	3.3	31.7	8.3
Corycaeus americanus	10.2	2.5	1.9	0	0	0	0.6	7.0	7.1
Corycaeus giesbrechti	1.0	0	0.6	1.1	5.5	0.4	5.0	10.6	7.1
Corycaeus latus	0	0	0	0	3.1	0.4	0	0	0
Corycaeus speciosus	0	0	0	0	0.6	0	0	0	0
Farranula gracilis	0	0	0.6	18.9	65.8	9.5	0	0	0
Farranula rostrata	0	0	0	0	0	0	0	0	0
Lichomolgus sp.	0	0	1.3	0	0	0	0	0	0.6
Oithona brevicornis	0	0	0	0	0	0	0	0	0
Oithona fallax	1.0	0.4	0	0	0	0	0	0	0
Oithona nana	3.0	24.0	19.8	0.6	0.6	0	22.1	25.8	9.5
Oithona plumifera	2.0	0	1.9	2.9	14.1	11.3	3.9	48.1	21.3
Oithona simplex	0	0	0	0	0.6	0	0	0	0
Oithona sp.1	0	0	0	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	0	0	0	0	0

TABLE 6-2-1. (continued)

Oncaea media	28.4	0	79.4	0.6	36.3	1.4	0	2.3	0.6
Oncaea mediterranea	0	0	2.6	0	1.2	0	0	0	0.6
Oncaea ornata	0	0	0	0	0	0	0	0	0
Oncaea venusta	0	0.4	0.6	1.7	22.2	6.0	0	0	7.1
Saphirella sp.	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0	0	0	0	0.6	0	0	0	0
<u>HARPACTICOIDA</u>									
Clytemnestra scutellata	2.0	2.1	0	0	1.2	0	0	1.2	0
Macrosetella gracilis	0	0	0	0	0	0	0	0	0
Microsetella rosea	0	0	0	0	0	0	0	0	0

TABLE 6-2-2.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W23 - 1964

	3-19-64	4-16-64	5-23-64	6-26-64	7-17-64	8-30-64	10-29-64	11-23-64	12-17-64
Total No./m^3	160.0	298.7	353.3	147.8	325.2	359.2	297.3	812.9	347.2
CALANOIDA									
Acartia danae	0	0	0	0	0	0	0	0	0
Acartia lilljeborgii	0	0	0	3.1	0	0	0	0	0
Acartia tonsa	0	25.1	92.2	4.2	0	0	0	0	0
Acrocalanus andersoni	0	0	0	0	0	0	0	0	0
Acrocalanus longicornis	0	0	0	0	0	3.2	0	2.2	0
Aetideus acutus	0	0	0	0	0	0	0	0	0
Calanopia americana	0	0	0	0	1.5	0	0	2.2	0
Calocalanus pavo	0	0	0	0	1.5	0.8	2.7	2.2	0
Calocalanus pavoninus	0	0	0	0	0	3.2	0	0	0
Calocalanus styliremis	0	0	0	0	0.7	0	0	0	1.3
Calocalanus sp.1	0	0	0	0	0	0	0	0	0
Candacia curta	0	0	0	0	0	0	0	0	0
Centropages caribbeanensis	0	0	0	0	0	0	0	0	0
Centropages hamatus	0	0	0	0	0	0	0	0	0
Centropages velificatus	0	0	3.4	4.2	8.2	4.0	6.7	22.5	0
Clausocalanus furcatus	9.1	0	11.9	0	128.7	142.4	1.3	49.4	2.5
Clausocalanus jobei	3.0	0	0	0	0	0.8	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	1.5	0	8.5	2.1	0	0.8	4.0	9.0	2.5
Euchaeta marina	0	0	0	0	0	0.8	0	0	0
Euchaeta paraconcinna	0	0	0	0	0	0	0	2.2	0

TABLE 6-2-2. (continued)

Labidocera aestiva	0	0	0	0	0	0	0	0	0
Lucicutia flavicornis	0	0	0	0	0	0	0	0	0
Nannocalanus minor	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	0	0	1.7	0.5	4.5	14.4	17.3	53.9	20.3
Paracalanus crassirostris	0	2.5	3.4	29.1	3.7	0.8	12.0	2.2	5.1
Paracalanus indicus	32.0	62.7	59.7	47.9	0.7	63.2	21.3	312.1	55.8
Paracalanus quasimoto	29.0	168.2	49.5	7.3	2.2	8.8	4.0	44.9	10.1
Temora stylifera	0	0	0	0	0.7	0	0	0	0
Temora turbinata	0	5.0	35.8	3.6	2.2	17.6	8.0	13.5	15.2
Undinula vulgaris	0	0	0	0	0.7	0	0	0	0
CYCLOPOIDA									
Copilia mirabilis	0	0	0	0	0.7	0	0	0	0
Corycaeus amazonicus	6.1	0	30.7	4.2	0	0.8	6.7	13.5	11.4
Corycaeus americanus	4.6	10.0	10.2	1.0	0	1.6	2.7	42.7	30.4
Corycaeus giesbrechti	0	0	0	0	8.2	0.8	24.0	18.0	1.3
Corycaeus latus	0	0	0	0	3.0	0.8	0	0	0
Corycaeus speciosus	0	0	0	0	0	0	0	0	0
Farranula gracilis	0	0	1.7	0	100.5	6.4	0	4.5	0
Farranula rostrata	0	0	0	0	0	0	0	0	0
Lichomolgus sp.	0	0	0	0	0	0	0	4.5	2.5
Oithona brevicornis	0	0	0	1.0	0	0	0	0	0
Oithona fallax	0	0	0	0	0	0	0	0	0
Oithona nana	0	7.5	3.4	39.5	0.7	0	166.7	9.0	25.3
Oithona plumifera	0	0	0	0	9.7	24.0	5.3	56.1	10.1
Oithona simplex	0	0	0	0	0	0	0	4.5	11.4
Oithona sp.1	0	0	0	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	1.5	0	0	0	0

TABLE 6-2-2. (continued)

Oncaea media	61.0	1.0	25.6	0	29.0	7.2	1.3	58.4	131.8
Oncaea mediterranea	0	0	0	0	0	1.6	0	0	0
Oncaea ornata	0	0	0	0	0	0	0	0	0
Oncaea venusta	13.7	0	11.9	0	14.1	54.4	12.0	62.9	5.1
Saphirella sp.	0	0	0	0	0	0	0	0	2.5
Sapphirina nigromaculata	0	0	0	0	2.2	0	0	2.2	0
<u>HARPACTICOIDA</u>									
Clytemnestra scutellata	0	0	3.4	0	0	0.8	0	4.5	2.5
Macrosetella gracilis	0	0	0	0	0	0	1.3	15.7	0
Microsetella rosea	0	0	0	0	0	0	0	0	0

TABLE 6-2-3.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W23 - 1965

	1-8-65	2-28-65	3-22-65	4-24-65	5-30-65	6-13-65	8-12-65	9-11-65	12-10-65
Total No./m^3	228.8	359.8	180.5	299.2	624.2	414.6	66.9	405.5	845.9
CALANOIDA									
Acartia danae	0	0	0	0	0	3.8	0	0	0
Acartia lilljeborgii	0	0	0	0	0	0	0	0	0
Acartia tonsa	0	2.8	0.8	25.3	47.3	17.2	0	0	0
Acrocalanus andersoni	0	2.8	0	0	0	0	0	0	0
Acrocalanus longicornis	0	0	0	0	0	0	0	0	0
Aetideus acutus	0.9	0	0	0	0	0	0	0	0
Calanopia americana	0	0	0	0	0	0	0	0	0
Calocalanus pavo	0	0	0	0	0	0	0.8	0.8	0
Calocalanus pavoninus	1.7	0	0	0	0	0	0.8	0	0
Calocalanus styliremis	1.7	0	0	0	0	1.9	0	0	0
Calocalanus sp.1	0	1.4	0	0	0	0	0	0	0
Candacia curta	0	0	0	0	0	0	0	0	1.3
Centropages caribbeanensis	0	0	0	0	0	0	0	0	0
Centropages hamatus	0.9	45.5	1.6	1.5	2.0	0	0	0	0
Centropages velificatus	0	4.3	1.2	0	2.0	3.8	5.8	7.9	22.4
Clausocalanus furcatus	0.9	0	14.6	13.4	0	5.7	0	3.2	1.3
Clausocalanus jobei	0	0	0.8	0	0	3.8	0	0	0
Ctenocalanus vanus	0	1.4	0	0	0	1.9	0	0	0
Eucalanus pileatus	0	0	0.8	6.0	5.9	22.9	0	6.4	14.5
Euchaeta marina	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0	0	0	0	0	1.9	0	0	0

TABLE 6-2-3. (continued)

Labidocera aestiva	0	4.3	0.4	0	9.8	0	0	0	0
Lucicutia flavicornis	0	2.8	0	0	0	3.8	0	0	0
Nannocalanus minor	0	0	0.4	0	0	0	0	0	0
Paracalanus aculeatus	0.9	11.4	0.8	0	5.9	15.3	3.3	9.5	19.8
Paracalanus crassirostris	35.1	58.3	8.7	49.1	21.7	0	0	11.9	0
Paracalanus indicus	50.8	143.6	52.9	58.0	350.5	194.9	27.3	260.8	476.4
Paracalanus quasimoto	11.4	29.9	42.7	41.7	122.1	53.5	2.5	58.8	15.8
Temora stylifera	0	0	0	0	2.0	5.7	0	0	0
Temora turbinata	3.5	11.4	1.6	0	3.9	9.6	0	4.8	59.4
Undinula vulgaris	0	0	0	0	0	0	0	0	0
<u>CYCLOPOIDA</u>									
Copilia mirabilis	0	0	0	0	0	0	0	0	0
Corycaeus amazonicus	1.7	5.7	2.4	8.9	7.9	21.0	4.1	11.9	1.3
Corycaeus americanus	24.5	2.8	5.5	4.5	2.0	5.7	5.8	2.4	27.7
Corycaeus giesbrechti	0	0	0	0	0	0	5.8	0.8	5.3
Corycaeus latus	0	0	0	0	0	0	0	0	0
Corycaeus speciosus	0	0	0	0	0	0	0	0	0
Farranula gracilis	0	0	0	0	0	0	0	2.4	0
Farranula rostrata	0	1.4	0	0	0	0	0	0	0
Lichomolgus sp.	0	0	0	0	0	1.9	0	0	0
Oithona brevicornis	0	5.7	0	0	0	0	0	0	0
Oithona fallax	0	5.7	0	0	0	0	0	0	0
Oithona nana	20.2	0	27.3	7.4	41.4	9.6	0	14.3	13.2
Oithona plumifera	4.4	1.4	1.2	29.8	0	15.3	4.1	4.0	10.6
Oithona simplex	0	0	0	0	0	0	0	1.6	1.3
Oithona sp.1	0	4.3	0	0	0	0	0	0	0
Oncaea conifera	0	0	0.8	0	0	0	0	0	0

TABLE 6-2-3. (continued)

Oncaea media	67.5	8.5	13.4	47.6	0	11.5	0	0	170.2
Oncaea mediterranea	1.7	0	2.4	0	0	1.9	0	0	0
Oncaea ornata	0	1.4	0	0	0	0	0	0	0
Oncaea venusta	0.9	0	0	4.5	0	1.9	2.5	0	2.6
Saphirella sp.	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0	0	0	0	0	0	0	0	0
HARPACTICOIDA									
Clytemnestra scutellata	0	2.8	0	0	0	0	0.8	4.0	2.6
Macrosetella gracilis	0	0	0.4	0	0	0	3.3	0	0
Microsetella rosea	0	0	0	1.5	0	0	0	0	0

TABLE 6-3-1.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W24 - 1963

	4-6-63	5-3-63	5-22-63	6-27-63	7-15-63	8-28-63	10-3-63	11-3-63	12-1-63
Total No./m^3	865.2	148.0	449.9	56.1	652.5	243.8	498.9	183.9	144.6
<u>CALANOIDA</u>									
Acartia danae	0	1.3	0.6	0	12.5	0	0	0	0
Acartia lilljeborgii	0	0	0	5.6	3.1	0	34.5	2.5	4.5
Acartia tonsa	606.8	6.7	0	0	0	0	6.6	2.5	53.4
Acrocalanus longicornis	0	0	0	0	0	0	0	0	0
Calanopia americana	0	0	3.1	0	0	0	0	0	0
Calocalanus pavoninus	0	0	0	0.6	0	0	0	0	0
Calocalanus styliremis	0	0	0	0	0	0	0	0	0
Calocalanus sp.1	0	0	0	0	0	0	0	0	0
Centropages hamatus	0	0	0	0	0	0	0	0	0
Centropages velificatus	0	0	7.5	1.1	3.1	32.5	18.1	16.2	0.3
Clausocalanus furcatus	0	0	3.8	0.6	3.1	0	0	0	0.3
Clausocalanus jobei	2.4	0	0	0	0	0	0	0	0
Eucalanus pileatus	0	0	1.2	1.7	0	6.1	4.9	8.7	2.9
Labidocera aestiva	0	1.3	0.6	0	0	0	0	0	0.3
Labidocera scotti	0	0	0	0	0	2.0	0	0	0
Mecynocera clausi	0	0	0	0	6.2	0	0	0	0
Nannocalanus minor	0	0	0	0.6	0	0	0	0	0
Paracalanus aculeatus	0	0	0	0	0	8.1	0	0	0.3
Paracalanus crassirostris	222.8	37.3	16.9	6.7	12.5	0	196.9	17.4	15.4
Paracalanus indicus	4.7	5.3	151.2	1.1	284.1	46.7	3.3	18.6	6.1
Paracalanus quasimoto	23.7	32.0	99.8	7.3	25.0	4.1	3.3	22.4	10.2

TABLE 6-3-1. (continued)

Pseudodiaptomus sp.1	0	0	0	0	0	0	0	1.2	0
Temora stylifera	0	0	0	0.6	0	0	0	0	0
Temora turbinata	0	42.7	40.2	9.5	43.7	38.6	4.9	39.8	0.6
<u>CYCLOPOIDA</u>									
Corycaeus amazonicus	0	1.3	10.0	6.7	15.6	2.0	8.2	14.9	3.8
Corycaeus americanus	0	0	1.3	2.2	18.7	2.0	0	0	9.6
Corycaeus giesbrechti	0	0	1.9	0.6	0	14.2	1.6	13.7	1.0
Farranula gracilis	0	0	0.6	0	0	0	0	0	0
Lichomolgus sp.	4.7	0	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	3.3	0	2.6
Oithona fallax	0	0	1.3	0	53.1	0	0	0	0
Oithona hebes	0	0	0	0	0	0	0	0	0
Oithona nana	0	18.7	82.2	10.7	106.1	10.2	213.3	23.6	31.4
Oithona plumifera	0	0	0.6	0	3.1	0	0	2.5	1.0
Oithona simplex	0	0	1.2	0	25.0	0	0	0	0
Oithona sp.1	0	0	0.6	0	0	0	0	0	0
Oithona sp.3	0	0	0	0	0	0	0	0	0
Oncaea media	0	0	23.2	0.6	28.1	75.2	0	0	1.0
Oncaea mediterranea	0	0	1.9	0	0	0	0	0	0
Oncaea venusta	0	0	0	0	0	2.0	0	0	0
Paroithona pulla	0	0	0	0	3.1	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0	0
<u>HARPACTICOIDA</u>									
Clytemnestra scutellata	0	1.3	0	0	3.1	0	0	0	0
Microsetella rosea	0	0	0	0	3.1	0	0	0	0

TABLE 6-3-2.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W24 - 1964

	3-20-64	4-17-64	5-25-64	6-27-64	7-18-64	8-31-64	9-25-64	10-30-64	11-19-64	12-18-64
Total No./m^3	178.0	64.0	450.3	626.8	6.7	249.7	619.6	392.2	1406.8	322.6
CALANOIDA										
Acartia danae	0	0	0	0	0	0	0	0	0	0
Acartia lilljeborgii	0	0	0	3.8	0	0	318.4	0	229.2	13.0
Acartia tonsa	4.0	46.5	102.9	0	0.2	0	0	0	14.6	0.9
Acrocalanus longicornis	0	0	0	0	0	3.1	0	0	0	0
Calanopia americana	0	0	2.3	3.8	0	0	0	0	0	0
Calocalanus pavoninus	0	0	0	1.9	0	2.1	0	0	0	0
Calocalanus styliremis	0	0	0	7.5	0	1.1	0	0	0	0
Calocalanus sp.1	0	0	0	1.9	0	0	0	0	0	0
Centropages hamatus	2.0	2.3	0	0	0	0	0	0	0	0
Centropages velificatus	2.0	0	2.3	11.3	0.7	11.5	10.8	0	19.5	6.1
Clausocalanus furcatus	3.0	0	0	184.5	0	98.6	0	0	0	0
Clausocalanus jobei	1.0	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	0	0	11.4	5.6	0	4.2	0	8.2	0	1.7
Labidocera aestiva	0	0	0	0	0	0	0	0	0	0
Labidocera scotti	0	0	0	0	0	0	0	2.7	0	0
Mecynocera clausi	0	0	0	0	0	0	0	0	0	0
Nannocalanus minor	0	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	0	0	0	18.8	0	12.6	0	0	0	0
Paracalanus crassirostris	22.0	7.0	6.9	5.6	0	1.1	4.3	21.8	285.3	6.9
Paracalanus indicus	14.0	3.5	98.3	224.0	0	42.0	2.2	57.2	270.6	192.0
Paracalanus quasimoto	122.0	2.3	112.0	30.1	0	4.2	2.2	8.2	24.4	54.5

TABLE 6-3-2. (continued)

Pseudodiaptomus sp.1	0	1.2	0	0	0	0	0	0	0	0
Temora stylifera	0	0	0	0	0	1.1	0	0	0	0
Temora turbinata	2.0	0	45.7	32.0	0	8.4	8.6	24.5	182.9	6.1
<u>CYCLOPOIDA</u>										
Corycaeus amazonicus	0	0	43.4	3.8	0.2	1.1	146.3	8.2	90.2	2.6
Corycaeus americanus	2.0	0	20.6	0	0.5	1.1	4.3	5.4	56.1	9.5
Corycaeus giesbrechti	2.0	0	0	1.9	0	2.1	2.2	0	12.2	0.9
Farranula gracilis	0	0	0	13.2	0.2	12.6	0	0	0	0
Lichomolgus sp.	0	0	0	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0	8.2	58.5	0
Oithona fallax	0	0	0	0	0	0	0	0	0	0
Oithona hebes	0	0	0	0	0	0	4.3	0	2.4	0
Oithona nana	1.0	1.2	4.6	28.2	4.5	0	116.2	234.2	160.9	20.8
Oithona plumifera	0	0	0	30.1	0	12.6	0	0	0	0
Oithona simplex	0	0	0	0	0	0	0	13.6	0	0
Oithona sp.1	0	0	0	0	0	0	0	0	0	0
Oithona sp.3	0	0	0	0	0	0	0	0	0	0
Oncaea media	1.0	0	0	9.4	0.2	18.9	0	0	0	6.1
Oncaea mediterranea	0	0	0	0	0	1.1	0	0	0	0.9
Oncaea venusta	0	0	0	7.5	0	10.5	0	0	0	0
Paroithona pulla	0	0	0	0	0	0	0	0	0	0
Saphirella sp.	0	0	0	1.9	0	0	0	0	0	0
<u>HARPACTICOIDA</u>										
Clytemnestra scutellata	0	0	0	0	0	0	0	0	0	0.9
Microsetella rosea	0	0	0	0	0	0	0	0	0	0

TABLE 6-3-3.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W24 - 1965

	1-9-65	2-28-65	3-23-65	4-24-65	5-29-65	6-14-65	8-12-65	9-11-65	12-10-65
Total No./m^3	377.4	110.3	480.3	231.2	19.2	36.0	209.1	167.3	133.0
CALANOIDA									
Acartia danae	0	0	0	0	0	0.7	0	0	0
Acartia lilljeborgii	4.4	0	0	0	0	11.8	1.1	86.2	1.7
Acartia tonsa	4.4	0	11.9	5.7	5.0	13.2	0	8.9	6.6
Acrocalanus longicornis	0	0	0	0	0	0	0	0	0
Calanopia americana	0	0	0	0	0	0	0	3.8	0
Calocalanus pavoninus	0	0	0	0	0	0	0	0	0
Calocalanus styliremis	0	0	0	0	0	0	0	0	0
Calocalanus sp.1	0	0	0	0	0	0	0	0	0
Centropages hamatus	0	12.7	132.0	0	0	0	0	0	0
Centropages velificatus	0	0	0	3.8	0	0	4.6	12.7	0.8
Clausocalanus furcatus	0	0	0	11.5	0.7	0	2.3	1.3	0
Clausocalanus jobei	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	0	0	0	3.8	0	0	3.4	0	0
Labidocera aestiva	0	0	0	1.9	0	0	0	0	0
Labidocera scotti	0	0	0	0	0	0	0	2.5	0
Mecynocera clausi	0	0	0	0	0	0	0	0	0
Nannocalanus minor	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	0	0	0	1.9	0	0	2.3	0	0
Paracalanus crassirostris	289.1	65.1	192.7	15.3	7.1	2.9	2.3	8.9	16.6
Paracalanus indicus	35.3	16.6	51.5	84.1	1.4	4.4	115.4	3.8	41.6
Paracalanus quasimoto	13.2	2.2	9.2	59.2	0	0.7	12.6	20.3	0.8

TABLE 6-3-3. (continued)

Pseudodiaptomus sp.1	0	0	0	0	0	0	0	0	0.8
Temora stylifera	0	0	0	0	0	0	1.1	1.3	0
Temora turbinata	2.2	6.1	11.9	0	0	0	21.7	7.6	0
<u>CYCLOPOIDA</u>									
Corycaeus amazonicus	0	0	1.3	3.8	0.7	1.5	5.7	1.3	2.5
Corycaeus americanus	4.4	0	51.5	3.8	1.4	0.7	0	0	0
Corycaeus giesbrechti	0	0	0	1.9	0	0	9.1	2.5	2.5
Farranula gracilis	0	0	0	0	0	0	0	0	0
Lichomolgus sp.	0	0	0	1.9	0	0	0	0	0
Oithona brevicornis	8.8	0	0	0	0	0	0	0	0.8
Oithona fallax	0	0	0	1.9	0	0	0	0	0
Oithona hebes	0	0	0	0	0	0	0	2.5	0
Oithona nana	4.4	7.2	17.2	24.8	2.1	0	20.6	2.5	17.5
Oithona plumifera	0	0	0	1.9	0	0	2.3	0	0
Oithona simplex	0	0	0	0	0	0	0	0	0.8
Oithona sp.1	0	0	0	0	0	0	0	0	0
Oithona sp.3	0	0	0	0	0	0	0	1.3	0
Oncaea media	11.0	0	1.3	1.9	0.7	0	1.1	0	39.9
Oncaea mediterranea	0	0	0	0	0	0	0	0	0
Oncaea venusta	0	0	0	0	0	0	3.4	0	0
Paroithona pulla	0	0	0	0	0	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0	0
<u>HARPACTICOIDA</u>									
Clytemnestra scutellata	0	0.6	0	1.9	0	0	0	0	0
Microsetella rosea	0	0	0	0	0	0	0	0	0

TABLE 6-4-1.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W58 - 1963

	3-9-63	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-11-63	11-4-63	12-2-63	12-21-63
Total No./m^3	129.0	849.3	103.5	178.4	314.0	285.8	252.8	254.7	127.3	139.8	71.4
CALANOIDA											
Acartia danae	0.3	0	0.8	5.2	1.1	10.3	1.6	0	0.2	0	0
Acartia tonsa	1.9	4.1	0.8	0	0.5	0.5	0	0	0	0.7	0
Acrocalanus andersoni	0	0	0	0	0	1.1	0	0	0	0	0.2
Acrocalanus longicornis	0.3	0	0	0	1.1	1.6	0	0.6	1.7	0.2	0.4
Calanopia americana	0.7	2.0	0.3	0.8	0	0	0	1.3	2.7	1.9	0.4
Calanus tenuicornis	0	0	0	0	0	0	0	0	0	0	0.4
Calocalanus elegans	0	0	0	0	0	0	0.8	0	0	0	0
Calocalanus pavo	2.2	4.1	1.2	2.1	0.5	2.7	0	8.8	1.4	0	0.6
Calocalanus pavoninus	0.7	0	0	0.3	21.3	8.1	2.4	1.9	4.8	0.2	2.2
Calocalanus styliremis	1.0	2.0	0.1	0.8	3.3	6.0	1.6	3.8	4.6	1.2	2.8
Calocalanus sp.1	0	0	0	0.3	5.5	0.5	0	0	0.2	0	0.2
Calocalanus sp.2	0	0	0	0	0	0.5	0	0	0	0	0.2
Calocalanus sp.3	0.3	2.0	0	0	0	1.1	0	0	0.5	0	2.0
Calocalanus sp.4	0.3	0	0	0	0	0	0	0	0	0	1.2
Candacia curta	0	0	0	0.5	0	0	0	0	0	0.2	0
Centropages hamatus	0.3	0	0	0	0	0	0	0	0	0	0.2
Centropages velificatus	0	2.0	0.1	0.8	0.5	0.5	0	1.3	0	1.7	0
Clausocalanus arcuicornis	0	2.0	0.5	0	0	0	0	0	0	0	0.2
Clausocalanus furcatus	3.5	26.4	5.1	13.4	31.9	76.5	7.1	43.9	28.4	15.1	8.1
Clausocalanus jobei	1.3	42.7	17.9	24.1	4.4	2.7	31.6	1.9	0.7	0	1.4
Clausocalanus mastigophorus	0	0	0	0	0	0	0	0	0	0	0.2
Clausocalanus parapergens	0	0	0.3	0.5	0	0	0	0	0	0	0.2
Clausocalanus paululus	0.7	0	0	0.3	0	0	3.2	0	0	0.2	3.0

TABLE 6-4-1. (continued)

Clausocalanus pergens	0.3	0	0	0.8	0	0	0	0	0	0	0.6
Ctenocalanus vanus	3.8	10.2	3.1	0.5	0	1.6	1.6	0	0.5	0	4.4
Eucalanus hyalinus	0.3	0	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	0.3	4.1	0.3	0.5	0	0.5	0	0	0	0.2	0.6
Eucalanus sewelli	0	0	0	0	0	0	0	0	0	0	0
Euchaeta marina	0	0	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0	0	0.1	0	0	0	0	0	0	0	0
Euchirella amoena	0	0	0	0	0	0	0	0	0	0	0
Haloptilus longicornis	0	0	0.1	0	0	0	0	0	0	0	0
Heterorhabdus papilliger	0	0	0	0	0	0	0	0	0	0	0
Ischnocalanus plumulosus	0	2.0	0.6	0.5	0	0	0	1.3	0.2	0	0.2
Labidocera aestiva	0	0	0	0	0	0	0	0	0	0	0
Lucicutia flavicornis	0.3	0	1.9	0	0	0	0	0	0	0.7	3.4
Lucicutia gaussae	0	0	0	0.5	0	0.5	0	0	0	0	0
Lucicutia paraclausi	0	0	0	0	0	0	0	0	0	0	0
Mecynocera clausi	0.3	2.0	1.7	0.8	3.3	9.2	1.6	0	0	0.2	1.0
Nannocalanus minor	1.6	10.2	2.5	2.4	0	4.9	0	0.6	0	0	0.6
Neocalanus gracilis	0	0	0	0.3	0	0	0	0	0	0	0
Paracalanus aculeatus	8.3	10.2	0.9	1.6	2.8	1.1	4.7	5.0	1.4	10.9	0.8
Paracalanus crassirostris	2.2	0	0	0	0	0	0	0	0.5	0	0
Paracalanus denudatus	0.3	0	0	0	1.1	0.5	2.4	0	0	0	0.4
Paracalanus indicus	8.6	355.6	4.9	24.4	1.1	2.2	10.3	40.2	5.3	54.3	2.6
Paracalanus quasimoto	36.2	166.6	5.1	2.9	1.1	3.3	82.2	38.9	4.1	3.3	0.4
Paracalanus sp.1	0	0	0	0	0.5	0.5	0	0	0	0	0.4
Paracandacia bispinosa	0	0	0	0	0	0	0	0	0	0	0
Paracandacia simplex	0	0	0.1	0.3	0	0	0	0	0	0	0
Parundinella spinodenticula	0	0	0	0	0	0	0	0	0	0	0.2
Pleuromamma gracilis	0	0	0	0	0	0	0	0	0	0	0
Pleuromamma piseki	0	0	0	0	0	0	0	0	0	0	0.2

TABLE 6-4-1. (continued)

Pontella securifer	0	0	0	0	0.5	0	0	0	0	0	0
Pontella meadii	0	0	0	0	0	0	0	0	0	0	0
Pontellina pulmata	0	0	0	0	0	0	0	0	0	0	0
Pontellopsis villosa	0	0	0	0	0	0	0	0	0	0	0
Rhincalanus cornutus	0.7	0	0	0	0	0	0	0	0	0	0
Scolecithricella tenuiserrata	0	0	0	0	0	0	0	0	0	0	0.2
Scolecithrix bradyi	0	0	0	0	0	0	0	0	0	0	0.2
Scolecithrix danae	0	0	0.1	0	0	0	0	0	0	0	0.2
Stephos deichmannae	0	0	0	0	0	0	0.8	0	0	0.7	0
Temora stylifera	0	8.1	0	0.8	1.1	6.5	0	0	0.2	0	0
Temora turbinata	1.6	4.1	0.5	14.9	0	4.9	0	3.1	2.9	1.4	0.4
Undinula vulgaris	0	0	0	0	0	0	0	0	0	0	0
<u>CYCLOPOIDA</u>											
Copilia lata	0.3	0	0	0	0	0.5	0	0	0	0	0
Copilia mirabilis	0	0	0	0.3	0	0	0	0	0	0	0
Copilia quadrata	0	0	0	0	0	0	0	0	0	0	0.2
Corycaeus amazonicus	1.6	18.3	2.6	2.6	2.2	0	1.6	3.1	1.9	8.6	0
Corycaeus americanus	4.5	18.3	0.5	1.6	0	0	0.8	0.6	0	2.9	0.6
Corycaeus clausi	0	0	0.3	0	0.5	0	0	0	0	0	0
Corycaeus flaccus	0	0	0	0	0	0	0.8	0	0	0	0
Corycaeus giesbrechti	0.6	0	2.3	3.1	1.6	1.6	1.6	1.3	3.9	3.2	0
Corycaeus latus	0	0	0	0	1.6	0.5	0	0	0.5	0	0
Corycaeus limbatus	0	0	0.2	0.3	0	0	0	0	0	0	0.2
Corycaeus speciosus	0	0	0	0.3	0	1.6	0	0	0.2	0.2	0
Corycaeus typicus	0	0	0	0	0	0.5	0	0	0	0	0
Farranula gracilis	0	0	0.3	0.8	143.3	28.2	12.6	2.5	4.8	0.2	0.4
Farranula rostrata	1.0	0	1.2	0.5	0	4.3	8.7	0	0	0	0.4
Lichomolgus sp.	5.8	2.0	2.0	13.4	0	0	0	0	0	0	0
Lubbockia squillimana	0.3	2.0	0	0	0.5	0.5	0	0	0	0	0

TABLE 6-4-1. (continued)

Oithona brevicornis	0	0	0	0	0	0	1.6	0	0	0	0
Oithona fallax	0.6	0	0.3	3.1	0.5	4.9	4.7	0	0	0	3.6
Oithona nana	1.0	2.0	1.5	0.5	1.1	0	0	1.9	0.2	0.2	0.2
Oithona plumifera	9.3	28.4	1.5	6.6	37.2	23.3	22.9	42.0	29.1	19.8	11.1
Oithona robusta	0	0	0	0	0	0	0	0	0	0	0.2
Oithona setigera	0	0	1.5	2.1	0	3.2	3.2	0	0	0	0.4
Oithona simplex	0	0	0	0	0	0	0	0	0	0	0
Oithona tenuis	0.6	0	0.5	4.7	0	1.1	0	0	0.2	0	0
Oithona vivida	0	0	0.2	0	0	0.5	0	0	0	0	0.8
Oithona sp.1	0	0	4.2	0.8	0	1.1	14.2	0	0	0	0.2
Oncaea conifera	0.3	0	2.2	0.3	0	2.2	0	0	0.2	0	0.2
Oncaea media	12.5	61.0	12.2	13.6	6.6	10.8	19.7	9.4	7.0	3.7	2.0
Oncaea mediterranea	8.0	36.6	19.5	18.9	10.5	41.8	4.7	10.0	6.3	1.2	6.2
Oncaea venusta	2.6	16.3	0.9	3.4	1.1	8.1	2.4	27.6	11.8	2.1	2.6
Paroithona sp.	0	0	0	0	0	0	0	0	0	0	0
Saphirella sp.	0.3	0	0	0	0	0	0	0	0	0	0
Sapphirina angusta	0	0	0	0	0.5	0	0	0	0	0	0
Sapphirina auronitens	0	0	0	0	0	0.5	0	0	0	0	0.2
Sapphirina metallina	0	0	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0.6	2.0	0.2	0.3	0	0.5	0	0	0	0	0
HARPACTICOIDA											
Clytemnestra scutellata	0	0	0.5	0.3	0	0	0	3.8	0.7	4.4	0.2
Macrosetella gracilis	0.6	2.0	0	0.5	25.3	1.6	1.6	0	0	0.2	1.2
Microsetella rosea	0	0	0	0.3	0	0	0	0	0	0	0
Oculosetella gracilis	0	0	0	0	0	0	0	0	0	0	0

TABLE 6-4-2.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W58 - 1964

	1-29-64	2-18-64	3-19-64	4-16-64	5-24-64	6-26-64	7-17-64	8-31-64	9-26-64	10-29-64	11-24-64	12-17-64
Total No./m^3	229.6	39.7	109.2	309.3	294.5	155.3	295.1	246.6	371.3	298.9	480.5	597.6
CALANOIDA												
Acartia danae	0	0	0.7	0	1.8	0	0	0	0	0	0	0
Acartia tonsa	0.6	0.3	1.4	0	20.6	0	0	0	0	0	0	0
Acrocalanus andersoni	0.6	0	0	0	0	0	0	0	0	0	0	0
Acrocalanus longicornis	1.2	0	0	0	0	0	0	0.8	7.4	7.7	7.4	0.9
Calanopia americana	0.6	0	0	0	0	0	0	2.3	4.0	1.5	7.4	1.7
Calanus tenuicornis	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus elegans	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus pavo	0.6	0	0	0	0	2.0	1.4	15.6	2.7	36.0	10.2	0.9
Calocalanus pavoninus	4.7	0.3	0.7	0	0.9	7.4	6.4	0.8	7.4	6.9	10.2	2.6
Calocalanus styliremis	1.8	0.3	0	0	0	5.0	0.7	0	3.3	6.9	18.6	1.7
Calocalanus sp.1	0.6	0	0	0	0	1.0	0	0	0	0	3.7	0
Calocalanus sp.2	0.6	0	0	1.2	0	1.0	0	0.8	0	0	0.9	0
Calocalanus sp.3	0.6	0	0	0	0	0	0	0	0	0	0	0
Calocalanus sp.4	0	0	0	0	0	0.5	0	0	0	0	1.9	0
Candacia curta	0	0	0	0	0	0.5	0	0	0	0	0	0
Centropages hamatus	0	0	0	0	0	0	0	0	0	0	0	0
Centropages velificatus	1.8	0	0	0	2.7	8.4	2.1	0.8	4.0	0.8	0.9	7.8
Clausocalanus arcuicornis	0	0	0	0	0	0.5	0	0	0	0	0	0
Clausocalanus furcatus	17.6	0.5	3.5	7.0	8.9	15.4	98.1	58.5	27.5	104.2	169.7	88.2
Clausocalanus jobei	4.1	0.8	1.4	20.1	43.0	0	5.7	4.7	0.7	0.8	0.9	0.9
Clausocalanus mastigophorus	0.6	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus parapergens	0	1.1	0	0	1.8	0	0	0	0	0	0	0
Clausocalanus paululus	0.6	0	0	0	0	0	0	0	0	0.8	3.7	0

TABLE 6-4-2. (continued)

Clausocalanus pergens	0	0.3	0	0	1.8	0	0	0	0	0	0	0
Ctenocalanus vanus	0	1.1	0.7	10.7	10.7	0.5	1.4	0	0	0	0	0
Eucalanus hyalinus	0	0	0	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	10.6	0.8	2.1	2.4	5.4	0.5	0	0.8	0.7	0	2.8	2.6
Eucalanus sewelli	0	0	0	0	0	0	0	0	0	0	0	0
Euchaeta marina	0.6	0	0	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0.6	0.3	0	0	0	0	0	0	0	0	0	0
Euchirella amoena	0	0	0	0	0	0	0	0	0	0	0	0
Haloptilus longicornis	0	0	0	0	0	0	0	0	0	0	0	0
Heterorhabdus papilliger	0	0	0	0	0	0	0	0	0	0	0	0
Ischnocalanus plumulosus	1.2	0	0	0	0	0	0.7	0.8	0	0	0.9	0
Labidocera aestiva	0	0	0	0	0.9	0	0	0	0	0	0	0
Lucicutia flavicornis	0	0.8	0	0	5.4	0	0	0.8	0	0	3.7	0
Lucicutia gaussae	0	0	0	0	0	0.5	0.7	0	0	0	0	0
Lucicutia paraclausi	0	0	0	0	0.9	0	0	0	0	0	0	0
Mecynocera clausi	0	0	0	0	4.5	3.5	0.7	1.6	0.7	0	4.6	0
Nannocalanus minor	4.7	1.1	0	0	0	0.5	2.1	0	0	0.8	0.9	0
Neocalanus gracilis	0	0	0	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	5.9	0.3	0	1.2	0.9	2.5	4.3	19.5	14.7	3.8	19.5	24.2
Paracalanus crassirostris	0.6	0.5	0.7	1.2	0.9	0	0	0	0	0	0	0
Paracalanus denudatus	0	0.3	0	0	0.9	0	0	0	0	0	0.9	0
Paracalanus indicus	60.5	11.3	20.9	42.7	34.0	1.0	0	5.5	31.5	7.7	15.8	68.3
Paracalanus quasimoto	37.0	5.2	36.2	66.4	30.3	8.9	2.8	6.2	16.7	39.1	8.4	249.1
Paracalanus sp.1	0	0	0	0	0	0	0	0	0	1.5	0	0
Paracandacia bispinosa	0	0	0	0	0	0	0	0	0	0	0	0
Paracandacia simplex	0	0	0	0	0	0	0.7	0	0	0	0	0
Parundinella spinodenticula	0	0	0	0	0	0	0	0	0	0	0	0
Pleuromamma gracilis	0	0	0	0	0.9	0	0	0	0	0	0	0
Pleuromamma piseki	0	0	0	0	0.9	0	0	0	0	0	0	0

TABLE 6-4-2. (continued)

Pontella securifer	0	0	0	0	0	0	0	0	0	0	0	0
Pontella meadii	0	0	0	0	0.9	0	0	0	0	0	0	0
Pontellina pulmata	0	0	0	0	0	0	0	0	0	0	0	0
Pontellopsis villosa	0	0	0	0	0	0	0	0	0	0	0	0
Rhincalanus cornutus	0	0	0	0	0	0	0	0	0	0	0	0
Scolecithricella tenuiserrata	0	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix bradyi	0	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix danae	0.6	0	0	0	0.9	0.5	0	0	0	0	0	0
Stephos deichmannae	0	0	0	2.4	0	0	0	0	0	0	0	4.3
Temora stylifera	0.6	0	0	1.2	1.8	1.5	2.8	2.3	2.7	0	0	0
Temora turbinata	7.6	0.5	1.4	0	6.3	1.0	4.3	0.8	3.3	1.5	6.5	6.9
Undinula vulgaris	0	0	0	0	0	0	1.4	0	0.7	0	0	0
<u>CYCLOPOIDA</u>												
Copilia lata	0	0	0	0	0	0	0	0	0	0	0	0
Copilia mirabilis	0	0	0	0	0	0.5	1.4	1.6	0.7	0	0	0
Copilia quadrata	0	0	0	0	0	0	0	0	0	0	0	0
Corycaeus amazonicus	0	1.7	2.8	15.4	8.1	0	0.7	0	16.1	0.8	1.9	6.1
Corycaeus americanus	2.3	1.1	16.0	15.4	4.5	0	0	0	2.0	0	0	1.7
Corycaeus clausi	0	0	0	0	0	0	0	0	0	0	0	0
Corycaeus flaccus	0	0	0	0	0	0	0	0	0	0	0	0
Corycaeus giesbrechti	0	0.3	0	0	0	2.5	0.7	2.3	5.4	1.5	6.5	3.5
Corycaeus latus	0	0.3	0	0	0	0	0.7	0	0	0.8	0.9	0
Corycaeus limbatus	0	0	0	0	0	0	0	0	0	0	0	0
Corycaeus speciosus	0	0	0	0	0	1.0	0.7	0.8	0	0	0	0
Corycaeus typicus	0	0	0	0	0	0	0	0	0	0	0	0
Farranula gracilis	0.6	0	0	1.2	0	17.9	63.3	37.5	4.0	31.4	25.0	11.2
Farranula rostrata	0.6	0	0	1.2	0	0	0	0.8	0	0	0	0.9
Lichomolgus sp.	0.6	0	0	2.4	0.9	0	0	0	0	0	0	0.9
Lubbockia squillimana	0.6	0	0	0	0	0	0	0	0	0	0	0

TABLE 6-4-2. (continued)

Oithona brevicornis	0	0	0.7	0	0	0	0	0	0	0	0	1.7
Oithona fallax	0	0.8	0	8.3	1.8	1.5	0.7	2.3	0	0	0.9	0
Oithona nana	2.3	0.5	0.7	0	0.9	0	0	0	0.7	3.8	4.6	1.7
Oithona plumifera	6.5	1.7	2.8	9.5	5.4	15.9	22.8	10.9	171.6	12.3	50.1	19.0
Oithona robusta	0	0	0	0	0	0	0	0	0	0	0	0
Oithona setigera	0.6	0	1.4	0	0	1.5	0	0	0	0	0	0
Oithona simplex	0	0	0	0	0	0	0	0	0.7	0	0	0
Oithona tenuis	0	0	0	0	0	0.5	0	0	0	0	0	0
Oithona vivida	0	0	0	0	0	1.0	0	0.8	0	0	1.9	0
Oithona sp.1	0	0	0	11.8	4.5	1.5	0	2.3	0	0	0	0
Oncaea conifera	0	0.5	0	0	3.6	0	0.7	3.9	0	0	0.9	0
Oncaea media	31.7	4.4	10.4	69.9	36.7	3.0	26.3	37.5	13.4	3.1	8.4	22.5
Oncaea mediterranea	9.4	1.1	1.4	11.8	27.7	28.3	9.2	7.0	3.3	0.8	7.4	2.6
Oncaea venusta	7.0	0.8	2.1	1.2	11.6	14.9	30.6	14.0	21.4	16.1	68.6	43.2
Paroithona sp.	0	0	0	1.2	0	0	0	0	0	0	0.9	1.7
Saphirella sp.	0	0	0	0	0	0	0	0	0	0	0	1.7
Sapphirina angusta	0	0	0	0	0	0.5	0	0	0	0	0	0
Sapphirina auronitens	0	0	0	0	0	0	0	0	0	0	0	0
Sapphirina metallina	0	0.3	0	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0	0.3	0.7	2.4	0	0	0	0	0.7	0	0	0
<u>HARPACTICOIDA</u>												
Clytemnestra scutellata	0	0	0	1.2	0.9	1.0	0	0.8	0.7	0.8	0	0.9
Macrosetella gracilis	0.6	0	0.7	0	0	0.5	0.7	1.6	2.7	7.7	2.8	17.3
Microsetella rosea	0	0	0	0	0	1.0	0	0	0	0	0	0
Oculosetella gracilis	0	0	0	0	0	0	0	0	0	0	0	0.9

TABLE 6-4-3.

NUMERICAL ABUNDANCE OF ADULT FEMALE COPEPODS PER M^3 AT W58 - 1965

	1-8-65	2-28-65	4-24-65	5-30-65	6-13-65	8-13-65	9-11-65	12-11-65
Total No./m^3	37.3	57.6	701.8	147.5	302.2	195.3	179.9	141.1
CALANOIDA								
Acartia danae	0	0.2	0	4.7	2.7	0.5	0	0
Acartia tonsa	0	0	15.7	43.8	0	0	0	0
Acrocalanus andersoni	0.3	0	1.7	0.7	0.9	0.5	0	0.2
Acrocalanus longicornis	0	0.5	0	0	0.9	1.4	4.5	1.4
Calanopia americana	0.1	0.5	0	0	0	0.5	0	1.8
Calanus tenuicornis	0	0.2	0	0	0	0	0	0
Calocalanus elegans	0	0	0	0	0	0	0	0
Calocalanus pavo	0	0.2	0	0.7	0	4.3	21.1	0
Calocalanus pavoninus	0.4	0.8	0	1.3	0.9	4.3	0.7	1.1
Calocalanus styliremis	1.1	0.7	0	0.7	1.8	0.5	0.7	1.1
Calocalanus sp.1	0	0.2	1.7	0	0	1.4	0	0.2
Calocalanus sp.2	0.1	0	0	0	0	0.9	0	0
Calocalanus sp.3	0.1	0	0	0	0.9	0	0	0
Calocalanus sp.4	0.1	0.2	0	0	0.9	0.9	0	0
Candacia curta	0	0	0	0	0	0	0	0
Centropages hamatus	0	0	0	0	0	0	0	0
Centropages velificatus	0.5	0.5	0	0	3.5	0.5	0	0.9
Clausocalanus arcuicornis	0	0	0	0	0	0	0	0
Clausocalanus furcatus	3.0	8.7	3.5	0.7	4.4	43.0	27.9	55.2
Clausocalanus jobei	0.1	0.8	3.5	6.1	3.6	12.9	1.5	0.5
Clausocalanus mastigophorus	0.1	0.2	0	0	0	0	0	0.5
Clausocalanus parapergens	0	0.2	0	0	0	0.9	0	0
Clausocalanus paululus	0	0.7	0	0	0	0.5	0	0.5

TABLE 6-4-3. (continued)

Clausocalanus pergens	0.1	0	1.7	0.7	0	0.5	0	0
Ctenocalanus vanus	0.5	1.0	17.4	2.0	10.7	0	0	0
Eucalanus hyalinus	0	0	3.5	0	0	0	0	0
Eucalanus pileatus	1.2	2.4	3.5	0	16.9	2.4	0	5.8
Eucalanus sewelli	0.1	0	0	0	0	0	0	0
Euchaeta marina	0	0.2	1.7	0	0	1.4	0	0
Euchaeta paraconcinna	0	0	5.2	0	0	0	0	0
Euchirella amoena	0	0.2	0	0	0	0	0	0
Haloptilus longicornis	0	0	0	0	0	0	0	0
Heterorhabdus papilliger	0.1	0	0	0	0	0	0	0
Ischnocalanus plumulosus	0	0.3	0	0	0	1.4	0	0
Labidocera aestiva	0	0.2	0	0	0	0	0	0
Lucicutia flavicornis	1.0	0.3	1.7	0	0	1.9	0	0
Lucicutia gaussae	0	0	0	0.7	0	0	0	0
Lucicutia paraclausi	0	0	1.7	1.3	0	0	0	0
Mecynocera clausi	0.4	0.8	0	3.4	0	4.3	0.7	0.2
Nannocalanus minor	1.0	0.7	3.5	0	0	8.6	1.5	5.6
Neocalanus gracilis	0	0	0	0	0	0	0	0.2
Paracalanus aculeatus	1.6	1.5	3.5	6.1	9.8	14.8	3.0	0
Paracalanus crassirostris	0	0.3	26.1	0.7	0	0	0	0
Paracalanus denudatus	0.1	1.0	0	0	0	0.9	0	0
Paracalanus indicus	1.6	12.0	55.7	11.4	8.9	11.0	9.0	19.4
Paracalanus quasimoto	1.5	2.7	168.9	6.7	84.4	0	61.0	10.1
Paracalanus sp.1	0	0.2	0	0	0	0.5	0	0
Paracandacia bispinosa	0	0.2	0	0	0	0	0	0
Paracandacia simplex	0.1	0	0	0	0	0	0	0
Parundinella spinodenticula	0	0	5.2	0	0	0	0	0
Pleuromamma gracilis	0	0	0	0	0	0	0	0
Pleuromamma piseki	0	0	0	0	0	0.5	0	0

TABLE 6-4-3. (continued)

Pontella securifer	0	0	0	0	0	0	0	0
Pontella meadii	0	0	0	0	0	0	0	0
Pontellina pulmata	0	0	0	0	0	0	0	0.2
Pontellopsis villosa	0.1	0	0	0	0	0	0	0
Rhincalanus cornutus	0	0.8	3.5	2.0	0	0	0	0.5
Scolecithricella tenuiserrata	0	0	0	0	0	0	0	0
Scolecithrix bradyi	0	0	0	0	0	0	0	0
Scolecithrix danae	0.1	0.3	0	0	0	0.5	0	0
Stephos deichmannae	0	1.0	0	0	0	0	0	0
Temora stylifera	0	0	0	0.7	32.9	2.9	1.5	0.2
Temora turbinata	0.9	0	1.7	2.0	0.9	0.9	0	9.0
Undinula vulgaris	0	0	0	0	0	2.4	1.5	0.5
<u>CYCLOPOIDA</u>								
Copilia lata	0	0	0	0	0	0	0	0
Copilia mirabilis	0	0	0	0	0	0	0	0
Copilia quadrata	0	0	0	0	0	0	0	0
Corycaeus amazonicus	0.9	0.7	31.3	9.4	20.4	0	0	0.2
Corycaeus americanus	0.7	0	22.6	2.7	8.9	0	0	0
Corycaeus clausi	0	0	0	0	0	0	0	0
Corycaeus flaccus	0	0.2	0	0	0	0	0	0
Corycaeus giesbrechti	0.1	0.5	0	0	2.7	1.4	0.7	0.2
Corycaeus latus	0	0.3	0	0.7	0.9	0.9	0.7	0
Corycaeus limbatus	0	0	0	0	0	0	0	0
Corycaeus speciosus	0	0.2	0	0	0	0.5	0	0
Corycaeus typicus	0	0	0	0	0	0	0	0
Farranula gracilis	0.1	0.5	0	0	2.7	5.7	24.8	4.1
Farranula rostrata	0.1	0.2	0	0	0	0	0	0.2
Lichomolgus sp.	0	0	1.7	0	0	0	0	0
Lubbockia squillimana	0	0	0	0.7	0	1.4	0	0

TABLE 6-4-3. (continued)

Oithona brevicornis	0	0	5.2	0	0	0	0	0
Oithona fallax	0.1	0.2	181.1	2.0	0	1.4	0	0
Oithona nana	0	0.2	17.4	3.4	0	0	0	0
Oithona plumifera	6.6	2.2	10.4	7.4	11.5	21.0	6.8	2.9
Oithona robusta	0	0	0	0	0	0	0	0
Oithona setigera	0	0	1.7	0.7	5.3	0.9	0	0
Oithona simplex	0	0	0	0	0	0	0	0
Oithona tenuis	0	0	0	0	0	0	0	0
Oithona vivida	0	0	1.7	0.7	0	0	0	0
Oithona sp.1	0	0	10.4	6.1	8.9	0	0	0
Oncaea conifera	0.4	0	7.0	8.1	4.4	2.9	0	0.5
Oncaea media	1.7	6.6	54.0	2.0	35.5	8.6	1.5	2.0
Oncaea mediterranea	5.8	3.0	19.1	4.7	13.3	5.3	3.8	0.9
Oncaea venusta	3.3	1.3	1.7	1.3	1.8	15.3	6.8	7.7
Paroithona sp.	0	0	3.5	0	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0
Sapphirina angusta	0	0	0	0	0	0	0	0
Sapphirina auronitens	0	0	0	0	0	0	0	0
Sapphirina metallina	0	0.2	0	0	0	0	0	0
Sapphirina nigromaculata	0	0.2	0	0	0	0.5	0	0
HARPACTICOIDA								
Clytemnestra scutellata	0.6	0.7	1.7	0.7	0.9	0.9	0	0.5
Macrosetella gracilis	0.5	0	0	0.7	0	0.5	0	6.8
Microsetella rosea	0	0	0	0	0	0	0	0
Oculosetella gracilis	0	0	0	0	0	0	0	0

TABLE 7-1-1.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W22 - 1963

	3-9-63	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-4-63	11-4-63	12-1-63	12-21-63
CALANOIDA											
Acartia danae	0.3	0.4	0	0.9	0.7	0	0.2	0.3	0	0	0
Acartia tonsa	1.6	0.4	0	0.1	0.1	0	0	0	0	0.3	0
Acrocalanus andersoni	0	0	0	0	0	0	0.2	0	0	0	0
Acrocalanus longicornis	0	0	0	0	0.1	1.0	5.3	0.6	0.6	0.7	0.3
Aetideus acutus	0	0	0	0	0	0	0	0	0	0	0
Anomalocera ornata	0.3	0	0	0	0	0	0	0	0	0	0
Calanopia americana	0.3	0	0	0	0	0.1	0	0.3	1.6	1.0	0
Calocalanus elegans	0	0	0	0.2	0	0	0	0	0	0	0
Calocalanus pavo	0	0.8	0.7	0.8	0.1	0.3	2.7	1.9	0	0	0.2
Calocalanus pavoninus	0.5	1.1	0.5	1.3	0	3.2	0.5	0	0	0.6	0.6
Calocalanus styliremis	0.5	0.7	1.6	1.7	0.1	0.4	1.2	0.7	0.2	0.3	0.7
Calocalanus sp.1	0	0.2	0	0.1	0	0.1	0	0	0	0	0.3
Calocalanus sp.2	0.3	0	0	0	0	0	0	0	0	0	0
Calocalanus sp.3	0	0	0	0	0	0	0	0	0	0	0
Calocalanus sp.4	0	0	0.2	0	0	0	1.2	0	0	0	0
Candacia curta	0.3	0.2	0	0.1	0	0	0	0	0	0	0
Candacia pachydactyla	0	0	0	0	0	0	0	0	0	0	0
Centropages caribbeanensis	0	0	0	0.1	0	0	0	0	0	0	0
Centropages hamatus	0.8	0	0	0	0	0	0	0	0	0	0
Centropages velificatus	1.1	0.4	0	0.6	0	0.6	1.0	2.6	0.4	3.9	0.2
Clausocalanus arcuicornis	0	0.4	0	0.4	0	0	0	0	0	0.2	0
Clausocalanus furcatus	4.3	16.8	9.7	8.0	18.3	64.7	20.6	4.9	2.7	28.1	14.3

TABLE 7-1-1. (continued)

Clausocalanus jobei	2.1	8.6	6.5	21.1	0.4	0.1	5.6	0	0	0.2	0.7
Clausocalanus mastigophorus	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus paululus	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus pergens	0	0	0	0	0	0	0	0	0	0	0.2
Ctenocalanus vanus	0.3	0	0.2	0	0	0	0	0	0	0	0.3
Eucalanus monachus	0	0	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	1.6	0.2	0.2	1.2	0.6	0.3	0.7	1.3	0.8	0.3	0.2
Euchaeta marina	0	0	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0	0	0	0.1	0	0	0	0	0	0	0
Ischnocalanus plumulosus	0	0.4	0.2	1.5	0.1	0	0	0	0	0.2	0.3
Labidocera acutifrons	0	0	0	0	0	0	0	0	0	0	0
Labidocera aestiva	0	0	0	0	0	0	0	0	0	0	0
Lucicutia flavicornis	0	0	0	0	0	0	0	0	0	0	0.3
Lucicutia gaussae	0	0.4	0	0.2	0	0	0	0	0	0	0
Lucicutia paraclausi	0	0	0	0.1	0	0	0	0	0	0	0
Mecynocera clausi	0	0	0	0.9	0.1	0	1.7	0	0	0.2	0.3
Nannocalanus minor	4.0	1.7	0	1.7	0.3	2.6	0	0.3	0	0	0
Neocalanus gracilis	0.3	0	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	2.4	2.3	0.2	1.2	9.3	0.4	16.0	10.0	20.0	6.8	3.0
Paracalanus crassirostris	2.9	0.2	0.7	0.6	0	0.6	0	0.3	0	0.2	0
Paracalanus denudatus	0	0	0	0	0	0	0.7	0	0	0	0.3
Paracalanus indicus	17.3	21.9	12.6	0.6	17.4	0.3	1.7	1.0	27.1	2.0	38.5
Paracalanus quasimoto	23.7	13.9	9.2	14.8	6.6	2.8	11.7	28.5	3.3	13.0	6.8
Paracalanus sp.	0	0	0	0.2	0	0	0	0	0	0	0
Paracandacia simplex	0	0	0	0.1	0	0	0	0	0	0	0
Parundinella spinodenticula	0	0	0	0	0	0	0	0	0	0	0

TABLE 7-1-1. (continued)

Rhincalanus cornutus	0	0	0	0	0	0	0	0	0	0	0
Scolecithricella dentata	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix bradyi	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix danae	0	0	0	0	0	0.1	0	0	0	0	0
Stephos deichmannae	0	0	0	0	0	0	0	0	0	0.2	0
Temora stylifera	0.8	0.2	0	0	0	3.1	0.2	0.7	0.8	0.3	0
Temora turbinata	2.4	1.1	3.9	2.9	5.2	0	0.2	6.2	1.9	4.9	0.5
Undinula vulgaris	0	0	0	0.1	0	0	0	0	0	0	0
<u>CYCLOPOIDA</u>											
Copilia mirabilis	0	0	0	0.1	0	0	0	0	0	0	0
Corycaeus amazonicus	1.1	3.6	4.8	0.7	0.4	0	0.2	3.2	3.9	11.0	3.4
Corycaeus americanus	5.9	2.1	1.2	0.2	0.1	0	0	0.7	0	1.9	3.9
Corycaeus giesbrechti	0.8	1.5	1.2	1.9	1.0	0.1	1.5	4.2	5.0	5.2	0.5
Corycaeus latus	0	0	0	0	0	0.4	0.7	0	0	0	0
Corycaeus lautus	0	0	0	0.2	0	0	0	0	0	0	0
Corycaeus limbatus	0	0	0	0	0	0	0	0	0	0	0
Corycaeus speciosus	0.5	0.2	0	0	0	0	0	0	0	0	0
Corycaeus typicus	0	0	0	0	0	0	0	0	0	0	0
Farranula gracilis	0	0.2	0.2	1.2	11.6	8.0	12.4	1.3	0	1.4	0.2
Farranula rostrata	0	0	0.5	0	0	0	0	0	0	0	0.2
Lichomolgus sp.	0.3	0.7	0.5	0	0	0	0	0.3	0.2	0	0.7
Lubbockia squillimana	0	0	0	0	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0	0	0	0	0
Oithona fallax	0	0	0	1.0	0	0	0	0	0	0	0
Oithona nana	1.3	0	4.4	3.9	0	0.4	0	16.8	0.4	0	0.5
Oithona plumifera	2.7	2.5	3.6	8.7	1.0	3.6	5.8	5.8	25.8	8.5	6.2
Oithona setigera	0	0	0	0	0	0	0	0	0	0.2	0.2

TABLE 7-1-1. (continued)

Oithona similis	0	0	1.9	0.1	0	0	0.2	0	0	0	0.2
Oithona simplex	0	0	0	0.1	0	0	0	0	0	0	0
Oithona tenuis	0	0	0.7	2.9	0.7	0	0	0	0	0	0
Oithona vivida	0	0	0	0	0	0	0	0	0	0	0.2
Oithona sp.1	0	0	0.5	0	0	0	0.5	0	0	0	0.2
Oncaea conifera	0	0	0	0	0	0	0	0	0	0	0.2
Oncaea dentipes	0	0	0	0	0	0	0	0	0	0	0
Oncaea media	13.2	7.6	30.4	3.2	17.6	0.4	1.2	0.7	1.0	0.7	7.6
Oncaea mediterranea	1.6	4.4	0.7	10.2	0.6	0	1.0	0.7	0	0.2	2.8
Oncaea ornata	0	0	0	0	0	0	0	0	0	0	0.2
Oncaea venusta	3.5	4.4	1.9	3.3	7.5	5.7	4.9	6.5	4.0	5.3	3.4
Oncaea sp.	0	0	0	0	0	0	0	0	0	0	0
Paroithona pulla	0	0	0	0	0	0	0	0	0	0	0
Paroithona sp.	0	0	0	0	0	0	0	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0	0	0	0.1
Sapphirina auronitens	0	0	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0	0	0	0.1	0	0	0	0	0	0	0
Sapphirina ovatolanceolata	0	0	0	0	0	0	0	0	0	0	0
HARPACTICOIDA											
Clytemnestra rostrata	0.5	0	1.0	0	0	0	0	0	0.4	0	1.0
Clytemnestra scutellata	0	0	0	0	0	0	0	0	0	0	0.3
Macrosetella gracilis	0.3	0.4	0	0.1	0	0.6	0	0.3	0	2.3	0.3
Microsetella norvegica	0	0	0	0	0	0	0	0	0	0	0
Microsetella rosea	0	0	0	0.2	0	0	0	0	0	0	0
Miracia minor	0	0	0	0	0	0	0	0	0	0	0.2
Oculosetella gracilis	0.3	0	0	0	0	0	0	0	0	0	0

TABLE 7-1-2.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W22 - 1964

	1-29-64	2-20-64	3-19-64	4-16-64	5-23-64	6-26-64	7-17-64	8-30-64	9-19-64	10-29-64	11-23-64	12-17-64
CALANOIDA												
Acartia danae	0	0	0	0	0.3	0	0	0	0	0	0	0
Acartia tonsa	0.9	0.9	0	1.6	6.0	0	0	0	0	0.1	0	0
Acrocalanus andersoni	0.2	0	0	0	0	0	0	0	0	0	0.3	0
Acrocalanus longicornis	0.2	0	0	0	0	0	0	1.0	0	2.5	1.0	1.4
Aetideus acutus	0	0	0.8	0	0	0	0	0	0	0	0	0
Anomalocera ornata	0	0	0	0	0	0	0	0	0	0	0	0
Calanopia americana	0	0	0	0	0.3	0	0	0	0	0	2.1	0.7
Calocalanus elegans	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus pavo	0	0	0	0	0	2.5	0.9	3.1	0.3	1.9	0.6	0
Calocalanus pavoninus	1.6	0	0	0	0	2.8	0.7	5.1	0	0.6	1.0	0
Calocalanus styliremis	0.3	0	0	0	0.3	1.2	0.5	1.3	0.6	1.0	2.0	0.7
Calocalanus sp.1	0.3	0	0	0	0	0	0	0	0	0.1	0	0
Calocalanus sp.2	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus sp.3	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus sp.4	0	0	0.4	0	0	0	0	0	0	0	0.1	0
Candacia curta	0	0	0	0	0	0.2	0	0	0	0	0	0
Candacia pachydactyla	0	0	0	0	0	0	0	0	0	0	0	0
Centropages caribbeanensis	0	0	0	0	0	0	0	0	0	0	0	0
Centropages hamatus	0.3	0	0	0.3	0	0	0	0	0	0	0	0
Centropages velificatus	0.3	0	0	0	2.7	0.5	0.9	0.2	0.3	0.8	6.6	0.7
Clausocalanus arcuicornis	0.2	0	0	0	0.3	0	0	0	0	0	0	0
Clausocalanus furcatus	3.9	4.9	0.4	0	12.9	34.3	17.6	39.0	10.9	28.1	22.7	9.7

TABLE 7-1-2. (continued)

Clausocalanus jobei	0.5	0.3	0.8	0.3	0.6	1.2	9.1	0.3	0.3	0	0.6	0
Clausocalanus mastigophorus	0	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus parapergens	0.2	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus paululus	0.2	0	0	0	0	0	0	0	0	0	0.1	0
Clausocalanus pergens	0	0	0	0	0	0	0	0	0	0	0	0
Ctenocalanus vanus	0.2	0	0	0.5	0	0.3	1.9	0	0	0	0	0
Eucalanus monachus	0	0	0.4	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	1.0	0.6	0.8	0	1.8	0.8	0.2	1.2	0	0	3.2	1.4
Euchaeta marina	0.3	0	0	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0	0	0	0	0	0	0	0	0	0	0	0
Ischnocalanus plumulosus	0.2	0	0.4	0	0	0.2	0.2	0	0	0	0	0
Labidocera acutifrons	0	0	0	0	0	0	0	0	0	0	0	0
Labidocera aestiva	0	0	0	0	0.3	0	0	0	0	0	0	0
Lucicutia flavicornis	0.2	0.3	0.4	0	0.3	0	0.3	0	0	0	0.1	0
Lucicutia gaussae	0	0	0	0	0	0	0	0	0	0	0	0
Lucicutia paraclausi	0	0	0	0	0	0	0	0	0	0	0	0
Mecynocera clausi	0	0	0	0	0	0.2	1.4	0	0	0	0	0
Nannocalanus minor	2.1	0.3	0.8	0	0.3	0.6	0	0	0	0	0	0
Neocalanus gracilis	0	0	0	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	0	0	0.4	0	0.3	2.0	0.7	0.8	6.1	4.6	10.4	5.4
Paracalanus crassirostris	10.2	4.9	0	4.4	0	0	0	0	0	0	0.1	0.2
Paracalanus denudatus	0.3	0	0	0	0.3	0	0.2	0	0	0	0.4	0
Paracalanus indicus	20.3	11.1	5.8	8.6	34.2	0	0.2	0.7	3.6	3.3	7.2	23.0
Paracalanus quasimoto	19.8	39.2	50.8	24.9	17.7	7.5	1.4	0.3	5.1	16.9	2.8	14.0
Paracalanus sp.	0	0	0	0	0	0	0	0	0	0	0	0
Paracandacia simplex	0.5	0	0	0	0	0	0	0	0	0	0	0
Parundinella spinodenticula	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 7-1-2. (continued)

Rhincalanus cornutus	0.9	0	0.4	0	0	0	0	0	0	0	0	0
Scolecithricella dentata	0	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix bradyi	0	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix danae	0.3	0	0	0	0	0	0	0	0	0	0	0
Stephos deichmannae	0	0	0	0	0	0	0	0	0	0	0.4	0.2
Temora stylifera	0.2	0	0	0	0	0.5	0.5	0.3	0	0	0	0.2
Temora turbinata	0.5	1.2	0.8	0.5	0	0.6	0.9	0.2	2.6	1.6	2.9	3.1
Undinula vulgaris	0.3	0	0	0	0	0	0	0	0	0	0	0
CYCLOPOIDA												
Copilia mirabilis	0	0	0	0	0	0	0	0.2	1.3	0	0	0
Corycaeus amazonicus	0.3	0.3	0.8	2.9	5.7	0.5	0	0.3	1.9	0.3	1.8	5.0
Corycaeus americanus	2.4	11.4	11.9	4.4	2.4	0.5	0	0	1.0	0	1.1	1.1
Corycaeus giesbrechti	0.3	0	0.8	0	0	1.2	1.7	0.3	3.5	2.2	2.0	2.3
Corycaeus latus	0.2	0	0	0	0.3	0	0	0.3	0	0.1	0	0
Corycaeus lautus	0	0	0	0	0	0	0	0	0	0	0	0.2
Corycaeus limbatus	0	0	0.4	0	0	0	0	0	0	0	0	0
Corycaeus speciosus	0.2	0	0	0	0	0	0.2	0.3	0.6	0.3	0.1	0
Corycaeus typicus	0	0	0	0	0	0	0	0	0	0	0	0
Farranula gracilis	0.3	0	0	0	0	9.8	5.7	23.1	13.1	15.9	1.8	0.2
Farranula rostrata	0	0	0	0	0	0	0.3	0	0	0	0.1	0
Lichomolgus sp.	0.6	0.3	0	0.3	0	0	0	0	0	0	0.4	0.4
Lubbockia squillimana	0	0	0	0	0.3	0	0.2	0	0	0	0	0
Oithona brevicornis	0	0	0.4	0	0	0	0	0	0	0	0	0
Oithona fallax	0	0	0.8	0	0	0	0.2	0	0	0.1	0.1	0
Oithona nana	12.4	10.5	1.1	0	0.9	0.2	0	0.2	0.3	0.1	0.5	0.7
Oithona plumifera	3.9	1.5	1.9	0.3	0.3	21.4	6.6	9.9	46.2	11.2	11.0	9.7
Oithona setigera	0	0	0.8	0	0	0	0	0	0	0	0.1	0

TABLE 7-1-2. (continued)

Oithona similis	0	0	2.3	0	0	0	0	0	0	0	0	0
Oithona simplex	0	0	0	0	0	0	0	0	0	0	0	0
Oithona tenuis	0	0	0	0	0	0	0	0	0	0	0	0
Oithona vivida	0	0	0.4	0	0	0	0	0	0	0	0	0
Oithona sp.1	0	0	3.1	0.3	0	0.2	0	0	0	0	0	0
Oncaea conifera	0.2	0	0	0	0	0	0.2	0	0	0	0	0
Oncaea dentipes	0	0	0.4	0	0	0	0	0	0	0	0	0
Oncaea media	10.3	8.6	9.2	49.7	8.4	1.6	37.1	4.9	0	0.7	4.0	11.0
Oncaea mediterranea	1.3	0.9	1.9	0	0	1.9	6.4	0.2	0	0.1	0.5	0.2
Oncaea ornata	0.2	0	0	0.3	0	0	0	0	0	0	0	0
Oncaea venusta	1.5	1.5	0.4	0.3	2.7	7.0	3.1	6.3	1.6	5.6	10.4	4.5
Oncaea sp.	0	0	0.4	0	0	0	0	0	0	0	0	0
Paroithona pulla	0	0	0	0.3	0	0	0	0	0	0	0	0
Paroithona sp.	0	0	0	0	0	0	0.5	0	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0	0	0	0	0
Sapphirina auronitens	0	0	0	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0	0	0	0	0	0	0	0.2	0	0	0	0
Sapphirina ovatolanceolata	0	0	0	0	0	0	0.2	0	0	0	0	0
HARPACTICOIDA												
Clytemnestra rostrata	0.2	0.6	0	0	0.3	0.2	0.2	0	0.6	0	0.4	1.8
Clytemnestra scutellata	0	0	0	0	0	0	0	0	0	0	0	0
Macrosetella gracilis	0	0.3	0	0	0	0	0	0.3	0	1.8	1.1	2.2
Microsetella norvegica	0	0	0	0	0	0.2	0	0	0	0	0	0
Microsetella rosea	0	0	0	0	0	0	0	0	0	0	0	0
Miracia minor	0	0	0	0	0	0	0	0	0	0	0	0
Oculosetella gracilis	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 7-1-3.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W22 - 1965

	1-8-65	2-28-65	3-22-65	4-24-65	6-13-65	8-12-65	9-11-65	12-10-65
CALANOIDA								
Acartia danae	0	0.3	0	0.3	0	0	0	0
Acartia tonsa	0	0.7	0	3.9	7.5	0	0	0
Acrocalanus andersoni	0.8	0	0	0	0	0.3	0.1	0
Acrocalanus longicornis	2.2	0.1	0	0	0	0.3	0.3	0
Aetideus acutus	0.2	0	0	0	0	0	0	0
Anomalocera ornata	0	0	0	0	0	0	0	0
Calanopia americana	3.7	0.7	0	0	0	0	0.1	0.7
Calocalanus elegans	0	0	0	0	0	0	0	0
Calocalanus pavo	0.4	0.1	0	0	0.2	1.5	0.4	0
Calocalanus pavoninus	1.4	0.1	0	0	0.2	2.7	0	0
Calocalanus styliremis	2.4	0.3	0.3	0	0.2	2.0	0.3	0
Calocalanus sp.1	0	0	0.3	0.3	0	0	0	0
Calocalanus sp.2	0.4	0.1	0	0	0	0	0	0
Calocalanus sp.3	0	0	0	0	0.2	0	0	0
Calocalanus sp.4	0	0	0	0	0	0	0	0
Candacia curta	0	0	0.6	0	0	0	0	0
Candacia pachydactyla	0	0	0.3	0	0	0	0	0
Centropages caribbeanensis	0	0	0	0	0	0	0	0
Centropages hamatus	0	0.4	0	0	0	0	0	0
Centropages velificatus	1.8	0	0	0	2.7	0	0.3	3.1
Clausocalanus arcuicornis	0	0	0	0	0	0	0	0
Clausocalanus furcatus	14.4	3.2	6.2	0.6	3.9	6.7	1.0	6.6

TABLE 7-1-3. (continued)

Clausocalanus jobei	1.4	0.4	3.2	0.6	1.1	0	0.1	0
Clausocalanus mastigophorus	0	0	0.3	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	0	0
Clausocalanus paululus	0.2	0.1	0	0	0	0	0	0
Clausocalanus pergens	0.2	2.0	0	0	0	0	0	0
Ctenocalanus vanus	0.2	1.6	2.3	0.3	0	0	0	0
Eucalanus monachus	0	0	0	0	0	0	0	0
Eucalanus pileatus	2.4	0.9	1.8	0	9.6	0	1.1	2.4
Euchaeta marina	0	0	0.3	0	0	0	0	0
Euchaeta paraconcinna	0.4	0.1	0	0	0	0	0	0
Ischnocalanus plumulosus	0.4	0.1	0	0	0	0	0	0
Labidocera acutifrons	0	0	0	0	0	0.3	0	0
Labidocera aestiva	0	0	0	0	0	0	0	0
Lucicutia flavicornis	0.2	0.7	0.3	0	0	0	0	4.2
Lucicutia gaussae	0	0.1	0	0	0	0	0	0
Lucicutia paraclausi	0	0.7	0	0	0	0	0	0
Mecynocera clausi	0.2	0.1	0	0	0	0	0.1	0
Nannocalanus minor	2.4	0	1.8	1.3	0.2	0.3	0.1	0.2
Neocalanus gracilis	0	0	0	0	0	0	0	0
Paracalanus aculeatus	6.3	2.4	1.8	0	0.9	2.2	2.6	18.8
Paracalanus crassirostris	0	0.4	0	10.0	1.1	0	0	0
Paracalanus denudatus	0	0.3	0	0	0	0	0.1	0
Paracalanus indicus	3.7	19.1	21.9	8.1	7.3	44.7	5.7	26.9
Paracalanus quasimoto	3.7	53.9	25.7	17.5	20.2	5.0	22.6	2.4
Paracalanus sp.	0	0	0	0	0	0	0	0
Paracandacia simplex	0	0	0	0	0	0	0	0
Parundinella spinodenticula	0	0.1	0	0	0	0	0	0

TABLE 7-1-3. (continued)

Rhincalanus cornutus	0.2	0.1	1.8	1.6	0	0	0	0
Scolecithricella dentata	0	0.1	0	0	0	0	0	0
Scolecithrix bradyi	0	0	0.3	0	0	0	0	0
Scolecithrix danae	0	0.1	0.3	0	0	0	0	0
Stephos deichmannae	0.2	0.8	0.6	0	0	0	0	0
Temora stylifera	1.0	0.3	1.2	0.3	3.6	4.2	0.4	0.2
Temora turbinata	7.3	0.3	0.3	1.0	11.6	0.3	0.7	8.0
Undinula vulgaris	0	0	0	0	0	2.0	0.1	0.2
<u>CYCLOPOIDA</u>								
Copilia mirabilis	0	0	0	0	0	0.3	0	0
Corycaeus amazonicus	1.4	0.4	1.8	5.2	8.2	1.5	0.7	0.9
Corycaeus americanus	1.4	0	0.3	4.2	1.4	0	0.3	0.4
Corycaeus giesbrechti	2.2	0.1	0.9	0	0	1.5	4.8	3.1
Corycaeus latus	0	0.3	0	0	0	0.5	0.1	0
Corycaeus lautus	0	0	0	0	0	0	0	0
Corycaeus limbatus	0	0	0	0	0	0	0	0
Corycaeus speciosus	0	0.1	0	0	0	0.5	0.1	0
Corycaeus typicus	0.2	0	0	0	0	0	0	0
Farranula gracilis	1.2	0.1	2.1	0	0	3.3	38.5	0
Farranula rostrata	0.2	0	0.3	0.3	0	0	0	0
Lichomolgus sp.	0.4	0.5	0.3	0	0	0	0.4	0.2
Lubbockia squillimana	0	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0	0
Oithona fallax	0	0	0.3	1.0	0	0	0.4	0
Oithona nana	0	0	0.9	0.3	10.9	0	0.3	0
Oithona plumifera	7.5	0.7	0.6	5.5	4.1	10.5	4.1	0.2
Oithona setigera	0.2	0	0	0	0	0	0.3	0

TABLE 7-1-3. (continued)

Oithona similis	0	0.5	0.3	1.3	0	0	0	0
Oithona simplex	0	0	0	0	0.2	0	0	0.2
Oithona tenuis	0	0	0	0	0	0	0	0
Oithona vivida	0.2	0	0	0	0	0	0	0
Oithona sp.1	0.4	0	0	2.3	0	0	0.1	0
Oncaea conifera	0.8	0.1	0	0.7	0.5	0	0	0
Oncaea dentipes	0	0	0.3	0	0	0	0	0
Oncaea media	3.5	3.1	10.7	27.2	1.6	0	0.6	13.7
Oncaea mediterranea	10.6	0.9	4.7	3.2	0.9	0	7.5	0
Oncaea ornata	0	0.1	0	0	0	0	0	0
Oncaea venusta	9.7	0.3	4.1	2.3	1.4	7.5	3.7	6.0
Oncaea sp.	0	0	0	0	0	0	0	0
Paroithona pulla	0	0	0	0	0	0	0	0
Paroithona sp.	0	0	0	0	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0
Sapphirina auronitens	0	0	0	0	0	0.3	0	0
Sapphirina nigromaculata	0.4	0	0	0.3	0	0	0.1	0
Sapphirina ovatolanceolata	0	0	0	0	0	0	0	0
HARPACTICOIDA								
Clytemnestra rostrata	0.2	1.1	0.6	0.3	0.2	0	0.4	0.2
Clytemnestra scutellata	0	0.1	0	0	0	0	0	0
Macrosetella gracilis	1.6	0.1	0.3	0	0	1.7	1.2	1.3
Microsetella norvegica	0	0	0	0	0	0	0	0
Microsetella rosea	0	0.1	0	0	0	0	0	0
Miracia minor	0	0	0	0	0	0	0	0
Oculosetella gracilis	0	0	0	0	0	0	0	0

TABLE 7-2-1.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W23 - 1963

	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-4-63	11-1-63	12-1-63	12-21-63
CALANOIDA										
Acartia danae	0	0	0	0	0	0	0	0	0	0
Acartia lilljeborgii	0	0	0	0	0	0	0	0	0.2	0
Acartia tonsa	2.1	2.0	0	0.8	0	0	0	0	0	0
Acrocalanus andersoni	0	0	0	0	0	0	0	0	0	0
Acrocalanus longicornis	0	0	0	0.4	0.6	1.8	0.4	0	0	0
Aetideus acutus	0	0	0	0	0	0	0	0	0	0
Calanopia americana	0	0	0	0	0.6	0.5	0	0	0	0.3
Calocalanus pavo	0	0	0	0	0.9	2.3	0	0	0	0
Calocalanus pavoninus	0	0.8	0	0	7.2	3.8	0	0	0	0
Calocalanus styliremis	0	0	0	0	2.9	6.1	0	0	0	0
Calocalanus sp.1	0	0	0	0	0.5	0	0	0	0	0
Candacia curta	0	0	0	0	0	0	0	0	0	0
Centropages caribbeanensis	0	0	0	0	0.2	0	0	0	0	0
Centropages hamatus	0	0	0	0	0	0	0	0	0	0
Centropages velificatus	0	0	0.2	0	0	0	0	3.9	1.4	1.0
Clausocalanus furcatus	0	1.2	0.7	54.6	41.0	46.1	0	0	4.3	2.4
Clausocalanus jobei	0.7	0	1.3	0	0.5	0	0	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	0	0.8	0	0.8	0	1.3	1.9	0.7	2.7	0.7
Euchaeta marina	0	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0	0	0	0	0	0	0	0	0	0
Labidocera aestiva	0	0	0	0	0	0	0	0	0	0

TABLE 7-2-1. (continued)

Lucicutia flavicornis	0	0	0	0	0	0	0	0	0	0
Nannocalanus minor	0	0	0.3	0.4	0	0	0	0	0	0
Paracalanus aculeatus	1.4	0	0.5	20.8	1.4	12.3	3.4	17.6	15.7	5.4
Paracalanus crassirostris	2.1	0.8	0.7	0	0.3	0	1.9	0	0	0
Paracalanus indicus	2.1	17.0	13.3	2.7	2.2	0	19.8	3.3	32.3	20.0
Paracalanus quasimoto	52.9	17.8	53.9	2.3	1.1	3.8	40.7	2.0	15.3	5.4
Temora stylifera	0	0.4	0	0	0.5	0.8	0	0.7	0	0.7
Temora turbinata	2.1	21.7	0.3	0	0.6	0	8.0	1.3	3.6	4.4
Undinula vulgaris	0	0	0	0	0	0	0	0	0.2	0
<u>CYCLOPOIDA</u>										
Copilia mirabilis	0	0	0	0	0.2	0.3	0	0	0	0
Corycaeus amazonicus	2.9	10.0	0.8	0	1.5	0	2.3	17.6	3.2	1.4
Corycaeus americanus	7.1	2.4	0.5	0	0	0	0.4	3.9	2.7	3.7
Corycaeus giesbrechti	0.7	0	0.2	0.8	1.4	0.3	0	5.9	2.7	0.3
Corycaeus latus	0	0	0	0	0.8	0.3	3.4	0	0	0
Corycaeus speciosus	0	0	0	0	0.2	0	0	0	0	0
Farranula gracilis	0	0	0.2	12.7	16.4	6.9	0	0	0	0
Farranula rostrata	0	0	0	0	0	0	0	0	0	0
Lichomolgus sp.	0	0	0.3	0	0	0	0	0	0.2	0
Oithona brevicornis	0	0	0	0	0	0	0	0	0	0
Oithona fallax	0.7	0.4	0	0	0	0	0	0	0	0
Oithona nana	2.1	22.4	5.1	0.4	0.1	0	15.2	14.4	3.6	2.4
Oithona plumifera	1.4	0	0.5	1.9	3.5	8.2	2.7	26.8	8.9	1.7
Oithona simplex	0	0	0	0	0.1	0	0	0	0	0
Oithona sp.1	0	0	0	0	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	0	0	0	0	0	0
Oncaea media	20.2	0	20.4	0.4	9.1	1.0	0	1.3	0.2	43.1

TABLE 7-2-1. (continued)

Oncaea mediterranea	0	0	0.7	0	0.3	0	0	0	0.2	0
Oncaea ornata	0	0	0	0	0	0	0	0	0	0
Oncaea venusta	0	0.4	0.2	1.1	5.5	4.3	0	0	2.7	2.4
Saphirella sp.	0	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0	0	0	0	0.1	0	0	0	0	0
HARPACTICOIDA										
Clytemnestra scutellata	1.4	2.0	0	0	0.3	0	0	0.7	0	4.1
Macrosetella gracilis	0	0	0	0	0	0	0	0	0	0.7
Microsetella rosea	0	0	0	0	0	0	0	0	0	0

TABLE 7-2-2.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W23 - 1964

	3-19-64	4-16-64	5-23-64	6-26-64	7-17-64	8-30-64	10-29-64	11-23-64	12-17-64
CALANOIDA									
Acartia danae	0	0	0	0	0	0	0	0	0
Acartia lilljeborgii	0	0	0	2.1	0	0	0	0	0
Acartia tonsa	0	8.4	26.1	2.8	0	0	0	0	0
Acrocalanus andersoni	0	0	0	0	0	0	0	0	0
Acrocalanus longicornis	0	0	0	0	0	0.9	0	0.3	0
Aetideus acutus	0	0	0	0	0	0	0	0	0
Calanopia americana	0	0	0	0	0.5	0	0	0.3	0
Calocalanus pavo	0	0	0	0	0.5	0.2	0.9	0.3	0
Calocalanus pavoninus	0	0	0	0	0	0.9	0	0	0
Calocalanus styliremis	0	0	0	0	0.2	0	0	0	0.4
Calocalanus sp.1	0	0	0	0	0	0	0	0	0
Candacia curta	0	0	0	0	0	0	0	0	0
Centropages caribbeanensis	0	0	0	0	0	0	0	0	0
Centropages hamatus	0	0	0	0	0	0	0	0	0
Centropages velificatus	0	0	1.0	2.8	2.5	1.1	2.3	2.8	0
Clausocalanus furcatus	5.7	0	3.4	0	39.6	39.6	0.6	6.1	0.7
Clausocalanus jobei	1.9	0	0	0	0	0.2	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	0.9	0	2.4	1.4	0	0.2	1.3	1.1	0.7
Euchaeta marina	0	0	0	0	0	0.2	0	0	0
Euchaeta paraconcinna	0	0	0	0	0	0	0	0.3	0
Labidocera aestiva	0	0	0	0	0	0	0	0	0

TABLE 7-2-2. (continued)

Lucicutia flavicornis	0	0	0	0	0	0	0	0	0
Nannocalanus minor	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	0	0	0.5	0.4	1.4	4.0	5.8	6.6	5.8
Paracalanus crassirostris	0	3.4	1.0	19.7	1.1	0.2	4.0	0.3	1.5
Paracalanus indicus	20.0	21.0	16.9	32.4	0.2	17.6	7.2	38.4	16.1
Paracalanus quasimoto	18.1	56.3	14.0	4.9	0.7	2.4	1.3	5.5	2.9
Temora stylifera	0	0	0	0	0.2	0	0	0	0
Temora turbinata	0	1.7	10.1	2.5	0.7	4.9	2.7	1.7	4.4
Undinula vulgaris	0	0	0	0	0.2	0	0	0	0
<u>CYCLOPOIDA</u>									
Copilia mirabilis	0	0	0	0	0.2	0	0	0	0
Corycaeus amazonicus	3.8	0	8.7	2.8	0	0.2	2.2	1.7	3.3
Corycaeus americanus	2.9	3.4	2.9	0.7	0	0.5	0.9	5.2	8.8
Corycaeus giesbrechti	0	0	0	0	2.5	0.2	8.1	2.2	0.4
Corycaeus latus	0	0	0	0	0.9	0.2	0	0	0
Corycaeus speciosus	0	0	0	0	0	0	0	0	0
Farranula gracilis	0	0	0.5	0	30.9	1.8	0	0.5	0
Farranula rostrata	0	0	0	0	0	0	0	0	0
Lichomolgus sp.	0	0	0	0	0	0	0	0.5	0.7
Oithona brevicornis	0	0	0	0.7	0	0	0	0	0
Oithona fallax	0	0	0	0	0	0	0	0	0
Oithona nana	0	2.5	1.0	26.8	0.2	0	56.0	1.1	7.3
Oithona plumifera	0	0	0	0	3.0	6.7	1.8	6.9	2.9
Oithona simplex	0	0	0	0	0	0	0	0.5	3.3
Oithona sp.1	0	0	0	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	0.5	0	0	0	0
Oncaea media	38.1	3.4	7.2	0	8.9	2.0	0.4	7.2	38.0

TABLE 7-2-2. (continued)

Oncaea mediterranea	0	0	0	0	0	0.4	0	0	0
Oncaea ornata	0	0	0	0	0	0	0	0	0
Oncaea venusta	8.6	0	3.4	0	4.3	15.1	4.0	7.7	1.5
Saphirella sp.	0	0	0	0	0	0	0	0	0.7
Sapphirina nigrocaculata	0	0	0	0	0.7	0	0	0.3	0
<u>HARPACTICOIDA</u>									
Clytemnestra scutellata	0	0	1.0	0	0	0.5	0	0.5	0.7
Macrosetella gracilis	0	0	0	0	0	0	0.4	1.9	0
Microsetella rosea	0	0	0	0	0	0	0	0	0

TABLE 7-2-3.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W23 - 1965

	1-8-65	2-28-65	3-22=65	4-24-65	5-30-65	6-13-65	8-12-65	9-11-65	12-10-65
CALANOIDA									
Acartia danae	0	0	0	0	0	0.9	0	0	0
Acartia lilljeborgii	0	0	0	0	0	0	0	0	0
Acartia tonsa	0	0.8	0.4	8.5	7.6	4.1	0	0	0
Acrocalanus andersoni	0	0.8	0	0	0	0	0	0	0
Acrocalanus longicornis	0	0	0	0	0	0	0	0	0
Aetideus acutus	0.4	0	0	0	0	0	0	0	0
Calanopia americana	0	0	0	0	0	0	0	0	0
Calocalanus pavo	0	0	0	0	0	0	1.2	0.2	0
Calocalanus pavoninus	0.8	0	0	0	0	0	1.2	0	0
Calocalanus styliremis	0.8	0	0	0	0	0.5	0	0	0
Calocalanus sp.1	0	0.4	0	0	0	0	0	0	0
Candacia curta	0	0	0	0	0	0	0	0	0.2
Centropages caribbeanensis	0	0	0	0	0	0	0	0	0
Centropages hamatus	0.4	12.6	0.9	0.5	0.3	0	0	0	0
Centropages velificatus	0	1.1	0.7	0	0.3	0.9	8.6	2.0	2.6
Clausocalanus furcatus	0.4	0	8.1	4.5	0	1.4	0	0.8	0.2
Clausocalanus jobei	0	0	0.4	0	0	0.9	0	0	0
Ctenocalanus vanus	0	0.4	0	0	0	0.5	0	0	0
Eucalanus pileatus	0	0	0.4	2.0	0.9	5.5	0	1.6	1.7
Euchaeta marina	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0	0	0	0	0	0.5	0	0	0
Labidocera aestiva	0	1.2	0.2	0	1.6	0	0	0	0

TABLE 7-2-3. (continued)

Lucicutia flavicornis	0	0.8	0	0	0	0.9	0	0	0
Nannocalanus minor	0	0	0.2	0	0	0	0	0	0
Paracalanus aculeatus	0.4	3.2	0.4	0	0.9	3.6	4.9	2.3	2.3
Paracalanus crassirostris	15.3	16.2	4.8	16.4	3.5	0	0	2.9	0
Paracalanus indicus	22.2	39.9	29.3	19.4	56.1	47.0	40.8	64.3	56.3
Paracalanus quasimoto	5.0	8.3	23.6	13.9	19.6	12.9	3.7	14.5	1.9
Temora stylifera	0	0	0	0	0.3	1.4	0	0	0
Temora turbinata	1.5	3.2	0.9	0	0.6	2.3	0	1.2	7.0
Undinula vulgaris	0	0	0	0	0	0	0	0	0
<u>CYCLOPOIDA</u>									
Copilia mirabilis	0	0	0	0	0	0	0	0	0
Corycaeus amazonicus	0.8	1.6	1.3	3.0	1.3	5.1	6.3	2.9	0.2
Corycaeus americanus	10.7	0.8	3.1	1.5	0.3	1.4	8.6	0.6	3.3
Corycaeus giesbrechti	0	0	0	0	0	0	8.6	0.2	0.6
Corycaeus latus	0	0	0	0	0	0	0	0	0
Corycaeus speciosus	0	0	0	0	0	0	0	0	0
Farranula gracilis	0	0	0	0	0	0	0	0.6	0
Farranula rostrata	0	0.4	0	0	0	0	0	0	0
Lichomolgus sp.	0	0	0	0	0	0.5	0	0	0
Oithona brevicornis	0	1.6	0	0	0	0	0	0	0
Oithona fallax	0	1.6	0	0	0	0	0	0	0
Oithona nana	8.8	0	15.1	2.5	6.6	2.3	0	3.5	1.6
Oithona plumifera	1.9	0.4	0.7	9.9	0	3.7	6.2	1.0	1.2
Oithona simplex	0	0	0	0	0	0	0	0.4	0.2
Oithona sp.1	0	1.2	0	0	0	0	0	0	0
Oncaea conifera	0	0	0.4	0	0	0	0	0	0
Oncaea media	29.5	2.4	7.4	15.9	0	2.8	0	0	20.1

TABLE 7-2-3. (continued)

Oncaea mediterranea	0.8	0	1.3	0	0	0.5	0	0	0
Oncaea ornata	0	0.4	0	0	0	0	0	0	0
Oncaea venusta	0.4	0	0	1.5	0	0.5	3.7	0	0.3
Saphirella sp.	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0	0	0	0	0	0	0	0	0
HARPACTICOIDA									
Clytemnestra scutellata	0	0.8	0	0	0	0	1.2	1.0	0.3
Macrosetella gracilis	0	0	0.4	0	0	0	4.9	0	0
Microsetella rosea	0	0	0	0.5	0	0	0	0	0

TABLE 7-3-1.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W24 - 1963

	4-6-63	5-3-63	5-22-63	6-27-63	7-15-63	8-28-63	10-3-63	11-3-63	12-1-63
CALANOIDA									
Acartia danae	0	0.9	0.1	0	1.9	0	0	0	0
Acartia lilljeborgii	0	0	0	10.0	0.5	0	6.9	1.3	3.1
Acartia tonsa	70.1	4.5	0	0	0	0	1.3	1.3	36.9
Acrocalanus longicornis	0	0	0	0	0	0	0	0	0
Calanopia americana	0	0	0.7	0	0	0	0	0	0
Calocalanus pavoninus	0	0	0	1.0	0	0	0	0	0
Calocalanus styliremis	0	0	0	0	0	0	0	0	0
Calocalanus sp.1	0	0	0	0	0	0	0	0	0
Centropages hamatus	0	0	0	0	0	0	0	0	0
Centropages velificatus	0	0	1.7	2.0	0.5	13.3	3.6	8.8	0.2
Clausocalanus furcatus	0	0	0.8	1.0	0.5	0	0	0	0.2
Clausocalanus jobei	0.3	0	0	0	0	0	0	0	0
Eucalanus pileatus	0	0	0.3	3.0	0	2.5	1.0	4.7	2.0
Labidocera aestiva	0	0.9	0.2	0	0	0	0	0	0.2
Labidocera scotti	0	0	0	0	0	0.8	0	0	0
Mecynocera clausi	0	0	0	0	1.0	0	0	0	0
Nannocalanus minor	0	0	0	1.0	0	0	0	0	0
Paracalanus aculeatus	0	0	0	0	0	3.3	0	0	0.2
Paracalanus crassirostris	25.7	25.2	3.8	12.0	1.9	0	39.5	9.4	10.6
Paracalanus indicus	0.5	3.6	33.6	2.0	43.5	19.2	0.7	10.1	4.2
Paracalanus quasimoto	2.7	21.6	22.2	13.0	3.8	1.7	0.7	12.2	7.1
Pseudodiaptomus sp.1	0	0	0	0	0	0	0	0.7	0

TABLE 7-3-1. (continued)

Temora stylifera	0	0	0	1.0	0	0	0	0	0
Temora turbinata	0	28.8	8.9	17.0	6.7	15.8	1.0	21.6	0.4
CYCLOPOIDA									
Corycaeus amazonicus	0	0.9	2.2	12.0	2.4	0.8	1.6	8.1	2.6
Corycaeus americanus	0	0	0.3	4.0	2.9	0.8	0	0	6.6
Corycaeus giesbrechti	0	0	0.4	1.0	0	5.8	0.3	7.4	0.7
Farranula gracilis	0	0	0.2	0	0	0	0	0	0
Lichomolgus sp.	0.5	0	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0.7	0	1.8
Oithona fallax	0	0	0.3	0	8.1	0	0	0	0
Oithona hebes	0	0	0	0	0	0	0	0	0
Oithona nana	0	12.6	18.3	19.0	16.3	4.2	42.8	12.8	21.7
Oithona plumifera	0	0	0.2	0	0.5	0	0	1.4	0.7
Oithona simplex	0	0	0.3	0	3.8	0	0	0	0
Oithona sp.1	0	0	0.2	0	0	0	0	0	0
Oithona sp.3	0	0	0	0	0	0	0	0	0
Oncaea media	0	0	5.2	1.0	4.3	30.8	0	0	0.7
Oncaea mediterranea	0	0	0.4	0	0	0	0	0	0
Oncaea venusta	0	0	0	0	0	0.8	0	0	0
Paroithona pulla	0	0	0	0	0.5	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0	0
HARPACTICOIDA									
Clytemnestra scutellata	0	0.9	0	0	0.5	0	0	0	0
Microsetella rosea	0	0	0	0	0.5	0	0	0	0

TABLE 7-3-2.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W24 - 1964

	3-20-64	4-17-65	5-25-64	6-27-64	7-18-64	8-31-64	9-25-64	10-30-64	11-19-64	12-18-64
CALANOIDA										
Acartia danae	0	0	0	0	0	0	0	0	0	0
Acartia lilljeborgii	0	0	0	0.6	0	0	51.4	0	16.3	4.0
Acartia tonsa	2.2	72.7	22.8	0	3.6	0	0	0	1.0	0.3
Acrocalanus longicornis	0	0	0	0	0	1.3	0	0	0	0
Calanopia americana	0	0	0.5	0.6	0	0	0	0	0	0
Calocalanus pavoninus	0	0	0	0.3	0	0.9	0	0	0	0
Calocalanus styliremis	0	0	0	1.2	0	0.4	0	0	0	0
Calocalanus sp.1	0	0	0	0.3	0	0	0	0	0	0
Centropages hamatus	1.1	3.6	0	0	0	0	0	0	0	0
Centropages velificatus	1.1	0	0.5	1.8	10.7	4.6	1.7	0	1.4	1.9
Clausocalanus furcatus	1.7	0	0	29.4	0	39.5	0	0	0	0
Clausocalanus jobei	0.6	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	0	0	2.5	0.9	0	1.7	0	2.1	0	0.5
Labidocera aestiva	0	0	0	0	0	0	0	0	0	0
Labidocera scotti	0	0	0	0	0	0	0	0.7	0	0
Mecynocera clausi	0	0	0	0	0	0	0	0	0	0
Nannocalanus minor	0	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	0	0	0	3.0	0	5.0	0	0	0	0
Paracalanus crassirostris	12.4	10.9	1.5	0.9	0	0.4	0.7	5.5	20.3	2.1
Paracalanus indicus	7.9	5.4	21.8	35.7	0	16.8	0.3	14.6	19.2	59.5
Paracalanus quasimoto	68.5	3.6	24.9	4.8	0	1.7	0.3	2.1	1.7	16.9
Pseudodiaptomus sp.1	0	1.8	0	0	0	0	0	0	0	0

TABLE 7-3-2. (continued)

Temora stylifera	0	0	10.2	0	0	0.4	0	0	0	0
Temora turbinata	1.1	0	0	5.1	0	3.4	1.4	6.2	13.0	1.9
<u>CYCLOPOIDA</u>										
Corycaeus amazonicus	0	0	9.6	0.6	3.6	0.4	23.6	2.1	6.4	0.8
Corycaeus americanus	1.1	0	4.6	0	7.1	0.4	0.7	1.4	4.0	2.9
Corycaeus giesbrechti	1.1	0	0	0.3	0	0.8	0.4	0	0.9	0.3
Farranula gracilis	0	0	0	2.1	3.6	5.0	0	0	0	0
Lichomolgus sp.	0	0	0	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0	2.1	4.2	0
Oithona fallax	0	0	0	0	0	0	0	0	0	0
Oithona hebes	0	0	0	0	0	0	0.7	0	0.2	0
Oithona nana	0.6	1.8	1.0	4.5	67.9	0	18.7	59.7	11.4	6.4
Oithona plumifera	0	0	0	4.8	0	5.0	0	0	0	0
Oithona simplex	0	0	0	0	0	0	0	3.5	0	0
Oithona sp.1	0	0	0	0	0	0	0	0	0	0
Oithona sp.3	0	0	0	0	0	0	0	0	0	0
Oncaea media	0.6	0	0	1.5	3.6	7.6	0	0	0	1.9
Oncaea mediterranea	0	0	0	0	0	0.4	0	0	0	0.3
Oncaea venusta	0	0	0	1.2	0	4.2	0	0	0	0
Paroithona pulla	0	0	0	0	0	0	0	0	0	0
Saphirella sp.	0	0	0	0.3	0	0	0	0	0	0
<u>HARPACTICOIDA</u>										
Clytemnestra scutellata	0	0	0	0	0	0	0	0	0	0.3
Microsetella rosea	0	0	0	0	0	0	0	0	0	0

TABLE 7-3-3.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W24 - 1965

	1-9-65	2-28-65	3-23-65	4-24-65	5-29-65	6-14-65	8-12-65	9-11-65	12-10-65
CALANOIDA									
Acartia danae	0	0	0	0	0	2.0	0	0	0
Acartia lilljeborgii	1.2	0	0	0	0	32.6	0.5	51.5	1.3
Acartia tonsa	1.2	0	2.5	2.5	25.9	36.7	0	5.3	5.0
Acrocalanus longicornis	0	0	0	0	0	0	0	0	0
Calanopia americana	0	0	0	0	0	0	0	2.3	0
Calocalanus pavoninus	0	0	0	0	0	0	0	0	0
Calocalanus styliremis	0	0	0	0	0	0	0	0	0
Calocalanus sp.1	0	0	0	0	0	0	0	0	0
Centropages hamatus	0	11.5	27.5	0	0	0	0	0	0
Centropages velificatus	0	0	0	1.6	0	0	2.3	7.6	0.6
Clausocalanus furcatus	0	0	0	5.0	3.7	0	1.1	0.8	0
Clausocalanus jobei	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	0	0	0	1.6	0	0	1.6	0	0
Labidocera aestiva	0	0	0	0.8	0	0	0	0	0
Labidocera scotti	0	0	0	0	0	0	0	1.5	0
Mecynocera clausi	0	0	0	0	0	0	0	0	0
Nannocalanus minor	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	0	0	0	0.8	0	0	1.1	0	0
Paracalanus crassirostris	76.6	59.0	40.1	6.6	37.0	8.3	1.1	5.3	12.5
Paracalanus indicus	9.4	15.0	10.7	36.4	7.4	12.2	55.2	2.3	31.3
Paracalanus quasimoto	3.5	2.0	1.9	25.6	0	2.0	6.0	12.1	0.6
Pseudodiaptomus sp.1	0	0	0	0	0	0	0	0	0.6

TABLE 7-3-3. (continued)

Temora stylifera	0	0	0	0	0	0	0.5	0.8	0
Temora turbinata	0.6	5.5	2.5	0	0	0	10.4	4.5	0
<u>CYCLOPOIDA</u>									
Corycaeus amazonicus	0	0	0.3	1.7	3.7	4.1	2.7	0.8	1.9
Corycaeus americanus	1.2	0	10.7	1.7	7.4	2.0	0	0	0
Corycaeus giesbrechti	0	0	0	0.8	0	0	4.4	1.5	1.9
Farranula gracilis	0	0	0	0	0	0	0	0	0
Lichomolgus sp.	0	0	0	0.8	0	0	0	0	0
Oithona brevicornis	2.3	0	0	0	0	0	0	0	0.6
Oithona fallax	0	0	0	0.8	0	0	0	0	0
Oithona hebes	0	0	0	0	0	0	0	1.5	0
Oithona nana	1.2	6.5	3.6	10.8	11.1	0	9.8	1.5	13.1
Oithona plumifera	0	0	0	0.8	0	0	1.1	0	0
Oithona simplex	0	0	0	0	0	0	0	0	0.6
Oithona sp.1	0	0	0	0	0	0	0	0	0
Oithona sp.3	0	0	0	0	0	0	0	0.8	0
Oncaea media	2.9	0	0.3	0.8	3.7	0	0.5	0	30.0
Oncaea mediterranea	0	0	0	0	0	0	0	0	0
Oncaea venusta	0	0	0	0	0	0	1.6	0	0
Paroithona pulla	0	0	0	0	0	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0	0
<u>HARPACTICOIDA</u>									
Clytemnestra scutellata	0	0.5	0	0.8	0	0	0	0	0
Microsetella rosea	0	0	0	0	0	0	0	0	0

TABLE 7-4-1.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W58 - 1963

	3-9-63	4-4-63	5-5-63	5-21-63	6-27-63	7-15-63	8-29-63	10-11-63	11-4-63	12-2-63	12-21-63
CALANOIDA											
Acartia danae	0.2	0	0	2.9	0.3	3.6	0.6	0	0.2	0	0
Acartia tonsa	1.5	0.5	0.7	0	0.2	0.2	0	0	0	0.5	0
Acrocalanus andersoni	0	0	0	0	0	0.4	0	0	0	0	0.3
Acrocalanus longicornis	0.2	0	0	0	0.3	0.6	0	0.2	1.3	0.2	0.6
Calanopia americana	0.5	0.3	0.3	0.4	0	0	0	0.5	2.1	1.3	0.6
Calanus tenuicornis	0	0	0	0	0	0	0	0	0	0	0.6
Calocalanus elegans	0	0	0	0	0	0	0.3	0	0	0	0
Calocalanus pavo	1.7	0.5	1.2	1.2	0.2	0.9	0	3.4	1.1	0	0.8
Calocalanus pavoninus	0.5	0	0	0.1	6.8	2.8	0.9	0.7	3.8	0.2	3.1
Calocalanus styliremis	0.7	0.2	0.1	0.4	1.0	2.1	0.6	1.5	3.6	0.8	3.9
Calocalanus sp.1	0	0	0	0.1	1.7	0.2	0	0	0.2	0	0.3
Calocalanus sp.2	0	0	0	0	0	0.2	0	0	0.4	0	0.3
Calocalanus sp.3	0.2	0.2	0	0	0	0.4	0	0	0	0	2.8
Calocalanus sp.4	0.2	0	0	0	0	0	0	0	0	0	1.7
Candacia curta	0	0	0	0.3	0	0	0	0	0	0.2	0
Centropages hamatus	0.2	0	0	0	0	0	0	0	0	0	0.3
Centropages velificatus	0	0.3	0.1	0.4	0.2	0.2	0	0.5	0	1.2	0
Clausocalanus arcuicornis	0	0.2	0.4	0	0	0	0	0	0	0	0.3
Clausocalanus furcatus	2.7	3.1	4.9	7.5	10.2	26.8	2.8	17.2	22.3	10.8	11.4
Clausocalanus jobei	1.0	5.0	17.2	13.5	1.4	0.9	12.5	0.7	0.6	0	2.0
Clausocalanus mastigophorus	0	0	0	0	0	0	0	0	0	0	0.3
Clausocalanus parapergens	0	0	0.3	0.3	0	0	0	0	0	0	0.3

TABLE 7-4-1. (continued)

Clausocalanus paululus	0.5	0	0	0.1	0	0	1.2	0	0	0.2	4.2
Clausocalanus pergens	0.2	0	0	0.4	0	0	0	0	0	0	0.8
Ctenocalanus vanus	3.0	1.2	3.0	0.3	0	0.6	0.6	0	0.4	0	6.1
Eucalanus hyalinus	0.2	0	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	0.2	0.5	0.3	0.3	0	0.2	0	0	0	0.2	0.8
Eucalanus sewelli	0	0	0	0	0	0	0	0	0	0	0
Euchaeta marina	0	0	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0	0	0.1	0	0	0	0	0	0	0	0
Euchirella amoena	0	0	0	0	0	0	0	0	0	0	0
Haloptilus longicornis	0	0	0.1	0	0	0	0	0	0	0	0
Heterorhabdus papilliger	0	0	0	0	0	0	0	0	0	0	0
Ischnocalanus plumulosus	0	0.2	0.6	0.3	0	0	0	0.5	0.2	0	0.3
Labidocera aestiva	0	0	0	0	0	0	0	0	0	0	0
Lucicutia flavicornis	0.2	0	1.8	0	0	0	0	0	0	0.5	4.7
Lucicutia gaussae	0	0	0	0.3	0	0.2	0	0	0	0	0
Lucicutia paraclausi	0	0	0	0	0	0	0	0	0	0	0
Mecynocera clausi	0.2	0.2	1.6	0.4	1.0	3.2	0.6	0	0	0.2	1.4
Nannocalanus minor	1.2	1.2	2.4	1.3	0	1.7	0	0.3	0	0	0.8
Neocalanus gracilis	0	0	0	0.1	0	0	0	0	0	0	0
Paracalanus aculeatus	6.4	1.2	0.9	0.9	0.9	0.4	1.9	2.0	1.1	6.8	1.1
Paracalanus crassirostris	1.7	0	0	0	0	0	0	0	0.4	0	0
Paracalanus denudatus	0.2	0	0	0.4	0.3	0.2	0.9	0	0	0	0.6
Paracalanus indicus	6.7	41.9	4.8	13.7	0.3	0.8	4.2	15.8	4.2	37.8	3.6
Paracalanus quasimoto	28.0	19.6	4.9	1.6	0.3	1.1	32.5	15.3	3.2	2.3	0.6
Paracalanus sp.1	0	0	0	0	0.2	0.2	0	0	0	0	0.6
Paracandacia bispinosa	0	0	0	0	0	0	0	0	0	0	0
Paracandacia simplex	0	0	0.1	0.1	0	0	0	0	0	0	0

TABLE 7-4-1. (continued)

Parundinella spinodenticula	0	0	0	0	0	0	0	0	0	0	0.3
Pleuromamma gracilis	0	0	0	0	0	0	0	0	0	0	0
Pleuromamma piseki	0	0	0	0	0	0	0	0	0	0	0.3
Pontella securifer	0	0	0	0	0.2	0	0	0	0	0	0
Pontella meadii	0	0	0	0	0	0	0	0	0	0	0
Pontellina pulmata	0	0	0	0	0	0	0	0	0	0	0
Pontellopsis villosa	0	0	0	0	0	0	0	0	0	0	0
Rhincalanus cornutus	0.5	0	0	0	0	0	0	0	0	0	0
Scolecithricella tenuiserrata	0	0	0	0	0	0	0	0	0	0	0.3
Scolecithrix bradyi	0	0	0	0	0	0	0	0	0	0	0.3
Scolecithrix danae	0	0	0.1	0	0	0	0	0	0	0	0.3
Stephos deichmannae	0	0	0	0	0	0	0.3	0	0	0.5	0
Temora stylifera	0	1.0	0	0.4	0.3	2.2	0	0	0.2	0	0
Temora turbinata	2.2	0.5	0.4	8.4	0	1.7	0	1.2	2.3	1.0	0.6
Undinula vulgaris	0	0	0	0	0	0	0	0	0	0	0
<u>CYCLOPOIDA</u>											
Copilia lata	0.2	0	0	0	0	0.2	0	0	0	0	0
Copilia mirabilis	0	0	0	0.1	0	0	0	0	0	0	0
Copilia quadrata	0	0	0	0	0	0	0	0	0	0	0.3
Corycaeus amazonicus	1.2	2.1	2.5	1.6	0.7	0	0.6	1.2	1.5	9.2	0
Corycaeus americanus	3.5	2.1	0.4	0.9	0	0	0.3	0.2	0	2.0	0.8
Corycaeus clausi	0	0	0.3	0	0.3	0	0	0	0	0	0
Corycaeus flaccus	0	0	0	0	0	0	0.3	0	0	0	0
Corycaeus giesbrechti	0.5	0	2.2	1.8	0.5	0.6	0.6	0.5	3.0	2.3	0
Corycaeus latus	0	0	0	0	0.5	0.2	0	0	0.4	0	0
Corycaeus limbatus	0	0	0.1	0.1	0	0	0	0	0	0	0.3
Corycaeus speciosus	0	0	0	0.1	0	0.6	0	0	0.2	0.2	0

TABLE 7-4-1. (continued)

Corycaeus typicus	0	0	0	0	0	0.2	0	0	0	0	0
Farranula gracilis	0	0	0.3	0.4	45.6	9.9	5.0	1.0	3.8	0.2	0.6
Farranula rostrata	0.7	0	1.2	0.3	0	1.5	3.4	0	0	0	0.6
Lichomolgus sp.	4.5	0.2	1.9	7.5	0	0	0	0	0	0	0
Lubbockia squillimana	0.2	0.2	0	0	0.2	0.2	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0.6	0	0	0	0
Oithona fallax	0.5	0	0.3	1.8	0.2	1.7	1.9	0	0	0	5.0
Oithona nana	0.7	0.2	1.5	0.3	0.3	0	0	0.7	0.2	0.2	0.3
Oithona plumifera	7.2	3.3	2.5	3.7	11.8	8.2	9.2	16.5	22.8	14.1	15.6
Oithona robusta	0	0	0	0	0	0	0	0	0	0	0.3
Oithona setigera	0	0	1.5	1.3	0	1.1	1.3	0	0	0	0.6
Oithona simplex	0	0	0	0	0	0	0	0	0	0	0
Oithona tenuis	0.5	0	0.4	2.6	0	0.4	0	0	0.2	0	0
Oithona vivida	0	0	0.1	0	0	0.2	0	0	0	0	1.1
Oithona sp.1	0	0	4.0	0.4	0	0.3	5.6	0	0	0	0.3
Oncaea conifera	0.2	0	2.1	.1	0	0.8	0	0	0.2	0	0.3
Oncaea media	9.7	7.3	11.8	7.6	2.1	3.8	7.8	3.8	5.4	2.6	2.8
Oncaea mediterranea	6.2	4.4	18.9	10.7	3.3	14.6	1.9	3.9	4.9	0.8	8.6
Oncaea venusta	2.0	1.9	0.9	1.9	0.3	2.8	0.9	10.8	9.3	1.5	3.6
Paroithona sp.	0	0	0	0	0	0	0	0	0	0	0
Saphirella sp.	0.2	0	0	0	0	0.2	0	0	0	0	0
Sapphirina angusta	0	0	0	0	0.3	0	0	0	0	0	0
Sapphirina auronitens	0	0	0	0	0	0	0	0	0	0	0.3
Sapphirina metallina	0	0	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0.5	0.2	0.1	0.1	0	0.2	0	0	0	0	0
HARPACTICOIDA											
Clytemnestra scutellata	0	0	0.4	0.1	0	0	0	1.5	0.6	3.1	0.3

TABLE 7-4-1. (continued)

Macrosetella gracilis	0.5	0.2	0	0.3	8.0	0.6	0.6	0	0	0.2	1.7
Microsetella rosea	0	0	0	0.1	0	0	0	0	0	0	0
Oculosetella gracilis	0	0	0	0	0	0	0	0	0	0	0

TABLE 7-4-2.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W58 - 1964

	1-29-64	2-18-64	3-19-64	4-16-64	5-24-64	6-26-64	7-17-64	8-31-64	9-26-64	10-29-64	11-24-64	12-17-64
CALANOIDA												
Acartia danae	0	0	0.6	0	0.6	0	0	0	0	0	0	0
Acartia tonsa	0.3	0.7	1.3	0	7.0	0	0	0	0	0	0	0
Acrocalanus andersoni	0.3	0	0	0	0	0	0	0	0	0	0	0
Acrocalanus longicornis	0.5	0	0	0	0	0	0	0.3	2.0	2.6	1.5	0.1
Calanopia americana	0.3	0	0	0	0	0	0	0.9	1.1	0.5	1.5	0.3
Calanus tenuicornis	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus elegans	0	0	0	0	0	0	0	0	0	0	0	0
Calocalanus pavo	0.3	0	0	0	0	1.4	0.5	6.3	0.7	12.0	2.1	0.1
Calocalanus pavoninus	2.0	0.7	0.6	0	0.3	4.8	2.2	0.3	2.0	2.3	2.1	0.4
Calocalanus styliremis	0.7	0.7	0	0	0	3.2	0.2	0	0.9	2.3	3.9	0.3
Calocalanus sp.1	0.3	0	0	0	0	0.6	0	0	0	0	0.8	0
Calocalanus sp.2	0.3	0	0.4	0	0	0.6	0	0.3	0	0	0.2	0
Calocalanus sp.3	0.3	0	0	0	0	0	0	0	0	0	0	0
Calocalanus sp.4	0	0	0	0	0	0.3	0	0	0	0	0.4	0
Candacia curta	0	0	0	0	0	0.3	0	0	0	0	0	0
Centropages hamatus	0	0	0	0	0	0	0	0	0	0	0	0
Centropages velificatus	0.8	0	0	0	0.9	5.5	0.7	0.3	1.1	0.3	0.2	1.3
Clausocalanus arcuicornis	0	0	0	0	0	0.3	0	0	0	0	0	0
Clausocalanus furcatus	7.7	1.4	3.2	2.3	3.0	9.9	33.2	23.7	7.4	34.9	35.3	14.8
Clausocalanus jobei	1.8	2.1	1.3	6.5	14.6	0	1.9	1.9	0.2	0.3	0.2	0.1
Clausocalanus mastigophorus	0.3	0	0	0	0	0	0	0	0	0	0	0
Clausocalanus parapergens	0	2.7	0	0	0.6	0	0	0	0	0	0	0

TABLE 7-4-2. (continued)

Clausocalanus paululus	0.3	0	0	0	0	0	0	0	0	0.3	0.8	0
Clausocalanus pergens	0	0.7	0	0	0.6	0	0	0	0	0	0	0
Ctenocalanus vanus	0	2.7	0.6	3.4	3.7	0.4	0.5	0	0	0	0	0
Eucalanus hyalinus	0	0	0	0	0	0	0	0	0	0	0	0
Eucalanus pileatus	4.5	2.1	2.0	0.8	1.8	0.3	0	0.3	0.2	0	0.6	0.4
Eucalanus sewelli	0	0	0	0	0	0	0	0	0	0	0	0
Euchaeta marina	0.3	0	0	0	0	0	0	0	0	0	0	0
Euchaeta paraconcinna	0.3	0.7	0	0	0	0	0	0	0	0	0	0
Euchirella amoena	0	0	0	0	0	0	0	0	0	0	0	0
Haloptilus longicornis	0	0	0	0	0	0	0	0	0	0	0	0
Heterorhabdus papilliger	0	0	0	0	0	0	0	0	0	0	0	0
Ischnocalanus plumulosus	0.5	0	0	0	0	0	0.2	0.3	0	0	0.2	0
Labidocera aestiva	0	0	0	0	0.3	0	0	0	0	0	0	0
Lucicutia flavicornis	0	2.1	0	0	1.8	0	0	0.3	0	0	0.8	0
Lucicutia gaussae	0	0	0	0	0	0.3	0.2	0	0	0	0	0
Lucicutia paraclausi	0	0	0	0	0.3	0	0	0	0	0	0	0
Mecynocera clausi	0	0	0	0	1.5	2.3	0.2	0.6	0.2	0	1.0	0
Nannocalanus minor	2.0	2.7	0	0	0	0.3	0.7	0	0	0.3	0.2	0
Neocalanus gracilis	0	0	0	0	0	0	0	0	0	0	0	0
Paracalanus aculeatus	2.5	0.7	0	0.4	0.3	1.6	1.4	7.9	4.0	1.3	4.0	4.0
Paracalanus crassirostris	0.3	1.4	0.6	0.4	0.3	0	0	0	0	0	0	0
Paracalanus denudatus	0	0.7	0	0	0.3	0	0	0	0	0	0.2	0
Paracalanus indicus	26.3	28.5	19.1	13.8	11.6	0.6	0	2.8	8.5	2.6	3.3	11.4
Paracalanus quasimoto	16.1	13.2	33.1	21.5	10.4	5.7	1.1	2.5	4.5	13.1	1.7	41.7
Paracalanus sp.1	0	0	0	0	0	0	0	0	0	0.5	0	0
Paracandacia bispinosa	0	0	0	0	0	0	0	0	0	0	0	0
Paracandacia simplex	0	0	0	0	0	0	0.2	0	0	0	0	0

TABLE 7-4-2. (continued)

Parundinella spinodenticula	0	0	0	0	0	0	0	0	0	0	0	0
Pleuromamma gracilis	0	0	0	0	0.3	0	0	0	0	0	0	0
Pleuromamma piseki	0	0	0	0	0.3	0	0	0	0	0	0	0
Pontella securifer	0	0	0	0	0	0	0	0	0	0	0	0
Pontella meadii	0	0	0	0	0.3	0	0	0	0	0	0	0
Pontellina pulmata	0	0	0	0	0	0	0	0	0	0	0	0
Pontellopsis villosa	0	0	0	0	0	0	0	0	0	0	0	0
Rhincalanus cornutus	0	0	0	0	0	0	0	0	0	0	0	0
Scolecithricella tenuiserrata	0	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix bradyi	0	0	0	0	0	0	0	0	0	0	0	0
Scolecithrix danae	0.3	0	0	0	0.3	0.3	0	0	0	0	0	0
Stephos deichmannae	0	0	0	0.8	0	0	0	0	0	0	0	0.7
Temora stylifera	0.3	0	0	0.4	0.6	1.0	1.0	0.9	0.7	0	0	0
Temora turbinata	3.2	1.4	1.3	0	2.1	0.6	1.5	0.3	0.9	0.5	1.3	1.2
Undinula vulgaris	0	0	0	0	0	0	0.5	0	0.2	0	0	0
CYCLOPOIDA												
Copilia lata	0	0	0	0	0	0	0	0	0	0	0	0
Copilia mirabilis	0	0	0	0	0	0.3	0.5	0.6	0.2	0	0	0
Copilia quadrata	0	0	0	0	0	0	0	0	0	0	0	0
Corycaeus amazonicus	0	4.2	2.5	5.0	2.7	0	0.2	0	4.3	0.3	0.4	1.0
Corycaeus americanus	0.9	2.8	14.6	5.0	1.5	0	0	0	0.5	0	0	0.3
Corycaeus clausi	0	0	0	0	0	0	0	0	0	0	0	0
Corycaeus flaccus	0	0	0	0	0	0	0	0	0	0	0	0
Corycaeus giesbrechti	0	0.7	0	0	0	1.6	0.2	0.9	1.4	0.5	1.3	0.6
Corycaeus latus	0	0.7	0	0	0	0	0.2	0	0	0.3	0.2	0
Corycaeus limbatus	0	0	0	0	0	0	0	0	0	0	0	0
Corycaeus speciosus	0	0	0	0	0	0.6	0.2	0.3	0	0	0	0

TABLE 7-4-2. (continued)

Corycaeus typicus	0	0	0	0	0	0	0	0	0	0	0	0
Farranula gracilis	0.3	0	0	0.4	0	11.5	21.4	15.3	1.1	10.5	5.1	1.9
Farranula rostrata	0.3	0	0	0.4	0	0	0	0.3	0	0	0	0.1
Lichomolgus sp.	0.3	0	0	0.8	0.3	0	0	0	0	0	0	0.1
Lubbockia squillimana	0.3	0	0	0	0	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0.6	0	0	0	0	0	0	0	0	0.3
Oithona fallax	0	2.1	0	2.7	0.6	1.0	0.3	0.9	0	0	0.2	0
Oithona nana	1.0	1.4	0.6	0	0.3	0	0	0	0.2	1.3	0	0.3
Oithona plumifera	2.7	4.2	2.5	3.1	1.8	10.2	7.8	4.4	46.3	4.1	10.3	3.2
Oithona robusta	0	0	0	0	0	0	0	0	0	0	0	0
Oithona setigera	0.3	0	1.3	0	0	1.0	0	0	0	0	0	0
Oithona simplex	0	0	0	0	0	0	0	0	0.2	0	0	0
Oithona tenuis	0	0	0	0	0	0.3	0	0	0	0	0	0
Oithona vivida	0	0	0	0	0	0.6	0	0.3	0	0	0.4	0
Oithona sp.1	0	0	0	3.8	1.5	1.0	0	0.9	0	0	0	0
Oncaea conifera	0	1.4	0	0	1.2	0	0.2	1.6	0	0	0.2	0
Oncaea media	13.7	11.1	9.4	22.6	12.5	1.9	8.9	15.2	3.6	1.0	1.7	3.8
Oncaea mediterranea	4.1	2.8	1.3	3.8	9.4	18.2	3.2	2.8	0.9	0.3	1.5	0.4
Oncaea venusta	3.1	2.1	2.0	0.4	4.0	9.6	10.4	5.7	5.8	5.4	14.2	7.2
Paroithona sp.	0	0	0	0.4	0	0	0	0	0	0	0.2	0.3
Saphirella sp.	0	0	0	0	0	0	0	0	0	0	0	0.3
Sapphirina angusta	0	0	0	0	0	0.3	0	0	0	0	0	0
Sapphirina auronitens	0	0	0	0	0	0	0	0	0	0	0	0
Sapphirina metallina	0	0.7	0	0	0	0	0	0	0	0	0	0
Sapphirina nigromaculata	0	0.7	0.6	0.8	0	0	0	0	0.3	0	0	0
HARPACTICOIDA												
Clytemnestra scutellata	0	0	0	0.4	0.3	0.6	0	0.3	0.2	0.3	0	0.1

TABLE 7-4-2. (continued)

Macrosetella gracilis	0.3	0	0.6	0	0	0.3	0.2	0.6	0.7	2.6	0.6	2.9
Microsetella rosea	0	0	0	0	0	0.6	0	0	0	0	0	0
Oculosetella gracilis	0	0	0	0	0	0	0	0	0	0	0	0.1

TABLE 7-4-3.

PERCENTAGE COMPOSITION OF ADULT FEMALE COPEPODS AT W58 - 1965

	1-8-65	2-28-65	4-24-65	5-30-65	6-13-65	8-13-65	9-11-65	12-11-65
CALANOIDA								
Acartia danae	0	0.3	0	3.2	0.9	0.3	0	0
Acartia tonsa	0	0	2.3	29.6	0	0	0	0
Acrocalanus andersoni	0.7	0	0.2	0.5	0.3	0.3	0	0.2
Acrocalanus longicornis	0	0.9	0	0	0.3	0.7	2.5	1.0
Calanopia americana	0.3	0.9	0	0	0	0.3	0	1.3
Calanus tenuicornis	0	0.3	0	0	0	0	0	0
Calocalanus elegans	0	0	0	0	0	0	0	0
Calocalanus pavo	0	0.3	0	0.5	0	2.2	11.7	0
Calocalanus pavoninus	1.0	1.4	0	0.8	0.3	2.2	0.4	0.8
Calocalanus styliremis	3.0	1.2	0	0.5	0.6	0.3	0.4	0.8
Calocalanus sp.1	0	0.3	0.2	0	0	0.7	0	0.2
Calocalanus sp.2	0.3	0	0	0	0	0.5	0	0
Calocalanus sp.3	0.3	0	0	0	0.3	0	0	0
Calocalanus sp.4	0.3	0.3	0	0	0.3	0.5	0	0
Candacia curta	0	0	0	0	0	0	0	0
Centropages hamatus	0	0	0	0	0	0	0	0
Centropages velificatus	1.3	0.9	0	0	1.2	0.3	0	0.6
Clausocalanus arcuicornis	0	0	0	0	0	0	0	0
Clausocalanus furcatus	8.1	15.2	0.5	0.5	1.5	22.0	15.5	39.1
Clausocalanus jobei	0.3	1.5	0.5	4.1	1.2	6.6	0.8	0.3
Clausocalanus mastigophorus	0.3	0.3	0	0	0	0	0	0.3
Clausocalanus parapergens	0	0.3	0	0	0	0.5	0	0

TABLE 7-4-3. (continued)

Clausocalanus paululus	0	1.2	0	0	0	0.3	0	0.3
Clausocalanus pergens	0.3	0	0.2	0.5	0	0.3	0	0
Ctenocalanus vanus	1.3	1.7	2.6	1.4	3.5	0	0	0
Eucalanus hyalinus	0	0	0.5	0	0	0	0	0
Eucalanus pileatus	3.4	4.1	0.5	0	5.6	1.2	0	4.1
Eucalanus sewelli	0.3	0	0	0	0	0	0	0
Euchaeta marina	0	0.3	0.2	0	0	0.7	0	0
Euchaeta paraconcinna	0	0	0.8	0	0	0	0	0
Euchirella amoena	0	0.3	0	0	0	0	0	0
Haloptilus longicornis	0	0	0	0	0	0	0	0
Heterorhabdus papilliger	0.4	0	0	0	0	0	0	0
Ischnocalanus plumulosus	0	0.6	0	0	0	0.7	0	0
Labidocera aestiva	0	0.3	0	0	0	0	0	0
Lucicutia flavicornis	2.7	0.6	0.2	0	0	1.0	0	0
Lucicutia gaussae	0	0	0	0.5	0	0	0	0
Lucicutia paraclausi	0	0	0.2	0.9	0	0	0	0
Mecynocera clausi	1.0	1.5	0	2.2	0	2.2	0.4	0.2
Nannocalanus minor	2.7	1.2	0.5	0	0	4.4	0.8	4.0
Neocalanus gracilis	0	0	0	0	0	0	0	0.2
Paracalanus aculeatus	4.5	2.6	0.5	4.1	3.2	7.6	1.7	0
Paracalanus crassirostris	0	0.9	3.8	0.5	0	0	0	0
Paracalanus denudatus	0.3	1.7	0	0	0	0.5	0	0
Paracalanus indicus	4.5	20.8	8.0	7.8	2.9	5.6	5.0	13.7
Paracalanus quasimoto	3.7	4.7	24.1	4.6	27.9	0	33.9	7.2
Paracalanus sp.1	0	0.3	0	0	0	0.2	0	0
Paracandacia bispinosa	0	0.3	0	0	0	0	0	0
Paracandacia simplex	0.3	0	0	0	0	0	0	0

TABLE 7-4-3. (continued)

Parundinella spinodenticula	0	0	0.5	0	0	0	0	0
Pleuromamma gracilis	0	0	0	0	0	0	0	0
Pleuromamma piseki	0	0	0	0	0	0.2	0	0
Pontella securifer	0	0	0	0	0	0	0	0
Pontella meadii	0	0	0	0	0	0	0	0
Pontellina pulmata	0	0	0	0	0	0	0	0.2
Pontellopsis villosa	0.3	0	0	0	0	0	0	0
Rhincalanus cornutus	0	1.5	0.5	1.4	0	0	0	0.3
Scolecithricella tenuiserrata	0	0	0	0	0	0	0	0
Scolecithrix bradyi	0	0	0	0	0	0	0	0
Scolecithrix danae	0.3	0.5	0	0	0	0.3	0	0
Stephos deichmannae	0	1.7	0	0	0	0	0	0
Temora stylifera	0	0	0	0.5	10.9	1.5	0.8	0.2
Temora turbinata	0	0	0.2	1.4	0.3	0.5	0	6.4
Undinula vulgaris	0	0	0	0	0	1.2	0.8	0.3
CYCLOPOIDA								
Copilia lata	0	0	0	0	0	0	0	0
Copilia mirabilis	0	0	0	0	0	0	0	0
Copilia quadrata	0	0	0	0	0	0	0	0
Corycaeus amazonicus	2.5	0	4.5	6.3	6.8	0	0	0.2
Corycaeus americanus	2.2	1.2	3.3	1.8	2.9	0	0	0
Corycaeus clausi	0	0	0	0	0	0	0	0
Corycaeus flaccus	0	0.3	0	0	0	0	0	0
Corycaeus giesbrechti	0.3	0.9	0	0	0.9	0.7	0.4	0.2
Corycaeus latus	0	0.6	0	0.5	0.3	0.5	0.4	0
Corycaeus limbatus	0	0	0	0	0	0	0	0
Corycaeus speciosus	0	0.3	0	0	0	0.3	0	0

TABLE 7-4-3. (continued)

Corycaeus typicus	0	0	0	0	0	0	0	0
Farranula gracilis	0.3	0.9	0	0	0.9	2.9	13.8	2.9
Farranula rostrata	0.3	0.3	0	0	0	0	0	0.2
Lichomolgus sp.	0	0	0.2	0	0	0	0	0
Lubbockia squillimana	0	0	0	0.5	0	0.7	0	0
Oithona brevicornis	0	0	0.7	0	0	0	0	0
Oithona fallax	0.3	0.3	25.9	1.4	0	0.7	0	0
Oithona nana	0	0.3	2.5	2.3	0	0	0	0
Oithona plumifera	18.3	3.7	1.5	5.0	3.8	10.8	3.8	2.1
Oithona robusta	0	0	0	0	0	0	0	0
Oithona setigera	0	0	0.2	0.5	1.8	0.5	0	0
Oithona simplex	0	0	0	0	0	0	0	0
Oithona tenuis	0	0	0	0	0	0	0	0
Oithona vivida	0	0	0.2	0.5	0	0	0	0
Oithona sp.1	0	0	1.5	4.1	2.9	0	0	0
Oncaea conifera	1.0	0	1.0	5.4	1.5	1.5	0	0.3
Oncaea media	4.8	11.4	7.8	1.4	11.8	4.4	0.8	1.4
Oncaea mediterranea	15.9	5.3	2.7	3.2	4.4	2.7	2.2	0.6
Oncaea venusta	9.1	2.3	0.2	0.9	0.6	7.8	3.8	5.4
Paroithona sp.	0	0	0.5	0	0	0	0	0
Saphirella sp.	0	0	0	0	0	0	0	0
Saphirella angusta	0	0	0	0	0	0	0	0
Sapphirina auronitens	0	0	0	0	0	0	0	0
Sapphirina metallina	0	0.3	0	0	0	0	0	0
Sapphirina nigromaculata	0	0.3	0	0	0	0.2	0	0
HARPACTICOIDA								
Clytemnestra scutellata	1.7	1.2	0.2	0.4	0.3	0.5	0	0.3

TABLE 7-4-3. (continued)

Macrosetella gracilis	1.3	0	0	0.4	0	0.2	0	4.8
Microsetella rosea	0	0	0	0	0	0	0	0
Oculosetella gracilis	0	0	0	0	0	0	0	0

TABLE 8-1.

NUMBER OF SPECIMENS AND SPECIES OF COPEPODS OBSERVED AND CALCULATED SPECIES DIVERSITY INDEX AND EQUITABILITY AT STATION W22

Date	No. of Specimens (N)	No. of Species (S)	Species Diversity Index (H)	Equitability $E = \frac{S'}{S}$	$E = \frac{H(S)}{H_{max}(S)}$
3-9-63	375	35	3.8373	0.600	0.7480
4-4-63	475	32	3.6837	0.563	0.7367
5-5-63	414	29	3.5681	0.586	0.7344
5-21-63	826	46	4.0570	0.522	0.7344
6-27-63	717	24	3.2635	0.542	0.7117
7-15-63	702	25	2.2009	0.240	0.4739
8-29-63	412	28	3.6823	0.679	0.7659
10-4-63	309	26	3.5052	0.615	0.7456
11-4-63	516	19	2.9175	0.579	0.6867
12-1-63	691	29	3.5159	0.552	0.7237
12-21-63	673	41	3.3446	0.366	0.6242
1-29-64	668	44	3.6730	0.409	0.6727
2-20-64	324	20	2.9487	0.550	0.6822
3-19-64	260	31	2.8784	0.323	0.5809
4-16-64	386	18	2.2363	0.333	0.5362
5-23-64	333	25	3.0809	0.480	0.6634
6-26-64	641	28	3.1354	0.429	0.6522
7-17-64	579	31	3.1810	0.419	0.6420
8-30-64	607	26	2.8243	0.385	0.6008
9-19-64	312	19	2.7860	0.526	0.6558
10-29-64	732	24	3.2213	0.542	0.7025

TABLE 8-1. (continued)

11-23-64	801	36	3.9150	0.611	0.7572
12-17-64	444	26	3.6288	0.692	0.7719
1-8-65	507	45	4.4484	0.711	0.8099
2-28-65	742	50	2.7303	0.180	0.4837
3-22-65	338	37	3.6894	0.514	0.7081
4-24-65	309	27	3.5540	0.630	0.7474
6-13-65	440	26	3.7443	0.731	0.7965
8-12-65	400	24	3.0677	0.500	0.6690
9-11-65	725	36	3.0487	0.333	0.5896
12-10-65	453	22	3.2714	0.636	0.7335

TABLE 8-2.

NUMBER OF SPECIMENS AND SPECIES OF COPEPODS OBSERVED AND

CALCULATED SPECIES DIVERSITY INDEX AND EQUITABILITY AT STATION W23

Date	No. of Specimens (N)	No. of Species (S)	Species Diversity Index (H)	Equitability $E = \frac{S'}{S}$	$E = \frac{H(S)}{H_{max}(S)}$
4-4-63	140	15	2.3789	0.467	0.6088
5-5-63	253	15	3.0293	0.800	0.7753
5-21-63	608	19	2.0925	0.316	0.4925
6-27-63	260	14	2.0608	0.429	0.5412
7-15-63	65	29	3.0681	0.414	0.6315
8-29-63	392	17	2.7851	0.588	0.6813
10-4-63	263	12	2.5963	0.667	0.7242
11-1-63	153	14	2.9801	0.786	0.7827
12-1-63	439	18	3.1268	0.667	0.7498
12-21-63	295	18	2.8446	0.556	0.6821
3-19-64	105	9	2.4795	0.889	0.7821
4-16-64	119	8	1.9661	0.625	0.6553
5-23-64	207	16	3.1936	0.813	0.7983
6-26-64	284	13	2.6121	0.615	0.7058
7-17-64	437	22	2.5748	0.364	0.5773
8-30-64	449	23	2.8304	0.435	0.6256
8-30-64	245	20	2.4790	0.400	0.5735
10-29-64	223	17	2.5313	0.471	0.6192
11-23-64	362	25	3.3349	0.560	0.7181
12-17-64	274	19	3.0922	0.632	0.7279

TABLE 8-2. (continued)

1-8-65	261	17	2.8573	0.588	0.6990
2-28-65	253	23	3.0184	0.522	0.6672
3-22-65	457	21	2.9685	0.524	0.6758
4-24-65	201	14	3.1920	0.929	0.8383
5-30-65	317	14	2.0897	0.429	0.5488
6-13-65	217	23	2.9979	0.478	0.6627
8-12-65	81	13	2.9551	0.846	0.7985
9-11-65	510	17	2.0309	0.294	0.4968
12-10-65	641	17	2.1648	0.353	0.5296

TABLE 8-3.

NUMBER OF SPECIMENS AND SPECIES OF COPEPODS OBSERVED AND CALCULATED SPECIES DIVERSITY INDEX AND EQUITABILITY AT STATION W24

Date	No. of Specimens (N)	No. of Species (S)	Species Diversity Index (H)	Equitability $E = \frac{S'}{S}$	$E = \frac{H(S)}{H_{max}(S)}$
4-6-63	365	6	1.1109	0.500	0.4297
5-3-63	111	10	2.4922	0.800	0.7501
5-22-63	717	21	2.7243	0.429	0.6202
6-27-63	100	16	3.3007	0.875	0.8251
7-15-63	209	19	2.8766	0.526	0.6771
8-28-63	120	13	2.8442	0.769	0.7685
10-3-63	304	12	1.9745	0.417	0.5507
11-3-63	148	13	3.2736	1.077	0.8846
12-1-63	452	18	2.8414	0.556	0.6813
3-20-64	178	13	1.7471	0.308	0.4721
4-17-64	55	7	1.4702	0.429	0.5236
5-25-64	197	11	2.7004	0.8182	0.7805
6-27-64	333	21	2.8650	0.476	0.6522
7-18-64	28	7	1.6835	0.571	0.5996
8-31-64	238	20	3.0498	0.600	0.7056
9-25-64	288	11	1.8599	0.454	0.5376
10-30-64	144	11	2.1003	0.454	0.6071
11-19-64	577	13	3.0521	0.923	0.8247
12-18-64	373	15	2.0997	0.400	0.5374
1-9-65	171	10	1.4034	0.300	0.4224
2-28-65	200	7	1.8561	0.714	0.6612

TABLE 8-3. (continued)

3-23-65	364	10	2.3232	0.700	0.6993
4-24-65	121	18	2.8352	0.556	0.6798
5-29-65	27	8	2.4726	1.00	0.8241
6-14-65	49	8	1.9267	0.625	0.6422
8-12-65	183	16	2.4480	0.437	0.6119
9-11-65	132	16	2.6239	0.500	0.6559
12-10-65	160	13	2.5443	0.6154	0.6875

TABLE 8-4.

NUMBER OF SPECIMENS AND SPECIES OF COPEPODS OBSERVED AND CALCULATED SPECIES DIVERSITY INDEX AND EQUITABILITY AT STATION W58

Date	No. of Specimens (N)	No. of Species (S)	Species Diversity Index (H)	Equitability $E = \frac{S'}{S}$	$E = \frac{H(S)}{H_{max}(S)}$
3-9-63	401	45	4.0300	0.533	0.7337
4-4-63	418	30	3.0305	0.400	0.6175
5-5-63	673	45	4.1804	0.600	0.7611
5-21-63	680	49	4.2528	0.571	0.7573
6-27-63	574	32	2.9356	0.344	0.5871
7-15-63	527	46	3.9800	0.500	0.7205
8-29-63	320	29	3.5930	0.586	0.7395
10-11-63	406	24	3.4601	0.667	0.7546
11-4-63	529	31	3.6673	0.581	0.7402
12-2-63	603	29	3.1678	0.448	0.6520
12-21-63	359	55	4.6410	0.673	0.8027
1-29-64	391	39	3.6959	0.487	0.6992
2-18-64	144	31	3.9199	0.710	0.7911
3-19-64	157	22	3.1332	0.545	0.7025
4-16-64	260	25	3.4600	0.640	0.7450
5-24-64	328	36	4.1065	0.694	0.7942
6-26-64	313	38	4.0825	0.658	0.7778
7-17-64	415	30	3.1344	0.400	0.6387
8-31-64	316	32	3.6733	0.562	0.7346
9-26-64	554	30	3.1396	0.433	0.6398

TABLE 8-4. (continued)

10-29-64	390	26	3.2584	0.538	0.6931
11-24-64	518	36	3.5546	0.472	0.6875
12-17-64	691	31	3.0315	0.387	0.6118
1-8-65	303	40	4.2356	0.700	0.7958
2-28-65	342	50	4.3359	0.600	0.7682
4-24-65	402	37	3.5898	0.459	0.6890
5-30-65	219	36	4.0559	0.667	0.7844
6-13-65	340	30	3.7773	0.667	0.7697
8-13-65	409	46	4.2784	0.630	0.7745
9-11-65	239	20	3.0788	0.600	0.7123
12-11-65	626	33	3.2836	0.424	0.6509

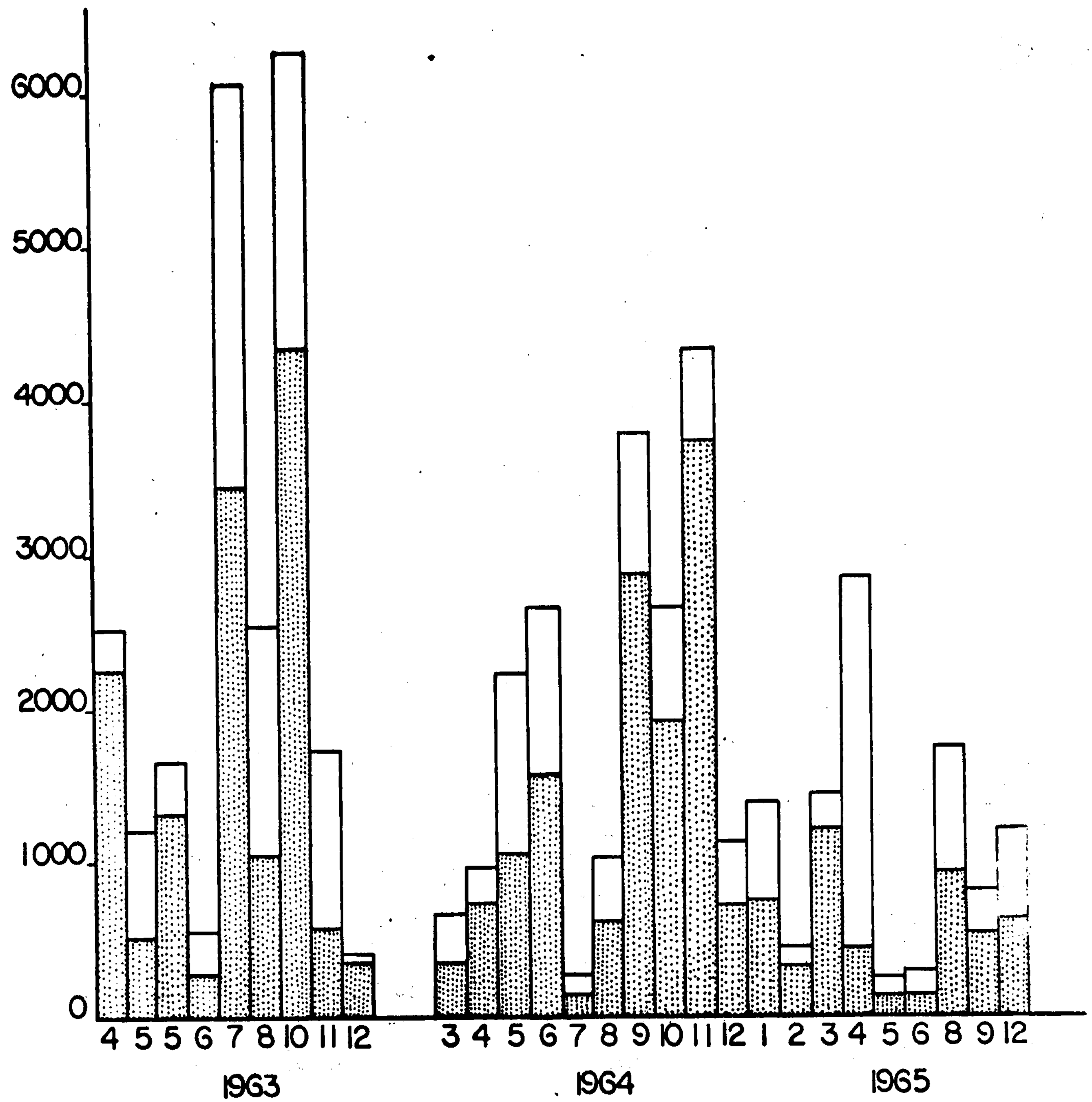

Figure 1-1. Numerical abundance of zooplankton per m^3 and proportion of copepods (shaded) at W24.

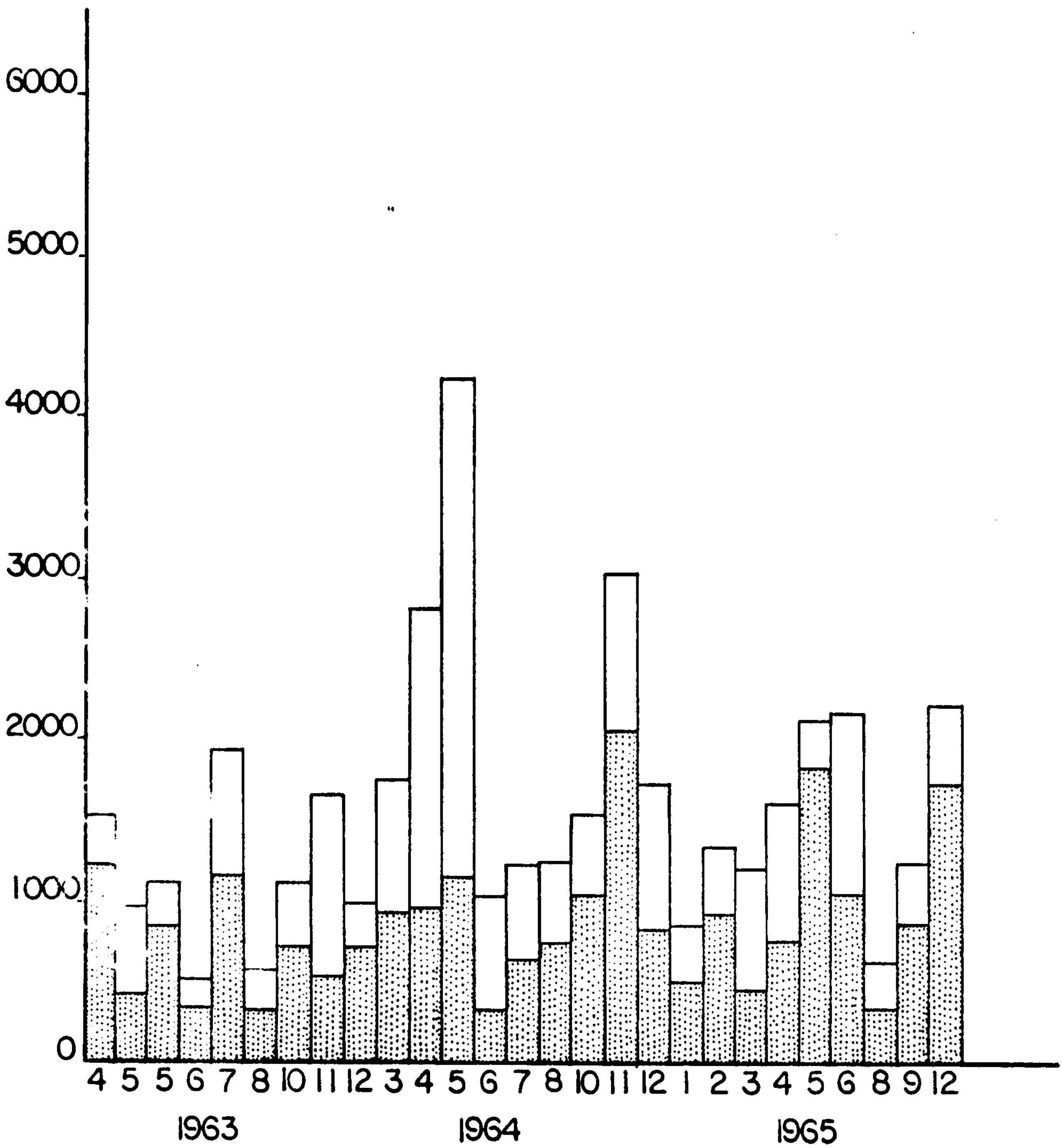

Figure 1-2. Numerical abundance of zooplankton per m^3 and proportion of copepods (shaded) at W23.

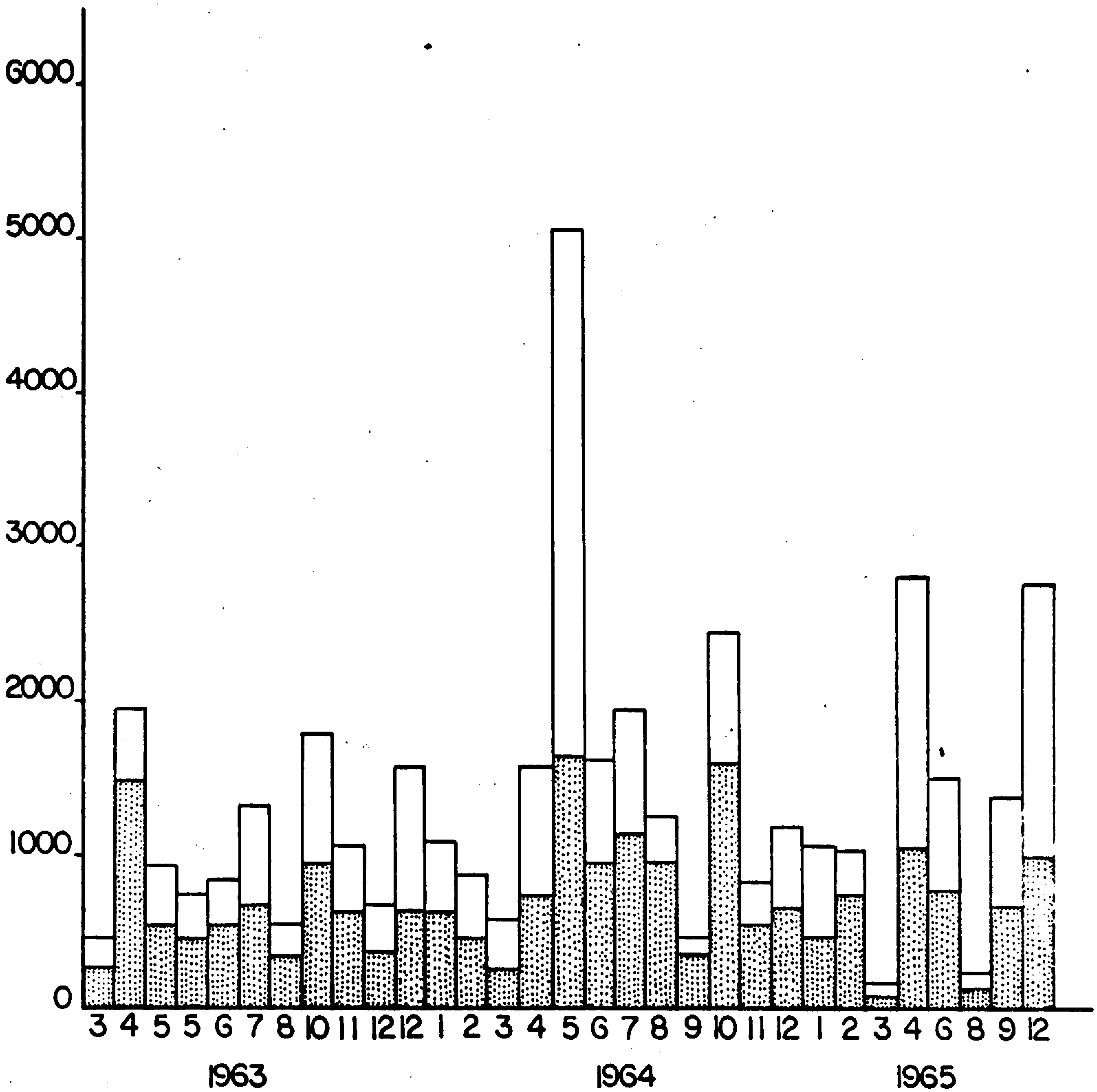

Figure 1-3. Numerical abundance of zooplankton per m^3 and proportion of copepods (shaded) at W22.

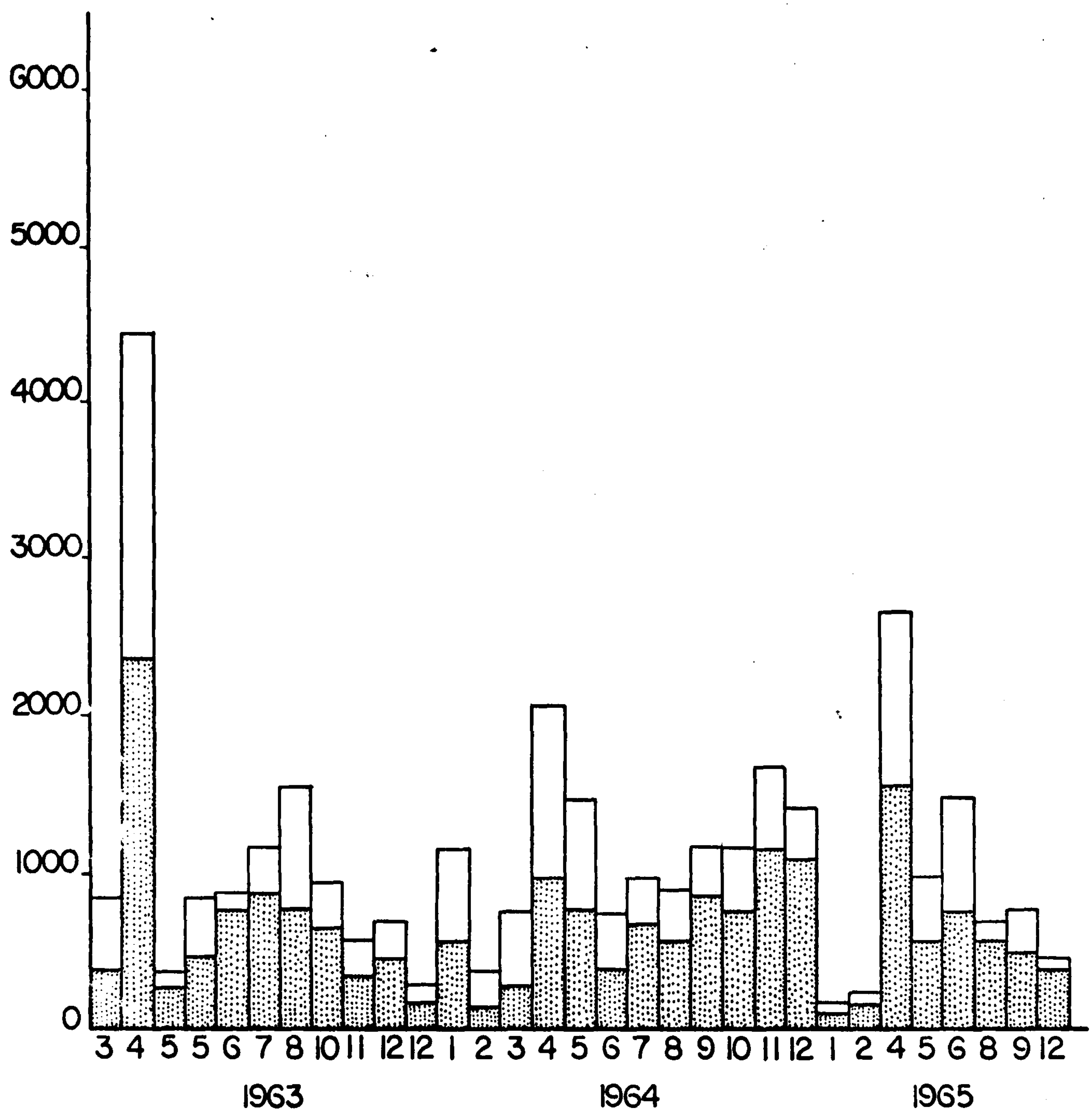

Figure 1-4. Numerical abundance of zooplankton per m^3 and proportion of copepods (shaded) at W58.

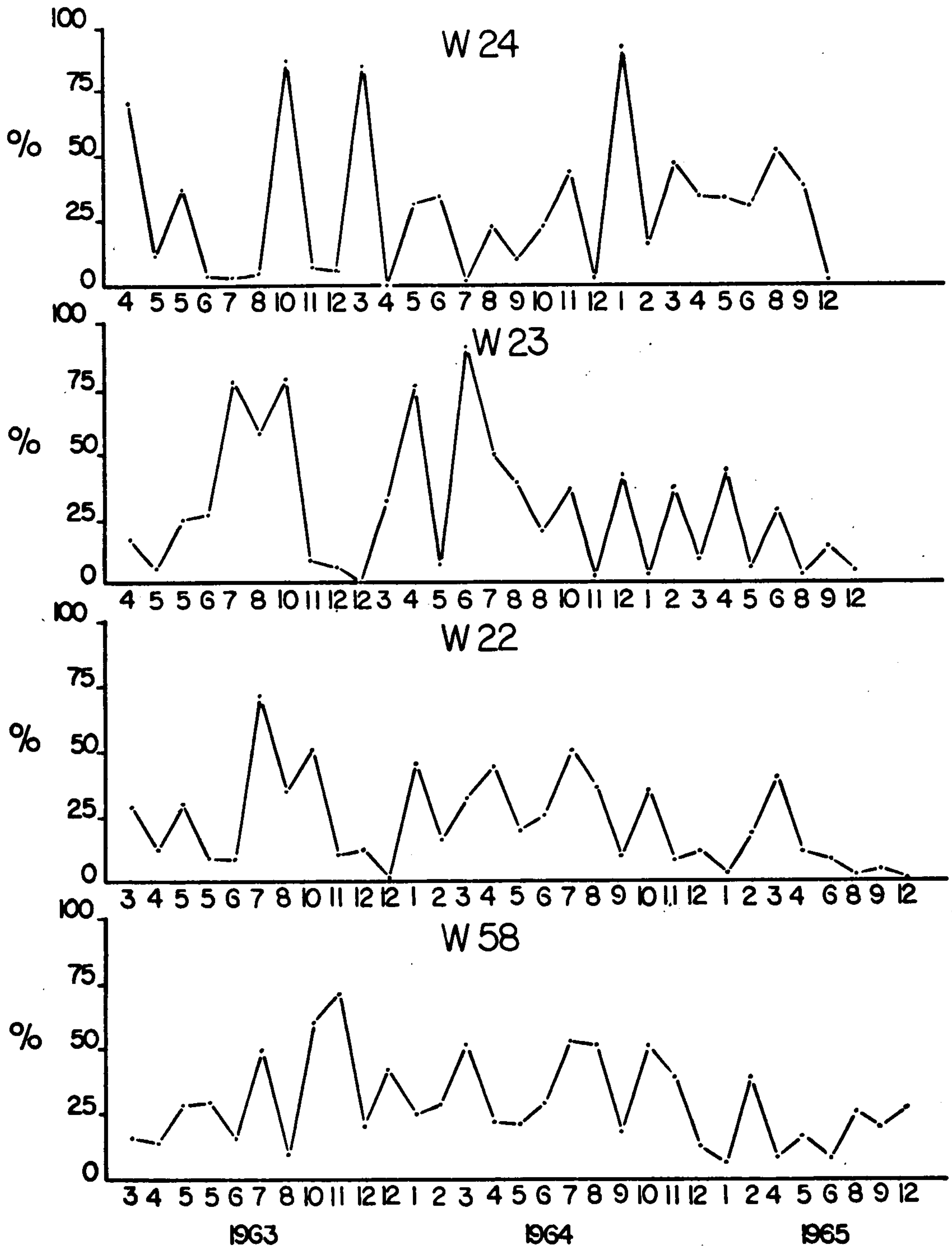

Figure 2. Percentage contribution of Larvacea to numerical abundan of zooplankton other than copepods.

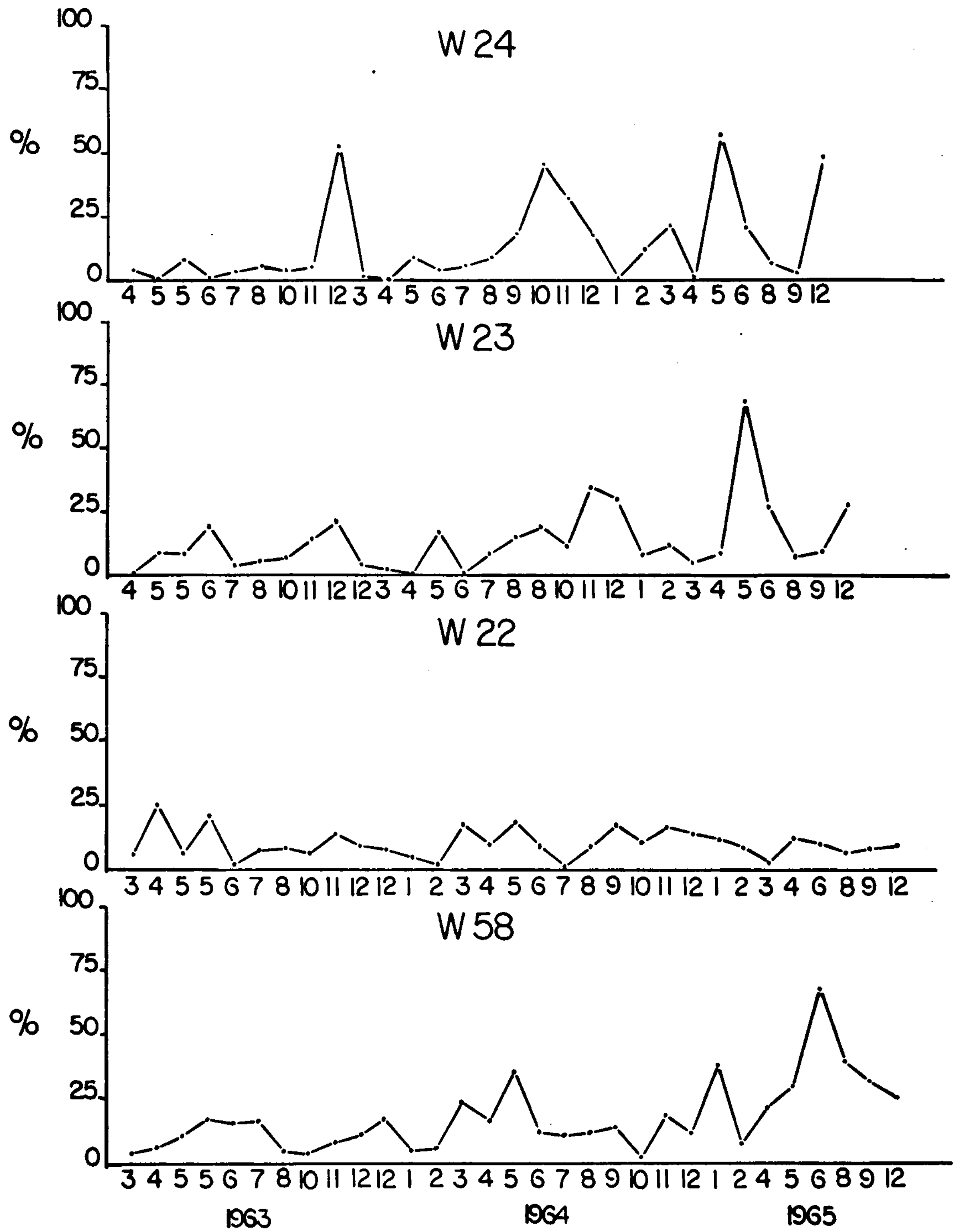

Figure 3 . Percentage contributions of Chaetognatha to numerical abundance of zooplankton other than copepods.

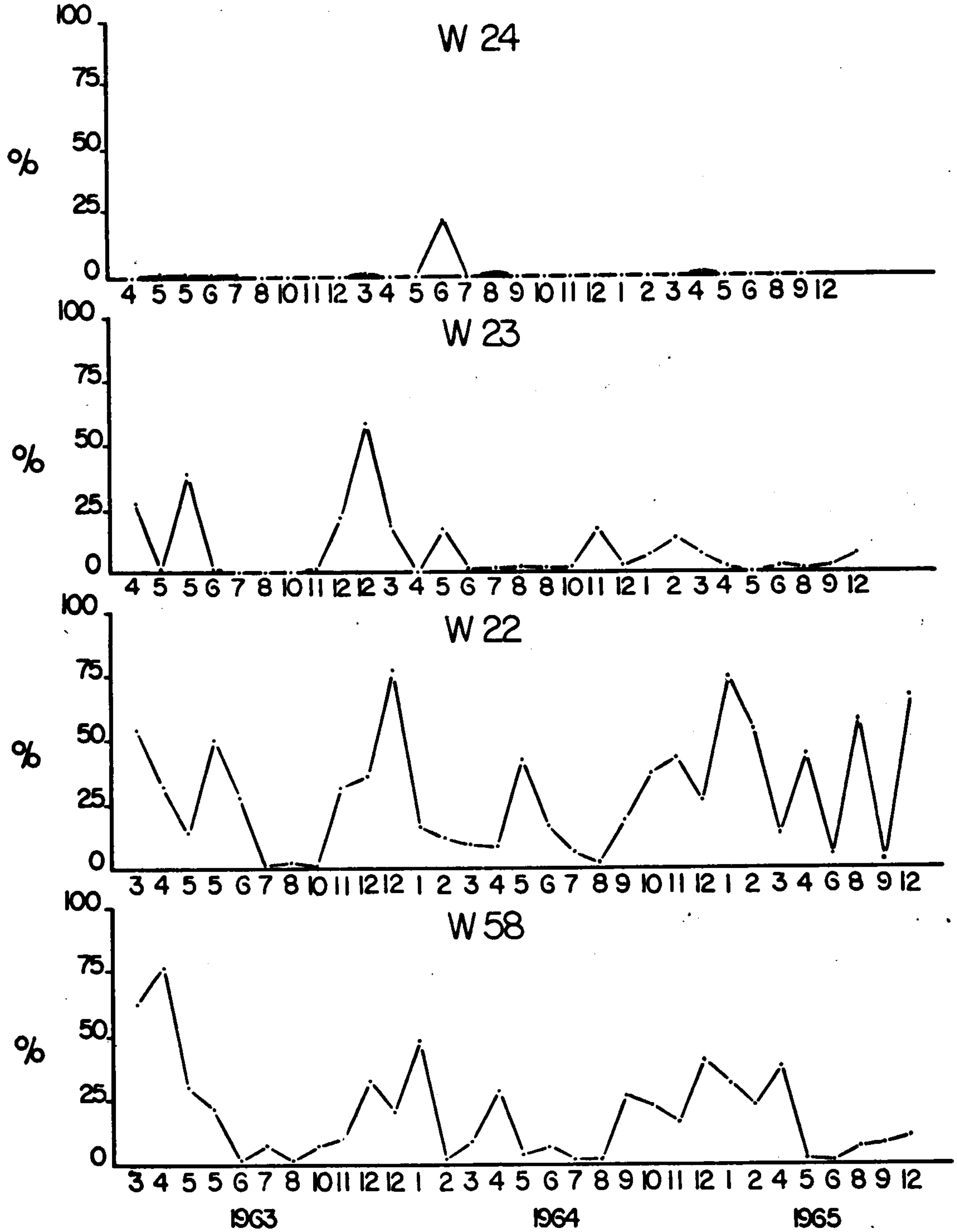

Figure 4. Percentage contribution of Ostracoda to numerical abundance of zooplankton other than copepods.

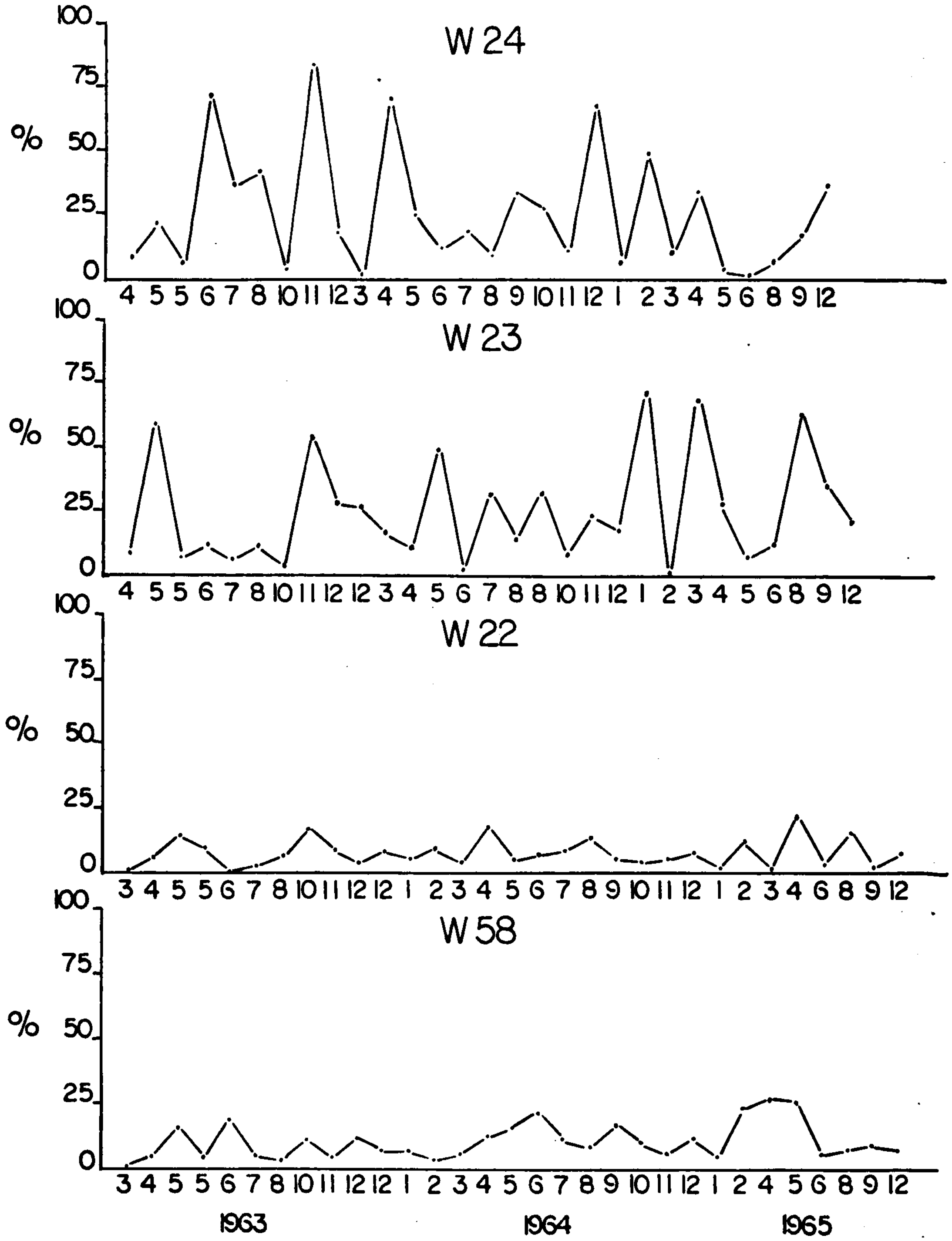

Figure 5. Percentage contribution of Mollusca to numerical abundance of zooplankton other than copepods.

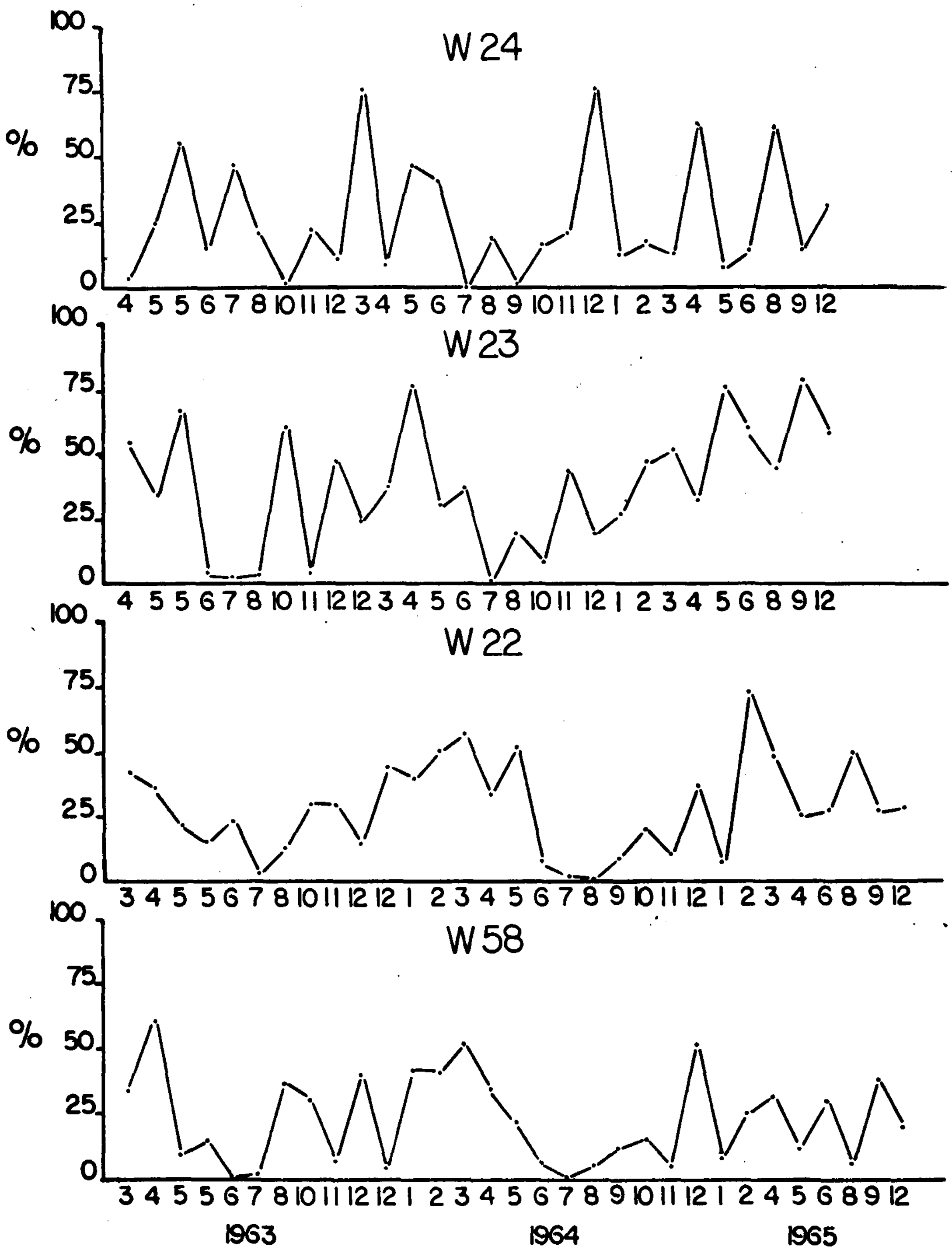

Figure 6. Percentage contribution of Paracalanus parvas group (P. indicus and P. quasimoto) to numerical abundance of adult female copepods.

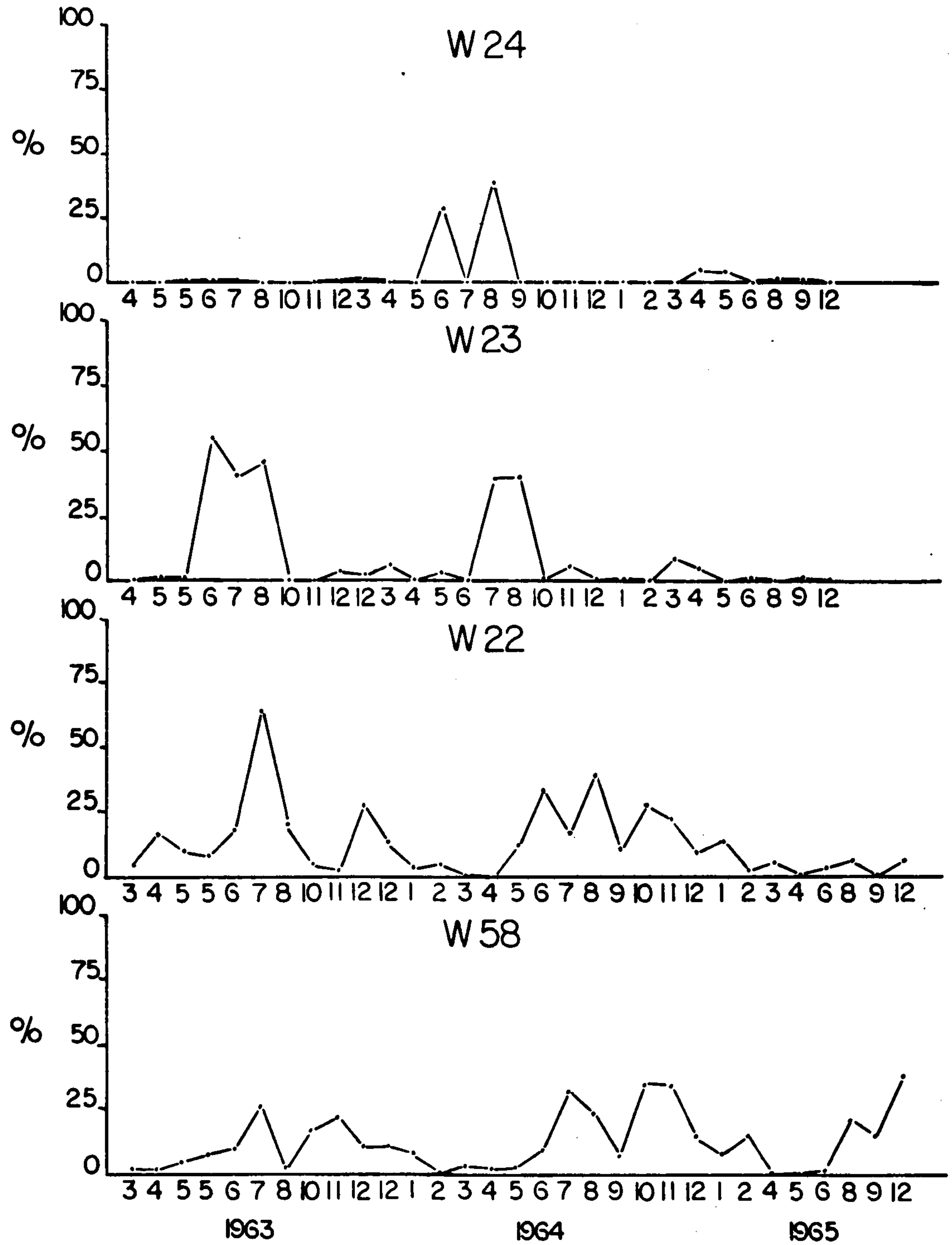

Figure 7. Percentage contribution of Clausocalanus furcatus to numerical abundance of adult female copepods.

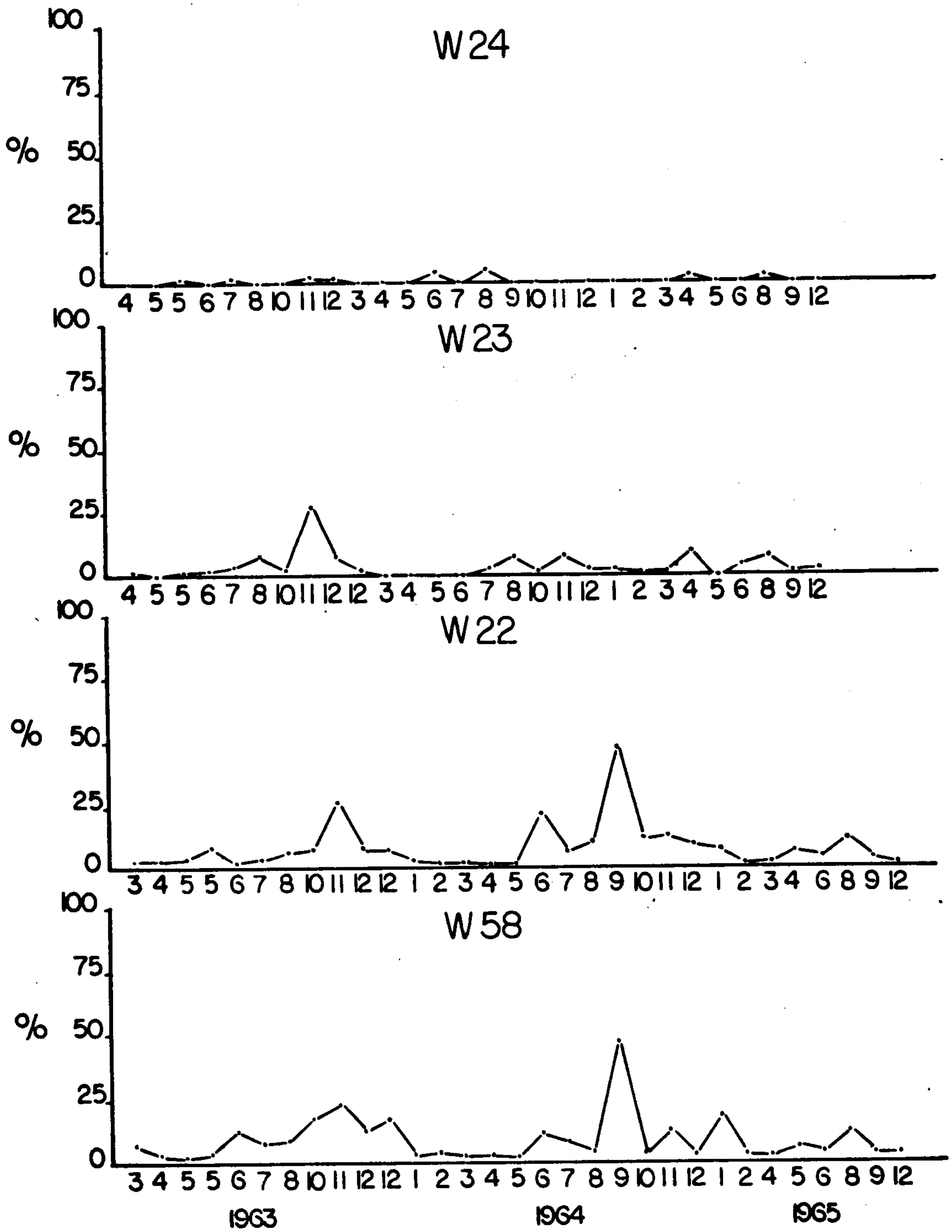

Figure 8. Percentage contribution of Oithona plumifera to numerical abundance of adult female copepods.

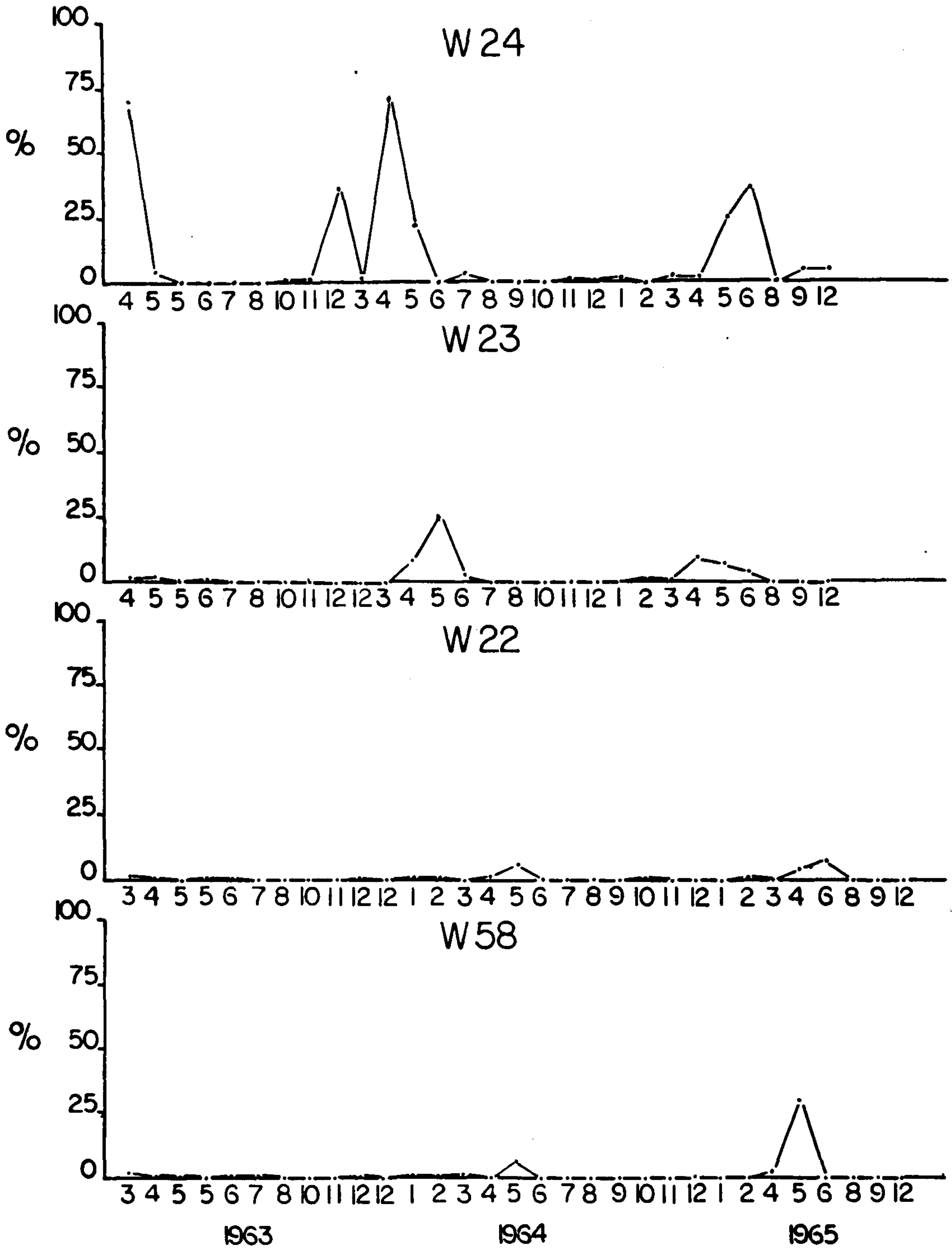

Figure 9. Percentage contribution of Acartia tonsa to numerical abundance of adult female copepods.

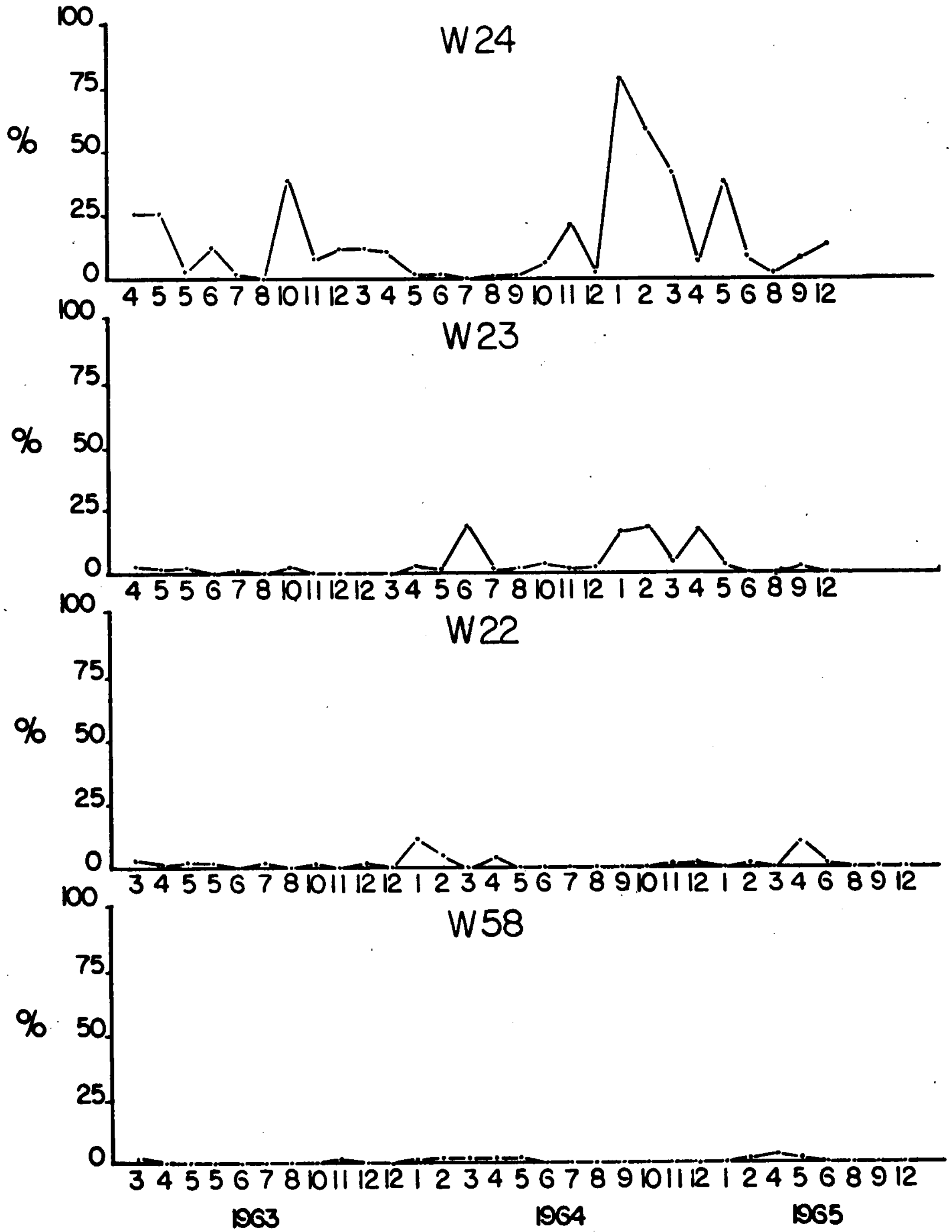

Figure 10. Percentage contribution of Paracalanus crassirostris to numerical abundance of adult female copepods.

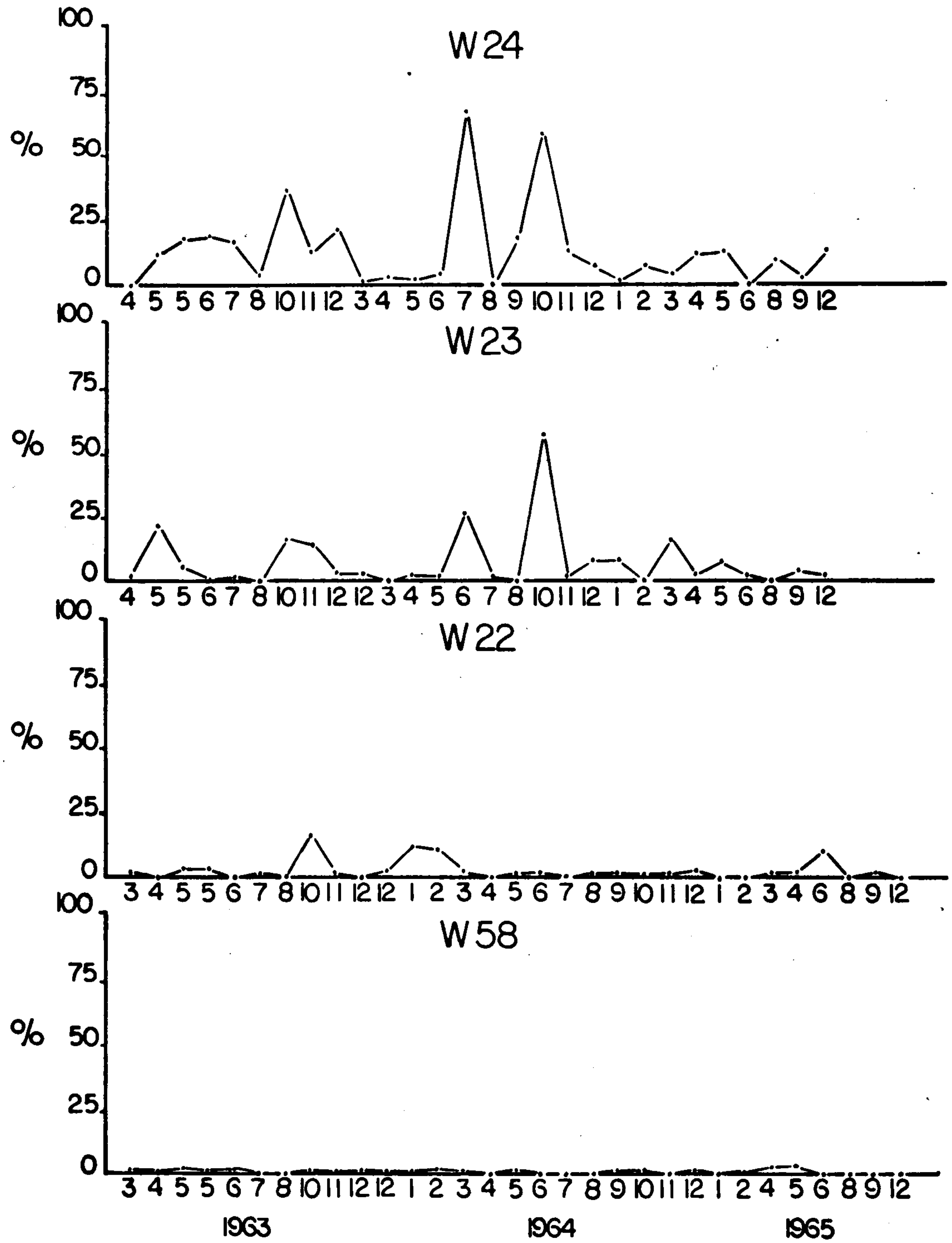

Figure 11. Percentage contribution of Oithona nana to numerical abundance of adult female copepods.

APPENDIX B

Larval Shrimp (*Penaeus* spp.)

LIST OF TABLES

Table 1

Average monthly catch (#/100 m^3) of Penaeus spp. larvae by stations in the 13.7 meter depth zone in 1962.

Month-Year	STATIONS				
	W- 1	W-12	W-13	W-24	W-25
01-62	0.0	- [1/]	0.0	0.0	0.0
02-62	0.0	-	0.0	0.0	0.0
03-62	0.0	0.0	0.0	0.0	0.0
04-62	0.0	0.0	0.0	0.0	0.0
05-62	14.7	0.0	6.7	0.0	-
06-62	0.0	-	98.7	4.4	0.0
07-62	1.6	2.8	19.0	2.3	1.9
08-62	39.8	0.0	0.0	0.0	24.0
09-62	0.0	0.0	23.3	5.7	8.9
10-62	3.2	0.0	3.1	1.9	8.0
11-62	0.0	0.0	0.0	0.0	0.0
12-62	0.0	-	0.0	0.0	0.0

1/ No sample taken.

Table 2

Average monthly catch (#/100 m^3) of Penaeus spp. larvae by stations in the 27.5 meter depth zone in 1962.

Month-Year	STATIONS				
	W- 2	W-11	W-14	W-23	W-26
01-62	0.0	-[1/]	-	0.0	0.0
02-62	0.0	-	0.0	0.0	0.0
03-62	0.0	0.0	0.0	0.0	0.0
04-62	0.0	0.0	0.0	0.0	0.0
05-62	8.3	2.3	-	-	-
06-62	0.0	0.0	1.2	0.0	34.4
07-62	1.3	1.9	4.8	2.3	0.0
08-62	2.7	0.8	0.0	0.0	9.5
09-62	46.8	16.7	15.9	20.6	49.3
10-62	8.1	26.1	0.0	0.0	40.2
11-62	0.0	15.2	3.9	5.2	5.0
12-62	0.0	-	5.6	0.0	0.0

1/ No sample taken.

Table 3

Average monthly catch (#/100 m^3) of *Penaeus* spp. larvae by stations in the 45.8 meter depth zone in 1962.

Month-Year	STATIONS				
	W- 3	W-10	W-15	W-22	W-27
01-62	0.0	1/	-	0.0	6.9
02-62	0.0	0.0	0.0	0.0	0.0
03-62	0.0	0.0	0.0	0.0	0.0
04-62	0.0	0.0	0.0	0.0	0.0
05-62	13.7	3.8	-	-	-
06-62	1.9	2.0	12.5	24.6	5.3
07-62	17.3	5.9	5.2	6.8	25.0
08-62	0.0	0.0	2.8	0.6	0.0
09-62	2.7	12.7	5.6	1.2	30.2
10-62	0.0	37.8	0.0	21.7	33.9
11-62	12.0	77.9	186.7	10.3	11.4
12-62	34.7	75.3	36.0	17.1	323.0

1/ No sample taken.

Table 4

Average monthly catch (#/100 m^3) of Penaeus spp. larvae by stations in the 64.0-109.7 meter depth zone in 1962.

Month-year	STATIONS														
	W- 4	W- 9	W-16	W-21	W-28	W- 5	W- 8	W-17	W-20	W-29	W- 6	W- 7	W-18	W-19	W-30
01-62	34.1	-[1]	-	0.0	-	0.0	-	-	0.0	-	0.0	-	-	0.0	-
02-62	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.7	0.0	0.0	0.0	0.0	0.0
03-62	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6
04-62	0.0	0.0	0.0	35.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0
05-62	0.0	27.8	-	-	-	0.8	0.0	-	-	-	0.0	2.0	-	-	-
06-62	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	-	0.0	-
07-62	0.0	1.2	1.3	1.6	3.1	0.0	2.7	1.6	1.7	1.4	0.0	-	0.0	1.5	0.0
08-62	0.0	0.9	6.8	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0
09-62	-	-	-	-	-	-	-	-	-	-	2.9	-	0.9	0.0	0.0
10-62	3.0	14.0	0.0	20.6	23.5	6.5	13.9	14.4	1.2	0.0	0.8	33.0	1.0	-	0.0
11-62	31.0	0.0	15.7	0.0	7.4	3.6	0.0	15.7	11.8	15.5	0.0	6.1	0.6	27.4	4.4
12-62	280.6	58.5	0.0	0.0	53.6	-	11.2	9.4	0.0	0.0	-	0.0	-	-	0.0

1/ No sample taken.

Table 5

Average monthly catch (#100 m^3) of Penaeus spp. larvae by stations in the 7.3-13.7 meter depth zone over a 3-year period, 1963-1965.

Month-year	STATIONS							
	W-53	W-55	W-56	W-59	W-60	W- 1	W-13	W-24
01-63	-1/	-	-	-	-	0.0	1.9	-
02-63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
03-63	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0
04-63	0.0	0.0	0.0	0.0	-	0.0	0.0	4.2
05-63	0.0	0.0	16.1	0.0	-	0.0	0.0	84.3
06-63	16.0	40.0	0.0	0.0	0.0	10.5	0.0	17.5
07-63	0.0	0.0	-	0.0	4.0	35.2	104.2	717.1
08-63	0.0	0.0	5.8	13.3	426.0	0.0	7.3	123.8
09-63	0.0	0.0	0.0	0.0	4.9	0.0	0.0	0.0
10-63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-63	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0
12-63	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
01-64	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
02-64	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
03-64	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
04-64	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
05-64	0.0	0.0	0.0	-	0.0	5.9	0.0	25.0
06-64	0.0	20.8	148.5	0.0	3.5	0.0	2.6	7.4
07-64	5.6	0.0	0.0	0.0	0.0	5.2	7.9	0.0
08-64	3.8	0.0	0.0	10.2	2.0	0.0	10.0	110.7
09-64	0.0	0.0	2.9	2.9	0.0	0.0	0.0	0.0
10-64	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-64	-	0.0	0.0	0.0	0.0	-	0.0	0.0
12-64	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
01-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
02-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
03-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
04-65	0.0	13.8	31.6	0.0	195.9	14.0	150.0	167.2
05-65	0.0	0.0	0.0	0.0	0.0	3.9	0.0	0.0
06-65	32.0	0.0	0.0	7.3	0.0	0.0	4.3	13.8
07-65	-	-	-	-	-	-	-	-
08-65	0.0	0.0	-	0.0	0.0	0.0	57.1	0.0
09-65	0.0	0.0	0.0	17.8	-	0.0	11.6	11.9
10-65	-	-	-	-	-	-	-	-
11-65	-	-	-	-	-	-	-	-
12-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

1/ No sample taken.

Table 6

Average monthly catch (#/100 m^3) of Penaeus spp. larvae by stations in the 22.9-27.5 meter depth zone over a 3-year period, 1963-1965.

Month-Year	STATIONS W-61	W- 2	W-14	W-23
01-63	1/	0.0	0.0	-
02-63	0.0	0.0	0.0	0.0
03-63	0.0	0.0	0.0	0.0
04-63	-	3.1	147.8	71.1
05-63	-	228.8	2.7	0.0
06-63	12.0	10.0	0.0	3.6
07-63	-	10.2	101.9	358.7
08-63	61.2	-	4.0	2.2
09-63	3.5	976.0	4.9	0.0
10-63	0.0	13.0	395.5	131.2
11-63	2.1	11.2	14.7	1.9
12-63	0.0	7.4	4.3	-
01-64	0.0	0.0	0.0	0.0
02-64	-	0.0	0.0	0.0
03-64	0.0	0.0	0.0	0.0
04-64	0.0	0.0	2.3	3.9
05-64	0.0	27.9	14.6	9.3
06-64	2.1	43.2	27.8	0.0
07-64	2.5	2.1	7.0	4.7
08-64	2.3	912.7	27.8	48.1
09-64	38.6	91.4	13.3	12.3
10-64	0.0	6.0	57.3	4.2
11-64	0.0	34.7	152.1	10.5
12-64	0.0	1.7	2.2	2.0
01-65	0.0	0.0	0.0	0.0
02-65	0.0	4.6	0.0	0.0
03-65	0.0	0.0	0.0	0.0
04-65	15.4	0.0	4.9	0.0
05-65	0.0	29.0	13.3	0.0
06-65	0.0	21.0	0.0	0.0
07-65	-	-	-	-
08-65	57.1	18.6	0.0	0.0
09-65	-	10.3	102.4	201.2
10-65	-	-	-	-
11-65	-	-	-	-
12-65	0.0	0.0	0.0	0.0

1/ No samples taken.

Table 7

Average monthly catch (#/100 m^3) of *Penaeus* spp. larvae by stations in the 45.8 meter depth zone over a 3-year period, 1963-1965.

Month-Year	STATIONS			
	W- 3	W-15	W-22	W-62
01-63	20.0	1/	-	-
02-63	0.0	0.0	0.0	0.0
03-63	0.0	0.0	0.0	0.0
04-63	40.8	98.9	36.0	-
05-63	93.2	10.2	0.0	-
06-63	20.0	22.2	0.0	0.0
07-63	14.8	18.0	3.6	0.0
08-63	-	2.0	2.0	26.7
09-63	1244.4	5898.7	358.7	492.4
10-63	181.3	515.7	103.9	99.1
11-63	173.6	94.7	29.2	307.7
12-63	70.1	25.6	-	38.2
01-64	0.0	0.0	0.0	0.0
02-64	0.0	0.0	0.0	-
03-64	0.0	0.0	0.0	0.0
04-64	38.0	53.9	2.2	0.0
05-64	25.4	27.7	108.3	24.0
06-64	31.8	0.0	0.0	0.0
07-64	12.0	0.0	2.3	16.7
08-64	14.4	7.7	6.6	29.0
09-64	22.5	572.0	312.0	69.8
10-64	115.8	421.2	57.8	70.7
11-64	250.6	375.7	23.6	29.3
12-64	28.4	16.8	36.2	21.9
01-65	-	0.0	19.4	0.6
02-65	3.3	0.0	-	0.0
03-65	0.0	0.0	0.0	0.0
04-65	0.0	0.0	4.4	26.1
05-65	3.6	35.6	0.0	0.0
06-65	0.0	47.8	0.0	3.6
07-65	0.0	0.0	0.0	0.0
08-65	0.0	2.4	0.0	0.0
09-65	14.3	3.5	33.3	-
10-65	0.0	0.0	0.0	0.0
11-65	0.0	0.0	0.0	0.0
12-65	88.1	94.6	93.9	0.0

1/ No sample taken.

Table 8

Average monthly catch (#/100 m^3) of Penaeus spp. larvae by stations in the 64.0-109.7 meter depth zone over a 3-year period, 1963-1965.

Month-Year	STATIONS			
	W-54	W-57	W-58	W- 6
01-63	3.9	1/	-	1.4
02-63	0.0	0.0	0.0	0.0
03-63	0.0	0.0	0.0	0.0
04-63	0.0	0.0	7.7	0.0
05-63	0.0	2.7	0.0	0.0
06-63	0.0	0.0	0.0	0.0
07-63	28.8	6.4	1.7	1.3
08-63	-	0.0	9.9	-
09-63	152.6	6.4	230.4	15.8
10-63	1.6	11.7	12.8	0.0
11-63	42.4	54.0	106.5	1.3
12-63	20.3	73.7	4.4	12.0
01-64	0.0	0.0	0.0	2.3
02-64	0.0	0.0	3.5	0.0
03-64	0.0	3.2	0.0	0.0
04-64	0.0	1.2	0.0	0.0
05-64	0.0	16.1	0.0	0.0
06-64	33.3	0.0	0.0	7.7
07-64	1.4	4.5	0.0	0.0
08-64	5.1	6.6	2.4	0.0
09-64	13.9	89.7	834.6	1.7
10-64	4.1	21.7	94.0	0.0
11-64	94.6	5.9	76.1	21.4
12-64	16.6	6.8	63.5	3.3
01-65	0.0	0.0	0.0	2.9
02-65	4.3	6.9	0.0	0.0
03-65	0.0	1.8	-	0.0
04-65	0.0	0.0	46.3	0.0
05-65	4.6	0.0	0.0	0.0
06-65	0.0	6.7	36.1	0.0
07-65	-	-	-	-
08-65	0.0	0.0	3.0	0.0
09-65	-	3.9	14.1	-
10-65	-	-	-	-
11-65	-	-	-	-
12-65	16.1	83.8	0.0	0.0

1/ No sample taken.

APPENDIX C

Ichthyoplankton

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Table 1. Station locations and depths for Texas outer continental shelf study.

Transect	Station	Latitude	Longitude	Depth (meters)
I	1	28°12'	96°27'	18
	2	27°54'5"	96°19'5"	42
	3	27°33'5"	96°06'5"	134
II	1	27°40'	96°59'	22
	2	27°30'	96°44'5"	49
	3	27°17'5"	96°23'	131
III	1	26°57'5"	97°11'	25
	2	26°57'5"	96°48'	65
	3	26°57'5"	96°32'5"	106
IV	1	26°10'	97°00'5"	27
	2	26°10'	96°39'	47
	3	26°10'	96°24'	91

Table 2. BLM ichthyoplankton data for first sampling cruise from December 5, 1974 to January 25, 1975 by transect, station, and time.

Transect and station	Date (1974-75)	Time (CST)	Water filtered per m^3	Total number eggs	Number eggs per 1000 m^3	Total number larvae	Number larvae per 1000 m^3
I(1)D*	12/6	1027-1043	940.4	472	502	312	332
N*	12/5	2043-2103	1,105.4	1,342	1,214	512	463
I(2)D	12/5	1343-1359	983.6	392	399	1,138	1,157
N	12/4	0112-0127	897.3	320	357	1,296	1,444
I(3)D	12/4	1105-1116	488.5	116	237	328	671
N	12/5	2223-2241	918.4	440	479	3,232	3,519
II(1)D	12/17	1358-1419	301.5	616	2,043	204	677
N	12/17	2123-2137	448.4	3,950	8,809	166	370
II(2)D	1/9	1420-1432	460.7	880	1,910	668	1,450
N	12/18	0103-0117	740.4	1,112	1,502	1,666	2,250
II(3)D	12/12	1429-1451	332.4	224	674	192	578
N	12/11	2205-2222	221.6	284	1,282	416	1,877
III(1)D	12/15	1012-1023	546.4	256	469	22	40
N	12/14	1924-1937	559.5	172	307	136	243
III(2)D	12/14	1256-1313	410.3	850	2,072	320	780
N	12/13	2026-2038	351.1	204	581	522	1,487
III(3)D	12/13	1237-1251	806.7	46	57	816	1,012
N	12/12	1956-2024	403.6	66	164	416	1,031

Table 2. (Continued)

Transect and station	Date (1974-75)	Time (CST)	Water filtered per m^3	Total number eggs	Number eggs per 1000 m^3	Total number larvae	Number larvae per 1000 m^3
IV(1)D	1/22	1216-1224	527.2	152	288	30	57
N	1/21	2112-2123	691.8	90	130	44	64
IV(2)D	1/24	1419-1433	894.5	1,474	1,648	900	1,006
N	1/24	2215-2230	1,126.4	3,868	3,434	2,834	2,516
IV(3)D	1/25	1345-1400	942.0	378	401	722	766
N	1/25	2209-2221	974.9	956	981	3,942	4,043

*D - Denotes day samples.
*N - Denotes night samples.

Table 3. BLM ichthyoplankton data for second sampling cruise from April 16 to May 15, 1975, by transect, station, and time.

Transect and station	Date (1975)	Time (CST)	Water filtered per m^3	Total number eggs	Number eggs per 1000 m^3	Total number larvae	Number larvae per 1000 m^3
I(1)D*	5/6	1408-1422	583.5	258	442	308	528
N*	5/6	2101-2114	447.2	12	26	3,790	8,474
I(2)D	5/6	1107-1119	711.1	326	458	172	242
N	5/6	2341-2356	608.1	106	174	582	957
I(3)D	5/6	0817-0830	980.6	192	196	1,710	1,744
N	5/7	0304-0316	718.3	156	217	2,048	2,851
II(1)D	4/17	1301-1316	436.5	860	1,970	728	1,668
N	4/16	2233-2248	257.4	2,628	10,210	1,490	5,789
II(2)D	4/17	1643-1656	562.0	1,718	3,057	240	427
N	4/17	2217-2231	852.2	5,352	6,280	1,408	1,652
II(3)D	5/16	1056-1111	1,072.6	88	82	126	117
N	5/16	0028-0042	945.0	302	320	512	542
III(1)D	5/14	1150-1205	360.1	8	22	68	189
N	5/13	2314-2328	345.9	62	179	248	717
III(2)D	5/15	1122-1136	706.6	358	507	412	583
N	5/15	0009-0022	865.8	888	1,026	1,704	1,968
III(3)D	5/16	1325-1339	939.0	734	782	706	752
N	5/15	2356-0011	813.0	226	278	1,888	2,322

Table 3. (Continued)

Transect and station	Date (1975)	Time (CST)	Water filtered per m^3	Total number eggs	Number eggs per 1000 m^3	Total number larvae	Number larvae per 1000 m^3
IV(1)D	5/1	1238-1252	339.6	178	524	292	860
N	5/1	2207-2219	357.1	246	689	1,754	4,912
IV(2)D	5/2	1330-1344	660.8	448	678	960	1,453
N	4/29	0245-0259	645.9	602	932	964	1,493
IV(3)D	4/30	1142-1156	615.2	194	315	114	185
N	4/29	2328-2342	581.4	88	151	822	1,414

*D - Denotes day samples.
*N - Denotes night samples.

Table 4. BLM ichthyoplankton data for third sampling cruise from August 27 to September 30, 1975, by transect, station, and time.

Transect and station	Date (1975)	Time (CST)	Water filtered per m^3	Total number eggs	Number eggs per 1000 m^3	Total number larvae	Number larvae per 1000 m^3
I(1)D*	8/27	1130-1140	448.3	2,450	5,465	1,746	3,895
N*	8/26	2320-2330	438.0	1,568	3,580	4,518	10,315
I(2)D	8/27	1558-1609	401.0	750	1,870	464	1,157
N	8/27	2355-0005	446.5	1,722	3,857	2,638	5,908
I(3)D	9/29	1621-1635	687.1	128	186	774	1,126
N	9/30	0236-0249	853.7	206	241	1,552	1,818
II(1)D	9/4	1019-1024	87.0	302	3,471	468	5,379
N	9/4	2231-2240	232.1	2,086	8,988	936	4,033
II(2)D	9/5	1107-1118	590.1	240	407	2,618	4,437
N	9/5	2253-2306	728.3	124	170	1,902	2,612
II(3)D	9/6	1546-1600	548.8	172	313	424	773
N	9/6	2238-2249	448.6	156	348	862	1,922
III(1)D	9/8	1301-1312	310.0	1,608	5,187	744	2,400
N	9/8	2316-2329	407.1	1,258	3,090	1,838	4,515
III(2)D	9/7	1559-1613	638.4	100	157	1,058	1,657
N	9/8	0124-0138	570.5	190	333	1,326	2,324
III(3)D	9/7	1346-1400	434.1	172	396	358	825
N	9/7	2223-2237	513.3	208	405	1,012	1,972

Table 4. (Continued)

Transect and station	Date (1975)	Time (CST)	Water filtered per m^3	Total number eggs	Number eggs per 1000 m^3	Total number larvae	Number larvae per 1000 m^3
IV(1)D	9/12	1125-1140	539.5	3,780	7,006	822	1,524
N	9/11	2139-2153	537.5	3,114	5,793	928	1,727
IV(2)D	9/12	1530-1541	197.5	1,756	8,891	290	1,468
N	9/13	0243-0256	631.8	530	839	3,846	6,087
IV(3)D	9/13	1410-1422	401.0	206	514	1,266	3,157
N	9/12	2248-2302	698.7	300	429	2,108	3,017

*D - Denotes day samples.
*N - Denotes night samples.

Table 5 Fish larvae from Cruise 1 showing family, genera, and species (December 6, 1974 - January 25, 1975).

Family	Genus	Species
AULOPIDAE		
(aulopus)	*Aulopus*	sp.
BATRACHOIDIDAE		
(toadfishes)	*Porichthys*	*porosissimus*
BOTHIDAE		
(lefteye flounders)	*Citharichthys*	sp.
	Bothus	sp.
	Paralichthys	sp.
	Bothus	*ocellatus*
BREGMACEROTIDAE		
(codlets)	*Bregmaceros*	*atlanticus*
	Bregmaceros	sp.
CARANGIDAE		
(jacks)	*Decapterus*	*punctatus*
CLUPEIDAE		
(herrings)	*Brevoortia*	*patronus*
	Brevoortia	sp.
	Etrumeus	*teres*
	Sardinella	sp.
CONGRIDAE		
(conger eels)	--	--
CYNOGLOSSIDAE		
(tonguefishes)	*Symphurus*	sp.
DYSOMMIDAE		
(arrowtooth eels)	--	--
ENGRAULIDAE		
(anchovies)	*Anchoa*	sp.
	Engraulis	*eurystole*
GADIDAE		
(codfishes)	*Urophycis*	sp.
GEMPYLIDAE		
(snake mackerels)	--	--

Table 5 (Continued)

Family	Genus	Species
GOBIIDAE (gobies)	Gobionellus	sp.
	Gobiosoma	sp.
GONOSTOMATIDAE (lightfishes)	Gonostoma	elongatum
LABRIDAE (wrasses)	--	--
MICRODESMIDAE (wormfishes)	Microdesmus	sp.
MUGILIDAE (mullets)	Mugil	sp.
MYCTOPHIDAE (lanternfishes)	Diaphus	sp.
	Ceratoscopelus	sp.
	Ceratoscopelus	warmingi
	Hygophum	sp.
	Diogenichthys	sp.
	Myctophum	sp.
	Benthosoma	suborbitale
	Notolychnus	valdiviae
	Hygophum	reinhardti
	Myctophum	obtusirostre
NETTASTOMIDAE (nettastomids)	--	--
OPHICHTHIDAE (snake eels)	Myrophis	punctatus
OPHIDIIDAE (cuskeels and brotulas)	Rissola	marginata
	Lepophidium	sp.
	Ophidion	sp.
OSTRACIIDAE (boxfishes)	Lactophrys	sp.
POMADASYIDAE (grunts)	--	--

Table 5 (Continued)

Family	Genus	Species
SCIAENIDAE (drums)	Cynoscion	sp.
	Menticirrhus	sp.
	Micropogon	undulatus
	Leiostomus	xanthurus
SCOMBRIDAE (mackerels and tunas)	Scomber	sp.
SCORPAENIDAE (scorpionfishes)	Scorpaena	sp.
SERRANIDAE (sea basses)	Centropristis	sp.
	Serranus	sp.
SPARIDAE (porgies)	Lagodon	rhomboides
STROMATEIDAE (butterfishes)	Peprilus	sp.
SYNGNATHIDAE (pipefishes and seahorses)	Syngnathus	louisianae
SYNODONTIDAE (lizardfishes)	Synodus	sp.
	Synodus	foetens
TRICHIURIDAE (cutlassfishes)	Trichiurus	lepturus
TRIGLIDAE (searobin)	Prionotus	sp.

Table 6 Fish larvae from Cruise 2 showing family, genera, and species (April 16 - May 15, 1975).

Family	Genus	Species
BALISTIDAE (triggerfishes and filefishes)	*Monacanthus*	sp.
BLENNIIDAE (combtooth blennies)	--	sp.
BOTHIDAE (lefteye flounders)	--	sp.
	Bothus	*ocellatus*
	Bothus	sp.
	Citharichthys	sp.
	Cyclopsetta	sp.
	Etropus	*microstomus*
	Monolene	sp.
	Paralichthys	sp.
	Syacium	sp.
	Citharichthys	*arctifrons*
BREGMACEROTIDAE (codlets)	*Bregmaceros*	*atlanticus*
	Bregmaceros	sp.
CALLIONYMIDAE (dragonets)	*Callionymus*	sp.
CARANGIDAE (jacks)	--	sp.
	Caranx	sp.
	Chloroscombrus	*chrysurus*
	Decapterus	*punctatus*
	Seriola	sp.
CLUPEIDAE (herrings)	--	sp.
	Brevoortia	*patronus*
	Etrumeus	*teres*
	Harengula	*jaguana*
	Opisthonema	*oglinum*
CONGRIDAE (conger eels)	--	sp.
CYNOGLOSSIDAE (tonguefishes)	*Symphurus*	sp.

Table 6 (Continued)

Family	Genus	Species
ENGRAULIDAE (anchovies)	Anchoa	hepsetus
	Engraulis	eurystole
	--	sp.
EPHIPPIDAE (spade fishes)	Chaetodipterus	faber
EXOCOETIDAE (flyingfishes and halfbeaks)	--	sp.
GEMPYLIDAE (snake mackerel)	--	sp.
GOBIESOCIDAE (clingfishes)	Gobiesox	strumosus
GOBIIDAE (gobies)	Gobiomellus	sp.
	Ioglossus	calliurus
	--	sp.
	Bathygobius	soporator
GONOSTOMATIDAE (lightfishes)	--	sp.
GRAMMISTIDAE (soapfishes)	Rypticus	saponaceus
LABRIDAE (wrasses)	--	sp.
LUTJANIDAE (snappers)	--	sp.
MELANOSTOMIATIDAE (scaleless dragonfishes)	--	sp.
MICRODESMIDAE (wormfishes)	Microdesmus	sp.
MUGILIDAE (mullets)	Mugil	sp.
	Mugil	curema

Table 6. (Continued)

Family	Genus	Species
MURAENESOCIDAE (pike congers)	Hoplunnis	sp.
MYCTOPHIDAE (lanternfishes)	Ceratoscopelus	maderensis
	Ceratoscopelus	warmingi
	Diaphus	sp.
	Hygophum	reinhardti
	Hygophum	sp.
	Myctophum	sp.
	--	sp.
NETTASTOMIDAE (nettastomids)	--	sp.
OGCOCEPHALIDAE (batfishes)	Ogcocephalus	sp.
	--	sp.
OPHICHTHIDAE (snake eels)	Myrophis	punctatus
	Myrophis	sp.
	--	sp.
OPHIDIIDAE (cuskeels and brotulas)	Lepophidium	sp.
	Ophidion	sp.
	Otophidium	omostigmum
	--	sp.
OPISTHOGNATHIDAE (jawfishes)	Lonchopisthus	sp.
POMADASYIDAE (grunts)	--	sp.
SCIAENIDAE (drums)	Cynoscion	arenarius
	Cynoscion	nebulosus
	Cynoscion	nothus
	Cynoscion	sp.
	Menticirrhus	sp.
	--	sp.

Table 6 (Continued)

Family	Genus	Species
SCOMBRIDAE		
(mackerels and tunas)	*Auxis*	sp.
	Euthynnus	sp.
	Scomberomorus	*cavalla*
	Scomberomorus	*maculatus*
	Thunnus	*thynnus*
	--	sp.
SCORPAENIDAE		
(scorpionfishes)	--	sp.
SERRANIDAE		
(sea basses)	*Diplectrum*	sp.
	Centropristis	sp.
	Epinephelus	sp.
	Serranus	sp.
	--	sp.
	Diplectrum	*bivittatum*
SOLEIDAE		
(soles)	--	sp.
SPARIDAE		
(porgies)	*Diplodus*	*holbrooki*
	Lagodon	*rhomboides*
	Pagrus	*sedecim*
	--	sp.
SPHYRAENIDAE		
(barracudas)	*Sphyraena*	*borealis*
	Sphyraena	sp.
STROMATEIDAE		
(butterfishes)	*Peprilus*	sp.
	--	sp.
SYNGNATHIDAE		
(pipefishes and seahorses)	*Syngnathus*	*louisianae*
SYNODONTIDAE		
(lizardfishes)	*Saurida*	sp.
	Synodus	*foetens*
	Synodus	sp.

Table 6 (Continued)

Family	Genus	Species
TETRAODONTIDAE (puffers)	Lagocephalus	laevigatus
	Sphoeroides	sp.
	--	sp.
TRICHIURIDAE (cutlassfishes)	Trichiurus	lepturus
TRIGLIDAE (searobins)	Prionotus	sp.
	--	sp.

Table 7 Fish larvae from Cruise 3 showing family, genera, and species (August 26 - September 30, 1975).

Family	Genus	Species
APOGONIDAE (poachers)	--	--
AULOPIDAE (aulopus)	Aulopus	sp.
BALISTIDAE (triggerfishes and filefishes)	Monacanthus	sp.
BLENNIIDAE (combtooth blennies)	Hypsoblennius	sp.
BOTHIDAE (lefteye flounder)	Citharichthys	sp.
	Syacium	sp.
	Bothus	ocellatus
	Cyclopsetta	sp.
	--	--
BREGMACEROTIDAE (codlets)	Bregmaceros	atlanticus
	Bregmaceros	sp.
CARANGIDAE (jacks)	Chloroscombrus	chrysurus
	Caranx	sp.
	--	--
	Oligoplites	saurus
	Decapterus	punctatus
	Vomer	setapinnis
	Selene	vomer
CLUPEIDAE (herrings)	Harengula	jaguana
	Opisthonema	oglinum
	Harengula	sp.
	Sardinella	sp.
CONGRIDAE (conger eels)	--	--
CYNOGLOSSIDAE (tonguefishes)	Symphurus	sp.

Table 7 (Continued)

Family	Genus	Family
ENGRAULIDAE		
(anchovies)	--	--
	Anchoa	hepsetus
	Engraulis	eurystole
EXOCOETIDAE		
(flyingfishes and halfbeaks)	Cypselurus	sp.
GOBIIDAE		
(gobies)	Gobionellus	sp.
	Gobiosoma	sp.
	--	--
GRAMMISTIDAE		
(soapfishes)	Rypticus	sp.
	Rypticus	saponaceus
LABRIDAE		
(wrasses)	Halichoeres	sp.
MICRODESMIDAE		
(wormfishes)	Microdesmus	sp.
MYCTOPHIDAE		
(lanternfishes)	Myctophum	sp.
	Notolychnus	valdiviae
	Diaphus	sp.
	Myctophum	obtusirostre
	Myctophum	sp.
NETTASTOMIDAE		
(nettastomids)	--	--
OGCOCEPHALIDAE		
(batfishes)	Ogcocephalus	sp.
OPHICHTHIDAE		
(snake eels)	--	--
OPHIDIIDAE		
(cuskeels and brotulas)	Lepophidium	sp.
	Ophidion	sp.
	Otophidium	omostigmum

Table 7 (Continued)

Family	Genus	Species
POMADASYIDAE (grunts)	--	--
SCIAENIDAE (drums)	*Cynoscion*	sp.
	Menticirrhus	sp.
	Cynoscion	*arenarius*
	Larimus	*fasciatus*
	Cynoscion	*nothus*
	--	--
SCOMBRIDAE (mackerels and tunas)	*Scomberomorus*	*cavalla*
	Scomberomorus	*maculatus*
	Euthynnus	sp.
	Auxis	sp.
	Scomber-	sp.
	--	--
SCORPAENIDAE (scorpionfishes)	*Scorpaena*	sp.
	Scorpaena	*brasiliensis*
SERRANIDAE (sea basses)	*Diplectrum*	sp.
	Serranus	sp.
	Epinephelus	sp.
	Centropristis	sp.
	--	--
SPHYRAENIDAE (barracudas)	*Sphyraena*	sp.
STROMATEIDAE (butterfishes)	*Peprilus*	sp.
	--	--
SYNGNATHIDAE (pipefishes and seahorses)	*Syngnathus*	*louisianae*
	Syngnathus	*floridae*
	Hippocampus	*erectus*

Table 7 (Continued)

Family	Genus	Species
SYNODONTIDAE		
(lizardfishes)	Synodus	sp.
	Synodus	foetens
	--	--
TETRAODONTIDAE		
(puffers)	Lagocephalus	laevigatus
	Sphoeroides	sp.
	Sphoeroides	parvus
TRICHIURIDAE		
(cutlassfishes)	Trichiurus	lepturus
	Trichiurus	sp.
TRIGLIDAE		
(searobins)	Prionotus	sp.

Table 8 Occurrence of larvae by family, genera, and species by transect and station for all cruises.

Fish larvae			Transect I			Transect II			Transect III			Transect IV		
			Station			Station			Station			Station		
Family	Genus	Species	1	2	3	1	2	3	1	2	3	1	2	3
Apogonidae				x										
Aulopidae	Aulopus	sp.			x					x	x		x	
Balistidae	Monacanthus	sp.					x				x			
Batrachoididae	Porichthys	porosissmus	x											
Blenniidae	Hypsoblennius	sp.	x											
	--	sp.	x	x		x			x	x			x	
Bothidae	Bothus	ocellatus	x	x	x	x	x	x		x	x	x	x	x
	Bothus	sp.		x	x			x						
	Citharichthys	sp.	x	x	x	x	x	x	x	x	x	x	x	x
	Cyclopsetta	sp.						x	x	x	x		x	x
	Etropus	microstomus							x					
	Monolene	sp.									x			
	Paralichthys	sp.		x		x	x		x	x			x	
	Syacium	sp.	x	x	x	x	x	x	x	x	x	x	x	x
	--	sp.	x	x	x	x	x						x	x
	Citharichthys	arctifrons								x				
Bregmacerotidae	Bregmaceros	altanticus	x	x	x	x	x	x	x	x	x	x	x	x
	Bregmaceros	sp.			x		x	x			x		x	x
Callionymidae	Callionymus	sp.								x				

Table 8 (Continued)

Fish larvae			Transect I			Transect II			Transect III			Transect IV		
			Station			Station			Station			Station		
Family	Genus	Species	1	2	3	1	2	3	1	2	3	1	2	3
Carangidae	Caranx	sp.	x			x	x	x	x	x	x	x	x	x
	Chloroscombrus	chrysurus	x			x			x	x		x	x	
	Decapterus	punctatus			x		x	x	x	x	x	x	x	x
	Oligoplites	saurus	x											
	Selene	vomer						x		x	x		x	x
	Seriola	sp.						x						
	Vomer	setapinnis					x							
	--	--	x	x	x	x	x	x		x	x		x	x
Clupeidae	Brevoortia	patronus	x				x							
	Brevoortia	sp.				x	x	x				x	x	
	Etrumeus	teres			x	x	x	x		x	x	x	x	x
	Harengula	jaguana	x			x	x	x				x	x	
	Harengula	sp.					x		x					
	Opisthonema	oglinum	x			x			x		x		x	x
	Sardinella	sp.										x	x	
	--	sp.	x	x	x	x	x		x	x	x	x	x	x
Congridae	--	--		x	x		x	x		x	x		x	x
Cynoglossidae	Symphurus	sp.	x	x	x	x	x	x	x	x	x	x	x	x
Dysommidae	--	--						x			x		x	
Engraulidae	Anchoa	hepsetus	x	x		x	x		x	x		x	x	x
	Anchoa	sp.	x											
	Engraulis	eurystole		x	x	x	x	x	x	x	x	x	x	x
	--	sp.	x	x	x	x	x		x	x	x	x	x	x

Table 8 (Continued)

Fish larvae			Transect I			Transect II			Transect III			Transect IV		
			Station			Station			Station			Station		
Family	Genus	Species	1	2	3	1	2	3	1	2	3	1	2	3
Ephippidae	*Chaetodipterus*	*faber*			x					x				
Exocoetidae	*Cypselurus*	sp.								x		x		
	--	sp.						x						
Gadidae	*Urophycis*	sp.					x			x	x		x	x
Gempylidae	--	--			x			x		x	x			
Gobiesocidae	*Gobiesox*	*strumosus*	x											
Gobiidae	*Gobionellas*	sp.	x	x			x	x	x	x	x	x	x	x
	Gobiosoma	sp.		x		x							x	
	Ioglossus	*calliurus*		x										
	--	sp.	x	x	x	x	x	x	x	x	x	x	x	x
	Bathygobius	*soporator*								x				
Gonastomastidae	*Gonostoma*	*elongatum*					x	x			x		x	
	--	sp.			x			x		x			x	x
Grammistidae	*Rypticus*	*saponaceus*		x				x			x			
	Rypticus	sp.		x			x		x	x		x	x	
Labridae	*Halichoeres*	sp.			x								x	
	--	sp.		x				x						
Lutjanidae	--	--									x	x	x	x
Melanostomiatidae	--	--									x			

Table 8 (Continued)

Fish larvae			Transect I			Transect II			Transect III			Transect IV		
			Station			Station			Station			Station		
Family	Genus	Species	1	2	3	1	2	3	1	2	3	1	2	3
Microdesmidae	Microdesmus	sp.	x	x	x	x	x	x	x	x	x	x	x	x
Mugilidae	Mugil	curema								x				
	Mugil	sp.		x	x		x	x		x	x		x	x
Muraenesocidae	Hoplunnis	sp.												x
Myctophidae	Ceratoscopelus	maderensis						x		x				
	Ceratoscopelus	warmingi					x	x		x			x	
	Ceratoscopelus	sp.					x							
	Diaphus	sp.			x	x	x	x		x	x		x	x
	Diogenichthys	sp.						x						
	Benthosema	suborbitale									x		x	
	Hygophum	reinhardti			x								x	
	Hygophum	sp.						x		x	x		x	x
	Myctophum	obtusirostre			x								x	x
	Myctophum	sp.			x			x		x	x	x	x	x
	Notolychnus	valdiviae			x						x		x	x
	--	--		x	x			x		x	x		x	x
Nettastomidae	--	--	x	x	x	x	x	x	x	x	x		x	x
Ogcocephalidae	Ogcocephalus	sp.		x	x		x			x				
	--	sp.									x			
Ophichthidae	Myrophis	punctatus	x			x	x				x			x
	Myrophis	sp.	x											
	--	sp.			x			x	x	x	x		x	x

Table 8 (Continued)

Fish larvae			Transect I			Transect II			Transect III			Transect IV		
			Station			Station			Station			Station		
Family	Genus	Species	1	2	3	1	2	3	1	2	3	1	2	3
Ophidiidae	*Lepophidium*	sp.		x	x	x	x		x	x	x	x	x	x
	Ophidion	sp.		x		x	x	x		x	x	x	x	x
	Otophidium	*omostigmum*		x						x				
	Rissola	*marginata*	x			x			x					
	--	sp.		x	x			x		x				x
Opisthognathidae	*Lonchopisthus*	*lindneri*		x										
Ostraciidae	*Lactophrys*	sp.			x									
Pomadasyidae	--	--				x		x				x	x	
Sciaenidae	*Cynoscion*	*arenarius*	x			x	x		x			x	x	
	Cynoscion	*nebulosus*	x											
	Cynoscion	*nothus*				x	x		x			x	x	
	Cynoscion	sp.	x	x		x	x		x	x	x	x	x	x
	Larimus	*fasciatus*	x			x						x	x	
	Leiostomus	*xanthurus*				x	x		x		x	x	x	
	Menticirrhus	sp.	x	x		x			x			x	x	x
	Micropogon	*undulatus*				x	x							
	--	sp.			x	x	x	x	x	x		x		
Scombridae	*Auxis*	sp		x	x		x	x			x		x	x
	Euthynnus	sp.		x			x	x					x	x
	Scomber	sp.						x					x	x
	Scomberomorus	*cavalla*	x	x	x		x	x	x	x	x	x	x	x
	Scomberomorus	*maculatus*	x			x			x			x	x	
	Thunnus	*thynnus*		x										
	--	sp.	x	x	x		x			x	x		x	x

Table 8 (Continued)

Fish larvae			Transect I Station			Transect II Station			Transect III Station			Transect IV Station		
Family	Genus	Species	1	2	3	1	2	3	1	2	3	1	2	3
Scorpaenidae	*Scorpaena*	*brasiliensis*								x				
	Scorpaena	sp.			x		x				x			x
	--	sp.		x										x
Serranidae	*Centropristis*	sp.					x	x	x			x	x	x
	Diplectrum	sp.		x	x		x	x		x	x			
	Epinephelus	sp.					x	x		x	x		x	
	Serranus	sp.		x	x		x	x	x	x			x	x
	--	sp.		x	x	x	x	x	x	x	x	x	x	x
	Diplectrum	*bivittatum*								x				
Soleidae	--	--												x
Sparidae	*Diplodus*	*holbrooki*		x										
	Lagodon	*rhomboides*				x	x							
	Pagrus	*sedecim*		x										
	--	sp.	x	x		x					x	x	x	x
Sphyraenidae	*Sphyraena*	*borealis*		x										
	Sphyraena	sp.		x	x		x	x		x	x		x	x
Stromateidae	*Peprilus*	sp.	x	x		x	x		x			x	x	
	--	--		x	x		x		x	x	x	x	x	x
Syngnathidae	*Syngnathus*	*floridae*							x					
	Syngnathus	*louisianae*	x	x		x			x					
	Hippocampus	*erectus*							x					

Table 8 (Continued)

Fish larvae			Transect I			Transect II			Transect III			Transect IV		
			Station			Station			Station			Station		
Family	Genus	Species	1	2	3	1	2	3	1	2	3	1	2	3
Synodontidae	*Saurida*	Sp.						x					x	x
	Synodus	*foetens*			x	x	x		x	x	x	x	x	x
	Synodus	sp.		x	x		x	x		x	x	x	x	x
Tetraodontidae	*Lagocephalus*	*laevigatus*			x					x				
	Sphoeroides	*parvus*										x		
	Sphoeroides	sp.	x	x	x		x		x	x	x	x	x	x
	--	sp.		x	x	x				x	x		x	
Trichiuridae	*Trichiurus*	*lepturus*	x	x	x	x	x	x	x	x	x	x	x	x
	Trichiurus	sp.					x							
Triglidae	*Prionotus*	*stearnsi*								x				
	Prionotus	sp.		x			x		x	x	x	x	x	x
	--	sp.			x	x		x			x	x	x	x

APPENDIX TABLE 1. NUMBERS OF ICHTHYOPLANKTON BY CRUISE, TRANSECT, STATION, DATE, TIME OF DAY, AND LARVAL IDENTIFICATION WITH SIZE RANGE.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
1	1(1)	12- 6-74	D	235	BOTHIDAE CITHARICHTHYS SP.	11	3.2 - 4.8
					CLUPEIDAE BREVOORTIA PATRONUS	70	5.6 - 15.0
					SCIAENIDAE CYNOSCION SP.	51	2.8 - 6.5
					SPARIDAE	1	7.0 - 7.0
					STROMATEIDAE PEPRILUS SP.	8	2.8 - 5.5
					UNKNOWN	15	1.6 - 3.5
1	1(1)	12- 5-74	N	671	BATRACHOIDIDAE PORICHTHYS POROSISSIMUS	2	29.0 - 31.0
					BOTHIDAE CITHARICHTHYS SP.	4	4.0 - 6.5
					BOTHIDAE	3	4.0 - 9.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	44	3.0 - 35.0
					CLUPEIDAE BREVOORTIA PATRONUS	65	6.5 - 14.0
					CLUPEIDAE	5	6.0 - 8.0
					ENGRAULIDAE ANCHOA SP.	3	13.0 - 21.0
					GOBIIDAE GOBIONELLUS SP.	2	7.4 - 8.5
					OPHICHTHIDAE MYROPHIS PUNCTATUS	1	60.0 - 60.0
					OPHIDIIDAE RISSOLA MARGINATA	1	13.0 - 13.0
					SCIAENIDAE CYNOSCION SP.	95	4.0 - 8.0
					SCIAENIDAE MENTICIRRHUS SP.	3	3.5 - 4.5
					STROMATEIDAE PEPRILUS SP.	13	2.5 - 4.5
					UNKNOWN	15	2.5 - 65.0
1	1(2)	12- 5-74	D	195	BOTHIDAE	64	2.0 - 5.5
					BOTHIDAE BOTHUS SP.	1	3.0 - 3.0
					BOTHIDAE PARALICHTHYS SP.	1	9.8 - 9.8
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	126	2.0 - 9.0
					CLUPEIDAE	31	3.0 - 10.0
					CONGRIDAE	1	11.0 - 11.0
					SCIAENIDAE CYNOSCION SP.	18	2.6 - 6.2
					SCIAENIDAE MENTICIRRHUS SP.	3	3.7 - 4.4
					STROMATEIDAE PEPRILUS SP.	22	2.5 - 4.2
					TRICHIURIDAE TRICHIURUS LEPTURUS	3	6.0 - 10.0
					TRIGLIDAE PRIONOTUS SP.	2	4.0 - 4.5
					UNKNOWN	297	2.0 - 5.0
1	1(2)	12- 4-74	N	160	BREGMACEROTIDAE BREGMACEROS ATLANTICUS	406	2.3 - 18.0
					BOTHIDAE PARALICHTHYS SP.	2	6.0 - 10.0
					BOTHIDAE	6	3.0 - 5.2
					CARANGIDAE	3	5.3 - 8.0

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					CLUPEIDAE	6	5.1 - 9.0
					CYNOGLOSSIDAE SYMPHURUS SP.	20	3.0 - 5.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	1	18.0 - 18.0
					GOBIIDAE GOBIONELLUS SP.	1	8.5 - 8.5
					GOBIIDAE GOBIOSOMA SP.	1	9.0 - 9.0
					GOBIIDAE	30	2.3 - 6.5
					NETTASTOMIDAE	1	18.0 - 18.0
					SCIAENIDAE CYNOSCION SP.	13	2.5 - 5.0
					STROMATEIDAE PEPRILUS SP.	12	2.6 - 5.0
					SYNGNATHIDAE SYNGNATHUS LOUISIANAE	1	60.0 - 60.0
					SYNODONTIDAE SYNODUS SP.	5	2.5 - 5.0
					TRIGLIDAE PRIONOTUS SP.	1	3.5 - 3.5
					UNKNOWN	139	2.0 - 10.0
1	1(3)	12- 4-74	D	29	BOTHIDAE BOTHUS OCELLATUS	2	4.7 - 7.1
					BOTHIDAE PARALICHTHYS SP.	1	6.8 - 6.8
					BOTHIDAE	2	2.4 - 4.5
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	25	2.0 - 9.9
					CONGRIDAE	3	4.5 - 9.0
					GOBIIDAE	15	3.3 - 9.0
					SERRANIDAE	6	2.6 - 3.2
					MYCTOPHIDAE	9	4.0 - 7.5
					UNKNOWN	19	1.5 - 7.3
					BOTHIDAE BOTHUS SP.	6	2.5 - 8.0
1	1(3)	12- 5-74	N	110	BOTHIDAE	14	3.0 - 5.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	269	1.9 - 12.0
					CONGRIDAE	23	5.0 - 57.0
					CYNOGLOSSIDAE SYMPHURUS SP.	4	5.0 - 8.0
					GOBIIDAE	208	3.0 - 14.0
					MUGILIDAE MUGIL SP.	33	1.9 - 4.5
					MYCTOPHIDAE	40	3.5 - 17.0
					OPHICHTHIDAE	17	4.5 - 44.0
					OPHIDIIDAE	2	4.0 - 7.0
					OSTRACIIDAE LACTOPHRYS SP.	1	3.6 - 3.6
					SCIAENIDAE	1	3.1 - 3.1
					SCOMBRIDAE	2	3.6 - 10.3
					SERRANIDAE	1	2.6 - 2.6
					SYNODONTIDAE SYNODUS SP.	4	3.3 - 11.0

APPFNDIX TABLE 1. CONT.

UISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					TRICHIURIDAE TRICHIURUS LEPTURUS	16	5.0 - 20.0
					UNKNOWN	167	1.8 - 29.0
1	2(1)	12-17-74	D	308	BREGMACEROTIDAE BREGMACEROS ATLANTICUS	12	5.4 - 9.9
					BOTHIDAE CITHARICHTHYS SP.	2	4.0 - 5.2
					BOTHIDAE	2	5.0 - 7.7
					CLUPEIDAE BREVOORTIA SP.	13	2.8 - 8.3
					MYCTOPHIDAE DIAPHUS SP.	2	3.6 - 4.2
					POMADASYIDAE	1	2.7 - 2.7
					SCIAENIDAE MICROPOGON UNDULATUS	46	2.1 - 4.0
					SERRANIDAE	5	2.9 - 4.0
					STROMATEIDAE PEPRILUS SP.	14	1.7 - 5.0
					UNKNOWN	5	2.0 - 4.8
1	2(1)	12-17-74	N	1990	BREGMACEROTIDAE BREGMACEROS ATLANTICUS	15	3.4 - 18.7
					BOTHIDAE CITHARICHTHYS SP.	14	2.5 - 5.0
					BOTHIDAE	1	5.1 - 5.1
					CARANGIDAE	1	4.8 - 4.8
					ENGRAULIDAE	1	11.5 - 11.5
					GOBIIDAE GOBIOSOMA SP.	1	5.3 - 5.3
					SCIAENIDAE LEIOSTOMUS XANTHURUS	2	4.5 - 4.7
					SCIAENIDAE MICROPOGON UNDULATUS	19	2.1 - 4.0
					SERRANIDAE	4	3.1 - 4.0
					STROMATEIDAE PEPRILUS SP.	10	3.0 - 4.7
					UNKNOWN	15	1.4 - 4.8
1	2(2)	1- 9-75	D	445	BOTHIDAE PARALICHTHYS SP.	1	4.3 - 4.3
					BOTHIDAE CITHARICHTHYS SP.	1	3.9 - 3.9
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	93	2.4 - 9.9
					BREGMACEROTIDAE BREGMACEROS SP.	2	3.7 - 4.7
					CARANGIDAE	32	2.5 - 5.5
					CLUPEIDAE BREVOORTIA PATRONUS	14	5.2 - 11.3
					CLUPEIDAE ETRUMEUS TERES	35	6.9 - 14.7
					CYNOGLOSSIDAE SYMPHURUS SP.	3	3.5 - 5.7
					GADIDAE UROPHYCIS SP.	1	5.0 - 5.0
					GOBIIDAE	13	2.3 - 5.2
					GONOSTOMATIDAE GONOSTOMA ELONGATUM	1	6.0 - 6.0
					MYCTOPHIDAE CERATOSCOPELUS SP.	1	7.0 - 7.0
					NETTASTOMIDAE	1	8.2 - 8.2
					SCIAENIDAE CYNOSCION SP.	46	2.9 - 6.3

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					SERRANIDAE CENTROPRISTIS SP.	8	4.6 - 11.7
					SERRANIDAE	28	2.8 - 4.5
					SPARIDAE LAGODON RHOMBOIDES	32	2.8 - 9.7
					STROMATEIDAE PEPRILUS SP.	12	2.5 - 6.4
					SYNODONTIDAE SYNODUS FOETENS	1	5.3 - 5.3
					TRICHIURIDAE TRICHIURUS LEPTURUS	2	7.2 - 7.5
					TRIGLIDAE PRIONOTUS SP.	5	4.0 - 7.0
					UNKNOWN	2	4.0 - 5.5
1	2(2)	12-18-74	N	555	BOTHIDAE CITHARICHTHYS SP.	6	4.0 - 11.2
					BOTHIDAE PARALICHTHYS SP.	33	1.8 - 4.5
					BOTHIDAE BOTHUS OCELLATUS	3	3.5 - 5.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	285	2.5 - 18.7
					BREGMACEROTIDAE BREGMACEROS SP.	6	3.0 - 4.7
					CARANGIDAE	56	1.8 - 7.0
					CLUPEIDAE BREVOORTIA SP.	5	3.4 - 6.3
					CLUPEIDAE ETRUMEUS TERES	41	3.3 - 9.6
					CONGRIDAE	1	13.0 - 13.0
					CYNOGLOSSIDAE SYMPHURUS SP.	3	3.0 - 5.3
					ENGRAULIDAE ENGRAULIS EURYSTOLE	6	6.5 - 8.6
					GADIDAE UROPHYCIS SP.	2	3.1 - 4.0
					GOBIIDAE GOBIONELLUS SP.	58	3.0 - 9.0
					GOBIIDAE	15	2.3 - 5.8
					MUGILIDAE MUGIL SP.	13	2.3 - 4.5
					MYCTOPHIDAE CERATOSCOPELUS WARMINGI	2	3.4 - 3.8
					MYCTOPHIDAE DIAPHUS SP.	17	3.0 - 6.3
					NETTASTOMIDAE	5	4.7 - 14.5
					OPHICHTHIDAE MYROPHIS PUNCTATUS	4	31.0 - 68.0
					OPHIDIIDAE LEPOPHIDIUM SP.	1	7.8 - 7.8
					SCIAENIDAE CYNOSCION SP.	17	2.3 - 3.5
					SCIAENIDAE LEIOSTOMUS XANTHURUS	53	1.9 - 6.0
					SCIAENIDAE MICROPOGON UNDULATUS	27	2.0 - 3.5
					SCOMBRIDAE	1	6.2 - 6.2
					SCORPAENIDAE SCORPAENA SP.	1	2.2 - 2.2
					SERRANIDAE SERRANUS SP.	44	1.9 - 4.9
					STROMATEIDAE	61	1.5 - 4.1
					SYNODONTIDAE SYNODUS SP.	20	2.8 - 12.8
					TRIGLIDAE PRIONOTUS SP.	19	2.0 - 9.7

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					UNKNOWN	28	1.8 - 9.0
1	2(3)	12-12-74	D	112	BOTHIDAE BOTHUS OCELLATUS	1	3.3 - 3.3
					BOTHIDAE CITHARICHTHYS SP.	5	2.6 - 4.5
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	14	1.8 - 9.8
					DYSOMMIDAE	1	8.8 - 8.8
					GOBIIDAE GOBIONELLUS SP.	21	4.6 - 7.5
					GOBIIDAE	1	3.6 - 3.6
					LABRIDAE	2	4.4 - 4.7
					MUGILIDAE MUGIL SP.	28	3.1 - 5.0
					MYCTOPHIDAE HYGOPHUM SP.	1	4.4 - 4.4
					MYCTOPHIDAE	4	4.3 - 4.6
					SCIAENIDAE	1	2.1 - 2.1
					TRICHIURIDAE TRICHIURUS LEPTURUS	3	8.9 - 19.0
					UNKNOWN	14	1.4 - 23.0
1	2(3)	12-11-74	N	142	BOTHIDAE BOTHUS OCELLATUS	3	4.0 - 9.0
					BOTHIDAE CITHARICHTHYS SP.	5	1.8 - 3.5
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	40	1.5 - 26.0
					CARANGIDAE DECAPTERUS PUNCTATUS	2	2.0 - 5.7
					CARANGIDAE	4	6.9 - 13.0
					GOBIIDAE GOBIONELLUS SP.	50	4.5 - 8.2
					GOBIIDAE	12	3.3 - 8.8
					GONOSTOMATIDAE GONOSTOMA ELONGATUM	1	5.8 - 5.8
					GONOSTOMATIDAE	1	7.1 - 7.1
					MICRODESMIDAE MICRODESMUS SP.	1	6.5 - 6.5
					MUGILIDAE MUGIL SP.	73	2.3 - 5.4
					MYCTOPHIDAE DIAPHUS SP.	1	4.0 - 4.0
					MYCTOPHIDAE DIOGENICHTHYS SP.	1	3.0 - 3.0
					MYCTOPHIDAE HYGOPHUM SP.	2	5.6 - 8.3
					OPHICHTHIDAE	6	8.3 - 15.0
					SERRANIDAE SERRANUS SP.	1	4.4 - 4.4
					TRICHIURIDAE TRICHIURUS LEPTURUS	1	8.1 - 8.1
					UNKNOWN	4	3.0 - 7.9
1	3(1)	12-15-74	D	123	BOTHIDAE PARALICHTHYS SP.	2	2.2 - 4.5
					CLUPEIDAE ETRUMEUS TERES	2	3.7 - 4.0
					ENGRAULIDAE	1	4.0 - 4.0
					SCIAENIDAE MENTICIRRHUS SP.	2	2.1 - 3.4
					SCIAENIDAE	2	2.2 - 2.5

APPENDIX TABLE 1. CONT.

RUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					STROMATEIDAE PEPRILUS SP.	1	7.3 - 7.3
					UNKNOWN	1	1.9 - 1.9
1	3(1)	12-14-74	N	83	BOTHIDAE PARALICHTHYS SP.	2	2.9 - 3.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	51	4.4 - 34.0
					CLUPEIDAE BREVOORTIA SP.	2	3.5 - 3.7
					CYNOGLOSSIDAE SYMPHURUS SP.	1	3.8 - 3.8
					GOBIIDAE	5	3.2 - 8.0
					OPHIDIIDAE RISSOLA MARGINATA	1	4.2 - 4.2
					SCIAENIDAE LEIOSTOMUS XANTHURUS	2	2.8 - 7.0
					SCIAENIDAE MENTICIRRHUS SP.	2	3.1 - 3.4
					STROMATEIDAE	2	3.1 - 4.4
1	3(2)	12-14-74	D	425	AULOPIDAE AULOPUS SP.	1	2.3 - 2.3
					BOTHIDAE CITHARICHTHYS SP.	1	4.4 - 4.4
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	80	1.4 - 8.6
					CLUPEIDAE ETRUMEUS TERES	2	3.8 - 4.7
					CYNOGLOSSIDAE SYMPHURUS SP.	5	2.7 - 3.9
					GADIDAE UROPHYCIS SP.	1	2.0 - 2.0
					GOBIIDAE GOBIONELLUS SP.	1	4.8 - 4.8
					GOBIIDAE	7	3.4 - 5.2
					GONOSTOMATIDAE	1	5.7 - 5.7
					MICRODESMIDAE MICRODESMUS SP.	1	9.0 - 9.0
					MUGILIDAE MUGIL SP.	24	1.4 - 4.1
					MYCTOPHIDAE DIAPHUS SP.	2	3.3 - 3.6
					MYCTOPHIDAE MYCTOPHUM SP.	1	2.6 - 2.6
					SCIAENIDAE CYNOSCION SP.	1	3.2 - 3.2
					SCIAENIDAE	7	1.6 - 3.3
					STROMATEIDAE	3	1.6 - 2.0
					UNKNOWN	22	1.3 - 5.1
1	3(2)	12-13-74	N	102	BOTHIDAE CITHARICHTHYS SP.	2	4.3 - 5.5
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	139	2.6 - 25.0
					CARANGIDAE DECAPTERUS PUNCTATUS	1	3.5 - 3.5
					CLUPEIDAE ETRUMEUS TERES	5	5.7 - 15.0
					CYNOGLOSSIDAE SYMPHURUS SP.	5	3.0 - 9.4
					ENGRAULIDAE	1	17.0 - 17.0
					GADIDAE UROPHYCIS SP.	1	2.4 - 2.4
					GOBIIDAE	15	2.0 - 8.9
					MUGILIDAE MUGIL SP.	65	2.5 - 7.7

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					MYCTOPHIDAE DIAPHUS SP.	6	3.5 - 6.8
					MYCTOPHIDAE MYCTOPHUM SP.	1	3.5 - 3.5
					OPHIDIIDAE OPHIDION SP.	1	4.0 - 4.0
					SERRANIDAE SERRANUS SP.	1	4.5 - 4.5
					STROMATEIDAE	1	2.7 - 2.7
					SYNODONTIDAE SYNODUS SP.	3	6.7 - 8.4
					TRICHIURIDAE TRICHIURUS LEPTURUS	2	5.8 - 28.0
					TRIGLIDAE PRIONOTUS SP.	5	3.1 - 5.2
					UNKNOWN	7	2.2 - 7.3
1	3(3)	12-13-74	D	23	AULOPIDAE AULOPUS SP.	1	4.6 - 4.6
					BOTHIDAE BOTHUS OCELLATUS	3	4.0 - 6.5
					BOTHIDAE CITHARICHTHYS SP.	12	2.9 - 4.5
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	197	1.7 - 9.8
					BREGMACEROTIDAE BREGMACEROS SP.	1	2.5 - 2.5
					CONGRIDAE	10	5.5 - 16.0
					CYNOGLOSSIDAE SYMPHURUS SP.	10	2.9 - 7.9
					DYSOMMIDAE	1	17.0 - 17.0
					GEMPYLIDAE	1	8.8 - 8.8
					GOBIIDAE GOBIONELLUS SP.	104	4.4 - 7.7
					GOBIIDAE	17	3.4 - 6.6
					MUGILIDAE MUGIL SP.	9	1.9 - 3.4
					MYCTOPHIDAE BENTHOSEMA SUBORBITALE	1	3.9 - 3.9
					MYCTOPHIDAE DIAPHUS SP.	8	3.7 - 5.7
					MYCTOPHIDAE HYGOPHUM SP.	1	5.2 - 5.2
					MYCTOPHIDAE	4	3.2 - 4.7
					NETTASTOMIDAE	2	13.0 - 34.0
					OPHICHTHIDAE	2	7.2 - 10.0
					SCIAENIDAE LEIOSTOMUS XANTHURUS	1	3.5 - 3.5
					SERRANIDAE	3	3.1 - 4.9
					SPARIDAE	2	3.7 - 6.1
					STROMATEIDAE	2	4.0 - 5.4
					SYNODONTIDAE SYNODUS SP.	8	3.6 - 8.0
					TRICHIURIDAE TRICHIURUS LEPTURUS	3	7.3 - 9.9
					UNKNOWN	4	1.9 - 6.8
1	3(3)	12-12-74	N	33	BOTHIDAE CITHARICHTHYS SP.	8	3.4 - 10.6
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	109	1.6 - 14.0
					CARANGIDAE DECAPTERUS PUNCTATUS	1	3.2 - 3.2

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					CYNOGLOSSIDAE SYMPHURUS SP.	1	4.3 - 4.3
					GADIDAE UROPHYCIS SP.	1	2.8 - 2.8
					GOBIIDAE GOBIONELLUS SP.	28	4.5 - 8.3
					GOBIIDAE	17	4.0 - 8.1
					GONOSTOMATIDAE GONOSTOMA ELONGATUM	1	6.5 - 6.5
					MICRODESMIDAE MICRODESMUS SP.	1	7.2 - 7.2
					MUGILIDAE MUGIL SP.	13	2.5 - 9.2
					MYCTOPHIDAE DIAPHUS SP.	2	3.9 - 5.9
					MYCTOPHIDAE MYCTOPHUM SP.	1	3.0 - 3.0
					MYCTOPHIDAE NOTOLYCHNUS VALDIVIAE	1	5.2 - 5.2
					NETTASTOMIDAE	2	8.0 - 33.0
					OPHICHTHIDAE MYROPHIS PUNCTATUS	2	11.0 - 68.0
					OPHIDIIDAE OPHIDION SP.	3	7.0 - 10.5
					SERRANIDAE	3	3.0 - 3.2
					SPARIDAE	6	2.5 - 7.2
					SYNODONTIDAE SYNODUS SP.	3	7.8 - 9.4
					TRICHIURIDAE TRICHIURUS LEPTURUS	1	7.1 - 7.1
					TRIGLIDAE	2	3.6 - 4.5
					UNKNOWN	2	1.7 - 3.5
1	4(1)	1-22-75	D	75	CARANGIDAE DECAPTERUS PUNCTATUS	1	3.1 - 3.1
					CLUPEIDAE BREVOORTIA SP.	5	5.1 - 10.0
					CLUPEIDAE ETRUMEUS TERES	2	6.5 - 9.0
					SCIAENIDAE LEIOSTOMUS XANTHURUS	2	4.7 - 5.5
					SERRANIDAE CENTROPRISTIS SP.	2	6.5 - 6.9
					STROMATEIDAE	1	5.8 - 5.8
					TRIGLIDAE	1	3.4 - 3.4
					UNKNOWN	1	3.3 - 3.3
1	4(1)	1-21-75	N	43	BREGMACEROTIDAE BREGMACEROS ATLANTICUS	2	22.0 - 26.0
					CARANGIDAE DECAPTERUS PUNCTATUS	6	2.2 - 2.7
					CLUPEIDAE ETRUMEUS TERES	7	16.0 - 20.0
					CLUPEIDAE SARDINELLA SP.	2	8.0 - 11.0
					GOBIIDAE GOBIONELLUS SP.	2	8.6 - 8.8
					SCIAENIDAE	3	2.0 - 2.6
1	4(2)	1-24-75	D	737	BOTHIDAE CITHARICHTHYS SP.	1	5.3 - 5.3
					BOTHIDAE PARALICHTHYS SP.	1	2.7 - 2.7
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	168	1.8 - 9.5
					BREGMACEROTIDAE BREGMACEROS SP.	3	2.5 - 2.8

APPENDIX TABLE 1. CONT.

RUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					CARANGIDAE DECAPTERUS PUNCTATUS	43	1.9 - 5.5
					CLUPEIDAE ETRUMEUS TERES	5	7.8 - 14.0
					CLUPEIDAE SARDINELLA SP.	1	8.0 - 8.0
					CLUPEIDAE	34	3.7 - 9.0
					CYNOGLOSSIDAE SYMPHURUS SP.	2	2.2 - 4.3
					GOBIIDAE GOBIONELLUS SP.	1	6.3 - 6.3
					GOBIIDAE	8	2.4 - 6.2
					GONOSTOMATIDAE	6	3.4 - 6.2
					MUGILIDAE MUGIL SP.	10	1.4 - 3.0
					MYCTOPHIDAE BENTHOSEMA SUBORBITALE	1	6.4 - 6.4
					MYCTOPHIDAE DIAPHUS SP.	4	3.4 - 4.3
					MYCTOPHIDAE HYGOPHUM REINHARDTI	1	13.4 - 13.4
					MYCTOPHIDAE NOTOLYCHNUS VALDIVIAE	1	4.4 - 4.4
					NETTASTOMIDAE	1	10.5 - 10.5
					OPHIDIIDAE OPHIDION SP.	1	5.7 - 5.7
					SCOMBRIDAE SCOMBER SP.	9	2.9 - 6.1
					SERRANIDAE CENTROPRISTIS SP.	3	6.5 - 8.6
					SERRANIDAE SERRANUS SP.	6	2.2 - 5.2
					SERRANIDAE	19	1.7 - 4.2
					SPARIDAE	4	3.7 - 6.5
					STROMATEIDAE	3	3.2 - 3.9
					SYNODONTIDAE SYNODUS SP.	2	4.0 - 6.2
					TRIGLIDAE PRIONOTUS SP.	12	2.1 - 6.5
					UNKNOWN	100	1.4 - 9.5
1	4(2)	1-24-75	N	1934	BOTHIDAE	1	4.8 - 4.8
					BOTHIDAE PARALICHTHYS SP.	3	2.5 - 3.0
					BOTHIDAE CITHARICHTHYS SP.	9	3.6 - 8.3
					BREGMACEROTIDAE BREGMACEROS SP.	5	2.0 - 5.8
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	339	1.5 - 14.0
					CARANGIDAE DECAPTERUS PUNCTATUS	64	1.9 - 5.3
					CLUPEIDAE BREVOORTIA SP.	3	8.0 - 18.0
					CLUPEIDAE ETRUMEUS TERES	42	8.0 - 19.0
					CLUPEIDAE	287	2.5 - 8.7
					CONGRIDAE	1	5.5 - 5.5
					DYSOMMIDAE	1	7.5 - 7.5
					ENGRAULIDAE ENGRAULIS EURYSTOLE	1	13.0 - 13.0
					GADIDAE UROPHYCIS SP.	4	1.4 - 1.7

APPENDIX TABLE 1. CONT.

RUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					GOBIIDAE GOBIONELLUS SP.	5	6.5 - 8.0
					GOBIIDAE	43	2.7 - 8.9
					GONOSTOMATIDAE GONOSTOMA ELONGATUM	1	6.9 - 6.9
					MUGILIDAE MUGIL SP.	18	1.9 - 5.3
					MYCTOPHIDAE CERATOSCOPELUS WARMINGI	1	4.5 - 4.5
					MYCTOPHIDAE DIAPHUS SP.	11	2.5 - 6.1
					MYCTOPHIDAE HYGOPHUM SP.	3	3.2 - 3.8
					MYCTOPHIDAE	3	3.9 - 4.5
					MYCTOPHIDAE MYCTOPHUM SP.	1	3.3 - 3.3
					MYCTOPHIDAE MYCTOPHUM OBTUSIROSTRE	1	3.8 - 3.8
					NETTASTOMIDAE	3	5.0 - 9.0
					SCIAENIDAE LEIOSTOMUS XANTHURUS	1	3.6 - 3.6
					SCOMBRIDAE SCOMBER SP.	2	3.3 - 3.9
					SERRANIDAE CENTROPRISTIS SP.	3	3.9 - 10.2
					SERRANIDAE SERRANUS SP.	5	2.8 - 3.4
					SPARIDAE	6	3.3 - 6.2
					STROMATEIDAE	10	1.7 - 4.0
					SYNODONTIDAE SYNODUS SP.	21	2.7 - 9.8
					TRIGLIDAE	9	1.8 - 5.5
					UNKNOWN	510	1.6 - 7.1
1	4(3)	1-25-75	D	189	BOTHIDAE CITHARICHTHYS SP.	8	2.6 - 8.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	104	2.2 - 10.0
					BREGMACEROTIDAE BREGMACEROS SP.	2	4.9 - 6.3
					CARANGIDAE DECAPTERUS PUNCTATUS	74	2.5 - 6.6
					CARANGIDAE	2	3.2 - 3.9
					CLUPEIDAE ETRUMEUS TERES	22	5.4 - 13.0
					CYNOGLOSSIDAE SYMPHURUS SP.	3	3.0 - 5.1
					ENGRAULIDAE	2	6.2 - 8.5
					GOBIIDAE GOBIONELLUS SP.	26	3.0 - 8.1
					GOBIIDAE	19	1.9 - 9.9
					MUGILIDAE MUGIL SP.	27	2.3 - 5.2
					MYCTOPHIDAE DIAPHUS SP.	4	3.9 - 9.4
					MYCTOPHIDAE HYGOPHUM SP.	2	2.5 - 4.0
					NETTASTOMIDAE	5	5.2 - 20.0
					OPHICHTHIDAE MYROPHIS PUNCTATUS	1	60.0 - 60.0
					OPHIDIIDAE	1	4.3 - 4.3
					SCOMBRIDAE SCOMBER SP.	1	6.1 - 6.1

APPENDIX TABLE 1. CONT.

JISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					SERRANIDAE	14	3.2 - 5.3
					STROMATEIDAE	3	2.3 - 7.7
					SYNODONTIDAE SYNODUS SP.	11	2.5 - 15.0
					TRICHIURIDAE TRICHIURUS LEPTURUS	1	7.1 - 7.1
					TRIGLIDAE	5	3.0 - 4.3
					UNKNOWN	24	1.3 - 8.0
1	4(3)	1-25-75	N	478	BOTHIDAE BOTHUS OCELLATUS	1	3.3 - 3.3
					BOTHIDAE CITHARICHTHYS SP.	6	2.7 - 6.2
					BOTHIDAE	2	5.0 - 5.5
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	670	1.4 - 11.5
					BREGMACEROTIDAE BREGMACEROS SP.	6	3.5 - 4.7
					CARANGIDAE DECAPTERUS PUNCTATUS	38	3.5 - 5.4
					CARANGIDAE	1	3.5 - 3.5
					CLUPEIDAE ETRUMEUS TERES	26	2.3 - 14.0
					CONGRIDAE	4	4.2 - 12.0
					CYNOGLOSSIDAE SYMPHURUS SP.	4	2.2 - 5.1
					GADIDAE UROPHYCIS SP.	10	1.7 - 2.8
					GOBIIDAE GOBIONELLUS SP.	252	5.5 - 9.0
					GOBIIDAE	78	3.3 - 9.2
					GONOSTOMATIDAE	2	4.1 - 6.1
					MUGILIDAE MUGIL SP.	14	2.3 - 3.6
					MYCTOPHIDAE DIAPHUS SP.	18	3.0 - 5.6
					MYCTOPHIDAE HYGOPHUM SP.	1	5.5 - 5.5
					MYCTOPHIDAE MYCTOPHUM OBTUSIROSTRE	1	4.3 - 4.3
					MYCTOPHIDAE MYCTOPHUM SP.	2	4.3 - 6.0
					MYCTOPHIDAE NOTOLYCHNUS VALDIVIAE	1	4.3 - 4.3
					MYCTOPHIDAE	21	2.3 - 6.6
					NETTASTOMIDAE	7	5.3 - 18.0
					OPHIDIIDAE OPHIDION SP.	4	2.8 - 8.6
					SCOMBRIDAE SCOMBER SP.	14	3.0 - 5.2
					SCOMBRIDAE	1	3.7 - 3.7
					SERRANIDAE	5	2.1 - 4.1
					SPARIDAE	1	2.2 - 2.2
					STROMATEIDAE	6	1.9 - 3.0
					SYNODONTIDAE SYNODUS SP.	94	2.2 - 16.0
					TRIGLIDAE	5	2.1 - 4.8
					UNKNOWN	676	1.7 - 20.0

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
2	1(1)	5- 6-75	D	129	BLENNIDAE	1	3.0 - 3.0
					CLUPEIDAE OPISTHONEMA OGLINUM	53	6.0 - 15.0
					ENGRAULIDAE	35	4.5 - 15.0
					GOBIIDAE	2	2.8 - 3.5
					SCIAENIDAE CYNOSCION SP.	56	3.2 - 6.6
					SCIAENIDAE MENTICIRRHUS SP.	1	4.6 - 4.6
					UNKNOWN	6	2.2 - 5.5
2	1(1)	5- 6-75	N	3	BOTHIDAE	3	9.0 - 12.0
					CLUPEIDAE OPISTHONEMA OGLINUM	898	6.5 - 20.0
					ENGRAULIDAE ANCHOA HEPSETUS	566	6.5 - 24.0
					GOBIESOCIDAE GOBIESOX STRUMOSUS	1	4.6 - 4.6
					GOBIIDAE	1	8.9 - 8.9
					OPHICHTHIDAE MYROPHIS SP.	1	68.0 - 68.0
					SCIAENIDAE CYNOSCION NEBULOSUS	1	3.2 - 3.2
					SCIAENIDAE CYNOSCION SP.	414	3.3 - 16.0
					SCIAENIDAE MENTICIRRHUS SP.	7	3.0 - 7.0
					STROMATEIDAE PEPRILUS SP.	1	4.2 - 4.2
					TETRAODONTIDAE SPHOEROIDES SP.	1	12.0 - 12.0
					UNKNOWN	1	4.5 - 4.5
2	1(2)	5- 6-75	D	163	BOTHIDAE BOTHUS SP.	2	3.0 - 3.0
					BOTHIDAE SYACIUM SP.	7	2.2 - 3.0
					BOTHIDAE	6	5.0 - 12.0
					CARANGIDAE	5	3.6 - 8.5
					CYNOGLOSSIDAE SYMPHURUS SP.	12	2.2 - 5.0
					ENGRAULIDAE	7	7.5 - 12.0
					MICRODESMIDAE MICRODESMUS SP.	4	7.0 - 11.0
					MYCTOPHIDAE	4	5.0 - 7.3
					OPHIDIIDAE	2	9.0 - 13.0
					SCOMBRIDAE	1	6.5 - 6.5
					SERRANIDAE	7	6.0 - 12.0
					SPARIDAE	5	7.0 - 10.0
					SPHYRAENIDAE SPHYRAENA BOREALIS	1	27.0 - 27.0
					TETRAODONTIDAE SPHOEROIDES SP.	1	3.3 - 3.3
					UNKNOWN	22	2.5 - 9.2
2	1(2)	5- 6-75	N	53	BLENNIDAE	1	2.8 - 2.8
					BOTHIDAE BOTHUS OCELLATUS	1	3.5 - 3.5
					BOTHIDAE CITHARICHTHYS SP.	38	4.1 - 7.0

APPENDIX TABLE 1. CONT.

JISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					BOTHIDAE SYACIUM SP.	7	2.0 - 2.8
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	8	19.0 - 33.0
					CARANGIDAE	1	6.0 - 6.0
					CYNOGLOSSIDAE SYMPHURUS SP.	9	2.7 - 5.5
					ENGRAULIDAE ENGRAULIS EURYSTOLE	40	8.5 - 19.0
					GOBIIDAE GOBIONELLUS SP.	1	8.0 - 8.0
					GOBIIDAE IOGLOSSUS CALLIURUS	1	10.0 - 10.0
					GOBIIDAE	29	3.6 - 10.0
					GRAMMISTIDAE RYPTICUS SAPONACEUS	1	6.3 - 6.3
					LABRIDAE	1	7.8 - 7.8
					MUGILIDAE MUGIL SP.	5	3.0 - 8.8
					MYCTOPHIDAE	26	2.0 - 12.0
					OGCOCEPHALIDAE OGCOCEPHALUS SP.	2	3.0 - 3.3
					OPHIDIIDAE OPHIDION SP.	1	23.0 - 23.0
					OPHIDIIDAE OTOPHIDIUM OMOSTIGMUM	2	9.5 - 12.0
					OPHIDIIDAE	2	9.0 - 15.0
					OPISTHOGNATHIDAE LONCHOPISTHUS LINDNERI	2	8.2 - 9.6
					SCOMBRIDAE AUXIS SP.	2	5.2 - 10.0
					SCOMBRIDAE EUTHYNNUS SP.	1	6.3 - 6.3
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	1	3.0 - 3.0
					SCOMBRIDAE THUNNUS THYNNUS	2	3.9 - 4.7
					SCORPAENIDAE	3	2.5 - 4.0
					SERRANIDAE DIPLECTRUM SP.	24	4.0 - 15.0
					SERRANIDAE	21	2.1 - 7.5
					SPARIDAE DIPLODUS HOLBROOKI	4	7.5 - 12.0
					SPARIDAE PAGRUS SEDECIM	1	13.0 - 13.0
					SPHYRAENIDAE SPHYRAENA BOREALIS	2	5.8 - 14.0
					STROMATEIDAE	1	3.0 - 3.0
					SYNODONTIDAE SYNODUS SP.	25	3.0 - 16.0
					TETRAODONTIDAE	4	2.3 - 4.0
					TRICHIURIDAE TRICHIURUS LEPTURUS	8	5.0 - 7.0
					TRIGLIDAE PRIONOTUS SP.	2	3.0 - 4.8
					UNKNOWN	12	2.5 - 22.0
!	1(3)	5- 6-75	D	95	BOTHIDAE	6	3.2 - 6.5
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	113	2.5 - 9.0
					CARANGIDAE	9	4.0 - 7.3
					CLUPEIDAE	368	3.0 - 11.0

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					CYNOGLOSSIDAE SYMPHURUS SP.	3	3.0 - 4.0
					ENGRAULIDAE	1	13.0 - 13.0
					GEMPYLIDAE	4	5.2 - 7.0
					GOBIIDAE	8	4.8 - 9.2
					MUGILIDAE MUGIL SP.	1	4.8 - 4.8
					MYCTOPHIDAE	116	3.6 - 10.0
					NETTASTOMIDAE	9	4.5 - 6.5
					OPHIDIIDAE	9	3.5 - 6.5
					SCOMBRIDAE	2	5.5 - 12.5
					SERRANIDAE DIPLECTRUM SP.	2	8.0 - 8.5
					SERRANIDAE	1	4.7 - 4.7
					STROMATEIDAE	2	5.2 - 5.9
					SYNODONTIDAE SYNODUS SP.	51	2.2 - 9.5
					TRICHIURIDAE TRICHIURUS LEPTURUS	6	4.7 - 10.0
					UNKNOWN	144	2.0 - 13.0
2	1(3)	5- 7-75	N	73	BOTHIDAE CITHARICHTHYS SP.	2	3.8 - 6.5
					BOTHIDAE	1	4.3 - 4.3
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	212	1.7 - 10.0
					BREGMACEROTIDAE BREGMACEROS SP.	6	2.5 - 3.8
					CARANGIDAE DECAPTERUS PUNCTATUS	5	4.0 - 5.0
					CARANGIDAE	2	3.2 - 3.3
					CLUPEIDAE ETRUMEUS TERES	367	4.0 - 12.0
					CLUPEIDAE	3	4.0 - 5.0
					CYNOGLOSSIDAE SYMPHURUS SP.	2	3.0 - 5.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	3	12.0 - 13.0
					EPHIPPIDAE CHAETODIPTERUS FABER	1	3.0 - 3.0
					GEMPYLIDAE	3	4.1 - 4.5
					GOBIIDAE	13	5.5 - 8.5
					GONOSTOMATIDAE	4	5.3 - 10.0
					MICRODESMIDAE MICRODESMUS SP.	1	17.0 - 17.0
					MUGILIDAE MUGIL SP.	4	5.5 - 7.2
					MYCTOPHIDAE MYCTOPHUM SP.	25	3.5 - 6.5
					MYCTOPHIDAE HYGOPHUM REINHARDTI	3	6.3 - 11.0
					MYCTOPHIDAE DIAPHUS SP.	31	3.5 - 5.0
					MYCTOPHIDAE	134	3.0 - 9.5
					NETTASTOMIDAE	2	7.0 - 7.5
					OPHIDIIDAE LEPOPHIDIUM SP.	3	3.2 - 6.5

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					SCOMBRIDAE AUXIS SP.	2	3.4 - 7.0
					SERRANIDAE DIPLECTRUM SP.	5	6.0 - 9.0
					SERRANIDAE SERRANUS SP.	4	2.8 - 3.0
					SERRANIDAE	1	4.4 - 4.4
					SYNODONTIDAE SYNODUS SP.	60	2.3 - 12.0
					TETRAODONTIDAE	2	1.8 - 2.1
					TRIGLIDAE	1	5.8 - 5.8
					UNKNOWN	122	2.0 - 35.0
2	2(1)	4-17-75	D	430	BLENNIIDAE	1	3.0 - 3.0
					BOTHIDAE BOTHUS OCELLATUS	1	8.8 - 8.8
					BOTHIDAE CITHARICHTHYS SP.	3	2.8 - 3.8
					BOTHIDAE SYACIUM SP.	1	1.8 - 1.8
					BOTHIDAE	4	1.9 - 3.0
					CLUPEIDAE ETRUMEUS TERES	1	13.0 - 13.0
					CLUPEIDAE OPISTHONEMA OGLINUM	1	11.0 - 11.0
					CYNOGLOSSIDAE SYMPHURUS SP.	2	1.5 - 5.2
					ENGRAULIDAE	207	4.5 - 12.0
					ENGRAULIDAE ANCHOA HEPSETUS	35	8.0 - 12.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	20	7.0 - 14.0
					MICRODESMIDAE MICRODESMUS SP.	1	4.1 - 4.1
					OPHIDIIDAE OPHIDION SP.	1	11.0 - 11.0
					SCIAENIDAE CYNOSCION SP.	4	3.4 - 3.9
					SCIAENIDAE MENTICIRRHUS SP.	3	3.2 - 4.1
					SPARIDAE	7	2.5 - 7.5
					SYNGNATHIDAE SYNGNATHUS LOUISIANAE	1	35.0 - 35.0
					SYNODONTIDAE SYNODUS FOETENS	20	5.0 - 22.0
					TETRAODONTIDAE	9	1.5 - 2.1
					TRIGLIDAE	4	3.2 - 5.3
					UNKNOWN	38	1.5 - 4.4
2	2(1)	4-16-75	N	1315	BOTHIDAE PARALICHTHYS SP.	1	9.3 - 9.3
					CLUPEIDAE OPISTHONEMA OGLINUM	1	11.0 - 11.0
					CLUPEIDAE	1	6.0 - 6.0
					ENGRAULIDAE	509	2.3 - 11.0
					ENGRAULIDAE ANCHOA HEPSETUS	108	8.1 - 10.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	79	6.5 - 14.0
					GOBIIDAE	2	9.5 - 11.0
					OPHICHTHIDAE MYROPHIS PUNCTATUS	1	54.0 - 54.0

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					OPHIDIIDAE OPHIDION SP.	1	9.0 - 9.0
					OPHIDIIDAE RISSOLA MARGINATA	1	7.2 - 7.2
					SCIAENIDAE CYNOSCION ARENARIUS	9	3.4 - 11.0
					SCIAENIDAE MENTICIRRHUS SP.	1	3.3 - 3.3
					SCIAENIDAE	8	2.0 - 3.7
					SPARIDAE LAGODON RHOMBOIDES	3	3.5 - 11.0
					STROMATEIDAE PEPRILUS SP.	1	3.0 - 3.0
					TRIGLIDAE	3	2.5 - 4.0
					UNKNOWN	16	1.8 - 9.0
2	2(2)	4-17-75	D	859	BOTHIDAE CITHARICHTHYS SP.	1	3.8 - 3.8
					CLUPEIDAE BREVOORTIA PATRONUS	22	5.1 - 8.8
					CLUPEIDAE HARENGULA JAGUANA	14	6.2 - 12.5
					CLUPEIDAE	51	2.1 - 7.0
					CYNOGLOSSIDAE SYMPHURUS SP.	1	2.4 - 2.4
					ENGRAULIDAE ENGRAULIS EURYSTOLE	17	6.2 - 10.5
					OPHIDIIDAE	2	2.5 - 4.0
					OPHIDIIDAE LEPOPHIDIUM SP.	1	4.3 - 4.3
					SCIAENIDAE	2	1.4 - 1.8
					SERRANIDAE DIPLECTRUM SP.	2	2.1 - 2.3
					STROMATEIDAE PEPRILUS SP.	2	3.2 - 4.1
					TRICHIURIDAE TRICHIURUS LEPTURUS	2	3.8 - 4.0
					TRIGLIDAE PRIONOTUS SP.	3	3.2 - 4.1
2	2(2)	4-17-75	N	2623	BOTHIDAE CITHARICHTHYS SP.	7	3.6 - 5.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	70	9.2 - 16.0
					CLUPEIDAE ETRUMEUS TERES	30	10.0 - 18.0
					CLUPEIDAE	51	3.5 - 17.0
					CYNOGLOSSIDAE SYMPHURUS SP.	17	1.5 - 9.2
					ENGRAULIDAE ANCHOA HEPSETUS	8	8.0 - 12.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	41	6.4 - 15.0
					ENGRAULIDAE	245	3.5 - 12.0
					GOBIIDAE GOBIONELLUS SP.	13	4.0 - 9.7
					MYCTOPHIDAE DIAPHUS SP.	27	1.8 - 3.2
					SCIAENIDAE CYNOSCION NOTHUS	1	3.8 - 3.8
					SCIAENIDAE CYNOSCION ARENARIUS	1	2.8 - 2.8
					SERRANIDAE DIPLECTRUM SP.	2	2.6 - 6.2
					STROMATEIDAE PEPRILUS SP.	4	2.1 - 3.9
					SYNODONTIDAE SYNODUS SP.	37	2.4 - 16.0

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					TETRAODONTIDAE SPHOEROIDES SP.	27	.8 - 2.8
					TRIGLIDAE PRIONOTUS SP.	5	2.2 - 3.6
					UNKNOWN	118	1.2 - 4.1
	2(3)	5-16-75	D	44	BOTHIDAE BOTHUS OCELLATUS	1	5.0 - 5.0
					BOTHIDAE SYACIUM SP.	1	4.0 - 4.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	2	8.1 - 9.0
					BREGMACEROTIDAE BREGMACEROS SP.	1	12.0 - 12.0
					CARANGIDAE CARANX SP.	6	4.0 - 5.0
					CARANGIDAE SERIOLA SP.	2	5.0 - 7.5
					CARANGIDAE	2	21.0 - 35.0
					CYNOGLOSSIDAE SYMPHURUS SP.	2	3.5 - 7.1
					GRAMMISTIDAE RYPTICUS SAPONACEUS	2	4.0 - 4.0
					MICRODESMIDAE MICRODESMUS SP.	4	8.8 - 12.0
					MYCTOPHIDAE DIAPHUS SP.	5	8.0 - 9.0
					MYCTOPHIDAE HYGOPHUM SP.	2	5.3 - 9.3
					MYCTOPHIDAE MYCTOPHUM SP.	7	4.2 - 8.9
					NETTASTOMIDAE	3	6.5 - 16.0
					SCOMBRIDAE AUXIS SP.	2	6.0 - 7.5
					SERRANIDAE DIPLECTRUM SP.	9	4.5 - 15.0
					SERRANIDAE	6	4.2 - 6.0
					SYNODONTIDAE SYNODUS SP.	2	7.5 - 9.3
					UNKNOWN	4	5.7 - 23.0
	2(3)	5-17-75	N	151	BOTHIDAE BOTHUS SP.	2	5.4 - 15.0
					BOTHIDAE CYCLOPSETTA SP.	1	23.0 - 23.0
					BOTHIDAE SYACIUM SP.	2	3.4 - 4.9
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	123	2.7 - 24.0
					BREGMACEROTIDAE BREGMACEROS SP.	10	4.5 - 11.7
					CARANGIDAE	1	3.7 - 3.7
					CONGRIDAE	1	73.0 - 73.0
					CYNOGLOSSIDAE SYMPHURUS SP.	2	3.7 - 7.5
					EXOCOETIDAE	1	5.0 - 5.0
					GEMPYLIDAE	1	5.2 - 5.2
					MICRODESMIDAE MICRODESMUS SP.	9	6.5 - 11.0
					MYCTOPHIDAE DIAPHUS SP.	8	7.7 - 8.6
					MYCTOPHIDAE CERATOSCOPELUS MADERENSIS	3	4.5 - 7.5
					MYCTOPHIDAE CERATOSCOPELUS WARMINGI	2	8.2 - 11.3
					MYCTOPHIDAE HYGOPHUM SP.	6	7.1 - 8.9

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					MYCTOPHIDAE	1	5.6 - 5.6
					NETTASTOMIDAE	3	7.0 - 19.0
					SCOMBRIDAE AUXIS SP.	1	22.0 - 22.0
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	1	6.0 - 6.0
					SERRANIDAE DIPLECTRUM SP.	9	5.7 - 13.0
					SERRANIDAE	2	6.0 - 7.0
					SYNODONTIDAE SAURIDA SP.	51	12.0 - 21.0
					TRIGLIDAE	1	5.8 - 5.8
					UNKNOWN	15	7.0 - 33.0
2	3(1)	5-14-75	D	4	BLENNIDAE	1	7.5 - 7.5
					BOTHIDAE ETROPUS MICROSTOMUS	2	8.6 - 10.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	1	7.3 - 7.3
					CYNOGLOSSIDAE SYMPHURUS SP.	4	5.3 - 6.5
					ENGRAULIDAE ANCHOA HEPSETUS	6	8.0 - 16.0
					GOBIIDAE	1	9.0 - 9.0
					MICRODESMIDAE MICRODESMUS SP.	2	9.2 - 9.5
					SCIAENIDAE MENTICIRRHUS SP.	5	2.8 - 7.5
					SERRANIDAE CENTROPRISTIS SP.	4	3.4 - 20.0
					SERRANIDAE SERRANUS SP.	1	6.0 - 6.0
					SERRANIDAE	4	4.5 - 8.8
					STROMATEIDAE	1	4.8 - 4.8
					STROMATEIDAE PEPRILUS SP.	1	4.0 - 4.0
					TRIGLIDAE PRIONOTUS SP.	1	6.7 - 6.7
2	3(1)	5-14-75	N	31	BOTHIDAE CITHARICHTHYS SP.	1	11.0 - 11.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	16	21.0 - 35.0
					CARANGIDAE DECAPTERUS PUNCTATUS	1	16.0 - 16.0
					CLUPEIDAE OPISTHONEMA OGLINUM	1	17.0 - 17.0
					CYNOGLOSSIDAE SYMPHURUS SP.	4	12.0 - 17.0
					ENGRAULIDAE ANCHOA HEPSETUS	9	13.0 - 24.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	66	6.7 - 23.0
					GOBIIDAE GOBIONELLUS SP.	7	9.8 - 11.0
					OPHICHTHIDAE	1	95.0 - 95.0
					SCIAENIDAE CYNOSCION ARENARIUS	4	5.8 - 15.0
					SCIAENIDAE CYNOSCION NOTHUS	2	7.9 - 8.2
					SCOMBRIDAE SCOMBEROMORUS MACULATUS	1	7.0 - 7.0
					STROMATEIDAE PEPRILUS SP.	3	10.0 - 12.0
					SYNODONTIDAE SYNODUS FOETENS	1	33.0 - 33.0

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					TETRAODONTIDAE SPHOEROIDES SP.	1	20.0 - 20.0
					TRICHIURIDAE TRICHIURUS LEPTURUS	2	7.5 - 17.0
					TRIGLIDAE PRIONOTUS SP.	4	12.0 - 14.0
?	3(2)	5-15-75	D	179	BOTHIDAE BOTHUS OCELLATUS	1	3.7 - 3.7
					BOTHIDAE CITHARICHTHYS SP.	1	6.0 - 6.0
					BOTHIDAE SYACIUM SP.	3	2.0 - 2.8
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	42	1.5 - 7.8
					CARANGIDAE CARANX SP.	2	2.6 - 4.0
					CLUPEIDAE ETRUMEUS TERES	16	7.8 - 9.2
					CYNOGLOSSIDAE SYMPHURUS SP.	3	1.7 - 3.4
					ENGRAULIDAE ANCHOA HEPSETUS	1	16.0 - 16.0
					GOBIIDAE	11	2.5 - 9.5
					MICRODESMIDAE MICRODESMUS SP.	6	5.2 - 13.0
					MUGILIDAE MUGIL SP.	1	4.5 - 4.5
					MYCTOPHIDAE DIAPHUS SP.	32	1.8 - 5.6
					MYCTOPHIDAE	1	3.5 - 3.5
					NETTASTOMIDAE	21	4.5 - 15.0
					OGCOCEPHALIDAE OGCOCEPHALUS SP.	5	1.7 - 3.0
					OPHIDIIDAE OPHIDION SP.	2	5.8 - 6.0
					OPHIDIIDAE OTOPHIDIUM OMOSTIGMUM	4	3.5 - 5.2
					SERRANIDAE EPINEPHELUS SP.	3	3.8 - 4.7
					SYNODONTIDAE SYNODUS SP.	32	3.1 - 7.3
					TETRAODONTIDAE LAGOCEPHALUS LAEVIGATUS	1	5.7 - 5.7
					TETRAODONTIDAE	1	1.6 - 1.6
					TRICHIURIDAE TRICHIURUS LEPTURUS	2	5.5 - 7.0
					UNKNOWN	15	1.5 - 18.0
	3(2)	5-15-75	N	444	BLENNIIDAE	1	6.8 - 6.8
					BOTHIDAE SYACIUM SP.	10	2.5 - 4.8
					BOTHIDAE BOTHUS OCELLATUS	4	3.3 - 4.5
					BOTHIDAE CITHARICHTHYS ARTICFRONS	10	2.3 - 4.4
					BOTHIDAE CITHARICHTHYS SP.	3	4.8 - 5.2
					BOTHIDAE PARALICHTHYS SP.	4	1.7 - 2.8
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	80	1.6 - 23.0
					CARANGIDAE DECAPTERUS PUNCTATUS	3	3.5 - 5.0
					CARANGIDAE CHLOROSCOMBRUS CHRYSURUS	2	3.0 - 3.5
					CARANGIDAE	5	2.9 - 3.7
					CALLIONYMIDAE CALLIONYMUS SP.	1	1.2 - 1.2

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					CLUPEIDAE ETRUMEUS TERES	44	6.2 - 18.0
					CONGRIDAE	6	4.8 - 95.0
					CYNOGLOSSIDAE SYMPHURUS SP.	8	2.5 - 5.3
					ENGRAULIDAE ENGRAULIS EURYSTOLE	4	5.6 - 10.8
					EPHIPPIDAE CHAETODIPTERUS FABER	1	4.8 - 4.8
					GOBIIDAE BATHYGOBIUS SOPORATOR	2	10.0 - 10.0
					GOBIIDAE	103	3.1 - 10.0
					GEMPYLIDAE	1	4.5 - 4.5
					MICRODESMIDAE MICRODESMUS SP.	11	2.0 - 10.3
					MUGILIDAE MUGIL CUREMA	1	13.2 - 13.2
					MYCTOPHIDAE DIAPHUS SP.	99	2.7 - 6.9
					MYCTOPHIDAE CERATOSCOPELUS MADERENSIS	2	5.6 - 6.5
					MYCTOPHIDAE CERATOSCOPELUS WARMINGI	3	4.8 - 7.8
					GRAMMISTIDAE RYPTICUS SAPONACEUS	2	4.8 - 4.9
					MYCTOPHIDAE MYCTOPHUM SP.	1	3.0 - 3.0
					MYCTOPHIDAE HYGOPHUM SP.	1	7.1 - 7.1
					MYCTOPHIDAE	1	4.4 - 4.4
					NETTASTOMIDAE	12	5.5 - 82.0
					OPHIDIIDAE LEPOPHIDIUM SP.	2	1.8 - 3.5
					OPHIDIIDAE OPHIDION SP.	9	2.0 - 9.3
					OPHIDIIDAE	2	1.8 - 2.6
					SERRANIDAE DIPLECTRUM BIVITTATUM	4	15.0 - 17.0
					SERRANIDAE DIPLECTRUM SP.	15	3.0 - 11.0
					SERRANIDAE SERRANUS SP.	12	2.3 - 9.1
					SERRANIDAE	1	4.5 - 4.5
					SYNODONTIDAE SYNODUS FOETENS	346	1.8 - 32.0
					TRIGLIDAE PRIONOTUS STEARNSI	2	25.0 - 53.0
					TRIGLIDAE PRIONOTUS SP.	2	2.8 - 36.0
					TRICHIURIDAE TRICHIURUS LEPTURUS	5	4.5 - 5.8
					TETRAODONTIDAE SPHOEROIDES SP.	5	2.2 - 2.5
					UNKNOWN	22	1.2 - 16.2
2	3(3)	5-16-75	D	367	BALISTIDAE MONACANTHUS SP.	1	2.6 - 2.6
					BOTHIDAE BOTHUS OCELLATUS	10	1.8 - 2.5
					BOTHIDAE CYCLOPSETTA SP.	1	2.6 - 2.6
					BOTHIDAE MONOLENE SP.	1	15.5 - 15.5
					BOTHIDAE SYACIUM SP.	9	2.5 - 4.2
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	5	1.8 - 9.0

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					BREGMACEROTIDAE BREGMACEROS SP.	13	1.8 - 12.0
					CARANGIDAE CARANX SP.	1	3.8 - 3.8
					CARANGIDAE DECAPTERUS PUNCTATUS	1	6.8 - 6.8
					CARANGIDAE	2	5.3 - 5.5
					CLUPEIDAE	1	3.8 - 3.8
					CYNOGLOSSIDAE SYMPHURUS SP.	8	2.3 - 9.2
					GEMPYLIDAE	4	5.3 - 16.0
					GOBIIDAE	23	2.0 - 4.0
					LUTJANIDAE	3	3.0 - 4.2
					MICRODESMIDAE MICRODESMUS SP.	2	8.6 - 9.0
					MYCTOPHIDAE DIAPHUS SP.	63	2.2 - 8.1
					MYCTOPHIDAE MYCTOPHUM SP.	9	4.5 - 9.0
					MYCTOPHIDAE	2	3.5 - 3.8
					NETTASTOMIDAE	26	4.0 - 20.0
					OGCOCEPHALIDAE	12	1.4 - 2.3
					OPHIDIIDAE OPHIDION SP.	3	3.6 - 4.9
					SCOMBRIDAE AUXIS SP.	4	3.2 - 7.4
					SERRANIDAE DIPLECTRUM SP.	3	5.5 - 7.1
					SERRANIDAE	6	4.2 - 6.5
					SPHYRAENIDAE SPHYRAENA SP.	1	6.6 - 6.6
					SYNODONTIDAE	2	2.5 - 2.5
					TETRAODONTIDAE	16	1.8 - 3.0
					TRICHIURIDAE TRICHIURUS LEPTURUS	1	4.1 - 4.1
					TRIGLIDAE	2	4.0 - 5.4
					UNKNOWN	118	1.4 - 51.0
2	3(3)	5-15-75	N	113	BOTHIDAE SYACIUM SP.	2	4.5 - 5.5
					BOTHIDAE CITHARICHTHYS SP.	2	4.3 - 4.5
					BOTHIDAE MONOLENE SP.	3	2.5 - 4.6
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	583	1.9 - 20.0
					BREGMACEROTIDAE BREGMACEROS SP.	2	4.2 - 5.8
					CARANGIDAE DECAPTERUS PUNCTATUS	6	3.4 - 5.2
					CLUPEIDAE ETRUMEUS TERES	6	11.5 - 16.0
					CONGRIDAE	6	4.5 - 6.3
					CYNOGLOSSIDAE SYMPHURUS SP.	2	2.2 - 2.8
					ENGRAULIDAE ENGRAULIS EURYSTOLE	1	13.0 - 13.0
					GEMPYLIDAE	3	6.6 - 8.3
					GOBIIDAE	17	5.0 - 8.5

APPENDIX TABLE 1. CONT.

RUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					TRIGLIDAE PRIONOTUS SP.	6	1.9 - 5.5
2	4(2)	5- 2-75	N	301	BOTHIDAE BOTHUS OCELLATUS	1	3.7 - 3.7
					BOTHIDAE CITHARICHTHYS SP.	10	2.3 - 10.2
					BOTHIDAE SYACIUM SP.	3	2.0 - 3.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	102	3.2 - 18.0
					CARANGIDAE DECAPTERUS PUNCTATUS	3	1.7 - 6.1
					CLUPEIDAE ETRUMEUS TERES	51	4.1 - 22.0
					CONGRIDAE	1	106.0 -106.0
					CYNOGLOSSIDAE SYMPHURUS SP.	2	5.5 - 6.3
					ENGRAULIDAE ANCHOA HEPSETUS	64	9.0 - 19.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	77	7.6 - 22.0
					ENGRAULIDAE	30	5.0 - 15.0
					GOBIIDAE GOBIONELLUS SP.	1	13.0 - 13.0
					GOBIIDAE	56	2.7 - 10.7
					LUTJANIDAE	6	2.8 - 4.6
					OPHIDIIDAE OPHIDION SP.	1	7.0 - 7.0
					SCIAENIDAE CYNOSCION SP.	1	3.8 - 3.8
					SCIAENIDAE MENTICIRRHUS SP.	5	2.2 - 4.5
					SERRANIDAE	1	3.8 - 3.8
					SPARIDAE	1	9.4 - 9.4
					SYNODONTIDAE SAURIDA SP.	40	3.5 - 27.0
					SYNODONTIDAE SYNODUS FOETENS	3	4.5 - 5.2
					SYNODONTIDAE SYNODUS SP.	5	2.1 - 3.5
					TETRAODONTIDAE SPHOEROIDES SP.	7	3.6 - 4.7
					TRICHIURIDAE TRICHIURUS LEPTURUS	2	6.6 - 7.9
					TRIGLIDAE	5	2.5 - 4.6
					UNKNOWN	4	2.6 - 7.3
2	4(3)	4-30-75	D	97	BOTHIDAE CITHARICHTHYS SP.	5	3.0 - 10.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	20	2.5 - 9.8
					BREGMACEROTIDAE BREGMACEROS SP.	1	7.4 - 7.4
					CLUPEIDAE ETRUMEUS TERES	10	6.0 - 9.0
					CLUPEIDAE	2	3.2 - 4.0
					CYNOGLOSSIDAE SYMPHURUS SP.	1	4.0 - 4.0
					LUTJANIDAE	1	3.3 - 3.3
					MICRODESMIDAE MICRODESMUS SP.	1	3.1 - 3.1
					MYCTOPHIDAE DIAPHUS SP.	5	3.0 - 11.0
					NETTASTOMIDAE	2	12.0 - 21.0

APPENDIX TABLE 1. CONT.

UISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					SYNODONTIDAE SYNODUS FOETENS	2	3.8 - 6.5
					SYNODONTIDAE SYNODUS SP.	2	9.0 - 9.2
					TRIGLIDAE	1	4.8 - 4.8
					UNKNOWN	4	3.0 - 6.0
2	4(3)	4-29-75	N	113	BOTHIDAE CITHARICHTHYS SP.	12	3.1 - 9.2
					BOTHIDAE SYACIUM SP.	2	1.5 - 2.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	62	2.4 - 35.0
					CARANGIDAE DECAPTERUS PUNCTATUS	3	2.3 - 4.5
					CARANGIDAE	3	1.8 - 2.9
					CLUPEIDAE ETRUMEUS TERES	142	7.5 - 15.0
					CLUPEIDAE	1	3.0 - 3.0
					CYNOGLOSSIDAE SYMPHURUS SP.	4	3.4 - 3.9
					ENGRAULIDAE ANCHOA HEPSETUS	15	6.5 - 15.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	22	6.8 - 17.0
					ENGRAULIDAE	2	6.6 - 7.4
					GOBIIDAE	12	2.2 - 8.0
					LUTJANIDAE	6	2.0 - 3.1
					MURAENESOCIDAE HOPLUNNIS SP.	1	90.0 - 90.0
					MYCTOPHIDAE DIAPHUS SP.	9	2.9 - 8.5
					MYCTOPHIDAE HYGOPHUM SP.	2	2.7 - 5.6
					NETTASTOMIDAE	3	7.7 - 14.5
					SCIAENIDAE CYNOSCION SP.	1	2.4 - 2.4
					SCIAENIDAE MENTICIRRHUS SP.	4	2.1 - 4.9
					SOLEIDAE	1	4.4 - 4.4
					SPARIDAE	7	2.8 - 6.3
					SYNODONTIDAE SAURIDA SP.	5	5.0 - 15.0
					SYNODONTIDAE SYNODUS FOETENS	4	2.1 - 3.6
					SYNODONTIDAE SYNODUS SP.	67	2.0 - 6.2
					TETRAODONTIDAE SPHOEROIDES SP.	1	3.8 - 3.8
					TRIGLIDAE PRIONOTUS SP.	8	2.0 - 7.2
					UNKNOWN	12	2.0 - 7.0
3	1(1)	8-27-75	D	1225	BOTHIDAE BOTHUS OCELLATUS	1	5.4 - 5.4
					BOTHIDAE CITHARICHTHYS SP.	14	2.2 - 6.7
					BOTHIDAE SYACIUM SP.	17	1.2 - 8.3
					CARANGIDAE CHLOROSCOMBRUS CHRYSURUS	37	1.5 - 4.1
					CARANGIDAE CARANX SP.	146	1.0 - 31.0
					CARANGIDAE	1	1.4 - 1.4

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					CLUPEIDAE	95	1.5 - 6.1
					CYNOGLOSSIDAE SYMPHURUS SP.	5	2.4 - 7.0
					ENGRAULIDAE	237	1.8 - 7.0
					GOBIIDAE	31	1.2 - 3.8
					MICRODESMIDAE MICRODESMUS SP.	9	1.4 - 6.0
					NETTASTOMIDAE	1	34.0 - 34.0
					SCIAENIDAE CYNOSCION SP.	181	1.2 - 3.2
					SCIAENIDAE MENTICIRRHUS SP.	19	1.7 - 3.1
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	2	3.0 - 11.0
					SCOMBRIDAE SCOMBEROMORUS MACULATUS	42	1.9 - 4.8
					SCOMBRIDAE	32	1.8 - 4.1
					STROMATEIDAE PEPRILUS SP.	1	2.1 - 2.1
					UNKNOWN	2	1.5 - 1.5
3	1(1)	8-26-75	N	784	BLENNIIDAE HYPSOBLENNIUS SP.	1	8.7 - 8.7
					BOTHIDAE CITHARICHTHYS SP.	24	1.8 - 8.4
					CARANGIDAE CARANX SP.	134	1.4 - 3.0
					CARANGIDAE CHLOROSCOMBRUS CHRYSURUS	345	1.7 - 9.4
					CARANGIDAE OLIGOPLITES SAURUS	2	3.0 - 3.0
					CLUPEIDAE HARENGULA JAGUANA	15	7.0 - 13.0
					CLUPEIDAE OPISTHONEMA OGLINUM	5	7.5 - 8.7
					CLUPEIDAE	21	2.1 - 7.6
					CYNOGLOSSIDAE SYMPHURUS SP.	13	1.9 - 10.0
					ENGRAULIDAE	1197	1.8 - 7.7
					ENGRAULIDAE ANCHOA HEPSETUS	59	7.0 - 19.0
					GOBIIDAE	15	1.8 - 7.8
					SCIAENIDAE CYNOSCION ARENARIUS	7	6.2 - 11.0
					SCIAENIDAE CYNOSCION SP.	326	1.4 - 5.9
					SCIAENIDAE LARIMUS FASCIATUS	1	5.8 - 5.8
					SCIAENIDAE MENTICIRRHUS SP.	49	2.1 - 5.2
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	2	3.5 - 4.8
					SCOMBRIDAE SCOMBEROMORUS MACULATUS	28	1.7 - 5.5
					SCOMBRIDAE	2	3.6 - 4.5
					SYNGNATHIDAE SYNGNATHUS LOUISIANAE	1	27.0 - 27.0
					TRICHIURIDAE TRICHIURUS LEPTURUS	1	15.0 - 15.0
					UNKNOWN	11	1.5 - 6.5
3	1(2)	8-27-75	D	375	APOGONIDAE	1	5.8 - 5.8
					BOTHIDAE BOTHUS OCELLATUS	4	2.0 - 5.1

APPENDIX TABLE 1. CONT.

UISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					BOTHIDAE CITHARICHTHYS SP.	13	2.3 - 4.0
					BOTHIDAE SYACIUM SP.	12	3.0 - 5.0
					CLUPEIDAE	2	2.2 - 2.9
					CONGRIDAE	2	6.0 - 7.2
					CYNOGLOSSIDAE SYMPHURUS SP.	14	1.8 - 7.0
					ENGRAULIDAE	25	2.2 - 7.5
					GOBIIDAE	26	2.0 - 5.5
					MICRODESMIDAE MICRODESMUS SP.	15	2.0 - 7.2
					OPHIDIIDAE LEPOPHIDIUM SP.	20	3.5 - 9.0
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	11	3.1 - 6.2
					SCOMBRIDAE	1	2.5 - 2.5
					SERRANIDAE	31	2.1 - 6.0
					SPHYRAENIDAE SPHYRAENA SP.	8	1.8 - 6.0
					SYNODONTIDAE SYNODUS SP.	8	2.6 - 14.0
					UNKNOWN	39	1.5 - 4.0
3	1(2)	8-27-75	N	861	BOTHIDAE BOTHUS OCELLATUS	12	2.0 - 5.0
					BOTHIDAE CITHARICHTHYS SP.	50	1.6 - 5.0
					BOTHIDAE SYACIUM SP.	121	1.4 - 5.1
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	9	2.9 - 15.0
					CARANGIDAE	2	2.1 - 3.0
					CLUPEIDAE	11	2.1 - 6.7
					CYNOGLOSSIDAE SYMPHURUS SP.	53	1.4 - 8.5
					ENGRAULIDAE ANCHOA HEPSETUS	23	8.3 - 14.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	24	8.2 - 14.0
					ENGRAULIDAE	119	2.0 - 9.0
					GRAMMISTIDAE RYPTICUS SP.	1	5.3 - 5.3
					GOBIIDAE	297	1.7 - 7.5
					GOBIIDAE GOBIONELLUS SP.	3	4.0 - 4.8
					MICRODESMIDAE MICRODESMUS SP.	84	1.5 - 14.0
					OGCOCEPHALIDAE OGCOCEPHALUS SP.	2	1.9 - 2.1
					OPHIDIIDAE LEPOPHIDIUM SP.	88	1.8 - 15.0
					SCIAENIDAE CYNOSCION SP.	4	1.5 - 1.9
					SCIAENIDAE MENTICIRRHUS SP.	1	2.7 - 2.7
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	3	3.2 - 6.7
					SCOMBRIDAE	6	3.0 - 6.4
					SCORPAENIDAE	1	3.5 - 3.5
					SERRANIDAE DIPLECTRUM SP.	4	3.7 - 4.8

APPENDIX TABLE 1. CONT.

RUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					SERRANIDAE SERRANUS SP.	2	3.3 - 3.8
					SERRANIDAE	93	1.4 - 5.3
					SPHYRAENIDAE SPHYRAENA SP.	17	1.8 - 7.C
					STRCMATEIDAE PEPRILUS SP.	6	1.6 - 1.9
					SYNODONTIDAE SYNODUS SP.	266	1.2 - 13.C
					TRICHIURIDAE TRICHIURUS LEPTURUS	1	5.5 - 5.5
					UNKNOWN	16	1.1 - 38.C
3	1(3)	9-29-75	D	64	AULOPIDAE AULOPUS SP.	4	1.7 - 2.4
					BOTHIDAE BOTHUS OCELLATUS	6	1.7 - 4.0
					BOTHIDAE SYACIUM SP.	5	1.8 - 4.1
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	70	2.0 - 6.5
					BREGMACEROTIDAE BREGMACEROS SP.	18	2.0 - 4.2
					CARANGIDAE DECAPTERUS PUNCTATUS	1	2.5 - 2.5
					CARANGIDAE	1	3.0 - 3.0
					CONGRIDAE	13	3.5 - 9.C
					CYNOGLOSSIDAE SYMPHURUS SP.	19	2.2 - 6.2
					ENGRAULIDAE	25	2.7 - 4.3
					GOBIIDAE	25	2.0 - 5.2
					MICRODESMIDAE MICRODESMUS SP.	1	8.8 - 8.8
					MYCTOPHIDAE MYCTOPHUM SP.	1	4.3 - 4.3
					MYCTOPHIDAE NOTOLYCHNUS VALDIVIAE	2	4.2 - 4.4
					MYCTOPHIDAE	24	3.0 - 4.4
					OGCOCEPHALIDAE OGCOCEPHALUS SP.	3	2.5 - 4.4
					OPHICHTHIDAE	13	3.8 - 14.C
					OPHIDIIDAE LEPOPHIDIUM SP.	9	2.3 - 12.0
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	3	2.5 - 4.C
					SCOMBRIDAE	1	6.5 - 6.5
					SERRANIDAE	2	2.3 - 3.C
					SPHYRAENIDAE SPHYRAENA SP.	6	1.8 - 2.2
					STROMATEIDAE	5	2.0 - 2.7
					SYNODONTIDAE SYNODUS SP.	6	2.5 - 3.3
					TETRAODONTIDAE LAGOCEPHALUS LAEVIGATUS	1	8.5 - 8.5
					TETRAODONTIDAE	6	1.8 - 4.C
					UNKNOWN	117	1.2 - 5.5
3	1(3)	9-30-75	N	103	AULOPIDAE AULOPUS SP.	1	3.6 - 3.6
					BOTHIDAE BOTHUS OCELLATUS	27	1.7 - 4.6
					BOTHIDAE CITHARICHTHYS SP.	1	5.0 - 5.0

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					BOTHIDAE SYACIUM SP.	6	2.5 - 4.7
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	124	2.0 - 18.0
					BREGMACEROTIDAE BREGMACEROS SP.	2	2.6 - 2.8
					CARANGIDAE DECAPTERUS PUNCTATUS	11	2.0 - 3.9
					CARANGIDAE	2	2.6 - 3.0
					CLUPEIDAE	2	3.3 - 6.5
					CONGRIDAE	7	3.9 - 5.8
					CYNOGLOSSIDAE SYMPHURUS SP.	28	2.5 - 5.5
					ENGRAULIDAE	6	2.7 - 3.5
					GOBIIDAE	185	2.6 - 7.6
					LABRIDAE HALICHOERES SP.	1	6.7 - 6.7
					MYCTOPHIDAE DIAPHUS SP.	203	3.7 - 5.2
					MYCTOPHIDAE MYCTOPHUM OBTUSIROSTRE	1	3.5 - 3.5
					MYCTOPHIDAE	2	2.4 - 3.4
					OGCOCEPHALIDAE OGCOCEPHALUS SP.	1	2.2 - 2.2
					OPHIDIIDAE LEPOPHIDIUM SP.	2	4.8 - 9.7
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	6	2.3 - 4.2
					SCOMBRIDAE	6	1.3 - 5.0
					SCORPAENIDAE SCORPAENA SP.	1	2.2 - 2.2
					SERRANIDAE SERRANUS SP.	4	3.4 - 4.6
					SERRANIDAE	8	2.0 - 3.2
					SPHYRAENIDAE SPHYRAENA SP.	6	1.9 - 2.7
					SYNODONTIDAE SYNODUS FOETENS	4	2.4 - 4.5
					SYNODONTIDAE SYNODUS SP.	5	4.2 - 10.0
					SYNODONTIDAE	12	3.4 - 6.2
					TETRAODONTIDAE SPHOEROIDES SP.	3	1.9 - 4.6
					UNKNOWN	109	1.5 - 34.0
3	2(1)	9- 4-75	D	151	BOTHIDAE CITHARICHTHYS SP.	4	1.6 - 5.0
					CARANGIDAE CARANX SP.	47	1.4 - 2.7
					CARANGIDAE CHLOROSCOMBRUS CHRYSURUS	101	1.5 - 6.9
					CLUPEIDAE HARENGULA SP.	1	7.0 - 7.0
					CLUPEIDAE OPISTHONEMA OGLINUM	2	2.9 - 8.6
					CYNOGLOSSIDAE SYMPHURUS SP.	1	9.2 - 9.2
					ENGRAULIDAE ANCHOA HEPSETUS	1	9.8 - 9.8
					ENGRAULIDAE	14	3.0 - 6.2
					GOBIIDAE	21	1.7 - 7.8
					SCIAENIDAE CYNOSCION ARENARIUS	1	7.1 - 7.1

APPENDIX TABLE 1. CONT.

UISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					SCIAENIDAE CYNOSCION SP.	20	1.9 - 5.5
					SCIAENIDAE CYNOSCION NOTHUS	6	5.8 - 8.5
					SCIAENIDAE MENTICIRRHUS SP.	9	1.8 - 3.0
					SCIAENIDAE LARIMUS FASCIATUS	1	3.5 - 3.5
					SCOMBRIDAE SCOMBEROMOPUS MACULATUS	2	2.1 - 3.5
					STROMATEIDAE PEPRILUS SP.	1	2.6 - 2.6
					UNKNOWN	2	2.3 - 2.4
3	2(1)	9- 4-75	N	1043	BOTHIDAE BOTHUS OCELLATUS	1	9.8 - 9.8
					BOTHIDAE CITHARICHTHYS SP.	13	1.5 - 7.4
					BOTHIDAE SYACIUM SP.	1	1.3 - 1.3
					BOTHIDAE	1	9.8 - 9.8
					CARANGIDAE CARANX SP.	31	1.4 - 2.2
					CLUPEIDAE	6	3.5 - 5.0
					CYNOGLOSSIDAE SYMPHURUS SP.	2	5.1 - 9.4
					ENGRAULIDAE ANCHOA HEPSETUS	61	7.0 - 16.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	34	6.5 - 13.0
					ENGRAULIDAE	123	3.1 - 8.4
					GOBIIDAE	89	2.2 - 11.0
					NETTASTOMIDAE	6	55.0 - 84.0
					OPHIDIIDAE LEPOPHIDIUM SP.	3	2.7 - 3.7
					SCIAENIDAE CYNOSCION NOTHUS	2	7.6 - 9.2
					SCIAENIDAE CYNOSCION SP.	80	2.1 - 5.2
					SCIAENIDAE MENTICIRRHUS SP.	5	1.8 - 4.3
					SCOMBRIDAE SCOMBEROMORUS MACULATUS	2	4.9 - 5.4
					SYNODONTIDAE SYNODUS FOETENS	1	17.0 - 17.0
					TRICHIURIDAE TRICHIURUS LEPTURUS	1	7.2 - 7.2
					UNKNOWN	7	1.5 - 2.5
3	2(2)	9- 5-75	D	120	BOTHIDAE BOTHUS OCELLATUS	6	2.6 - 7.2
					BOTHIDAE SYACIUM SP.	81	1.5 - 9.8
					CARANGIDAE VOMER SETAPINNIS	1	7.0 - 7.0
					CLUPEIDAE HARENGULA JAGUANA	1	11.0 - 11.0
					CONGRIDAE	1	5.9 - 5.9
					CYNOGLOSSIDAE SYMPHURUS SP.	11	1.3 - 2.6
					ENGRAULIDAE ENGRAULIS EURYSTOLE	8	7.1 - 12.0
					ENGRAULIDAE	49	2.2 - 5.4
					GOBIIDAE	1014	1.5 - 8.0
					GRAMMISTIDAE RYPTICUS SP.	2	2.7 - 3.3

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					MICRODESMIDAE MICRODESMUS SP.	33	1.5 - 15.0
					NETTASTOMIDAE	4	13.0 - 17.0
					OGCOCEPHALIDAE OGCOCEPHALUS SP.	2	2.4 - 2.4
					SCIAENIDAE	1	1.8 - 1.8
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	16	3.0 - 7.1
					SCOMBRIDAE	4	4.5 - 6.5
					SCORPAENIDAE SCORPAENA SP.	3	3.3 - 9.0
					SERRANIDAE EPINEPHELUS SP.	22	3.0 - 7.8
					SERRANIDAE	20	1.5 - 4.0
					SPHYRAENIDAE SPHYRAENA SP.	3	1.8 - 2.0
					SYNODONTIDAE SYNODUS FOETENS	7	1.8 - 7.4
					TRICHIURIDAE TRICHIURUS LEPTURUS	1	8.4 - 8.4
					TRICHIURIDAE TRICHIURUS SP.	3	4.9 - 5.5
					UNKNOWN	16	1.2 - 7.4
3	2(2)	9- 5-75	N	62	BALISTIDAE MONACANTHUS SP.	1	2.1 - 2.1
					BOTHIDAE BOTHUS OCELLATUS	9	1.4 - 2.1
					BOTHIDAE SYACIUM SP.	101	1.6 - 8.0
					BOTHIDAE	7	1.4 - 2.1
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	21	8.6 - 19.0
					CARANGIDAE CARANX SP.	1	2.5 - 2.5
					CARANGIDAE DECAPTERUS PUNCTATUS	4	4.2 - 6.7
					CARANGIDAE VOMER SETAPINNIS	1	7.0 - 7.0
					CLUPEIDAE HARENGULA SP.	22	2.9 - 6.8
					CONGRIDAE	1	16.0 - 16.0
					CYNOGLOSSIDAE SYMPHURUS SP.	1	4.7 - 4.7
					ENGRAULIDAE ENGRAULIS EURYSTOLE	67	4.5 - 13.0
					GOBIIDAE	535	1.1 - 6.8
					MICRODESMIDAE MICRODESMUS SP.	57	3.5 - 12.0
					NETTASTOMIDAE	11	6.3 - 28.0
					OGCOCEPHALIDAE OGCOCEPHALUS SP.	1	5.4 - 5.4
					OPHIDIIDAE OPHIDION SP.	1	8.6 - 8.6
					SCIAENIDAE	2	2.0 - 2.0
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	16	3.4 - 6.7
					SCOMBRIDAE EUTHYNNUS SP.	2	4.2 - 5.0
					SCOMBRIDAE AUXIS SP.	1	4.1 - 4.1
					SCOMBRIDAE	3	3.5 - 8.0
					SCORPAENIDAE SCORPAENA SP.	4	2.8 - 3.9

APPENDIX TABLE 1. CONT.

JISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					SERRANIDAE CENTROPRISTIS SP.	12	2.7 - 4.4
					SERRANIDAE EPINEPHELUS SP.	28	3.2 - 9.2
					SERRANIDAE SERRANUS SP.	12	2.6 - 4.5
					SERRANIDAE	10	2.5 - 4.8
					SPHYRAENIDAE SPHYRAENA SP.	1	3.0 - 3.0
					STROMATEIDAE	2	1.7 - 2.7
					SYNODONTIDAE SYNODUS SP.	7	3.1 - 6.5
					TRIGLIDAE PRIONOTUS SP.	1	2.8 - 2.8
					UNKNOWN	9	1.1 - 4.5
3	2(3)	9- 6-75	D	92	BOTHIDAE BOTHUS OCELLATUS	6	2.8 - 5.5
					BOTHIDAE CITHARICHTHYS SP.	1	4.6 - 4.6
					BOTHIDAE SYACIUM SP.	14	2.5 - 6.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	56	2.5 - 4.5
					CARANGIDAE CARANX SP.	1	2.5 - 2.5
					CLUPEIDAE HARENGULA JAGUANA	9	3.5 - 7.2
					CONGRIDAE	1	5.2 - 5.2
					CYNOGLOSSIDAE SYMPHURUS SP.	5	1.6 - 3.1
					ENGRAULIDAE ENGRAULIS EURYSTOLE	1	14.0 - 14.0
					GOBIIDAE	24	3.5 - 7.2
					MICRODESMIDAE MICRODESMUS SP.	4	5.0 - 9.0
					NETTASTOMIDAE	1	10.0 - 10.0
					OPHICHTHIDAE	1	4.0 - 4.0
					OPHIDIIDAE OPHIDION SP.	2	6.7 - 10.0
					POMADASYIDAE	10	2.7 - 4.8
					SCOMBRIDAE SCOMBER SP.	2	3.5 - 6.0
					SERRANIDAE EPINEPHELUS SP.	2	3.0 - 3.5
					SERRANIDAE SERRANUS SP.	4	2.7 - 4.0
					SERRANIDAE	22	3.0 - 3.6
					SPHYRAENIDAE SPHYRAENA SP.	5	2.0 - 4.0
					SYNODONTIDAE SYNODUS SP.	16	2.6 - 9.5
					TRICHIURIDAE TRICHIURUS SP.	3	4.5 - 5.2
					UNKNOWN	22	1.0 - 5.5
3	2(3)	9- 6-75	N	75	BOTHIDAE BOTHUS OCELLATUS	5	2.5 - 4.2
					BOTHIDAE SYACIUM SP.	35	2.1 - 4.0
					BREGMACEROTIDAE BREGMACEROS SP.	157	2.2 - 22.0
					CARANGIDAE CARANX SP.	1	2.3 - 2.3
					CARANGIDAE SELENE VOMER	4	2.6 - 3.2

PPENDIX TABLE 1. CONT.

ISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					CLUPEIDAE HARENGULA SP.	17	2.5 - 6.0
					CYNOGLOSSIDAE SYMPHURUS SP.	4	2.5 - 11.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	6	6.0 - 10.0
					GOBIIDAE GOBIONELLUS SP.	1	7.6 - 7.6
					GOBIIDAE	74	1.5 - 11.0
					MICRODESMIDAE MICRODESMUS SP.	10	2.8 - 4.0
					OPHICHTHIDAE	2	6.0 - 8.5
					OPHIDIIDAE	3	3.5 - 6.0
					POMADASYIDAE	8	3.0 - 3.5
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	1	3.5 - 3.5
					SCOMBRIDAE EUTHYNNUS SP.	2	6.5 - 6.5
					SCOMBRIDAE AUXIS SP.	2	4.2 - 4.5
					SERRANIDAE CENTROPRISTIS SP.	18	5.0 - 7.7
					SERRANIDAE SERRANUS SP.	5	4.0 - 5.0
					SERRANIDAE	3	4.0 - 4.0
					SPHYRAENIDAE SPHYRAENA SP.	9	2.7 - 5.2
					SYNODONTIDAE SYNODUS SP.	42	2.0 - 10.0
					UNKNOWN	22	1.7 - 2.4
I	3(1)	9- 8-75	D	804	BOTHIDAE CITHARICHTHYS SP.	9	3.6 - 6.7
					BOTHIDAE SYACIUM SP.	28	1.4 - 12.0
					CARANGIDAE CARANX SP.	73	1.5 - 3.1
					CARANGIDAE CHLOROSCOMBRUS CHRYSURUS	86	2.3 - 9.8
					CLUPEIDAE	2	3.5 - 3.5
					CYNOGLOSSIDAE SYMPHURUS SP.	6	1.7 - 7.5
					ENGRAULIDAE	47	7.9 - 8.2
					GOBIIDAE	47	1.6 - 9.0
					GRAMMISTIDAE RYPTICUS SP.	1	7.3 - 7.3
					MICRODESMIDAE MICRODESMUS SP.	3	4.5 - 19.0
					NETTASTOMIDAE	5	65.0 - 85.0
					OPHIDIIDAE LEPOPHIDIUM SP.	1	12.0 - 12.0
					SCIAENIDAE CYNOSCION SP.	35	1.8 - 9.6
					SCIAENIDAE MENTICIRRHUS SP.	13	1.4 - 3.4
					SCOMBRIDAE SCOMBEROMORUS MACULATUS	7	2.0 - 11.3
					SERRANIDAE	1	2.5 - 2.5
					STROMATEIDAE PEPRILUS SP.	1	5.5 - 5.5
					SYNGNATHIDAE SYNGNATHUS FLORIDAE	1	28.0 - 28.0
					TRICHIURIDAE TRICHIURUS LEPTURUS	4	6.6 - 14.0

APPENDIX TABLE 1. CONT.

RUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					UNKNOWN	2	1.6 - 1.8
3	3(1)	9- 8-75	N	629	BOTHIDAE CITHARICHTHYS SP.	18	3.0 - 5.5
					BOTHIDAE SYACIUM SP.	4	6.9 - 7.8
					CARANGIDAE CARANX SP.	82	1.5 - 3.2
					CARANGIDAE CHLOROSCOMBRUS CHRYSURUS	110	1.9 - 5.8
					CLUPEIDAE HARENGULA SP.	3	9.0 - 21.0
					ENGRAULIDAE ANCHOA HEPSETUS	391	3.8 - 23.0
					GOBIIDAE	110	4.1 - 9.0
					NETTASTOMIDAE	1	85.0 - 85.0
					SCIAENIDAE CYNOSCION SP.	145	1.9 - 14.0
					SCIAENIDAE MENTICIRRHUS SP.	27	2.0 - 4.4
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	1	1.8 - 1.8
					SCOMBRIDAE SCOMBEROMORUS MACULATUS	5	2.5 - 6.0
					SYNGNATHIDAE HIPPOCAMPUS ERECTUS	1	4.5 - 4.5
					SYNGNATHIDAE SYNGNATHUS LOUISIANAE	1	11.0 - 11.0
					UNKNOWN	20	2.5 - 10.0
3	3(2)	9- 7-75	D	51	BOTHIDAE BOTHUS OCELLATUS	5	1.6 - 4.4
					BOTHIDAE CYCLOPSETTA SP.	18	1.7 - 5.4
					BOTHIDAE SYACIUM SP.	45	2.1 - 10.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	1	9.3 - 9.3
					CARANGIDAE DECAPTERUS PUNCTATUS	9	1.8 - 2.5
					CARANGIDAE SELENE VOMER	9	1.5 - 2.8
					CYNOGLOSSIDAE SYMPHURUS SP.	10	2.0 - 4.8
					ENGRAULIDAE ENGRAULIS EURYSTOLE	6	6.6 - 9.2
					ENGRAULIDAE	30	2.3 - 6.0
					GOBIIDAE	122	1.8 - 7.0
					GRAMMISTIDAE RYPTICUS SP.	1	3.8 - 3.8
					MICRODESMIDAE MICRODESMUS SP.	15	1.6 - 9.5
					MYCTOPHIDAE DIAPHUS SP.	1	4.5 - 4.5
					OGCOCEPHALIDAE OGCOCEPHALUS SP.	1	2.6 - 2.6
					OPHIDIIDAE LEPOPHIDIUM SP.	5	3.8 - 11.0
					OPHIDIIDAE OTOPHIDIUM OMOSTIGMUM	3	3.5 - 8.3
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	11	2.5 - 7.0
					SCOMBRIDAE	41	2.0 - 5.0
					SERRANIDAE DIPLECTRUM SP.	3	2.4 - 3.5
					SERRANIDAE SERRANUS SP.	24	3.0 - 4.6
					SERRANIDAE	22	2.0 - 5.0

PPENDIX TABLE 1. CONT.

ISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					SPHYRAENIDAE SPHYRAENA SP.	7	1.5 - 3.0
					SYNODONTIDAE SYNODUS SP.	3	2.2 - 7.6
					TETRAODONTIDAE SPHOEROIDES SP.	1	2.8 - 2.8
					UNKNOWN	136	1.5 - 31.C
	3(2)	9- 6-75	N	94	BOTHIDAE BOTHUS OCELLATUS	12	2.5 - 4.9
					BOTHIDAE CITHARICHTHYS SP.	3	3.0 - 5.8
					BOTHIDAE CYCLOPSETTA SP.	18	1.8 - 6.C
					BOTHIDAE SYACIUM SP.	76	1.7 - 5.1
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	59	3.7 - 16.C
					CARANGIDAE DECAPTERUS PUNCTATUS	3	1.4 - 1.7
					CLUPEIDAE	1	7.0 - 7.C
					CYNOGLOSSIDAE SYMPHURUS SP.	23	2.5 - 6.C
					ENGRAULIDAE ENGRAULIS EURYSTOLE	13	6.5 - 12.C
					ENGRAULIDAE	23	1.8 - 7.7
					EXOCOETIDAE CYPSELURUS SP.	2	4.1 - 5.5
					GOBIIDAE	213	2.3 - 9.0
					MICRODESMIDAE MICRODESMUS SP.	7	3.9 - 5.9
					OPHIDIIDAE LEPOPHIDIUM SP.	22	2.7 - 17.C
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	10	1.9 - 4.6
					SCOMBRIDAE	23	1.9 - 5.1
					SCORPAENIDAE SCORPAENA BRASILIENSIS	1	8.5 - 8.5
					SERRANIDAE DIPLECTRUM SP.	1	3.2 - 3.2
					SERRANIDAE SERRANUS SP.	8	1.6 - 5.6
					SERRANIDAE	32	1.6 - 4.2
					SPHYRAENIDAE SPHYRAENA SP.	4	1.6 - 3.1
					SYNODONTIDAE SYNODUS FOETENS	32	2.2 - 6.5
					SYNODONTIDAE SYNODUS SP.	54	3.0 - 20.0
					TETRAODONTIDAE SPHOEROIDES SP.	1	3.7 - 3.7
					TRICHIURIDAE TRICHIURUS LEPTURUS	3	4.9 - 5.3
					UNKNOWN	19	3.2 - 36.C
	3(3)	9- 7-75	D	85	BOTHIDAE BOTHUS OCELLATUS	1	3.0 - 3.0
					BOTHIDAE SYACIUM SP.	5	2.0 - 3.6
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	81	1.8 - 6.C
					CARANGIDAE DECAPTERUS PUNCTATUS	4	2.3 - 3.2
					CONGRIDAE	3	3.6 - 5.4
					CYNOGLOSSIDAE SYMPHURUS SP.	6	1.9 - 7.3
					GOBIIDAE GOBIONELLUS SP.	1	4.9 - 4.9

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					GOBIIDAE	39	1.8 - 4.6
					MYCTOPHIDAE DIAPHUS SP.	13	2.1 - 4.3
					SCOMBRIDAE	2	2.3 - 2.3
					SERRANIDAE	2	3.0 - 3.0
					SYNODONTIDAE SYNODUS FOETENS	2	3.0 - 4.0
					SYNODONTIDAE	10	2.3 - 5.5
					UNKNOWN	10	1.4 - 5.7
3	3(3)	9- 7-75	N	104	BOTHIDAE BOTHUS OCELLATUS	4	1.7 - 3.6
					BOTHIDAE CITHARICHTHYS SP.	1	4.6 - 4.6
					BOTHIDAE CYCLOPSETTA SP.	5	2.5 - 3.1
					BOTHIDAE SYACIUM SP.	21	1.6 - 4.2
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	131	2.6 - 23.0
					CARANGIDAE DECAPTERUS PUNCTATUS	7	2.0 - 3.2
					CARANGIDAE SELENE VOMER	3	2.5 - 3.0
					CLUPEIDAE OPISTHONEMA OGLINUM	3	6.0 - 7.0
					CONGRIDAE	7	3.2 - 11.0
					CYNOGLOSSIDAE SYMPHURUS SP.	11	2.0 - 3.5
					ENGRAULIDAE	22	3.6 - 10.0
					GOBIIDAE	166	2.2 - 11.0
					MICRODESMIDAE MICRODESMUS SP.	13	3.4 - 11.0
					OPHIDIIDAE LEPOPHIDIUM SP.	6	4.1 - 6.8
					SCIAENIDAE CYNOSCION SP.	1	2.9 - 2.9
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	12	2.5 - 3.9
					SCOMBRIDAE	14	2.2 - 4.8
					SCORPAENIDAE SCORPAENA SP.	2	2.5 - 2.8
					SERRANIDAE	18	2.5 - 4.0
					SPHYRAENIDAE SPHYRAENA SP.	9	2.0 - 5.0
					SYNODONTIDAE SYNODUS SP.	17	3.0 - 7.0
					TETRAODONTIDAE SPHOEROIDES SP.	1	1.7 - 1.7
					UNKNOWN	32	1.5 - 7.5
3	4(1)	9-12-75	D	1920	BOTHIDAE BOTHUS OCELLATUS	4	9.5 - 12.0
					BOTHIDAE CITHARICHTHYS SP.	3	3.9 - 5.7
					BOTHIDAE SYACIUM SP.	17	1.6 - 13.0
					CARANGIDAE CARANX SP.	40	1.8 - 3.5
					CARANGIDAE CHLOROSCOMBRUS CHRYSURUS	53	2.5 - 15.0
					CLUPEIDAE HARENGULA JAGUANA	1	14.0 - 14.0
					CYNOGLOSSIDAE SYMPHURUS SP.	6	1.9 - 5.6

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					ENGRAULIDAE ANCHOA HEPSETUS	3	8.0 - 14.0
					ENGRAULIDAE	70	3.0 - 8.0
					EXOCOETIDAE CYPSELURUS SP.	1	12.0 - 12.0
					GOBIIDAE	49	1.6 - 9.4
					GRAMMISTIDAE RYPTICUS SP.	1	5.0 - 5.0
					MICRODESMIDAE MICRODESMUS SP.	2	2.4 - 18.0
					OPHIDIIDAE LEPOPHIDIUM SP.	1	3.1 - 3.1
					SCIAENIDAE CYNOSCION NOTHUS	14	6.2 - 11.0
					SCIAENIDAE CYNOSCION SP.	75	1.5 - 5.9
					SCIAENIDAE LARIMUS FASCIATUS	1	3.0 - 3.0
					SCIAENIDAE MENTICIRRHUS SP.	2	3.0 - 3.8
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	3	3.6 - 4.3
					SCOMBRIDAE SCOMBEROMORUS MACULATUS	9	4.2 - 6.6
					SERRANIDAE	1	9.3 - 9.3
					STROMATEIDAE PEPRILUS SP.	2	3.5 - 4.7
					TETRAODONTIDAE SPHOEROIDES PARVUS	1	14.0 - 14.0
					TETRAODONTIDAE SPHOEROIDES SP.	39	1.1 - 1.2
					TRICHIURIDAE TRICHIURUS LEPTURUS	2	5.0 - 22.0
					UNKNOWN	11	.7 - 47.0
3	4(1)	9-11-75	N	1557	BOTHIDAE BOTHUS OCELLATUS	1	2.4 - 2.4
					BOTHIDAE CITHARICHTHYS SP.	3	4.7 - 5.5
					BOTHIDAE SYACIUM SP.	2	1.9 - 6.5
					CARANGIDAE CARANX SP.	28	1.7 - 3.2
					CARANGIDAE CHLOROSCOMBRUS CHRYSURUS	13	2.3 - 4.2
					CLUPEIDAE SARDINELLA SP.	8	14.0 - 17.0
					CLUPEIDAE	3	3.4 - 4.4
					CYNOGLOSSIDAE SYMPHURUS SP.	3	3.2 - 3.3
					ENGRAULIDAE ANCHOA HEPSETUS	18	3.5 - 17.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	137	3.8 - 15.0
					ENGRAULIDAE	57	4.0 - 7.0
					GOBIIDAE	124	2.0 - 8.8
					MICRODESMIDAE MICRODESMUS SP.	1	4.8 - 4.8
					MYCTOPHIDAE MYCTOPHUM SP.	1	3.8 - 3.8
					SCIAENIDAE CYNOSCION SP.	48	1.9 - 5.2
					SCIAENIDAE LARIMUS FASCIATUS	3	2.5 - 2.6
					SCIAENIDAE MENTICIRRHUS SP.	10	2.0 - 3.3
					SCOMBRIDAE SCOMBEROMORUS MACULATUS	3	2.7 - 5.3

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					STRCMATEIDAE PEPRILUS SP.	1	3.2 - 3.2
3	4(2)	9-12-75	D	878	BCTHIDAE CYCLOPSETTA SP.	3	1.2 - 1.3
					BCTHIDAE SYACIUM SP.	11	1.5 - 4.5
					CARANGIDAE CARANX SP.	10	1.5 - 3.2
					CARANGIDAE CHLOROSCCMBRUS CHRYSURUS	4	2.7 - 3.6
					CARANGICAE DECAPTERUS PUNCTATUS	1	4.2 - 4.2
					CARANGICAE SELENE VCMER	2	2.7 - 3.1
					CLUPEIDAE SARDINELLA SP.	2	9.0 - 11.0
					CYNOGLOSSIDAE SYMPHURUS SP.	3	1.2 - 2.1
					ENGRAULIDAE	9	2.4 - 5.9
					ENGRAULIDAE ENGRAULIS EURYSTOLE	10	4.0 - 7.5
					GCBIIDAE	48	1.5 - 7.0
					GRAMMISTIDAE RYPTICUS SAPONACEUS	1	4.2 - 4.2
					MICRODESMIDAE MICRODESMUS SP..	9	2.3 - 21.0
					MYCTOPHIDAE	2	1.2 - 2.2
					OPHICHTHIDAE	1	12.0 - 12.0
					OPHIDIIDAE LEPOPHIDIUM SP.	2	3.2 - 3.5
					SCIAENICAE CYNCSCION ARENARIUS	1	2.6 - 2.6
					SCIAENIDAE CYNOSCION NOTHUS	1	1.6 - 1.6
					SCIAENICAE LARIMUS FASCIATUS	3	1.6 - 2.8
					SCCMBRIDAE SCCMBEROMORUS CAVALLA	5	2.1 - 6.2
					SERRANICAE	2	4.2 - 5.2
					SYNODONTIDAE SYNODUS SP.	1	2.6 - 2.6
					TETRAODCNTIDAE	1	1.7 - 1.7
					TRICHIURIDAE TRICHIURUS LEPTURUS	3	4.8 - 5.4
					UNKNOWN	10	6.2 - 46.0
3	4(2)	9-13-75	N	265	AULOPIDAE AULOPUS SP.	1	2.6 - 2.6
					BCTHIDAE BOTHUS OCELLATUS	22	1.8 - 13.0
					BCTHIDAE CITHARICHTHYS SP.	11	2.5 - 6.0
					BCTHIDAE CYCLOPSETTA SP.	10	2.6 - 12.0
					BCTHIDAE SYACIUM SP.	101	1.3 - 9.2
					BREGMACERCTIDAE BREGMACEROS ATLANTICUS	5	12.0 - 14.0
					CARANGICAE CARANX SP.	7	1.8 - 3.5
					CARANGIDAE SELENE VCMER	23	1.7 - 4.0
					CLUPEIDAE HARENGULA JAGUANA	3	7.5 - 13.0
					CLUPEIDAE OPISTHONEMA CGLINUM	3	6.5 - 8.0
					CLUPEIDAE	2	2.6 - 6.2

APPENDIX TABLE 1. CONT.

UISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					CONGRIDAE	5	4.0 - 8.5
					CYNOGLOSSIDAE SYMPHURUS SP.	26	1.8 - 8.2
					ENGRAULIDAE ANCHOA HEPSETUS	124	6.8 - 19.0
					ENGRAULIDAE ENGRAULIS EURYSTOLE	176	6.2 - 18.0
					ENGRAULIDAE	382	3.0 - 12.0
					GOBIIDAE GOBIOSOMA SP.	102	1.5 - 12.0
					GOBIIDAE	674	1.5 - 8.7
					GRAMMISTIDAE RYPTICUS SAPONACEUS	4	2.2 - 8.0
					LABRIDAE HALICHOERES SP.	1	9.8 - 9.8
					MICRODESMIDAE MICRODESMUS SP.	62	2.4 - 17.0
					NETTASTOMIDAE	6	8.9 - 50.0
					OPHIDIIDAE LEPOPHIDIUM SP.	8	2.1 - 4.8
					SCIAENIDAE LARIMUS FASCIATUS	2	2.0 - 3.0
					SCIAENIDAE MENTICIRRHUS SP.	3	1.8 - 5.3
					SCOMBRIDAE AUXIS SP.	6	1.4 - 4.1
					SCOMBRIDAE EUTHYNNUS SP.	3	6.5 - 7.2
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	21	2.5 - 6.0
					SCOMBRIDAE SCOMBEROMORUS MACULATUS	3	3.2 - 5.3
					SCOMBRIDAE	9	1.5 - 2.5
					SERRANIDAE EPINEPHELUS SP.	7	4.2 - 13.0
					SERRANIDAE SERRANUS SP.	6	2.2 - 3.1
					SERRANIDAE	8	2.0 - 6.7
					SPHYRAENIDAE SPHYRAENA SP.	5	2.3 - 9.5
					STROMATEIDAE PEPRILUS SP.	1	3.2 - 3.2
					STROMATEIDAE	1	1.8 - 1.8
					SYNODONTIDAE SYNODUS FOETENS	22	8.3 - 15.0
					TETRAODONTIDAE	1	1.5 - 1.5
					TRICHIURIDAE TRICHIURUS LEPTURUS	11	4.7 - 7.4
					UNKNOWN	56	1.2 - 72.0
3	4(3)	9-13-75	D	103	BOTHIDAE BOTHUS OCELLATUS	20	1.3 - 3.2
					BOTHIDAE CITHARICHTHYS SP.	21	1.7 - 4.3
					BOTHIDAE CYCLOPSETTA SP.	1	4.9 - 4.9
					BOTHIDAE SYACIUM SP.	103	1.6 - 7.2
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	2	2.0 - 7.2
					CARANGIDAE CARANX SP.	5	2.1 - 2.3
					CARANGIDAE DECAPTERUS PUNCTATUS	1	3.7 - 3.7
					CARANGIDAE SELENE VOMER	3	2.5 - 7.3

'PENDIX TABLE 1. CONT.

ISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL (IN MM)
					CLUPEIDAE	4	2.5 - 4.0
					CYNOGLOSSIDAE SYMPHURUS SP.	62	2.4 - 8.2
					ENGRAULIDAE	11	3.7 - 6.7
					GOBIIDAE	260	1.3 - 6.3
					MICRODESMIDAE MICRODESMUS SP.	19	2.1 - 5.7
					MYCTOPHIDAE	1	7.5 - 7.5
					OPHICHTHIDAE	18	3.7 - 5.5
					OPHIDIIDAE LEPOPHIDIUM SP.	12	2.9 - 9.3
					SCOMBRIDAE AUXIS SP.	16	1.9 - 5.2
					SCOMBRIDAE EUTHYNNUS SP.	2	3.0 - 4.8
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	24	2.6 - 4.8
					SCOMBRIDAE	2	1.8 - 2.1
					SCORPAENIDAE SCORPAENA SP.	1	2.2 - 2.2
					SERRANIDAE CENTROPRISTIS SP.	2	5.6 - 6.2
					SERRANIDAE SERRANUS SP.	18	1.8 - 3.5
					SERRANIDAE	5	1.8 - 3.2
					SPHYRAENIDAE SPHYRAENA SP.	6	1.8 - 4.3
					SYNODONTIDAE SYNODUS SP.	4	1.8 - 2.8
					TETRAODONTIDAE SPHOEROIDES SP.	1	1.3 - 1.3
					TRICHIURIDAE TRICHIURUS LEPTURUS	9	3.5 - 9.5
	4(3)	9-12-75	N	150	BOTHIDAE BOTHUS OCELLATUS	19	1.8 - 3.8
					BOTHIDAE CITHARICHTHYS SP.	17	1.6 - 3.2
					BOTHIDAE SYACIUM SP.	32	1.6 - 9.0
					BREGMACEROTIDAE BREGMACEROS ATLANTICUS	1	12.0 - 12.0
					CARANGIDAE CARANX SP.	4	1.6 - 1.9
					CARANGIDAE DECAPTERUS PUNCTATUS	1	3.2 - 3.2
					CARANGIDAE SELENE VOMER	2	2.9 - 3.3
					CLUPEIDAE OPISTHONEMA OGLINUM	1	5.5 - 5.5
					CONGRIDAE	8	2.3 - 8.0
					CYNOGLOSSIDAE SYMPHURUS SP.	178	1.9 - 4.8
					ENGRAULIDAE ENGRAULIS EURYSTOLE	4	5.8 - 14.0
					ENGRAULIDAE	7	2.7 - 3.2
					GOBIIDAE	629	1.3 - 7.9
					MICRODESMIDAE MICRODESMUS SP.	6	2.9 - 6.5
					MYCTOPHIDAE DIAPHUS SP.	1	2.8 - 2.8
					MYCTOPHIDAE	10	1.4 - 3.4
					NETTASTOMIDAE	2	65.0 - 71.0

APPENDIX TABLE 1. CONT.

CRUISE	TRANSECT (STATION)	DATE	DAY OR NIGHT	NUMBER OF EGGS	TAXON	NUMBER	SIZE RANGE SL(IN MM)
					OPHICHTHIDAE	22	4.8 - 9.5
					OPHIDIIDAE LEPOPHIDIUM SP.	9	4.6 - 5.0
					SCIAENIDAE CYNOSCION SP.	1	2.5 - 2.5
					SCOMBRIDAE AUXIS SP.	21	2.5 - 5.6
					SCOMBRIDAE EUTHYNNUS SP.	10	3.8 - 9.5
					SCOMBRIDAE SCOMBEROMORUS CAVALLA	18	2.8 - 4.0
					SCOMBRIDAE	11	1.8 - 4.3
					SCORPAENIDAE	1	3.2 - 3.2
					SERRANIDAE	5	2.2 - 5.5
					SPHYRAENIDAE SPHYRAENA SP.	2	2.5 - 2.5
					SYNODONTIDAE SYNODUS SP.	7	2.0 - 3.6
					TETRAODONTIDAE SPHOEROIDES SP.	1	2.3 - 2.3
					TRICHIURIDAE TRICHIURUS LEPTURUS	3	3.0 - 4.2
					UNKNOWN	21	1.2 - 5.5

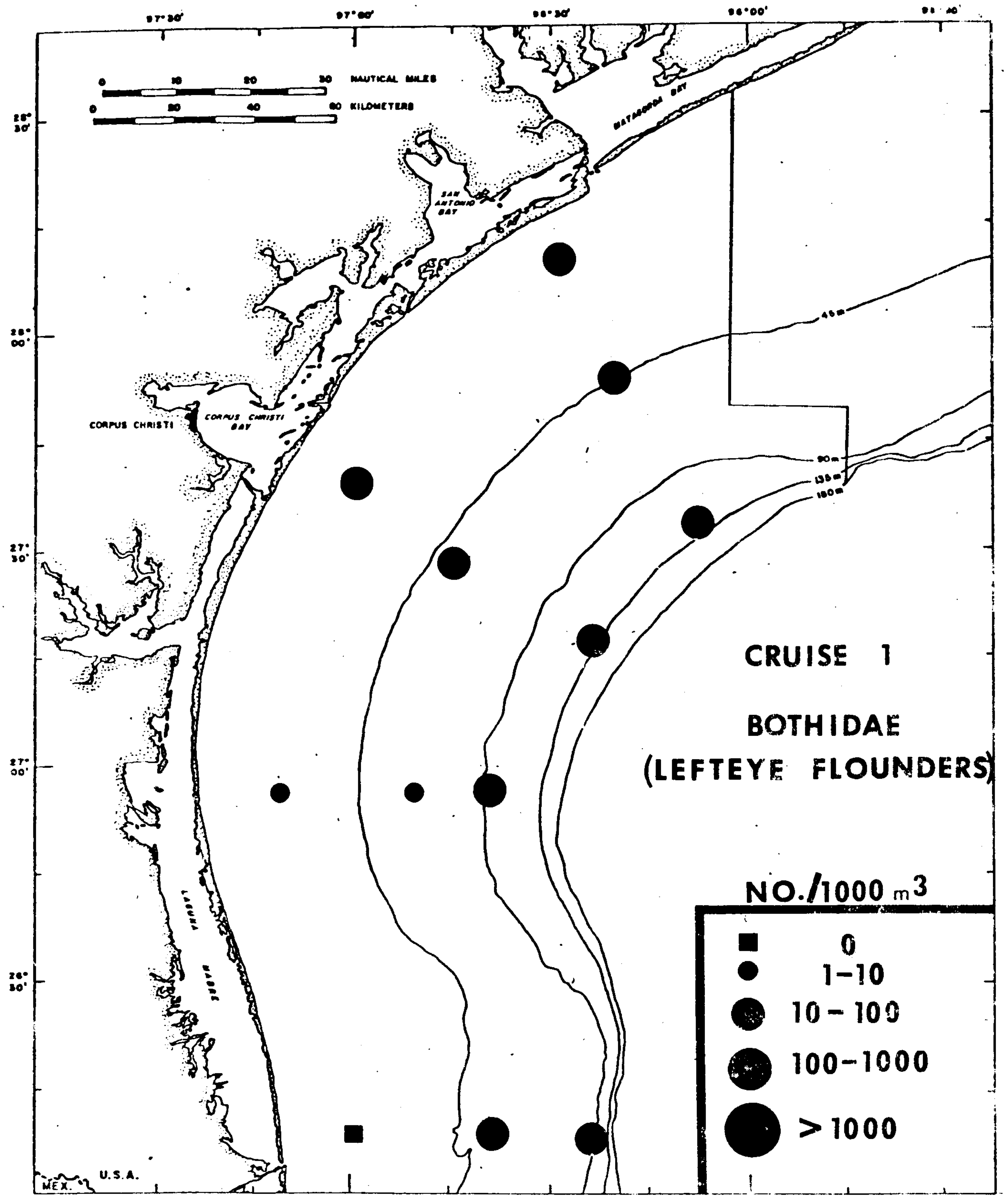


Figure 1 Numbers of bothid larvae per 1,000 m^3 by transect and station on Cruise 1.

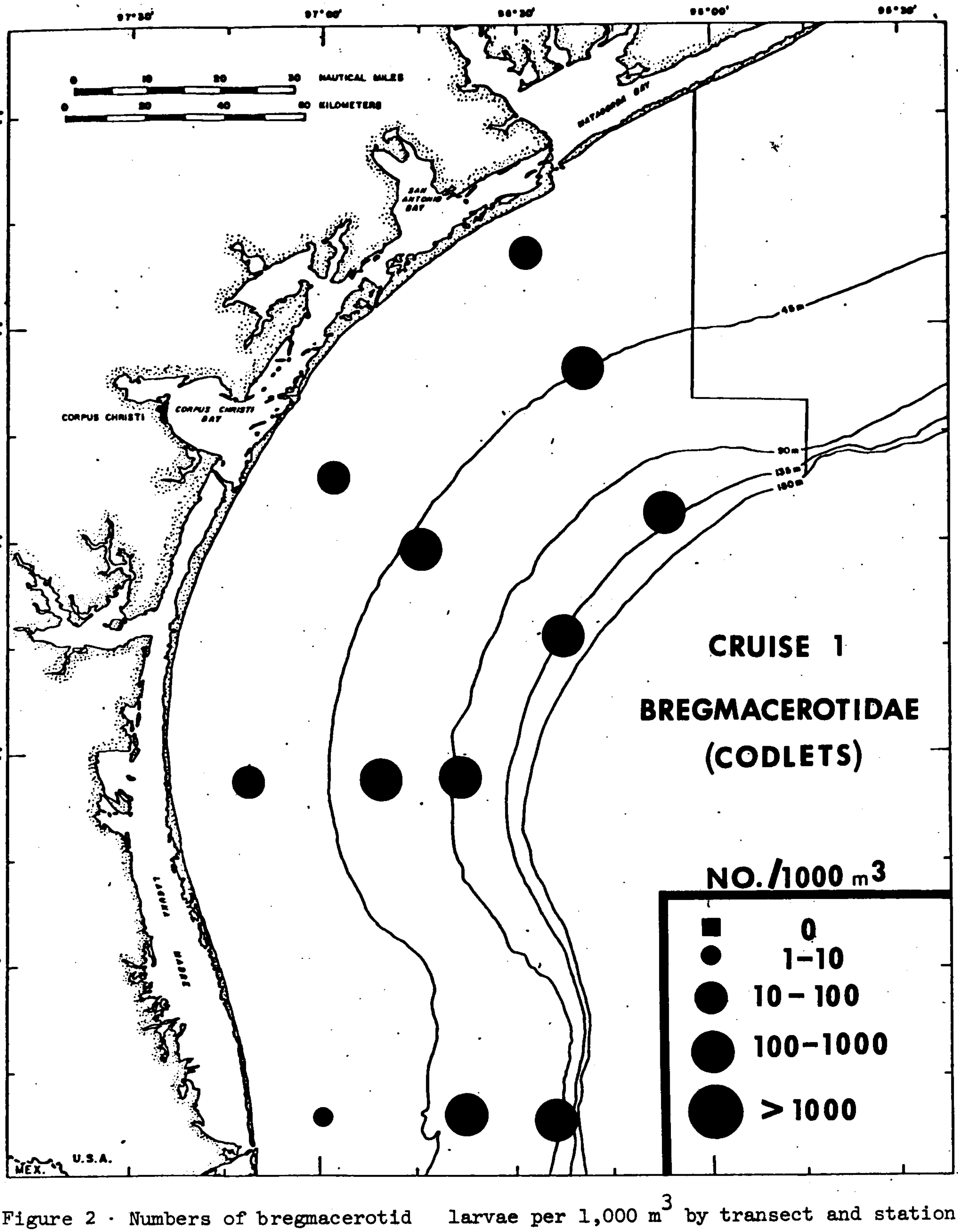


Figure 2 · Numbers of bregmacerotid larvae per 1,000 m^3 by transect and station on Cruise 1.

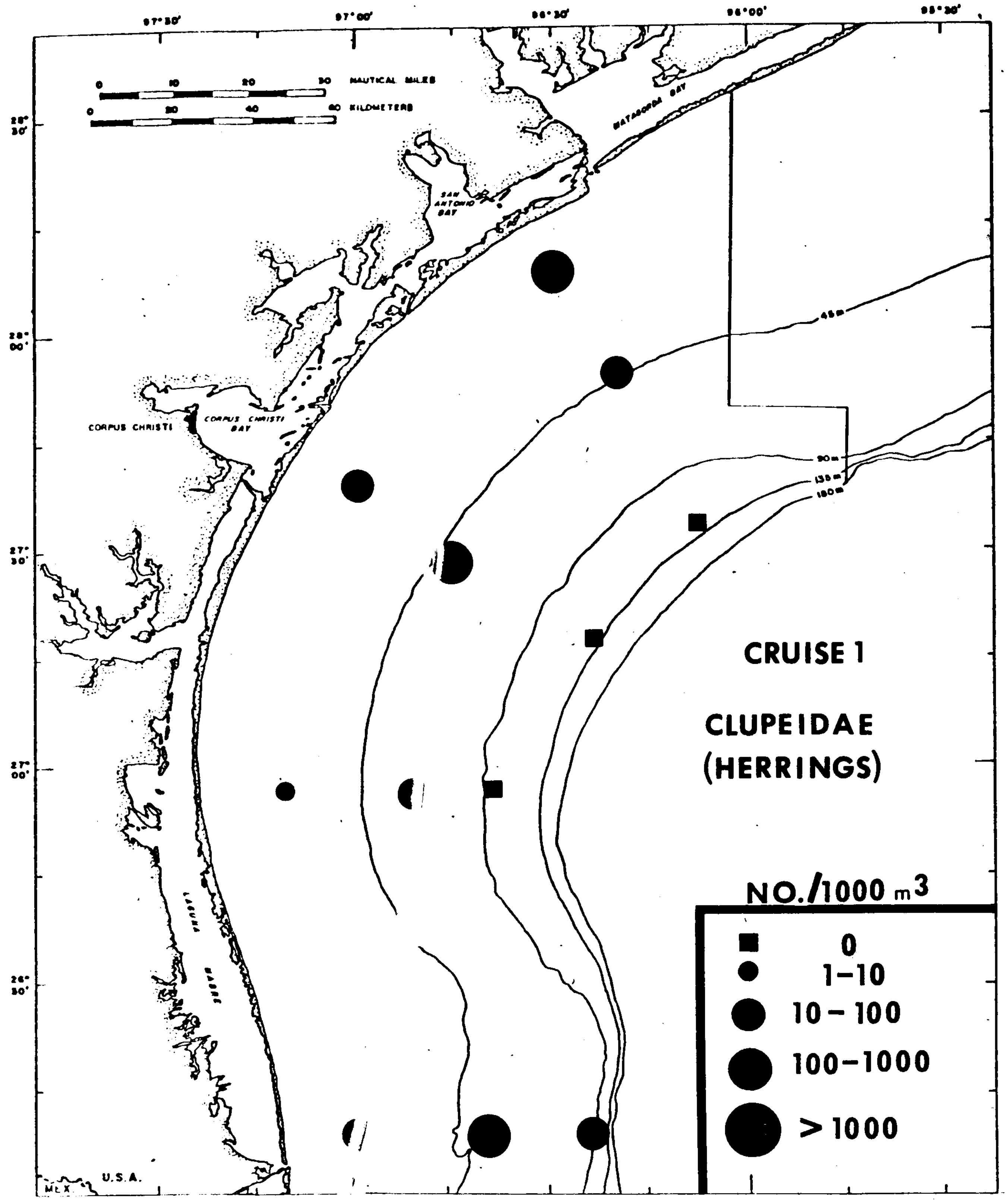


Figure 3 Numbers of cl id larvae per 1,000 m^3 by transect and station on Cruise 1.

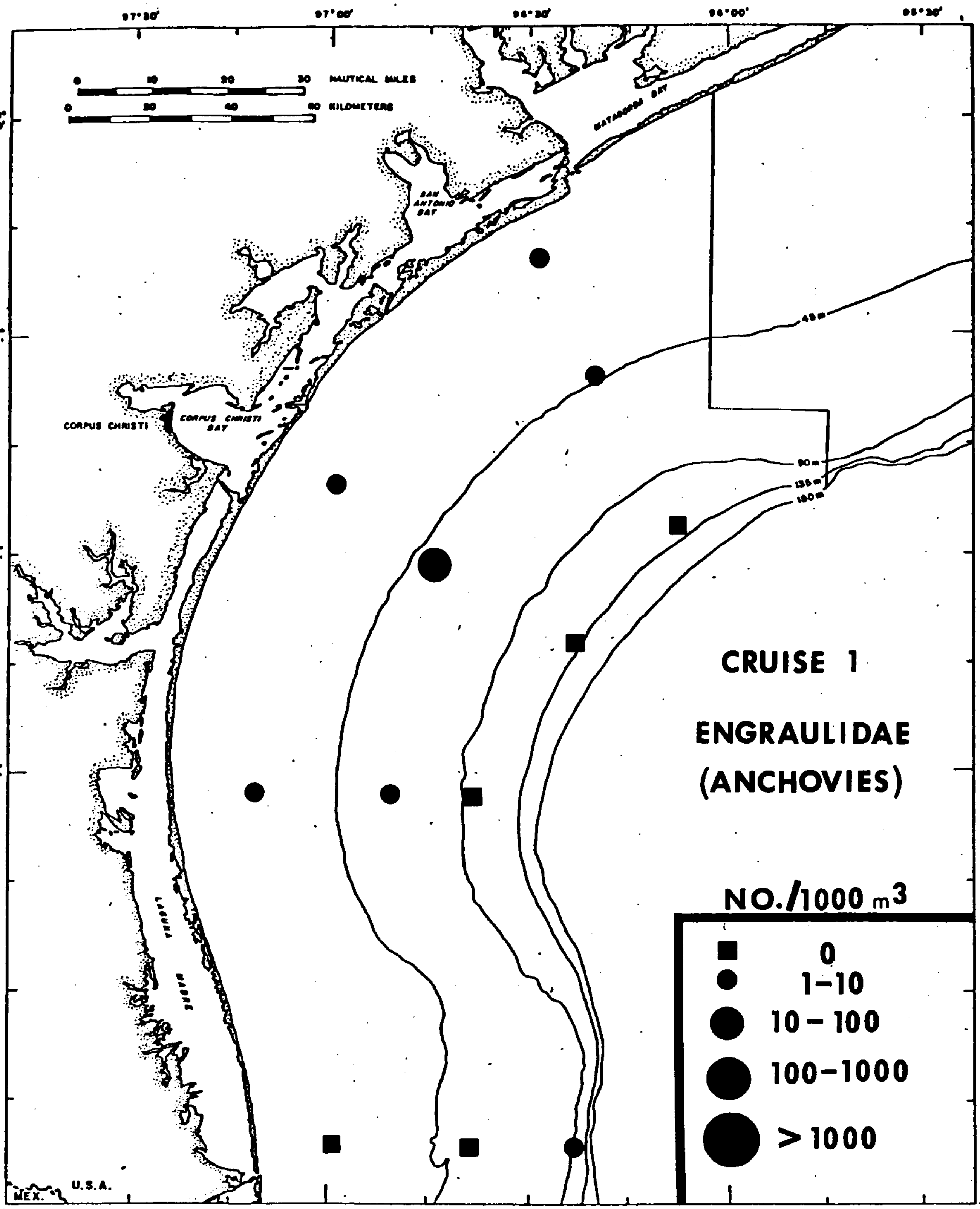


Figure 4 Numbers of engraulid larvae per 1,000 m^3 by transect and station on Cruise 1.

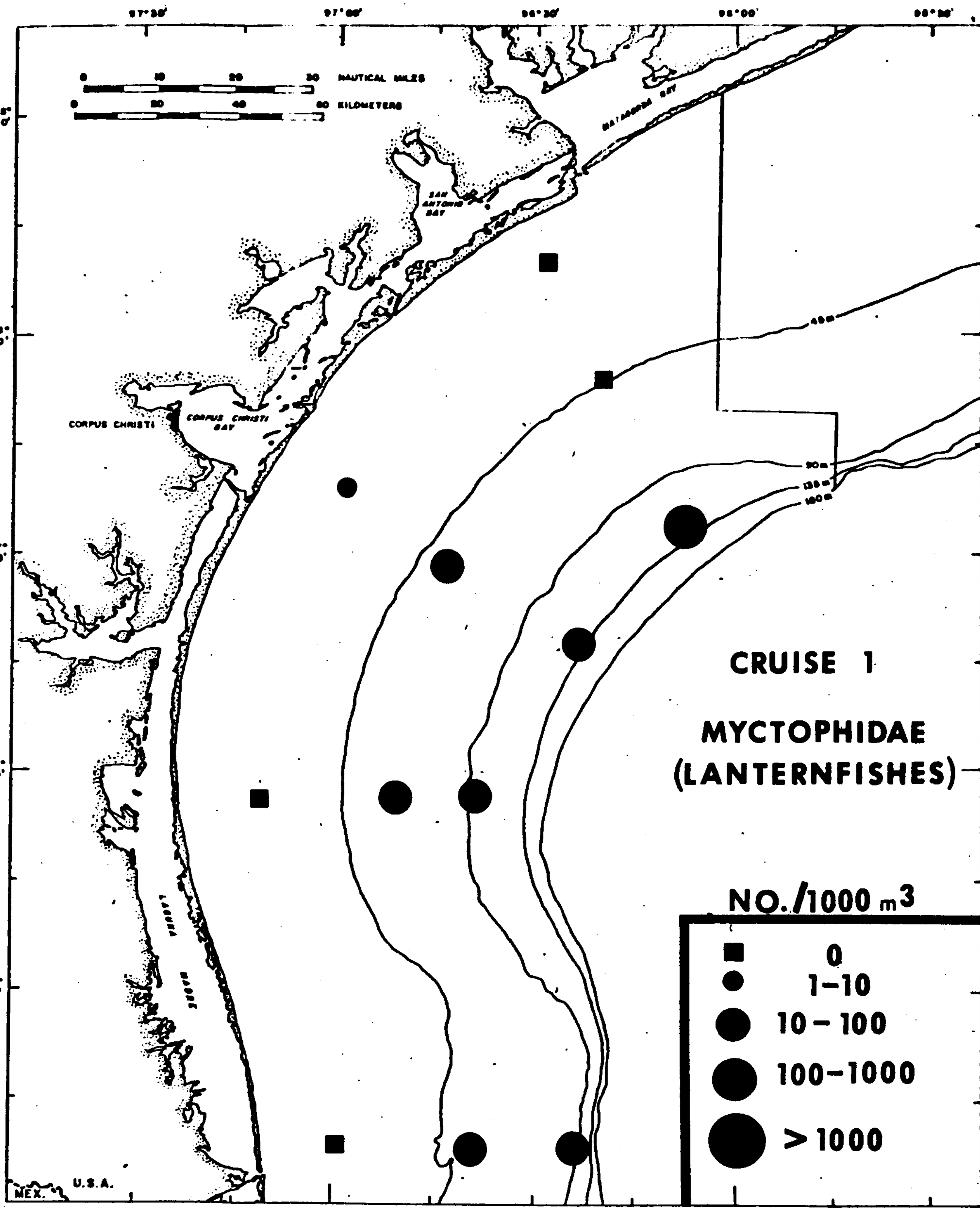


Figure 5 Numbers of myctophid larvae per 1,000 m^3 by transect and station on Cruise 1.

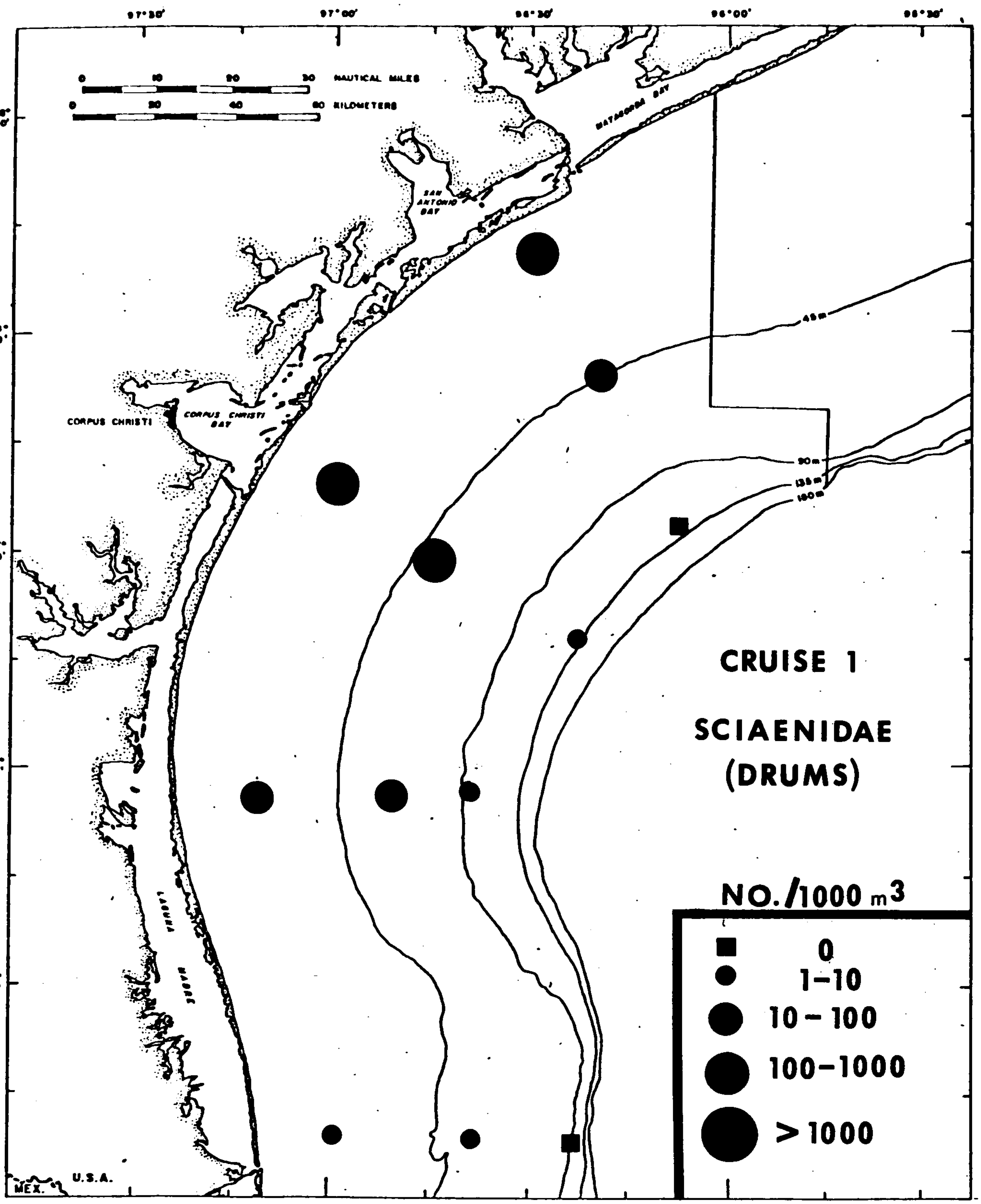


Figure 6 Numbers of sciaenid larvae per 1,000 m^3 by transect and station on Cruise 1.

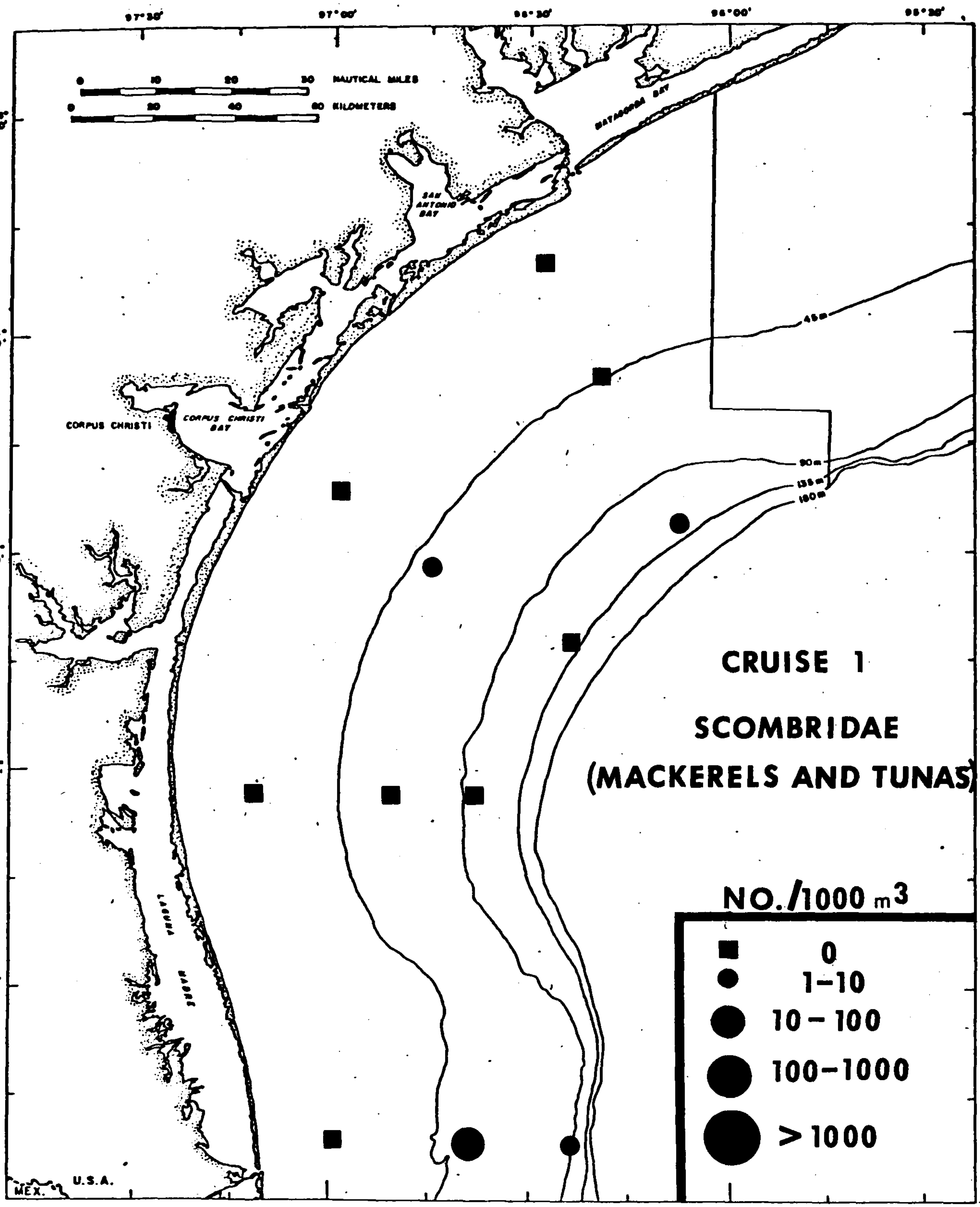


Figure 7 Numbers of scombrid larvae per 1,000 m^3 by transect and station on Cruise 1.

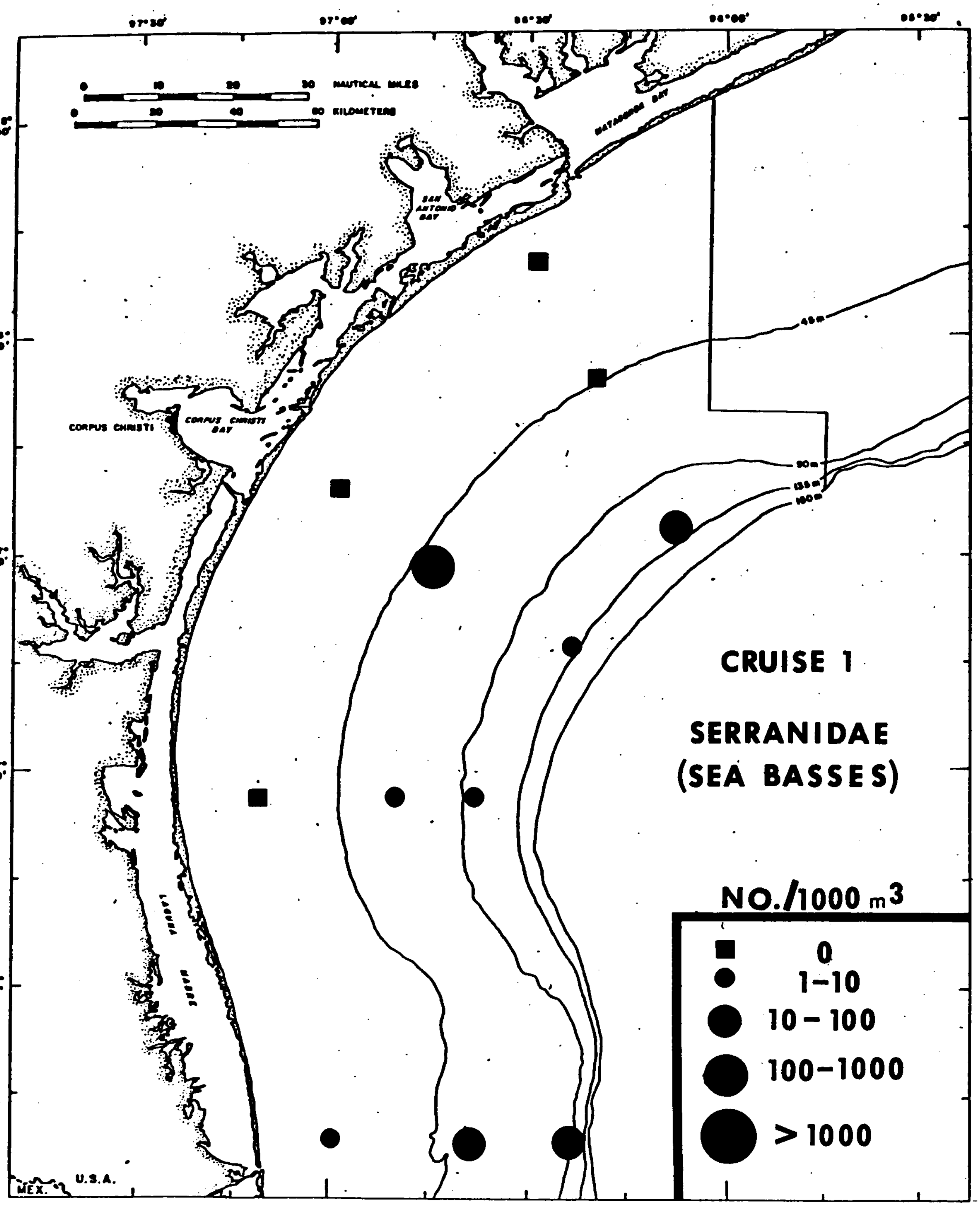


Figure 8. Numbers of serranid larvae per 1,000 m^3 by transect and station on Cruise 1.

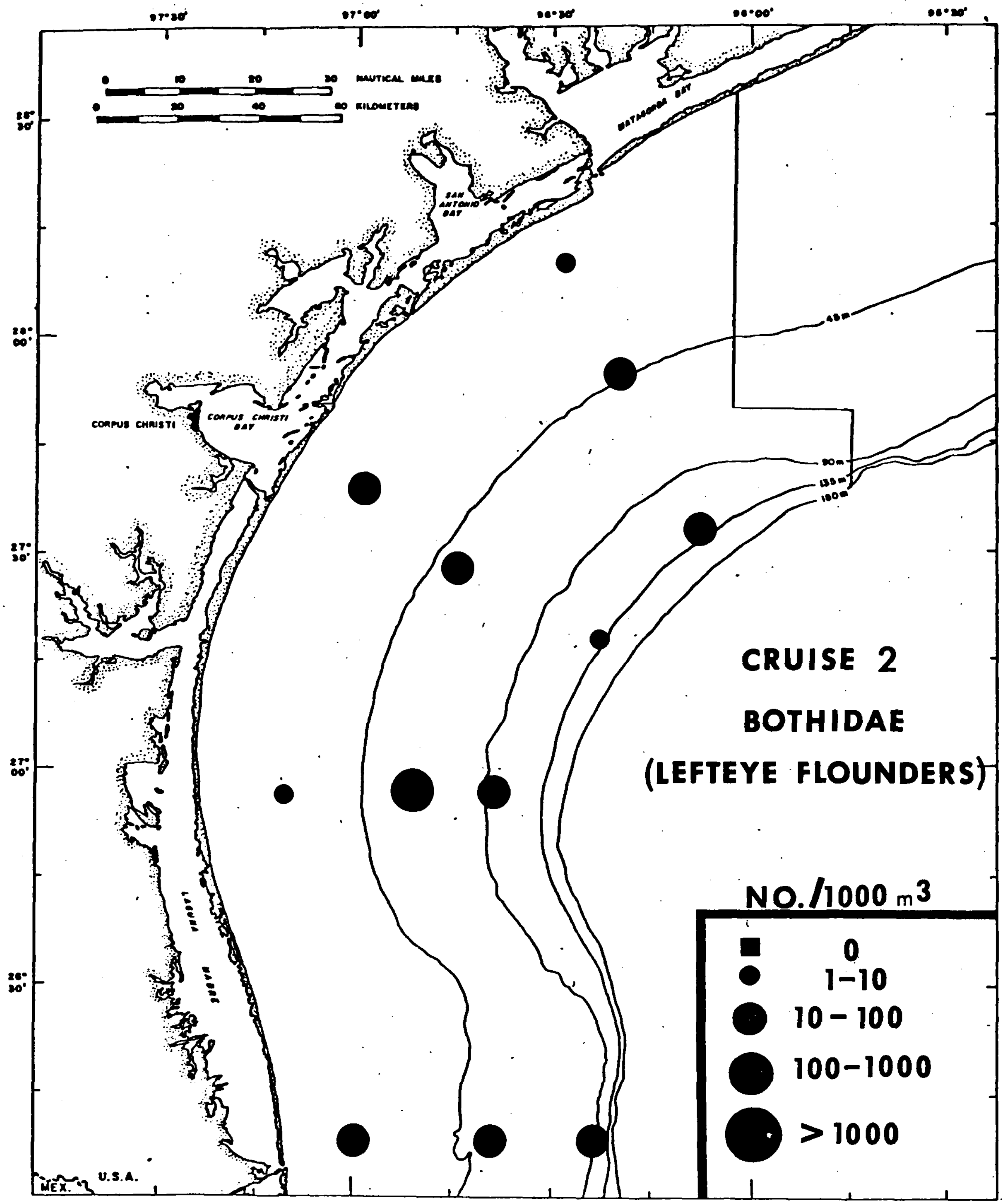


Figure 9 Numbers of bothid larvae per 1,000 m^3 by transect and station on Cruise 2.

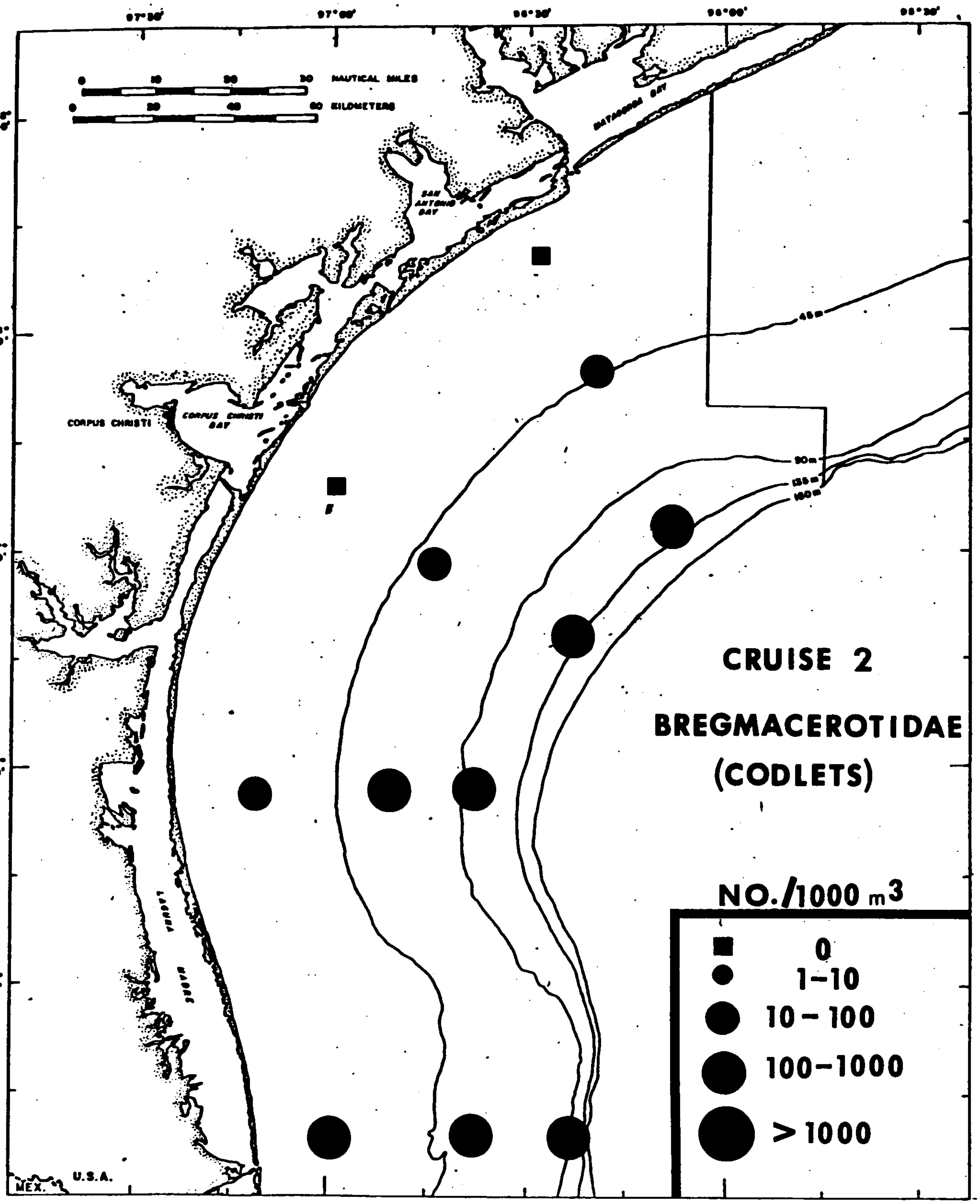


Figure 10 Numbers of bregmacerotid larvae per 1,000 m^3 by transect and station on Cruise 2.

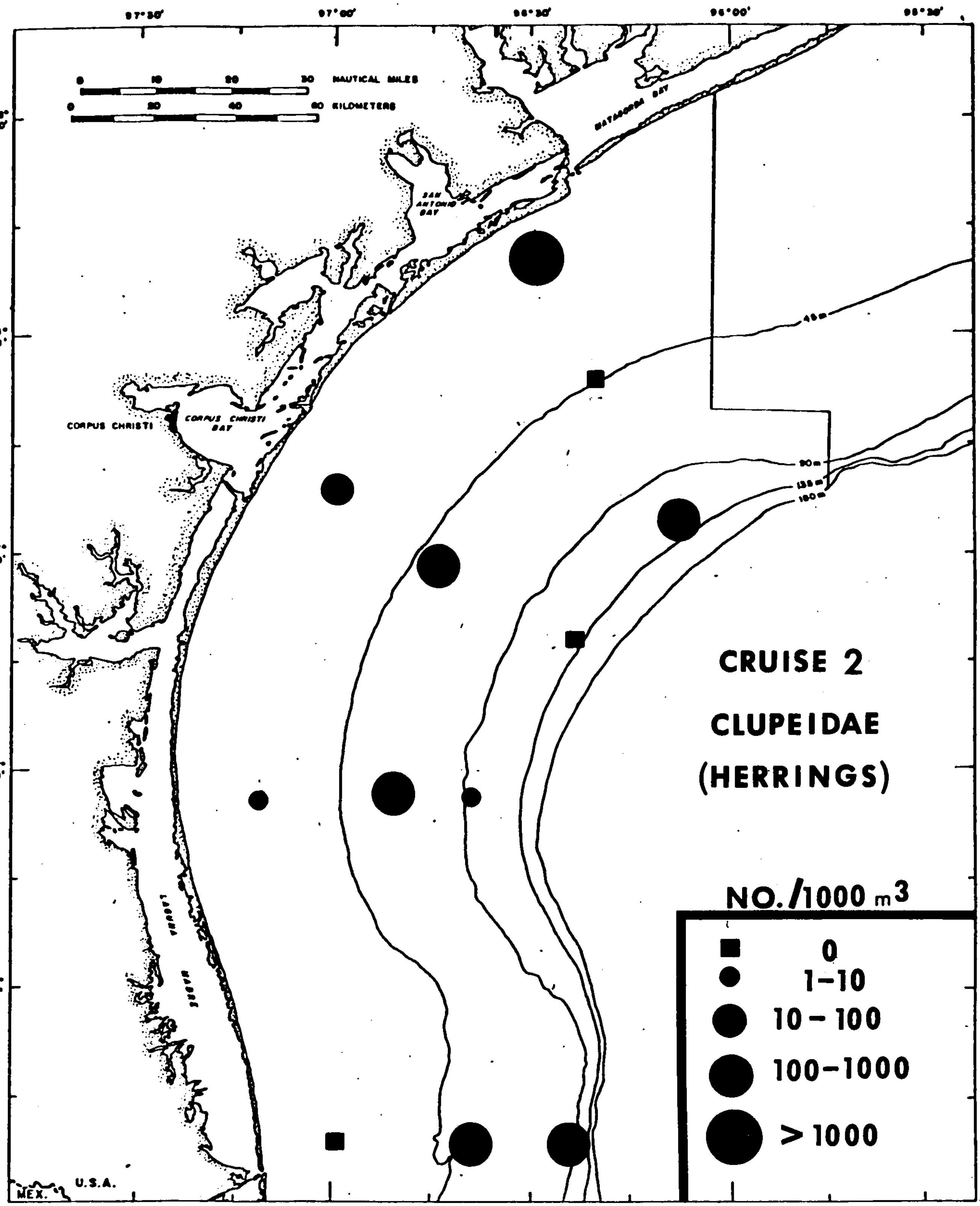


Figure 11 Numbers of clupeid larvae per 1,000 m^3 by transect and station on Cruise 2.

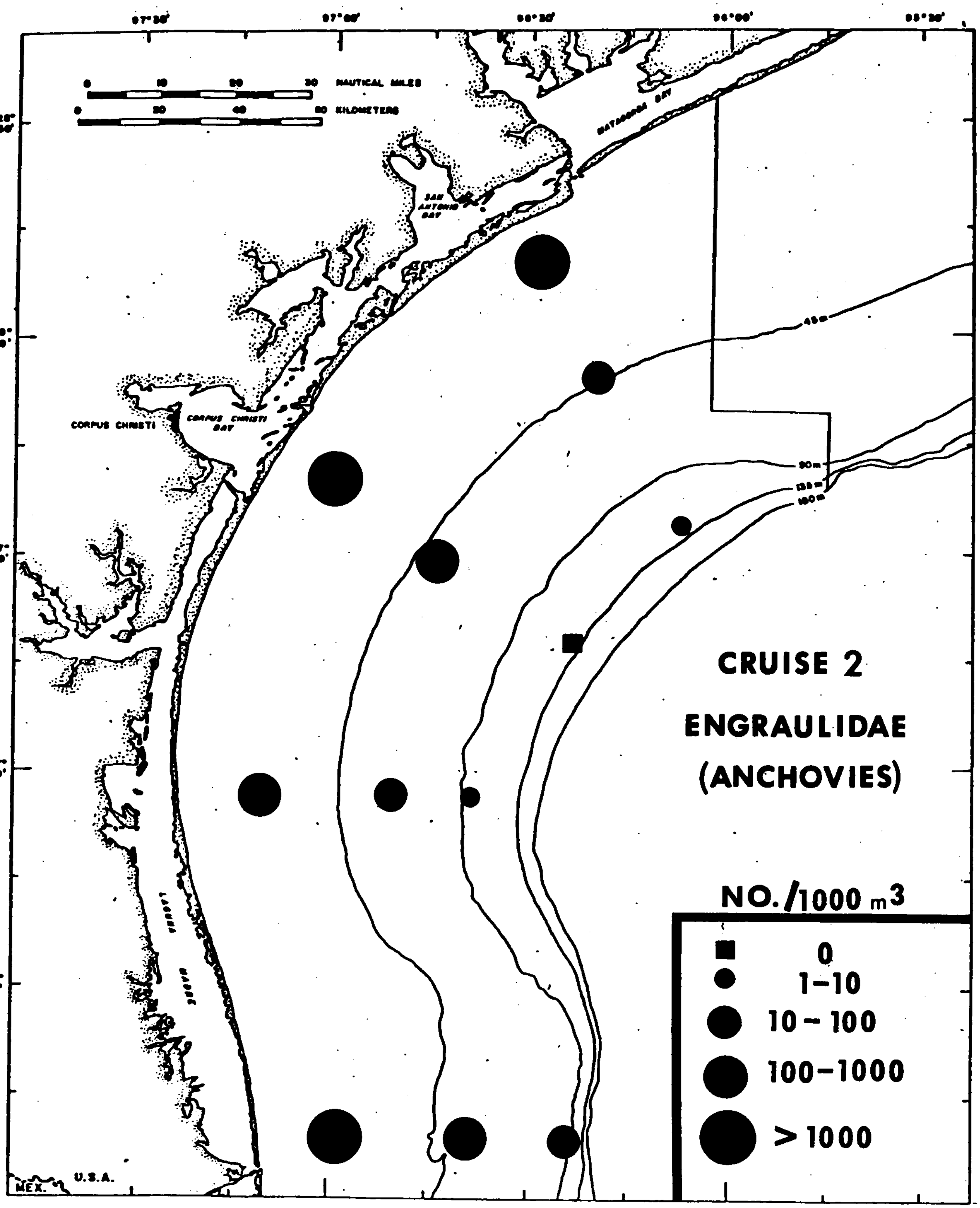


Figure 12 Numbers of engraulid larvae per 1,000 m^3 by transect and station on Cruise 2.

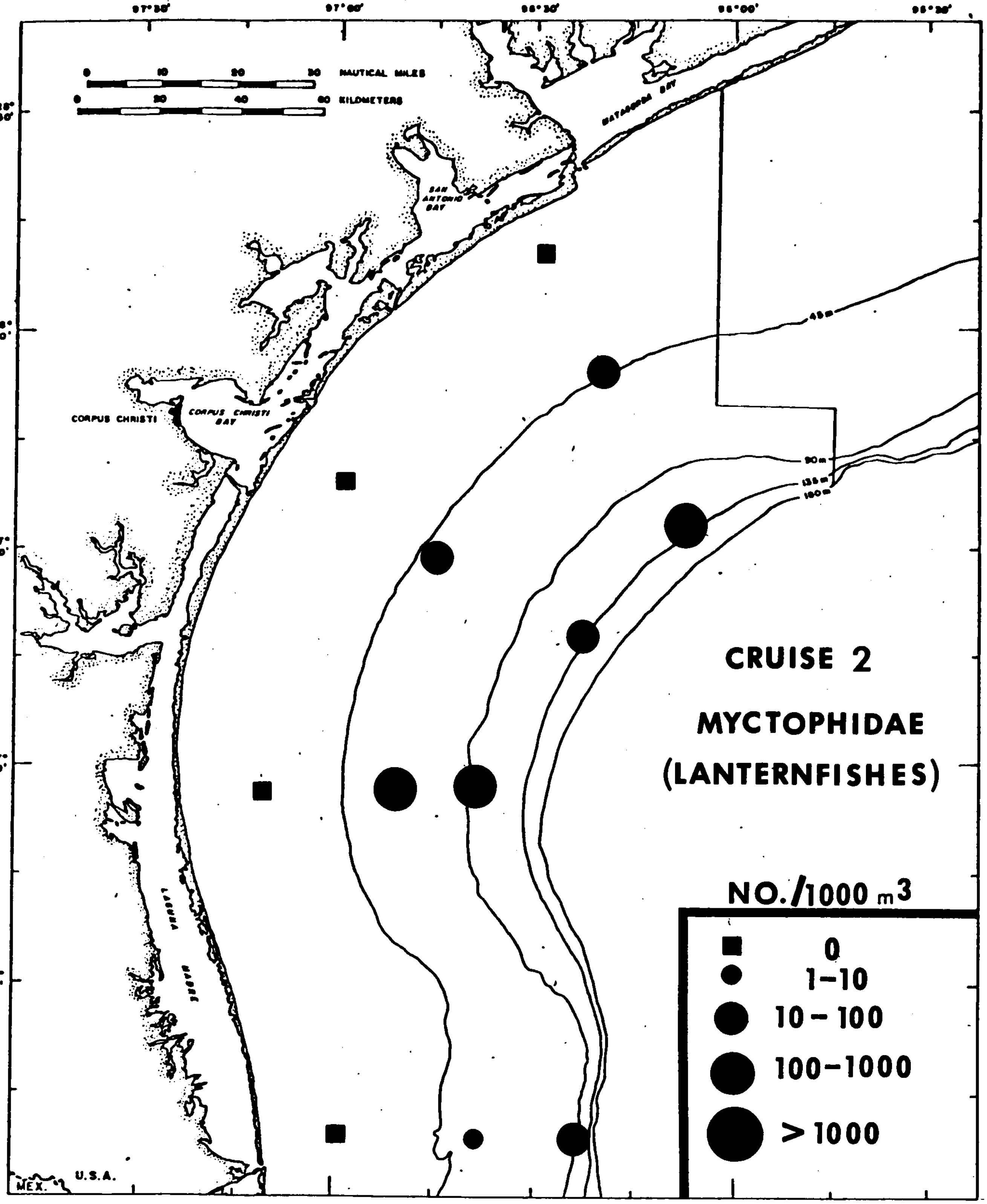


Figure 13. Numbers of myctophid larvae per 1,000 m^3 by transect and station on Cruise 2.

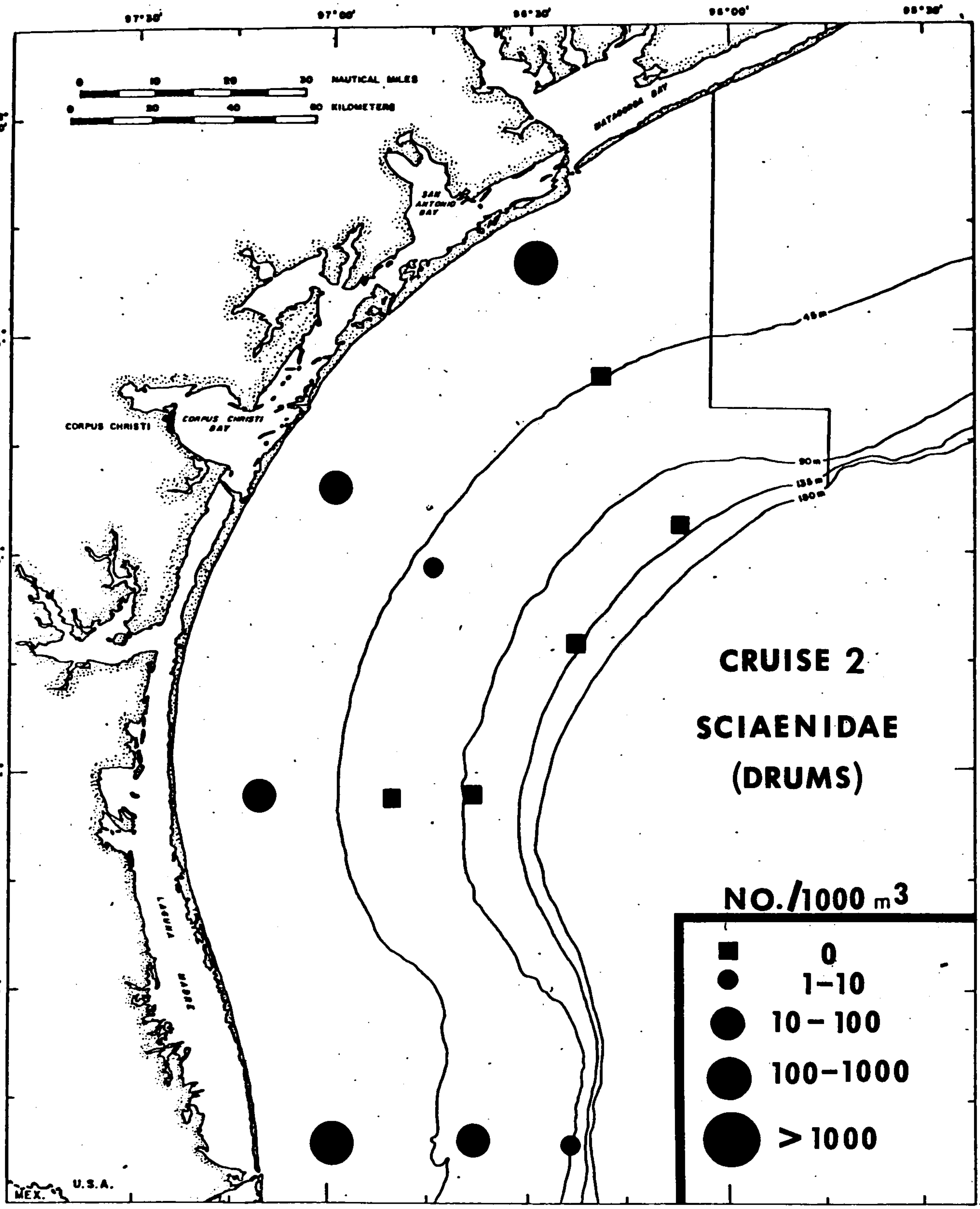


Figure 14 Numbers of sciaenid larvae per 1,000 m^3 by transect and station on Cruise 2.

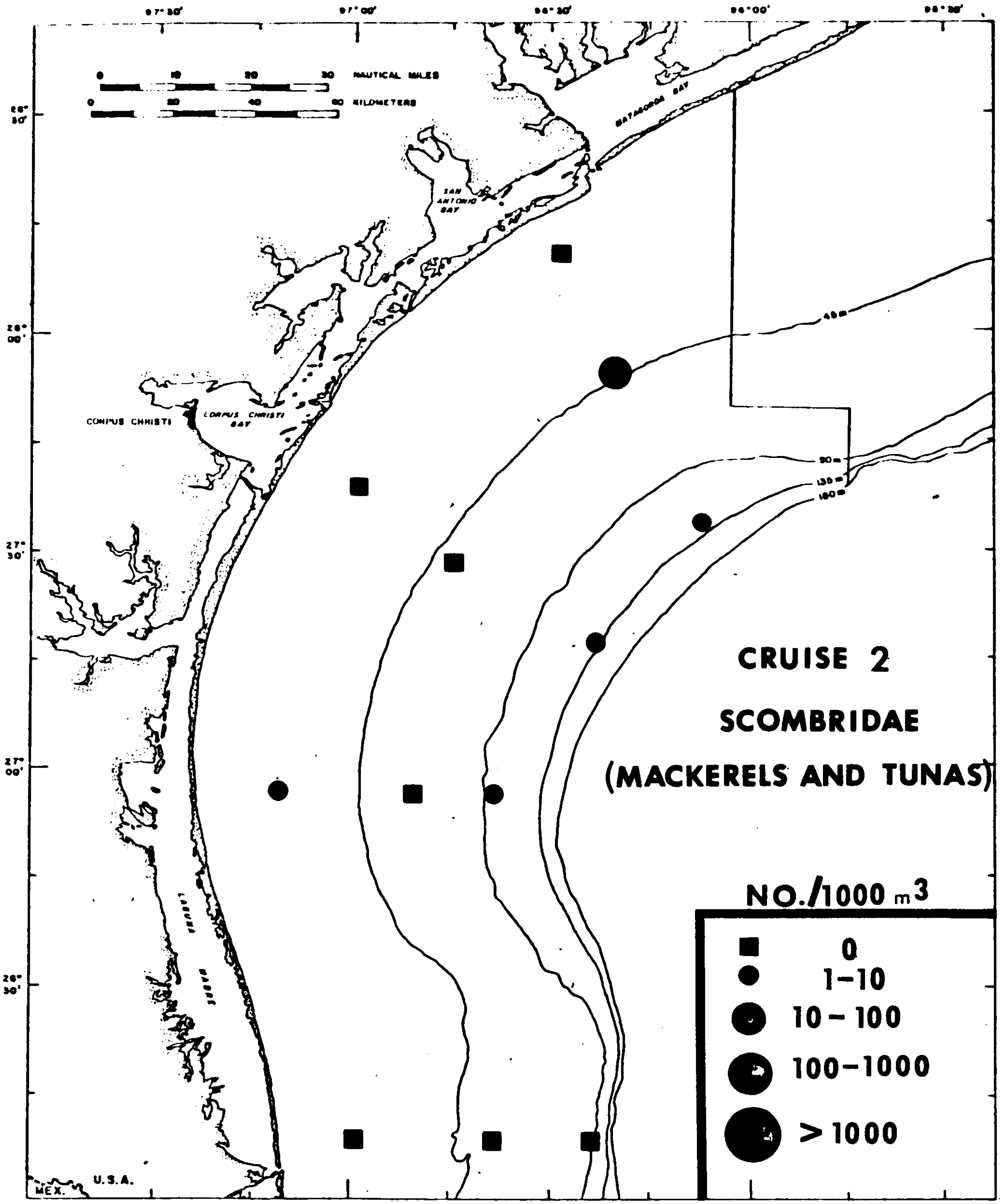


Figure 15 Numbers of scombrid larvae per 1,000 m^3 by transect and station on Cruise 2.

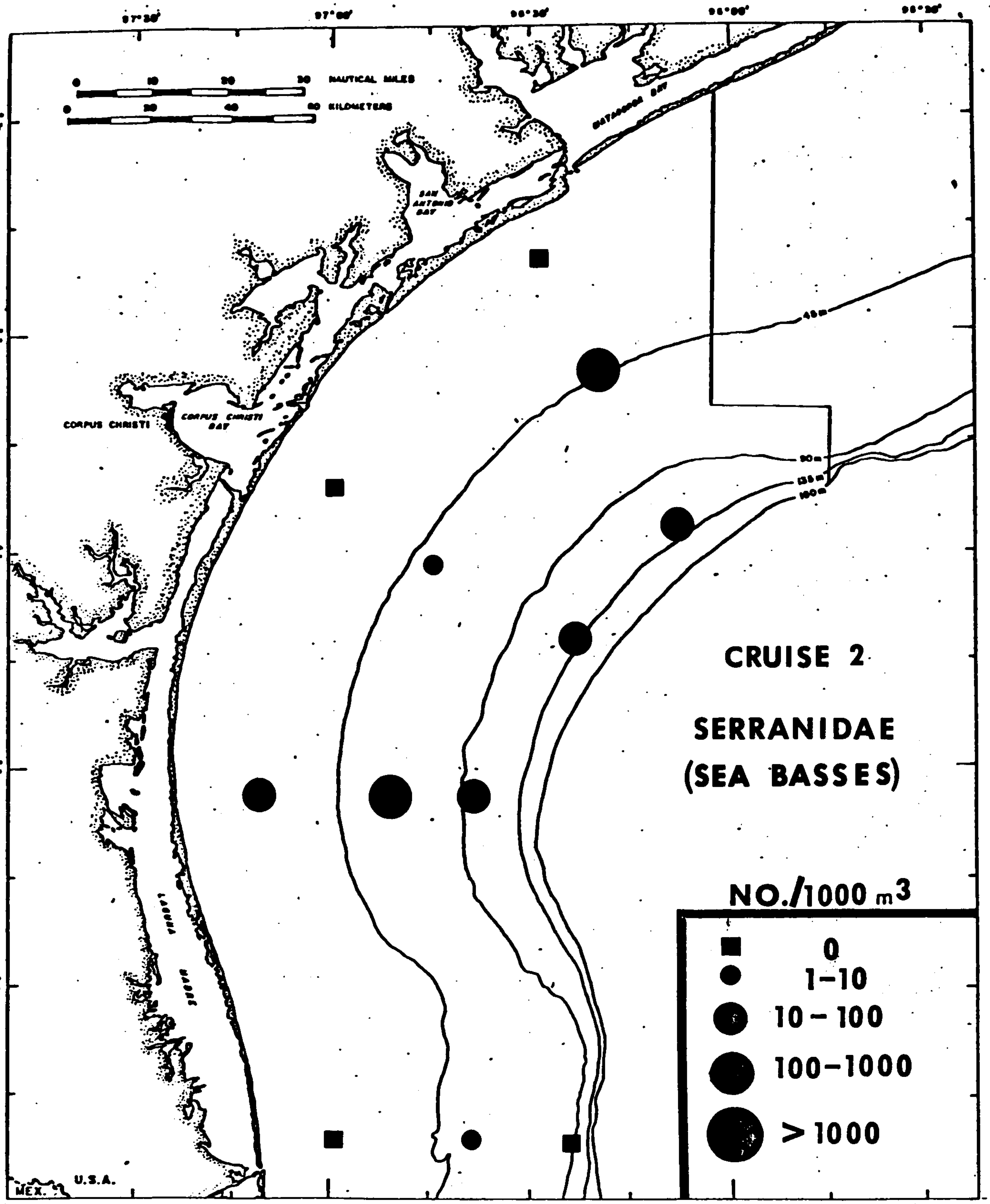


Figure 16   Numbers of serranid larvae per 1,000 m^3 by transect and station on Cruise 2.

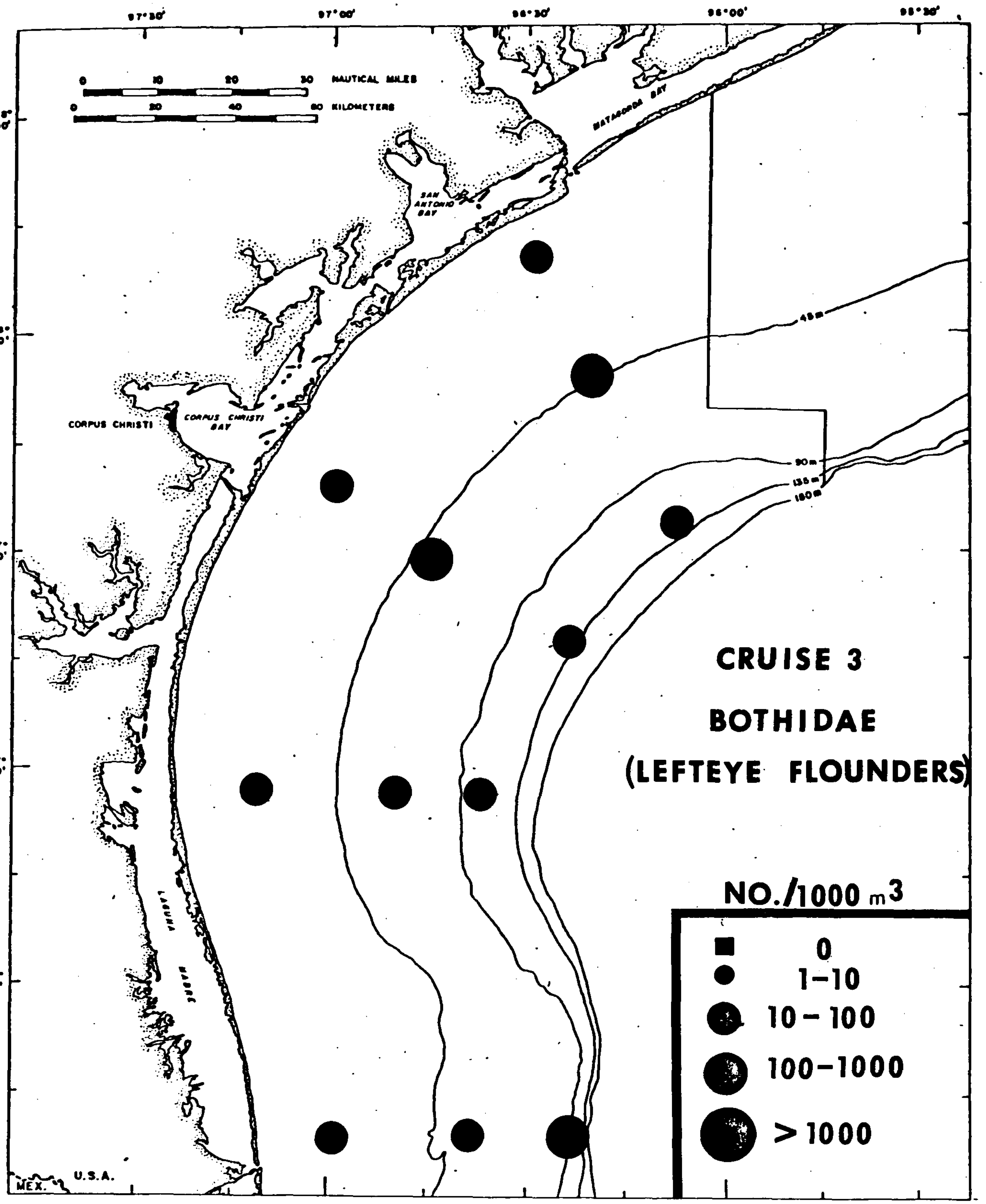


Figure 17 Numbers of bothid larvae per 1,000 m^3 by transect and station on Cruise 3.

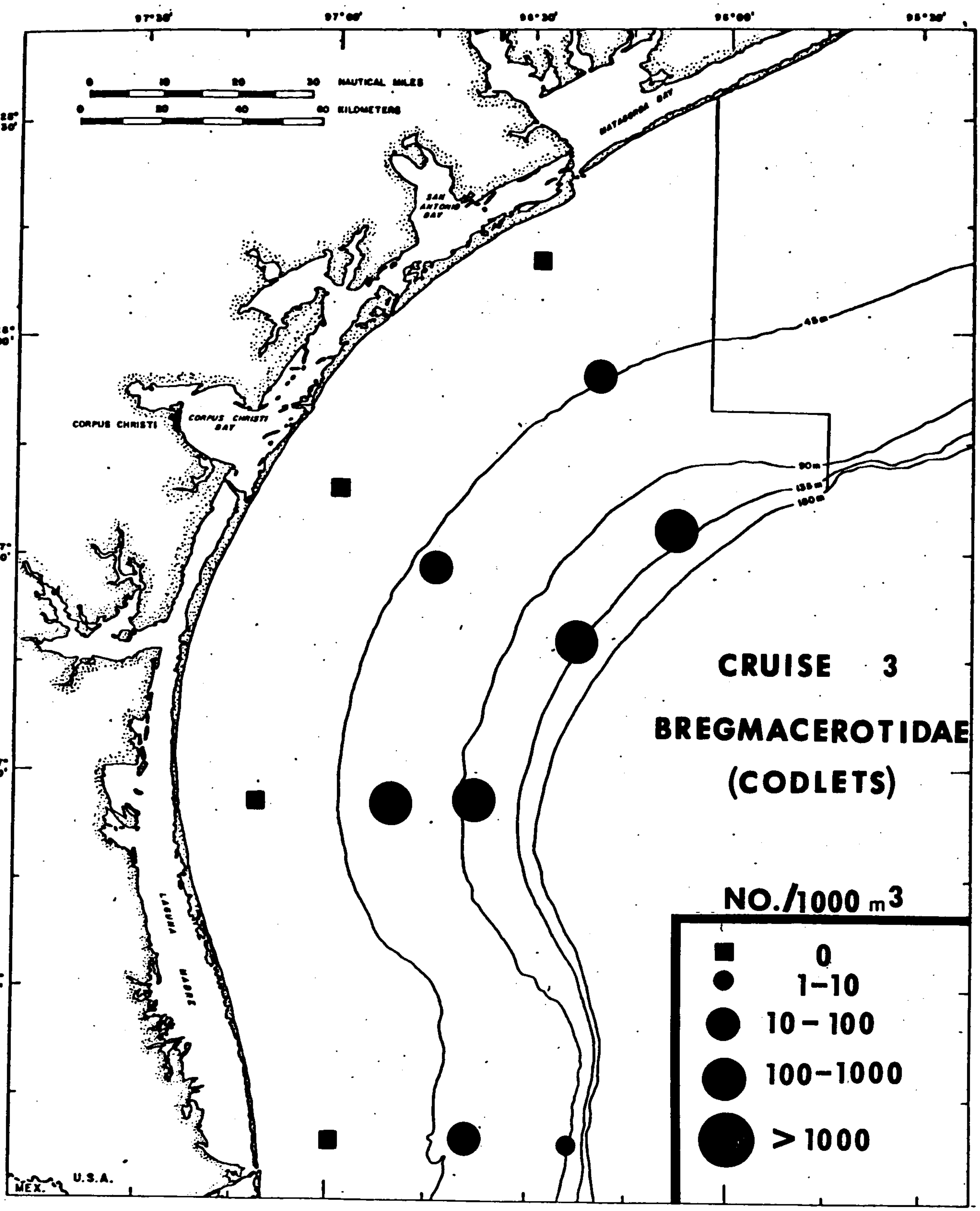


Figure 18 Numbers of bregmacerotid larvae per 1,000 m^3 by transect and station on Cruise 3.

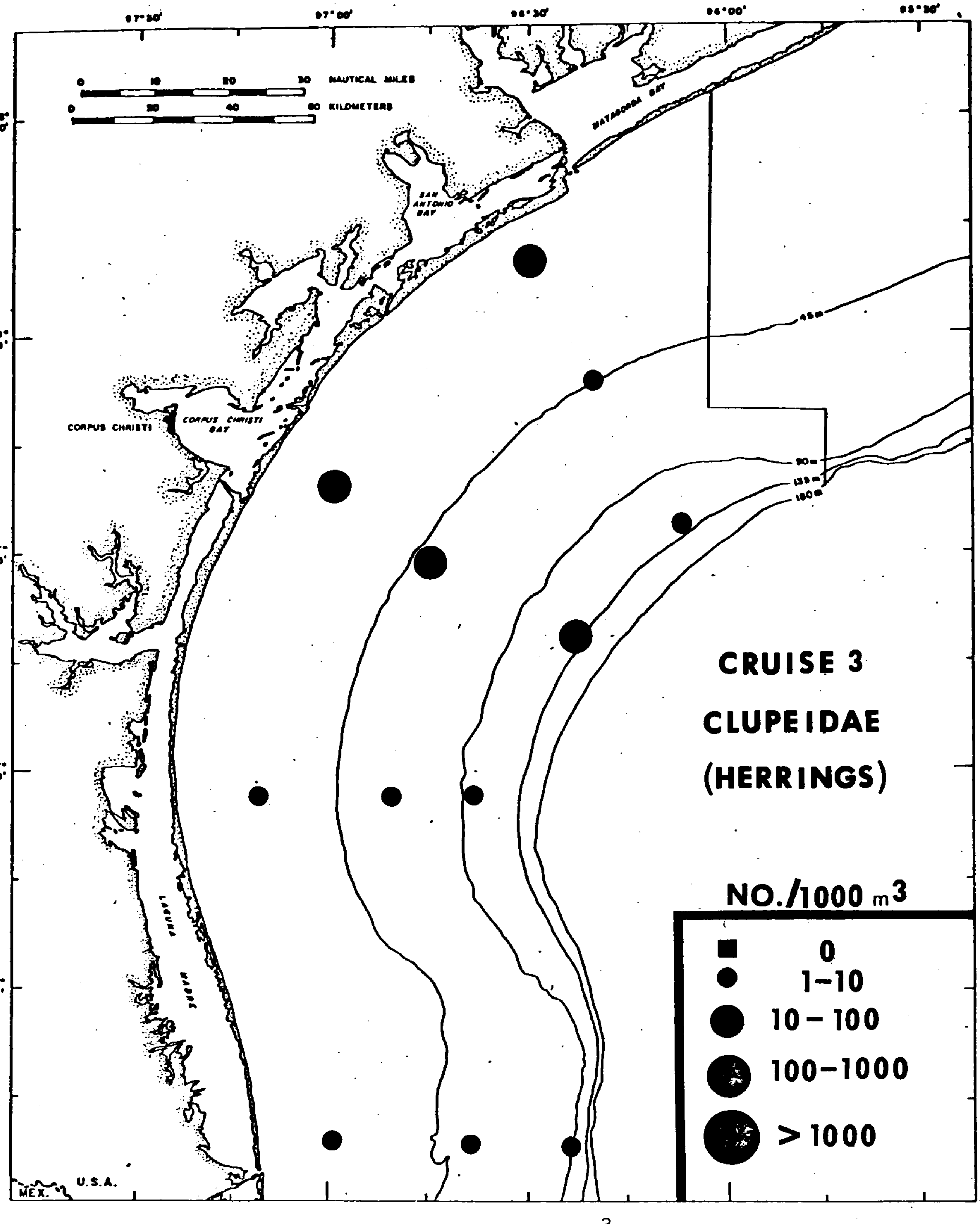


Figure 19 Numbers of clupeid larvae per 1,000 m^3 by transect and station on Cruise 3.

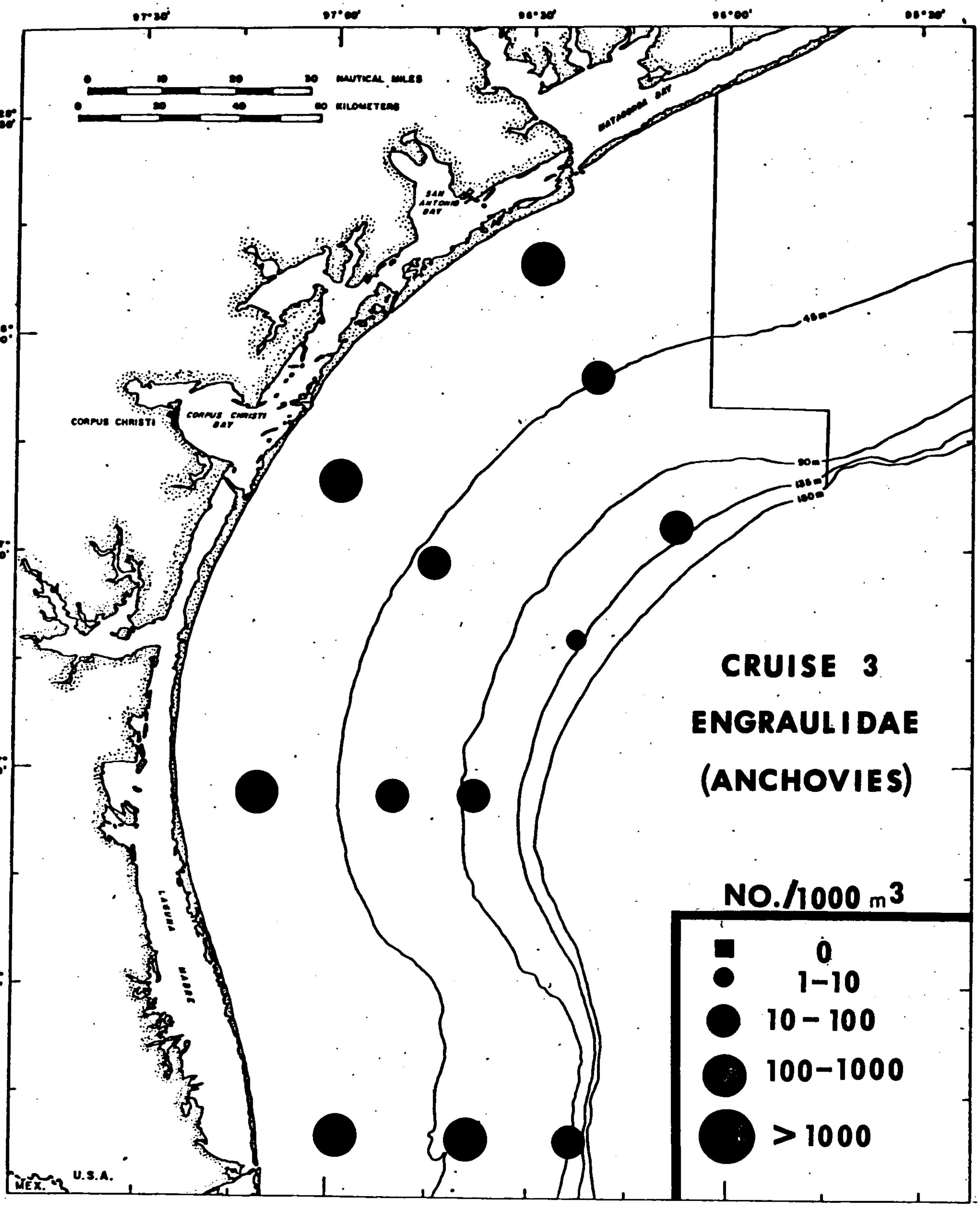


Figure 20 Numbers of engraulid larvae per 1,000 m^3 by transect and station on Cruise 3.

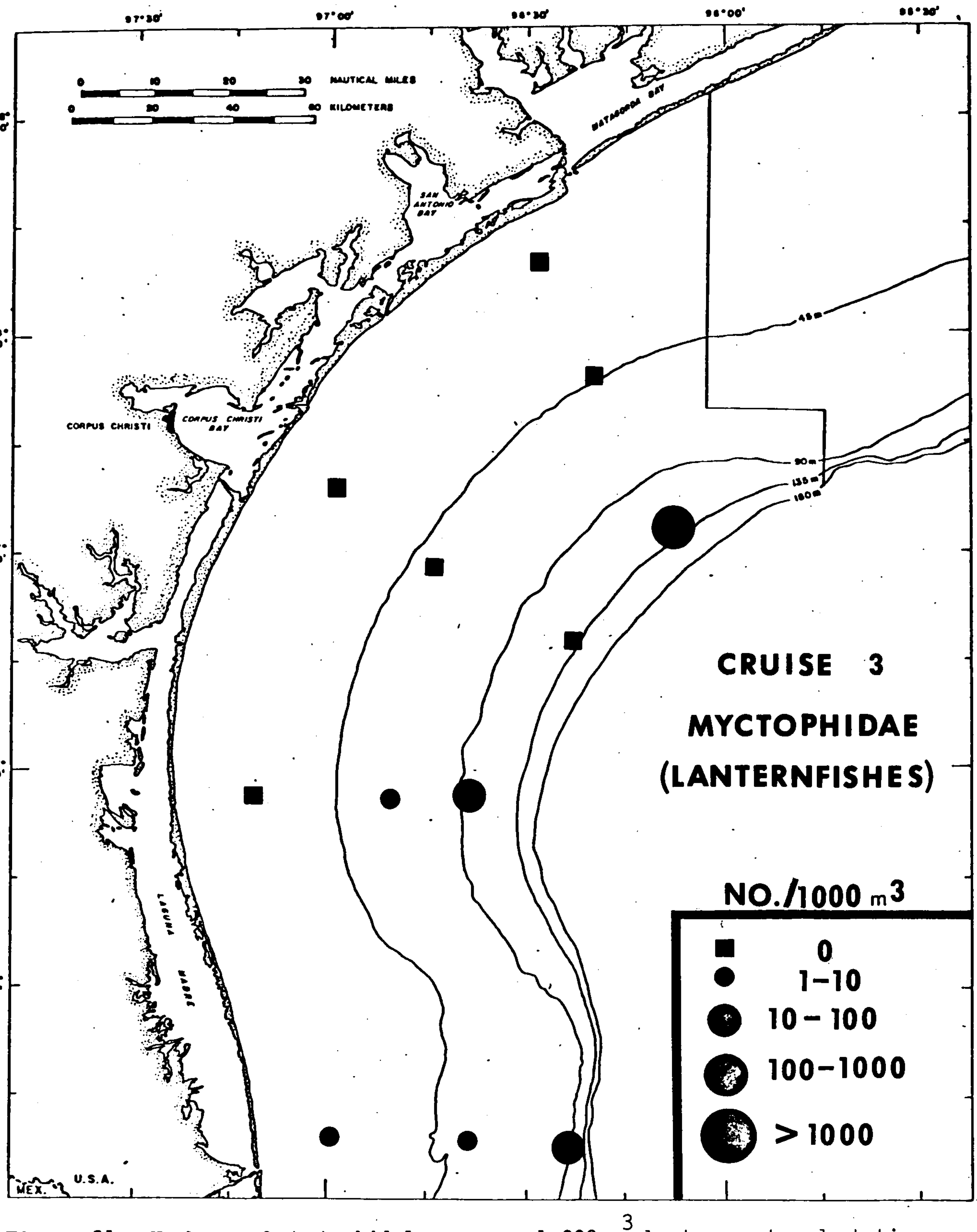


Figure 21 Numbers of myctophid larvae per 1,000 m^3 by transect and station on Cruise 3.

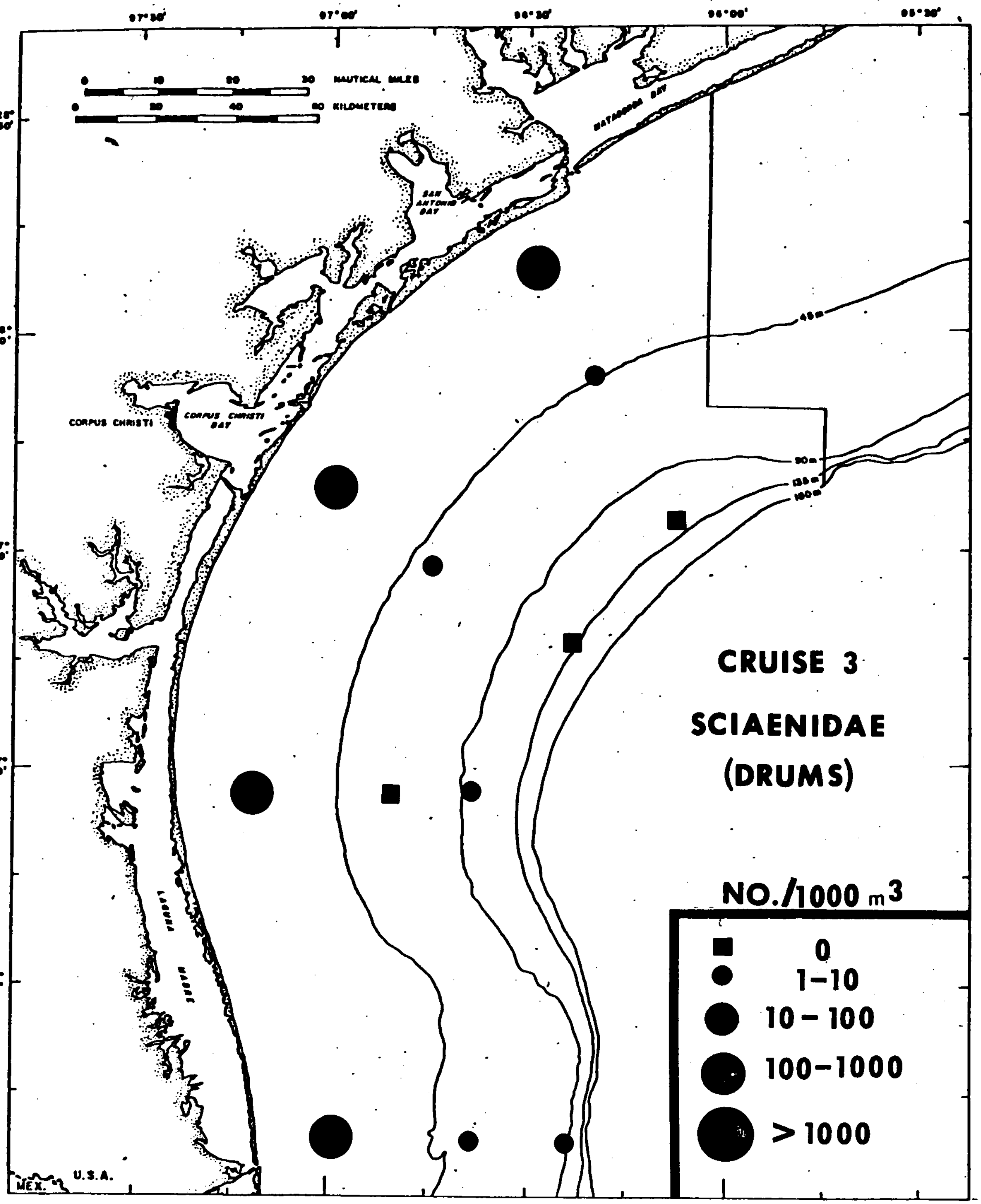


Figure 22 Numbers of sciaenid larvae per 1,000 m^3 by transect and station on Cruise 3.

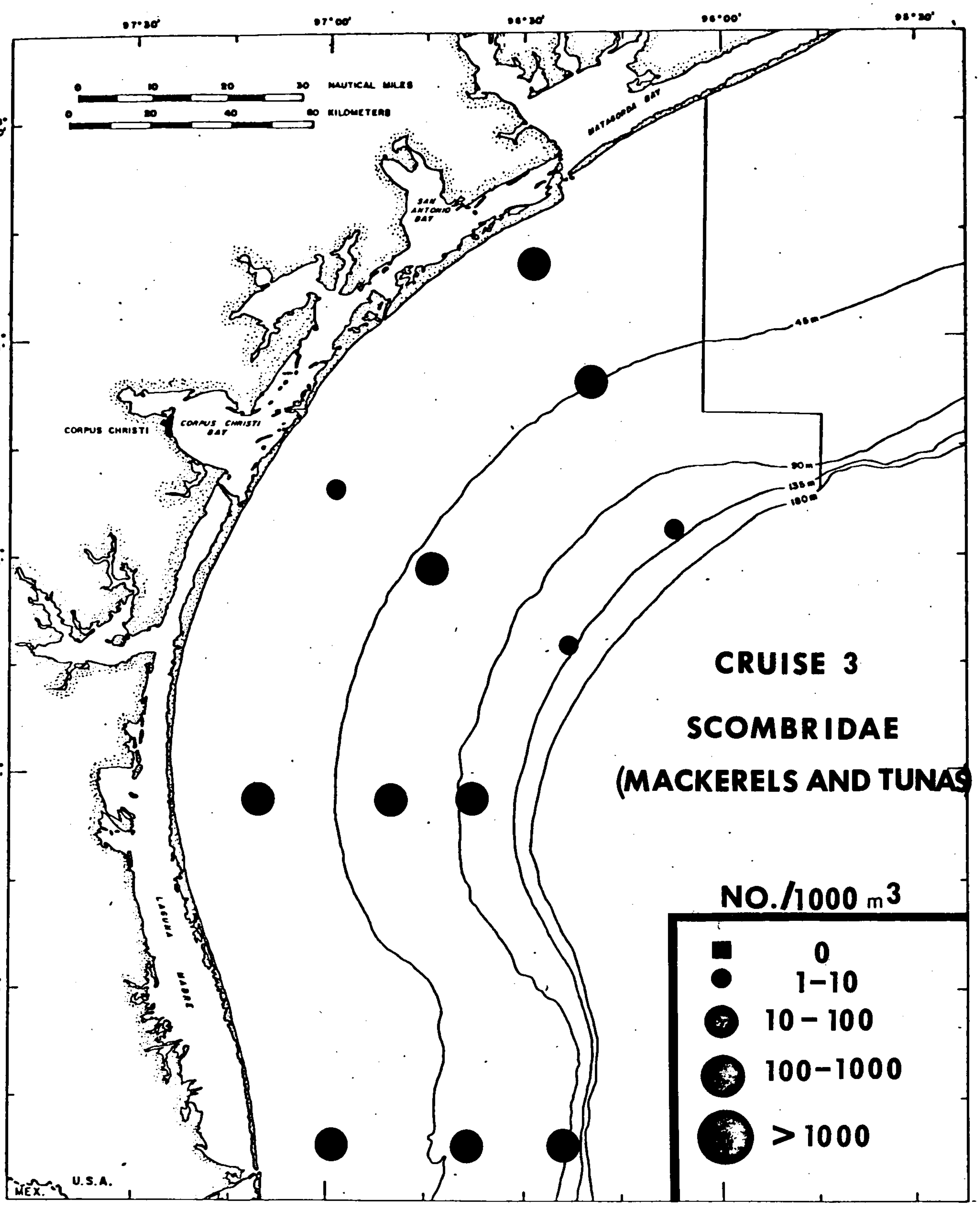


Figure 23 Numbers of scombrid larvae per 1,000 m^3 by transect and station on Cruise 3.

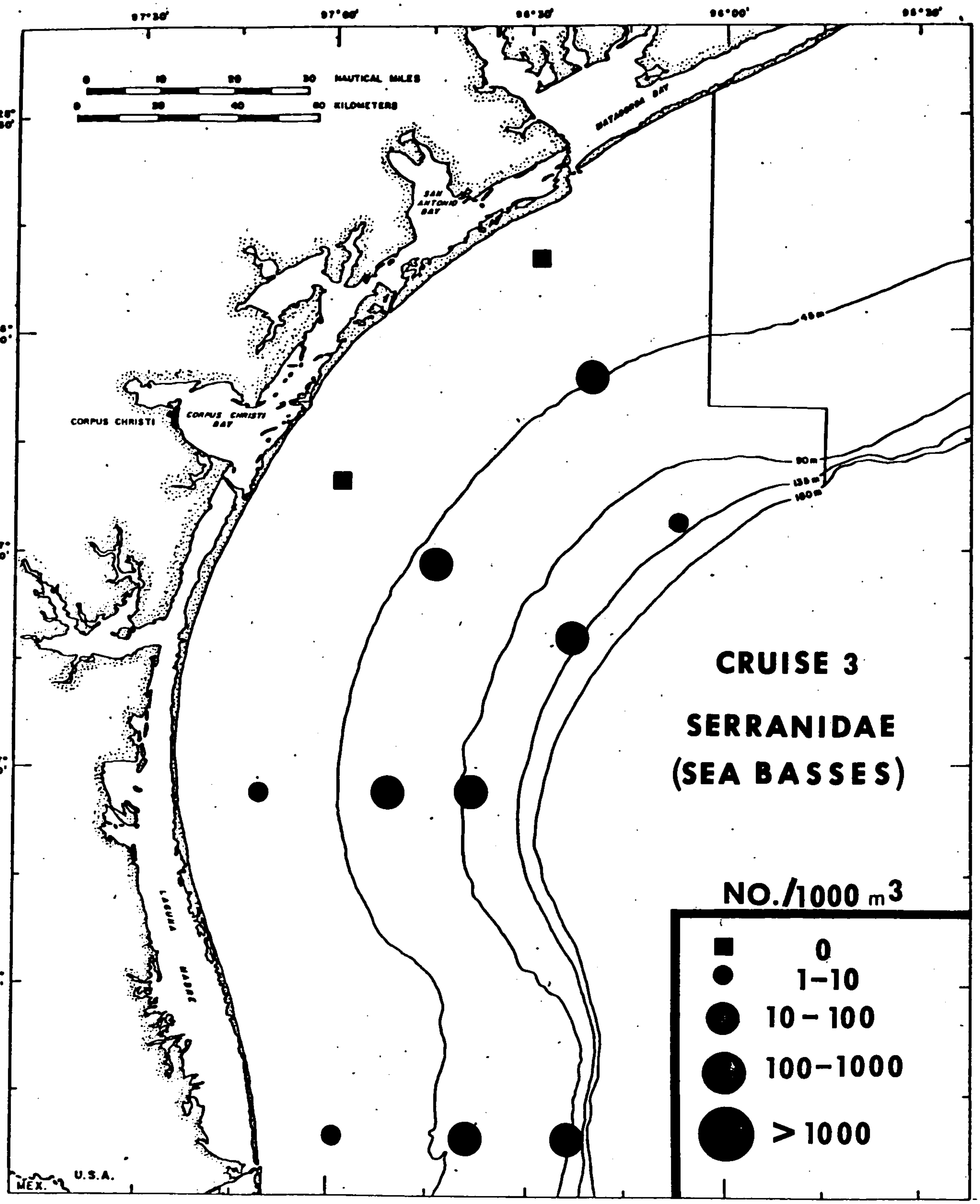


Figure 24 Number of serranid larvae per 1,000 m^3 by transect and station on Cruise 3.

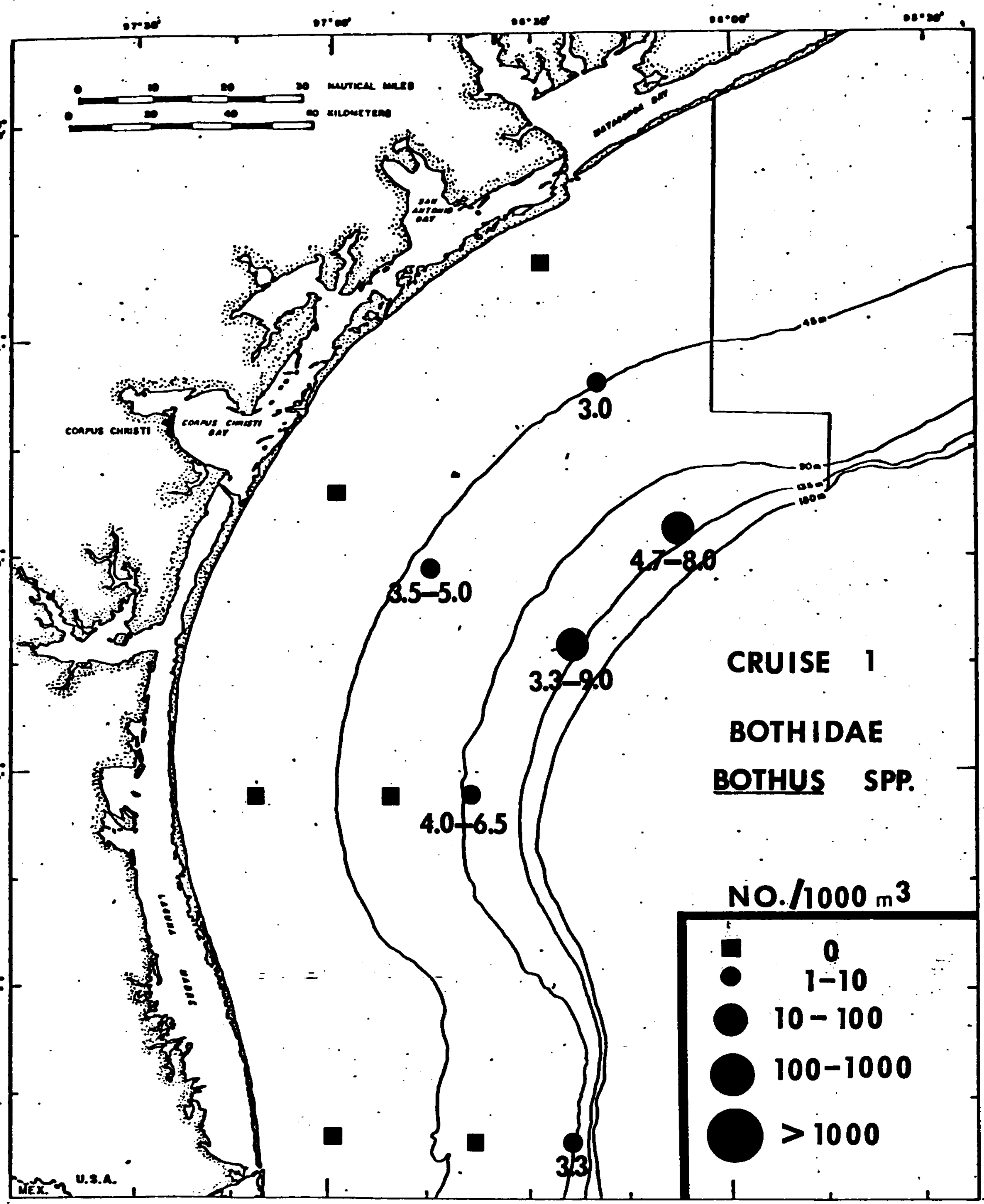


Figure 25 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Bothus spp. by transect and station on Cruise 1.

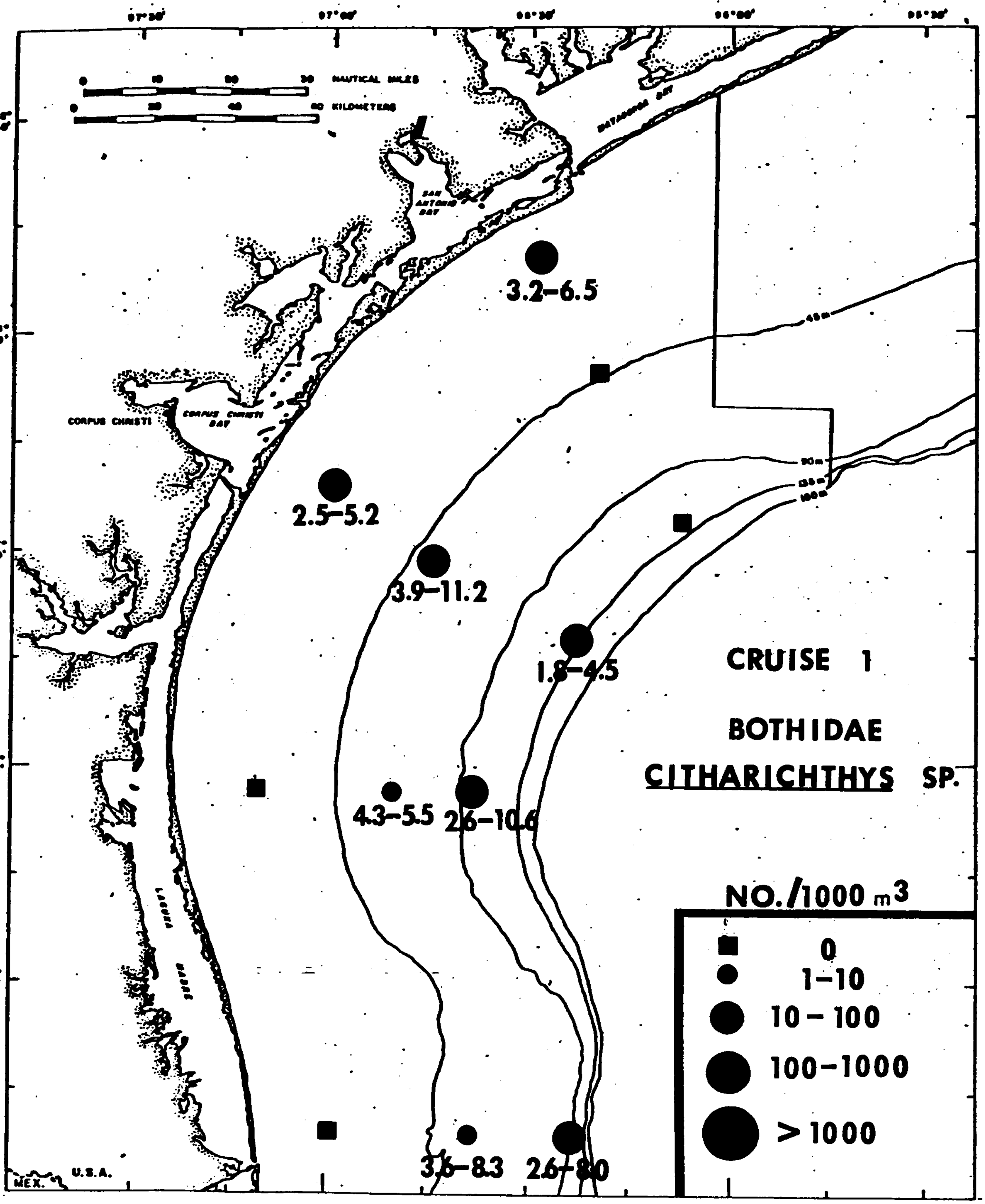


Figure 26 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Citharichthys sp. by transect and station on Cruise 1.

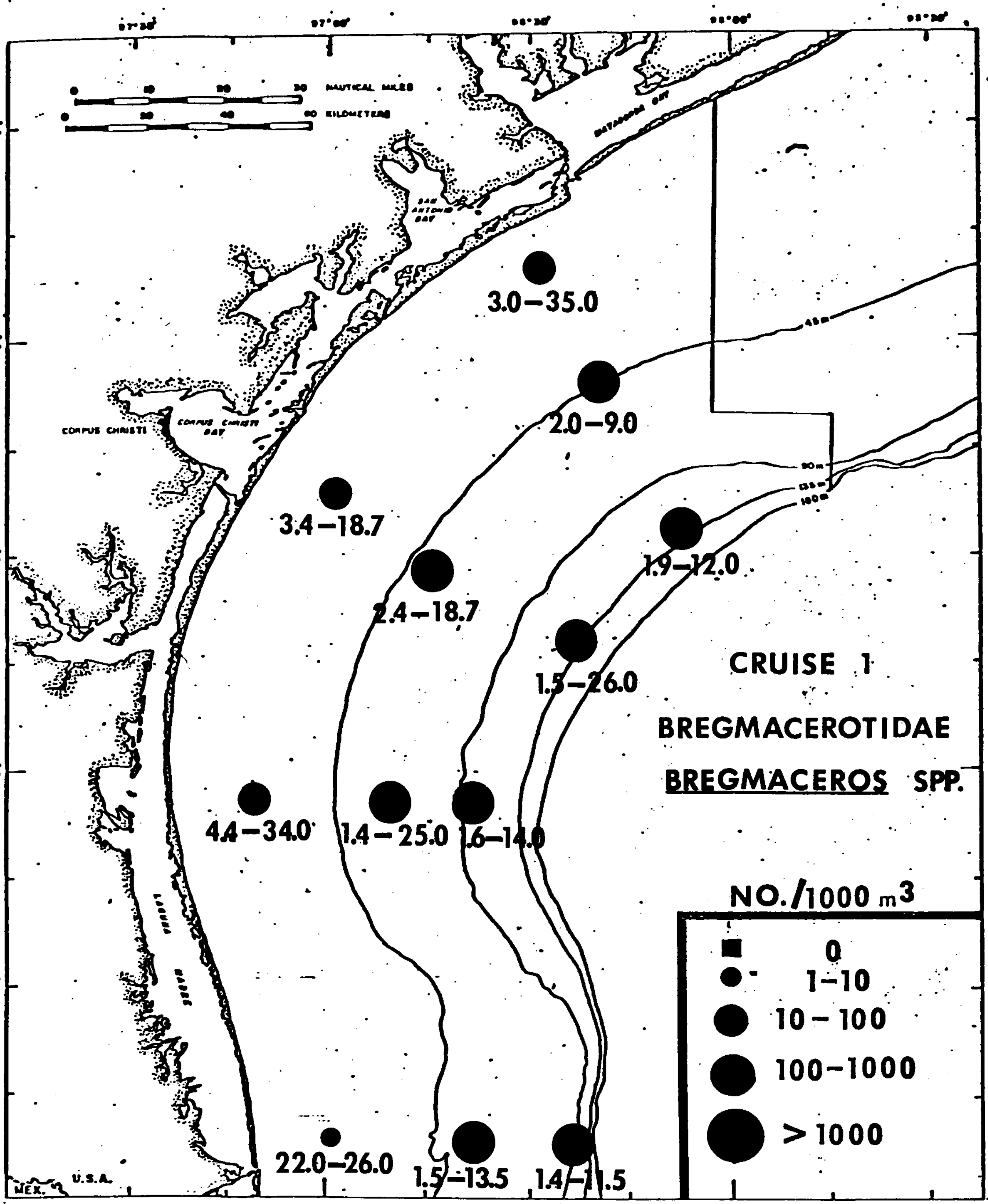


Figure 27 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of <u>Bregmaceros</u> spp. by transect and station on Cruise 1.

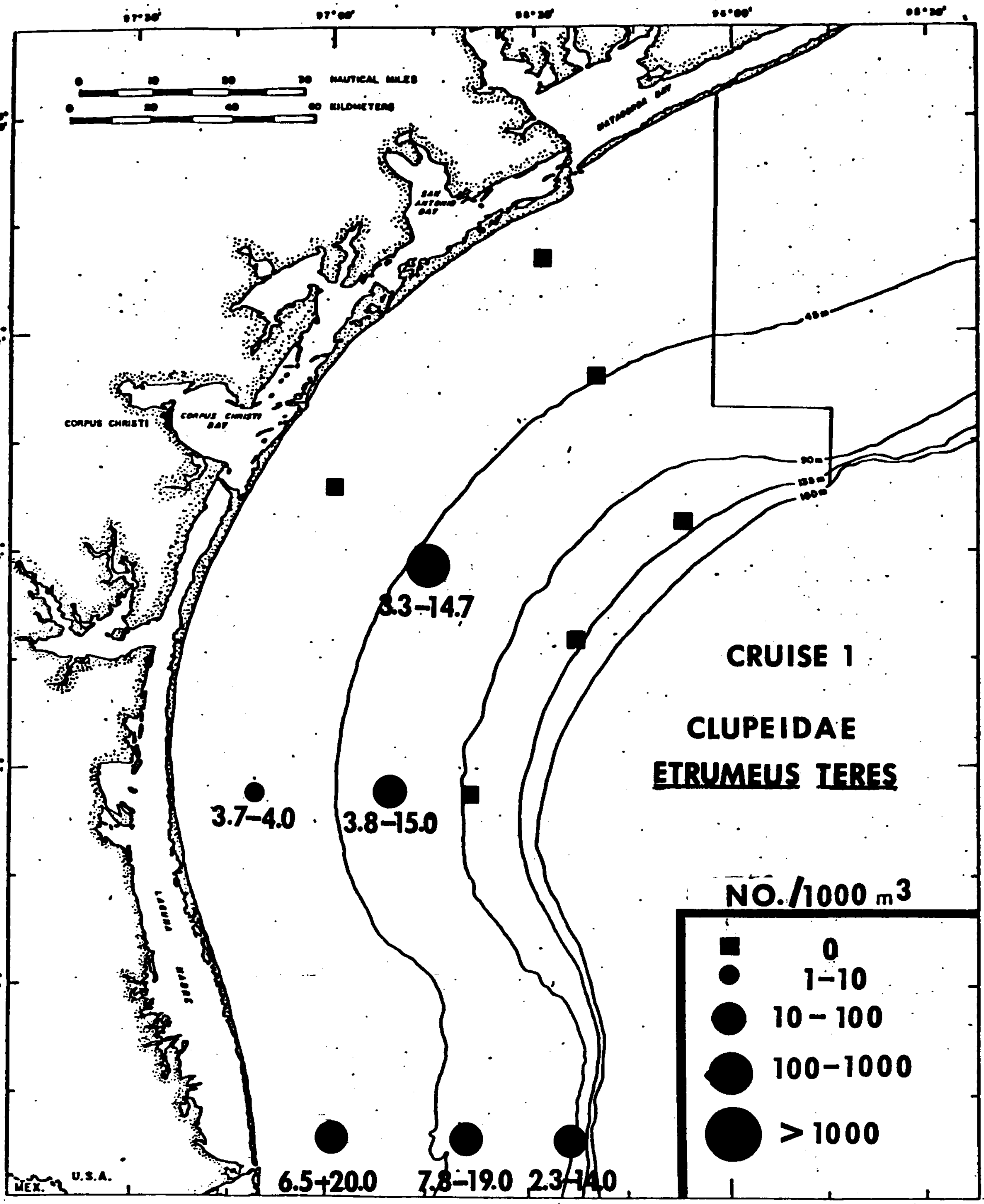


Figure 28. Numbers per 1,000 m^3 and size range (SL) in mm of larvae of <u>Etrumeus teres</u> by transect and station on Cruise 1.

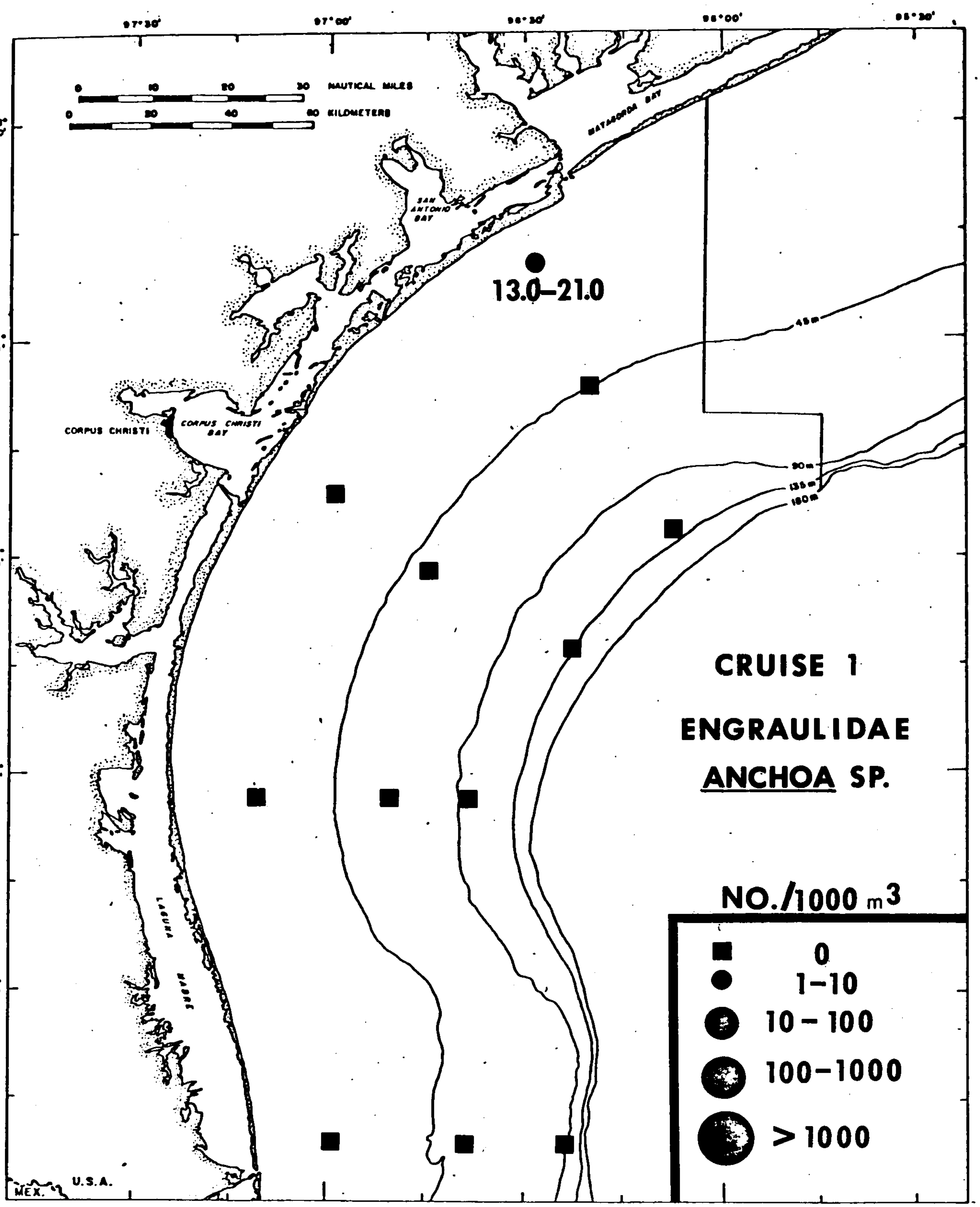


Figure 29 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Anchoa sp. by transect and station on Cruise 1.

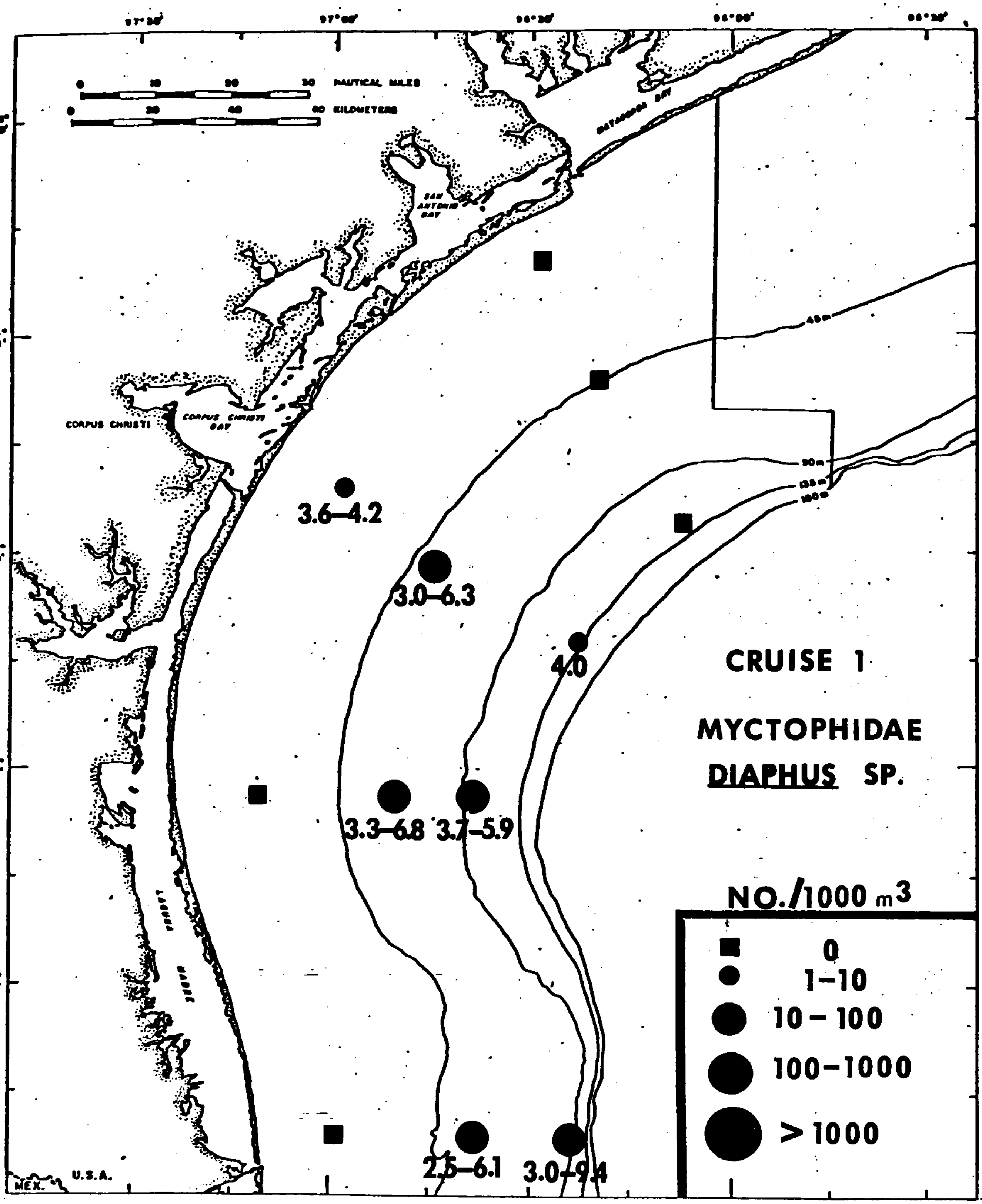


Figure 30 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Diaphus sp. by transect and station on Cruise 1.

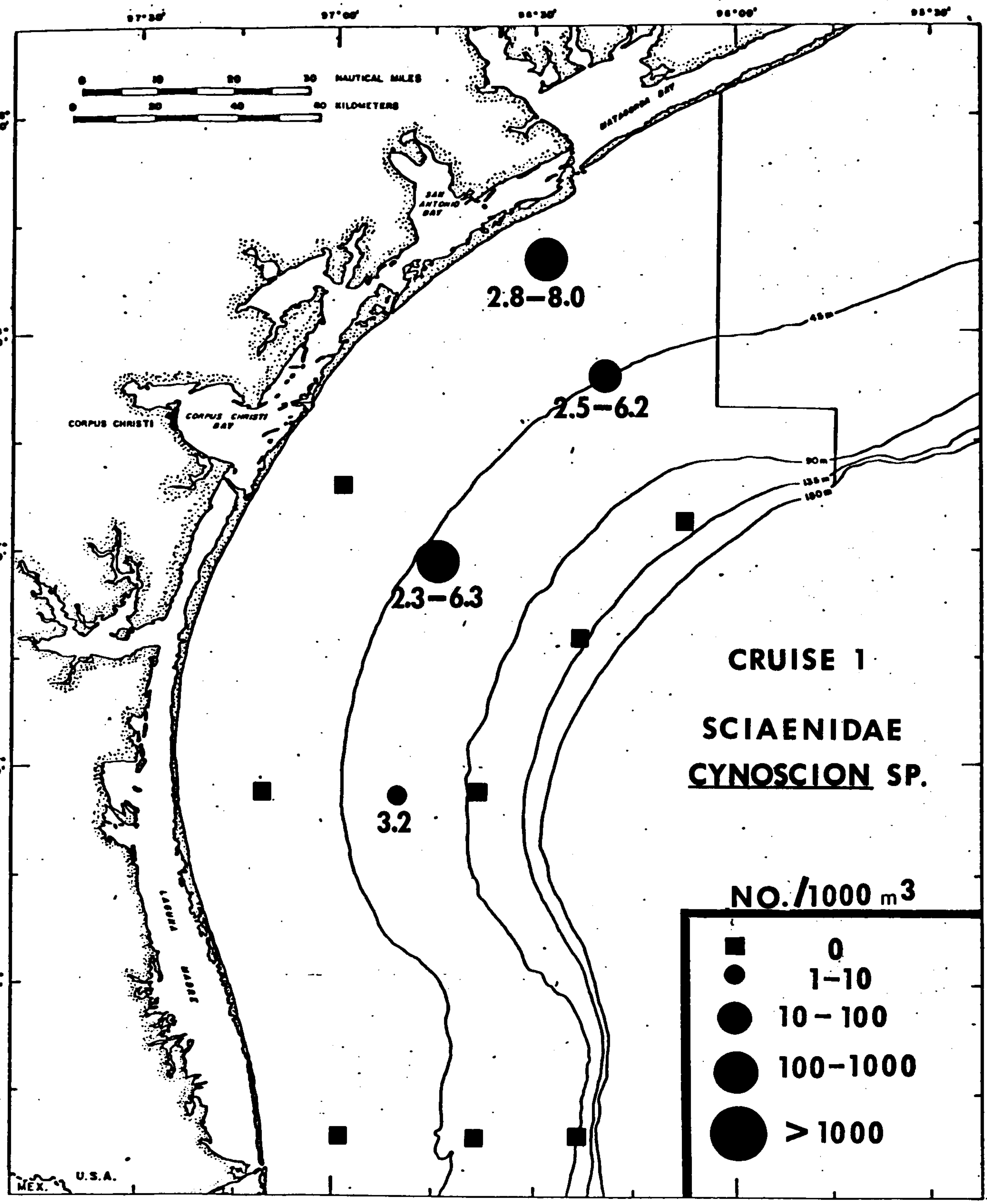


Figure 31 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of <u>Cynoscion</u> sp. by transect and station on Cruise 1.

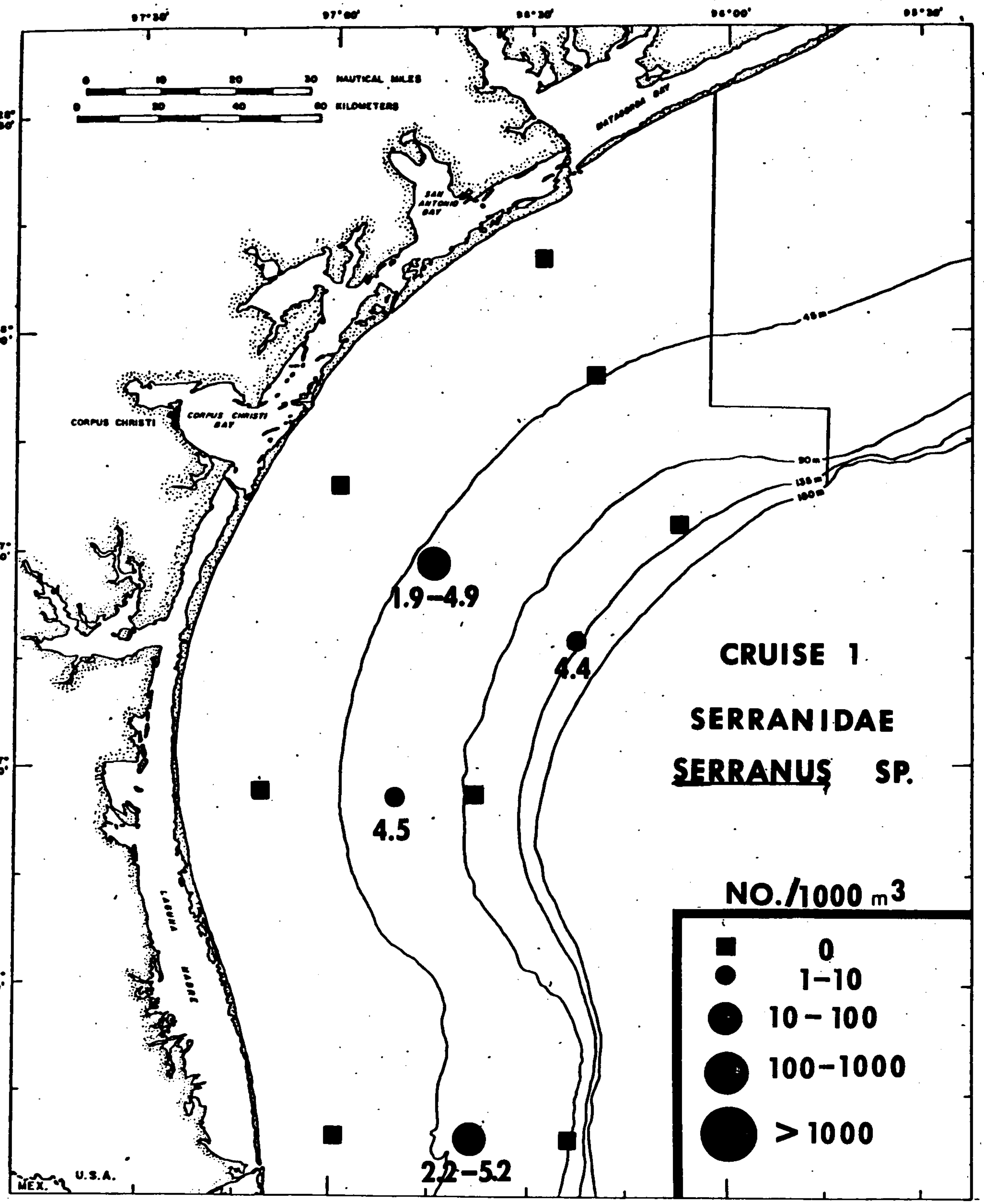


Figure 32 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of <u>Serranus</u> sp. by transect and station on Cruise 1.

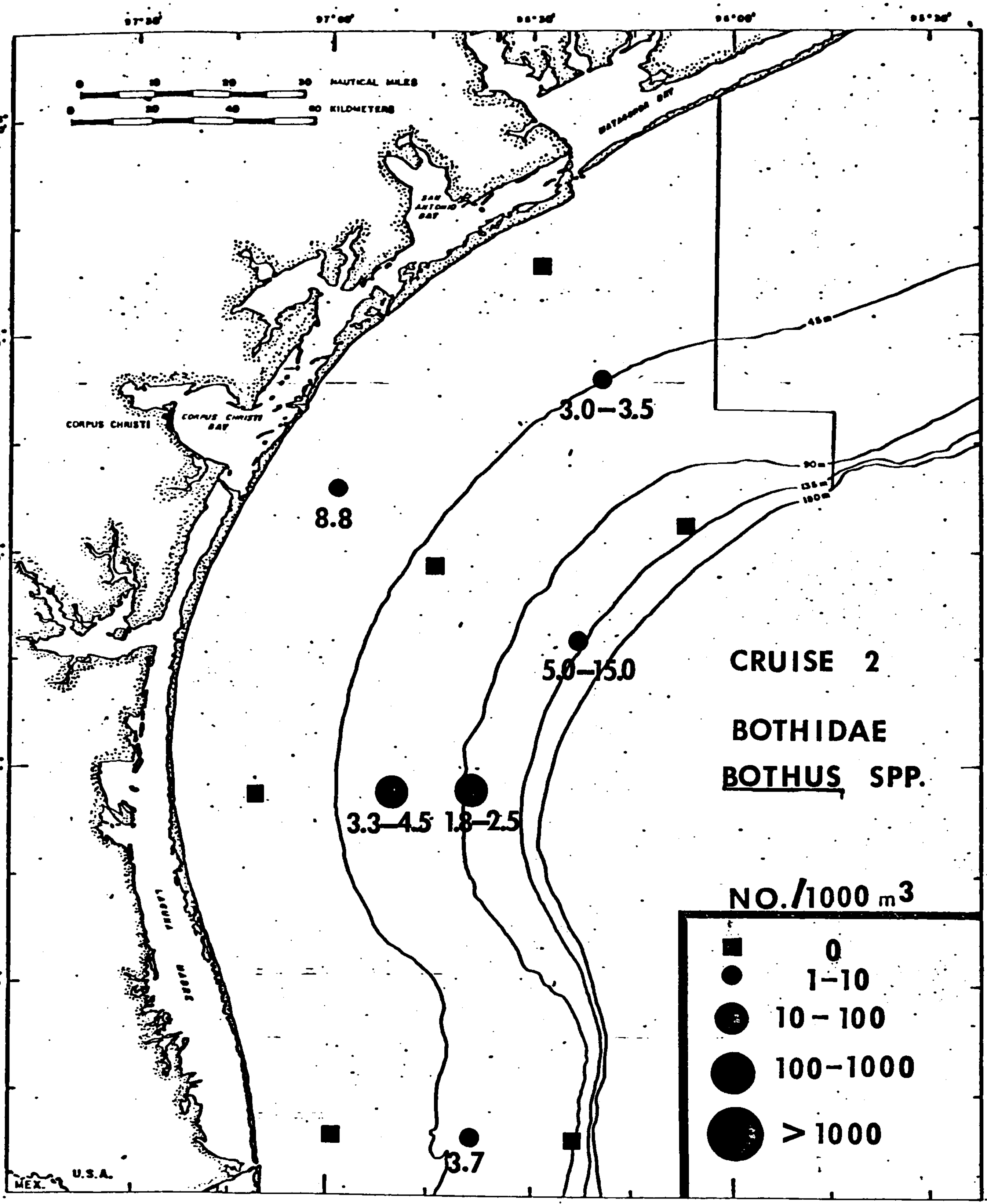


Figure 33 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Bothus spp. by transect and station on Cruise 2.

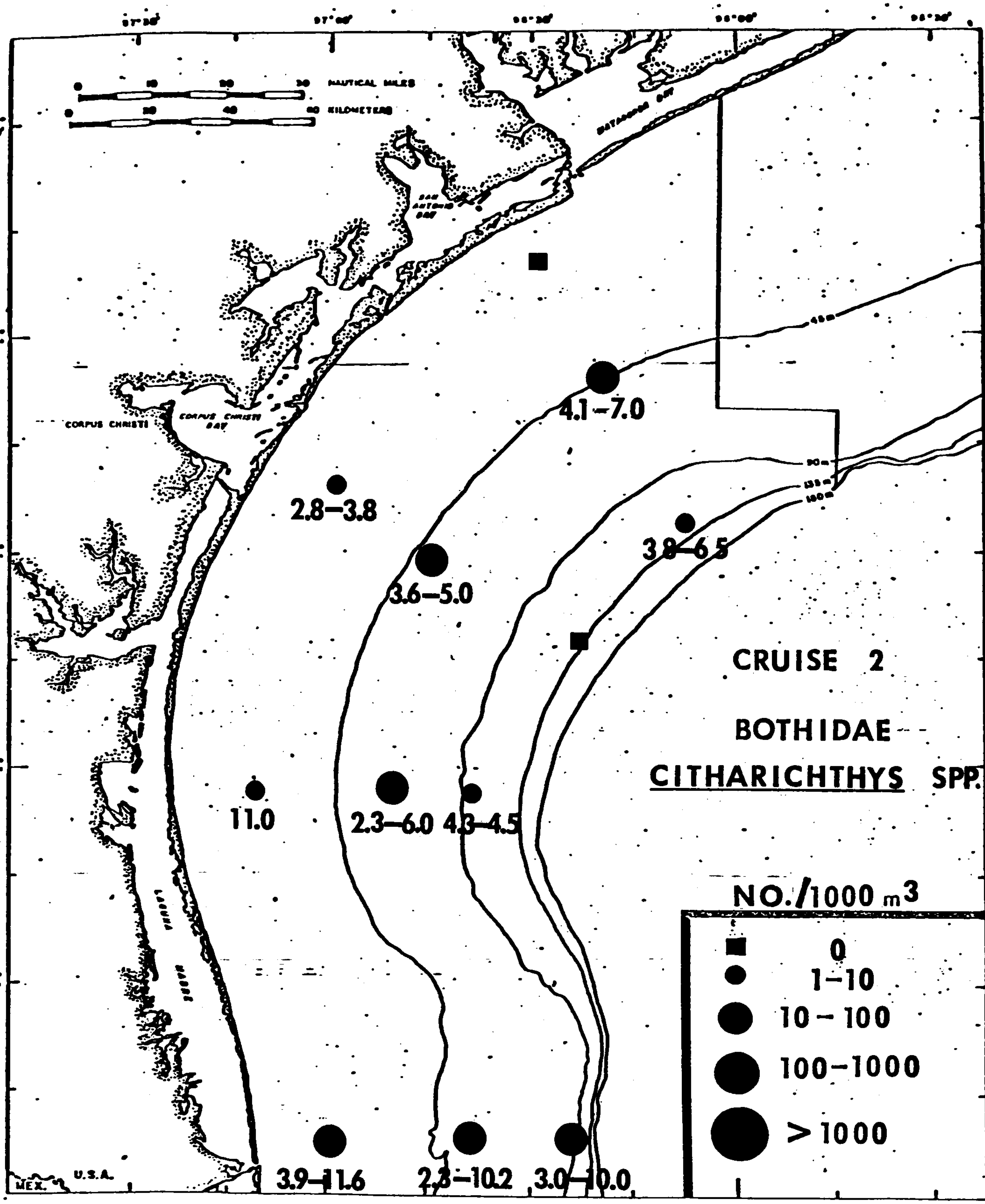


Figure 34. Numbers per 1,000 m^3 and size range (SL) in mm of larvae of *Citharichthys* spp. by transect and station on Cruise 2.

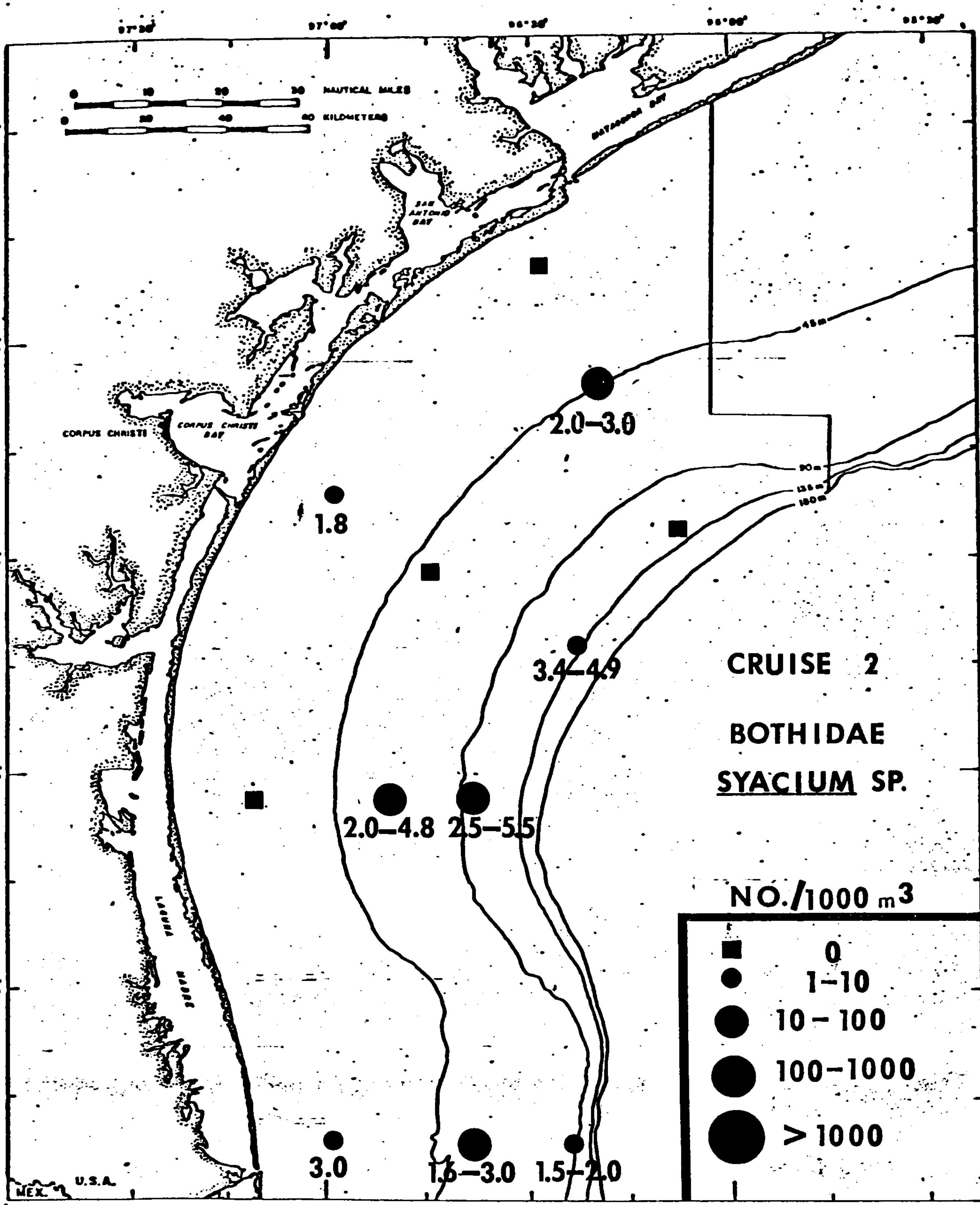


Figure 35. Numbers per 1,000 m^3 and size range (SL) in mm of larvae of *Syacium* sp. by transect and station on Cruise 2.

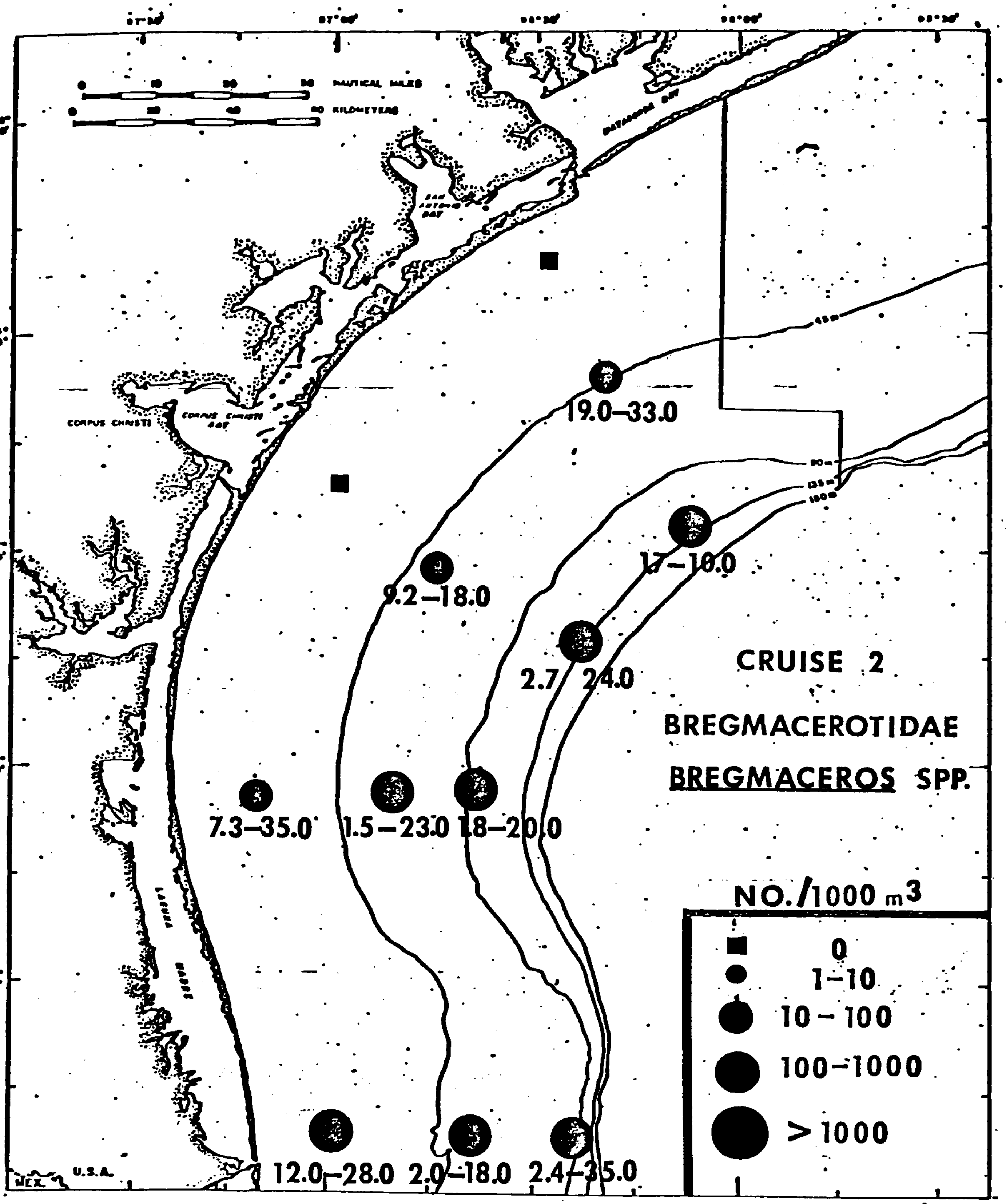


Figure 36 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Bregmaceros spp. by transect and station on Cruise 2.

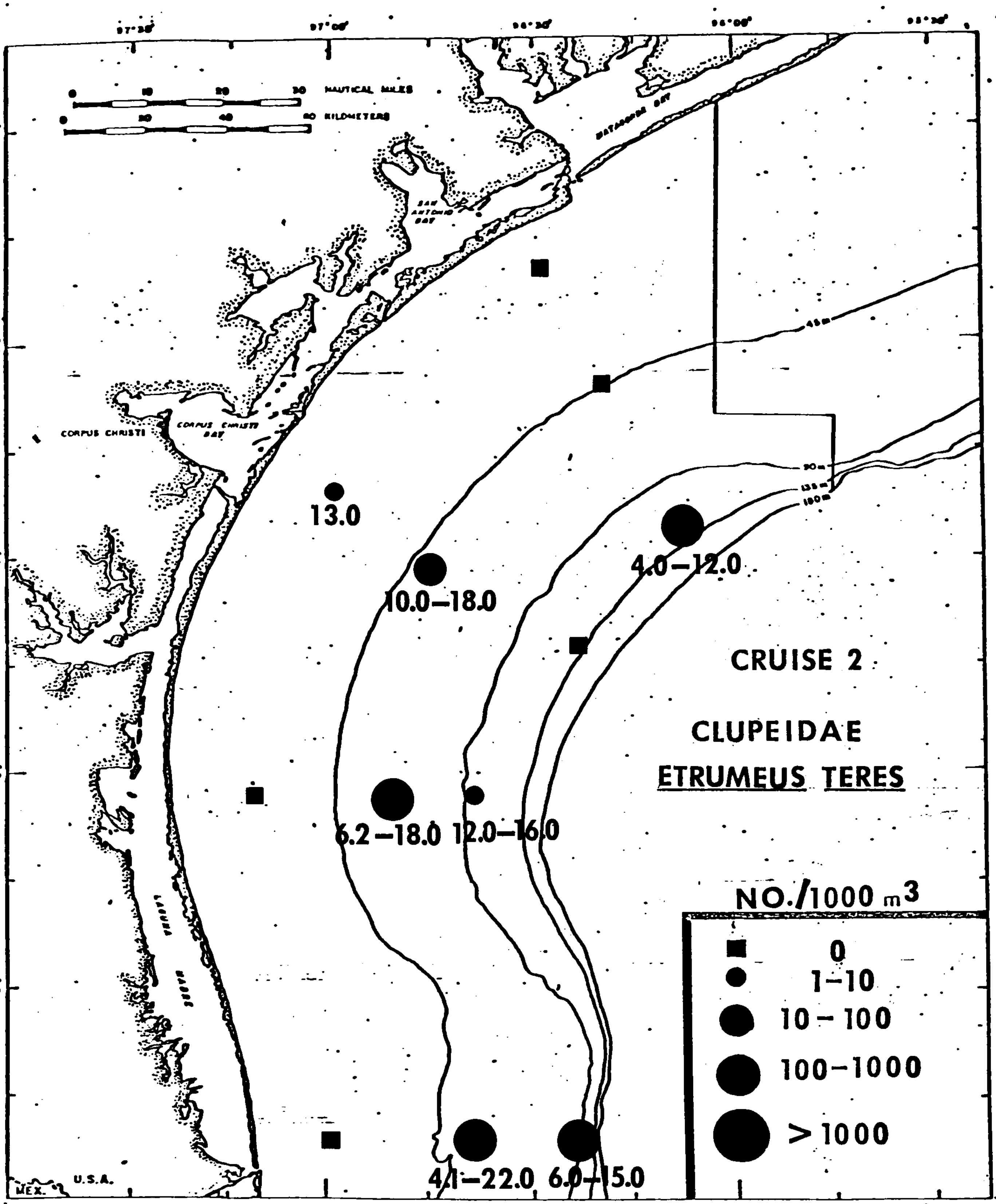


Figure 37 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Etrumeus teres by transect and station on Cruise 2.

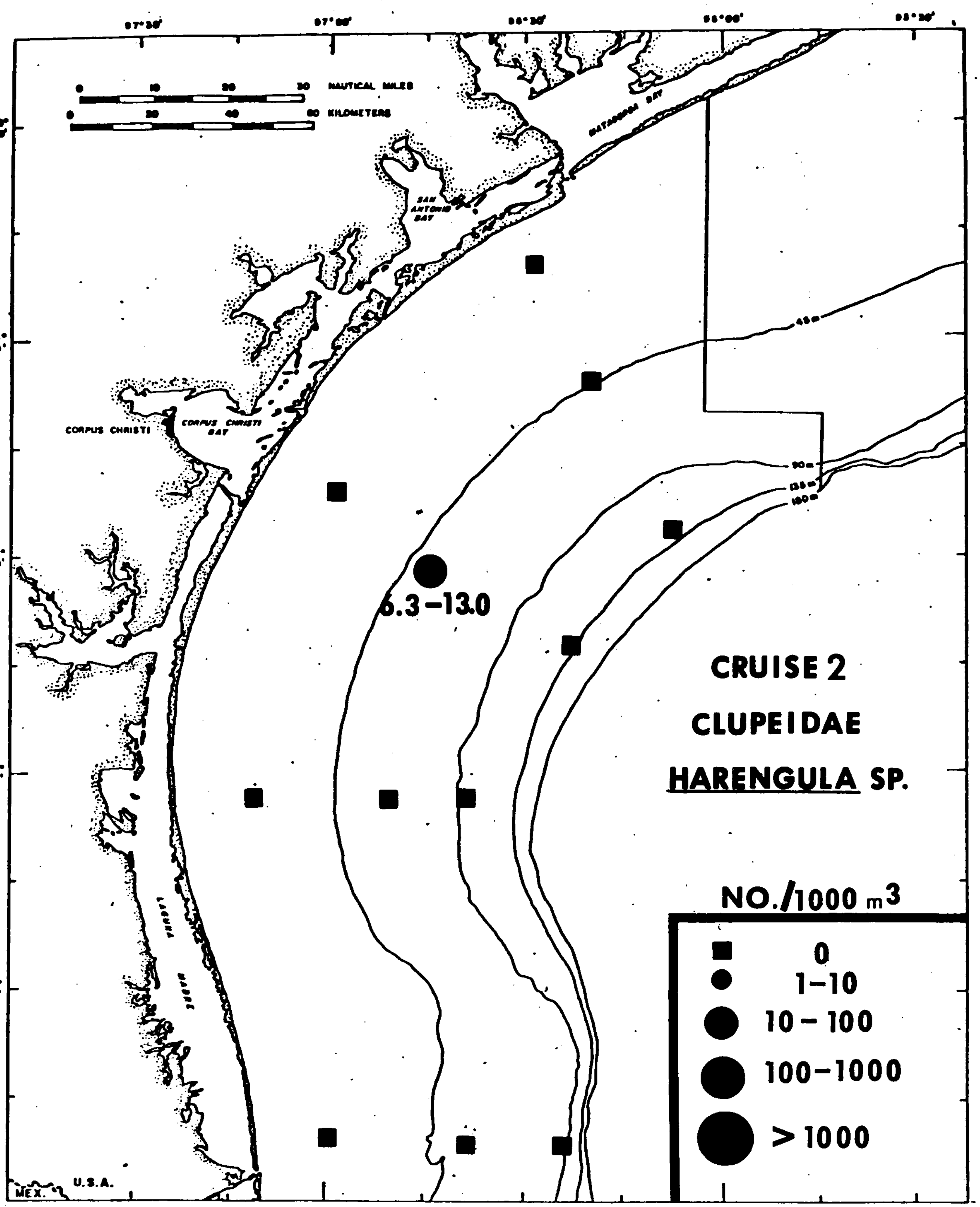


Figure 38 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Harengula sp. by transect and station on Cruise 2.

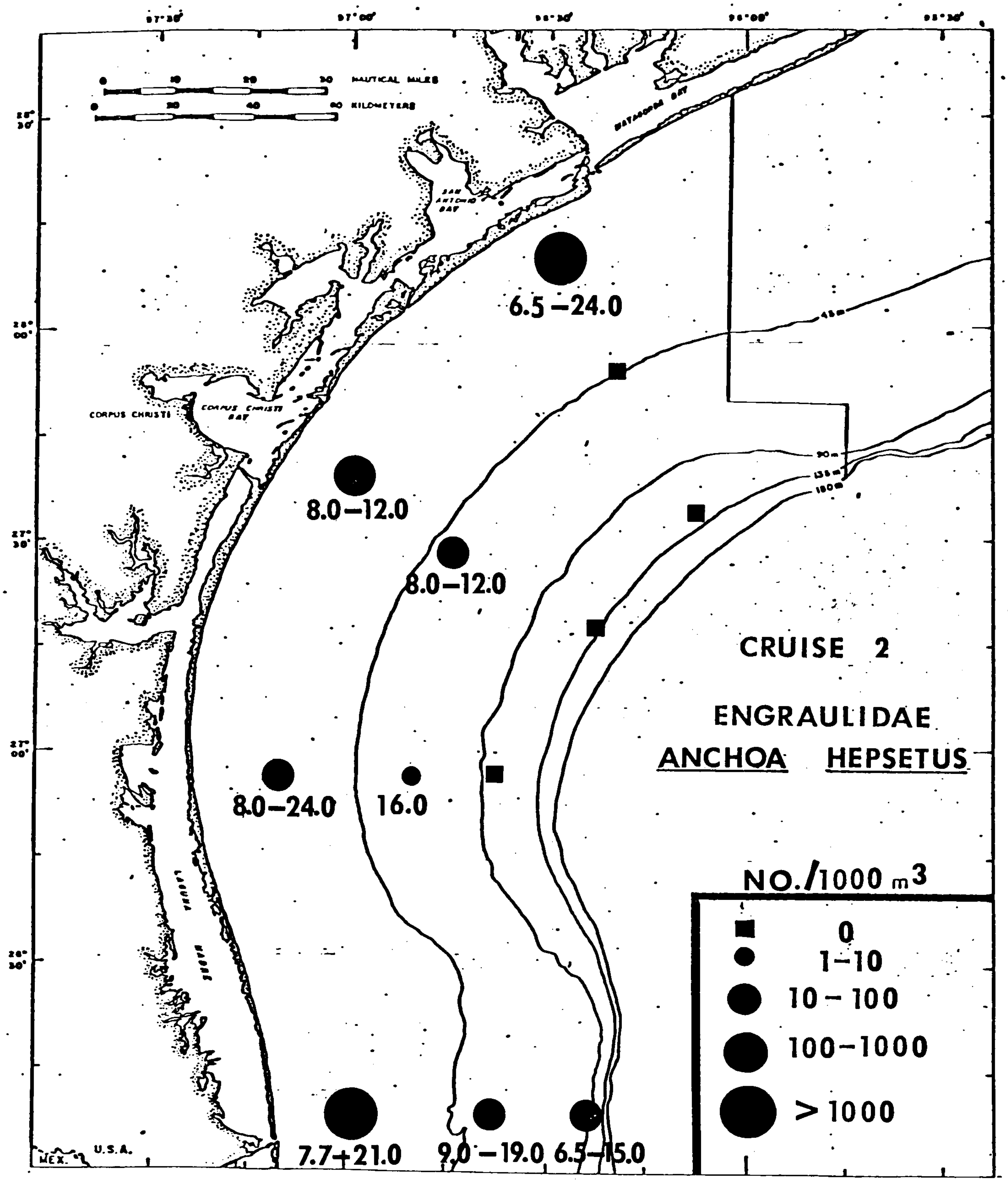


Figure 39 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of <u>Anchoa hepsetus</u> by transect and station on Cruise 2.

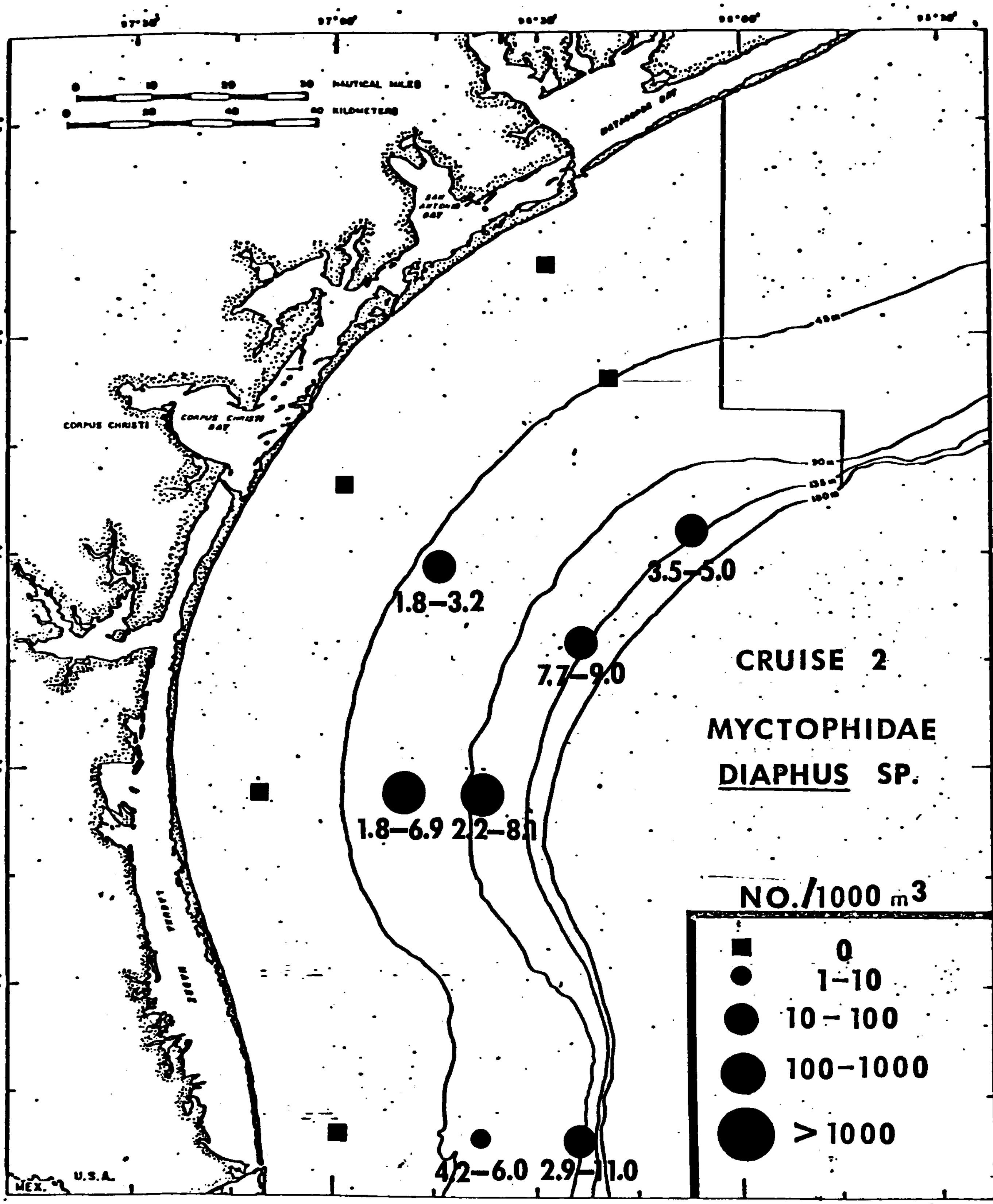


Figure 40. Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Diaphus sp. by transect and station on Cruise 2.

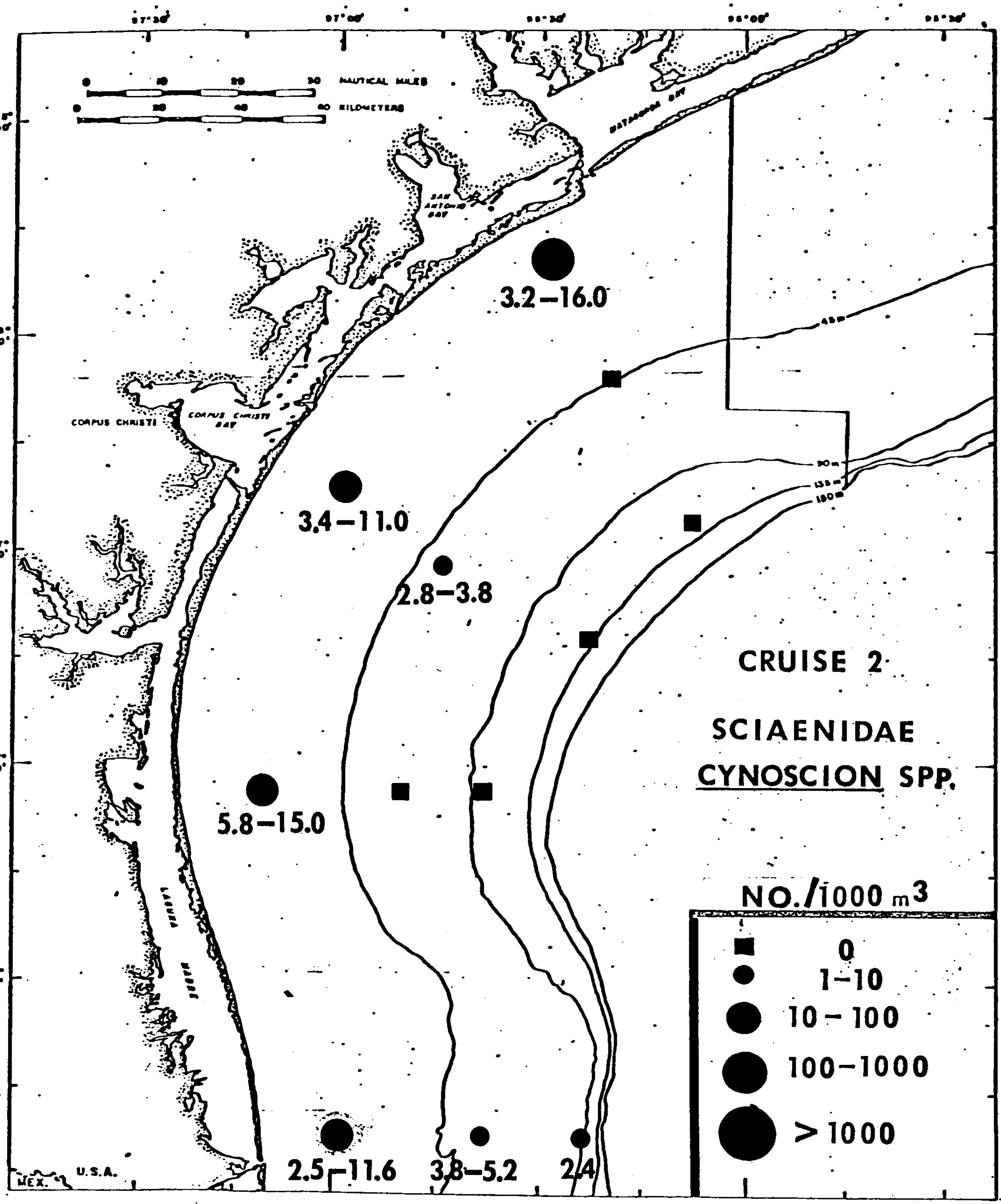


Figure 41 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Cynoscion spp. by transect and station on Cruise 2.

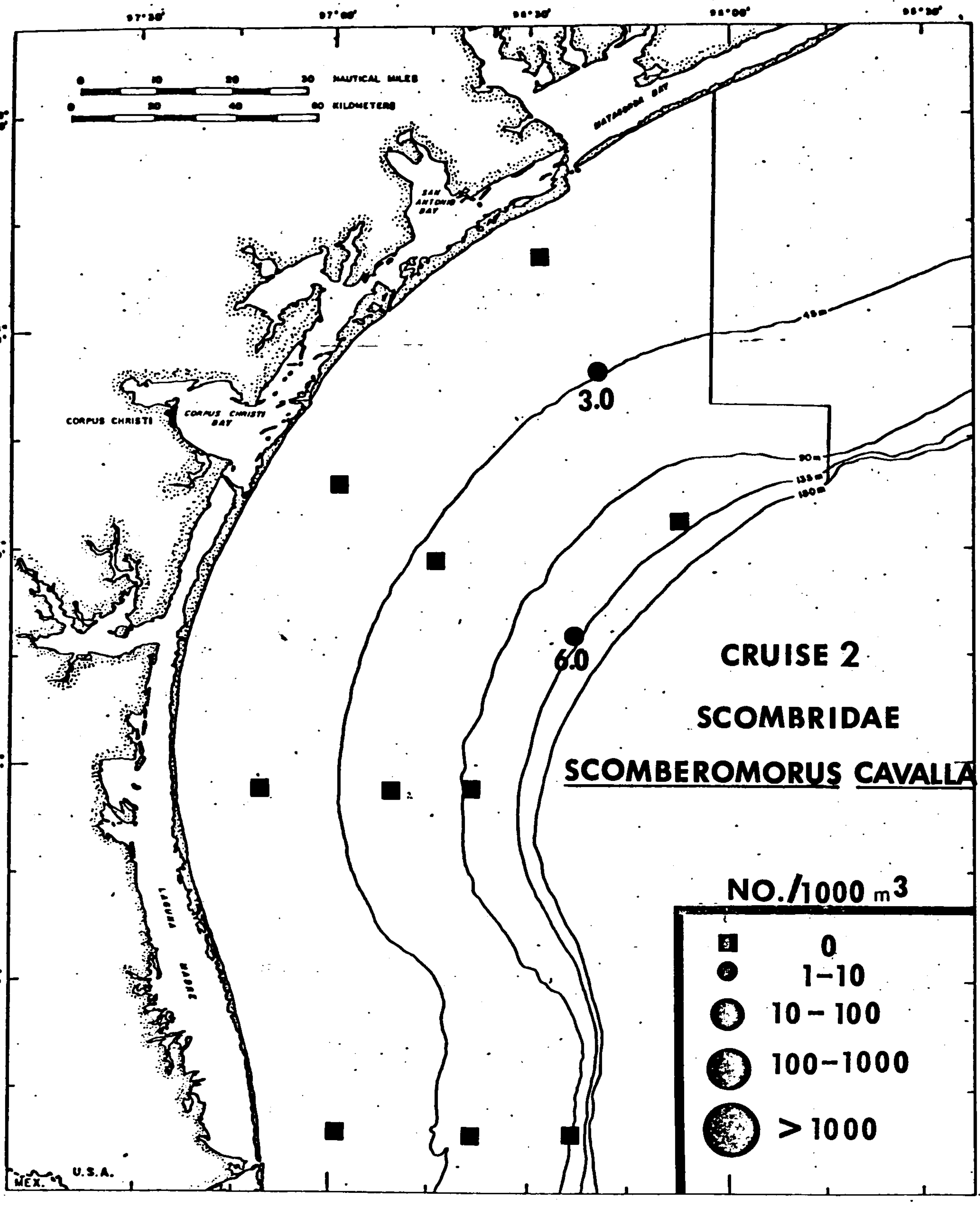


Figure 42 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Scomberomorus cavalla by transect and station on Cruise 2.

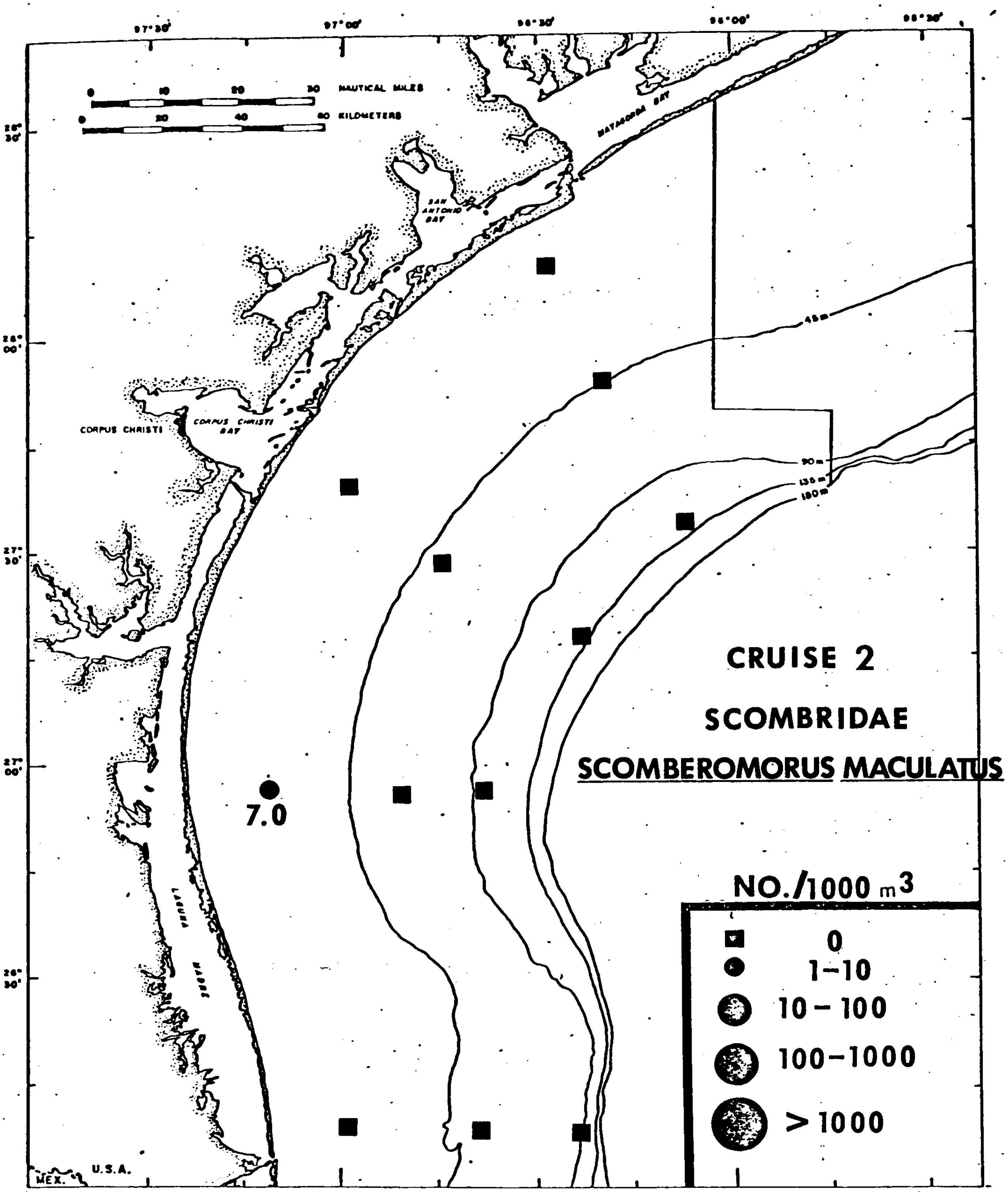


Figure 43 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of <u>Scomberomorus maculatus</u> by transect and station on Cruise 2.

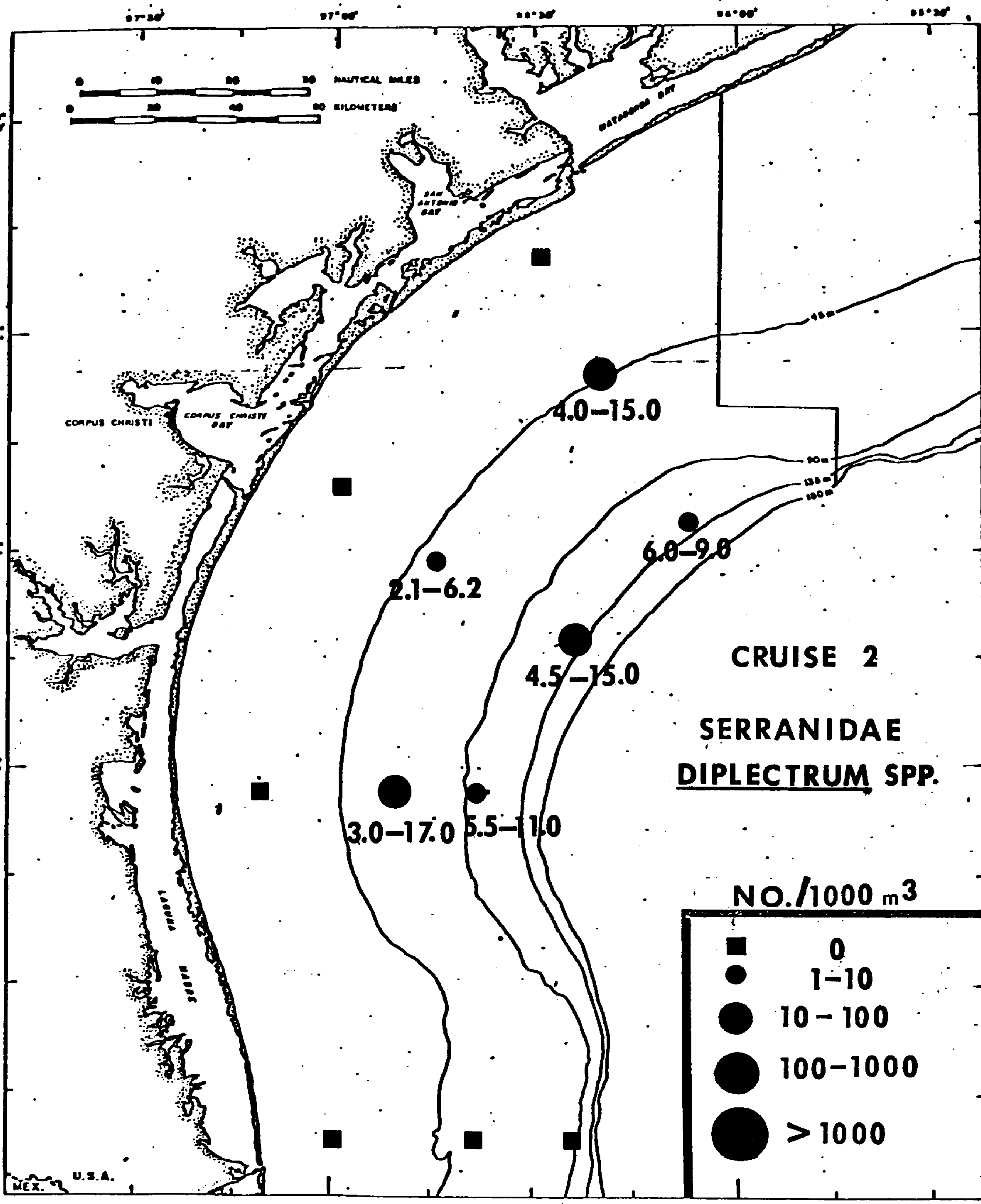


Figure 44 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Diplectrum spp. by transect and station on Cruise 2.

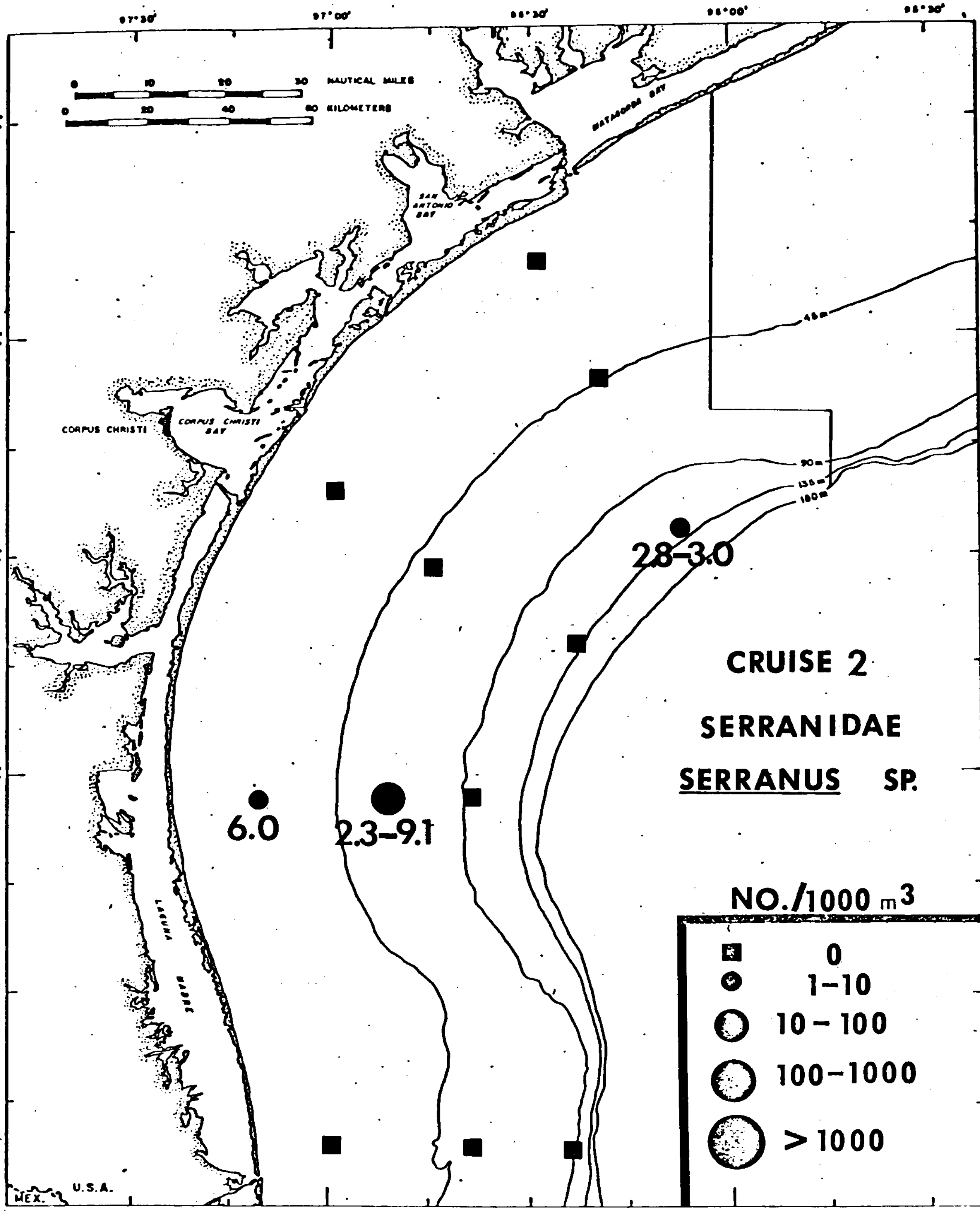


Figure 45 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of <u>Serranus</u> sp. by transect and station on Cruise 2.

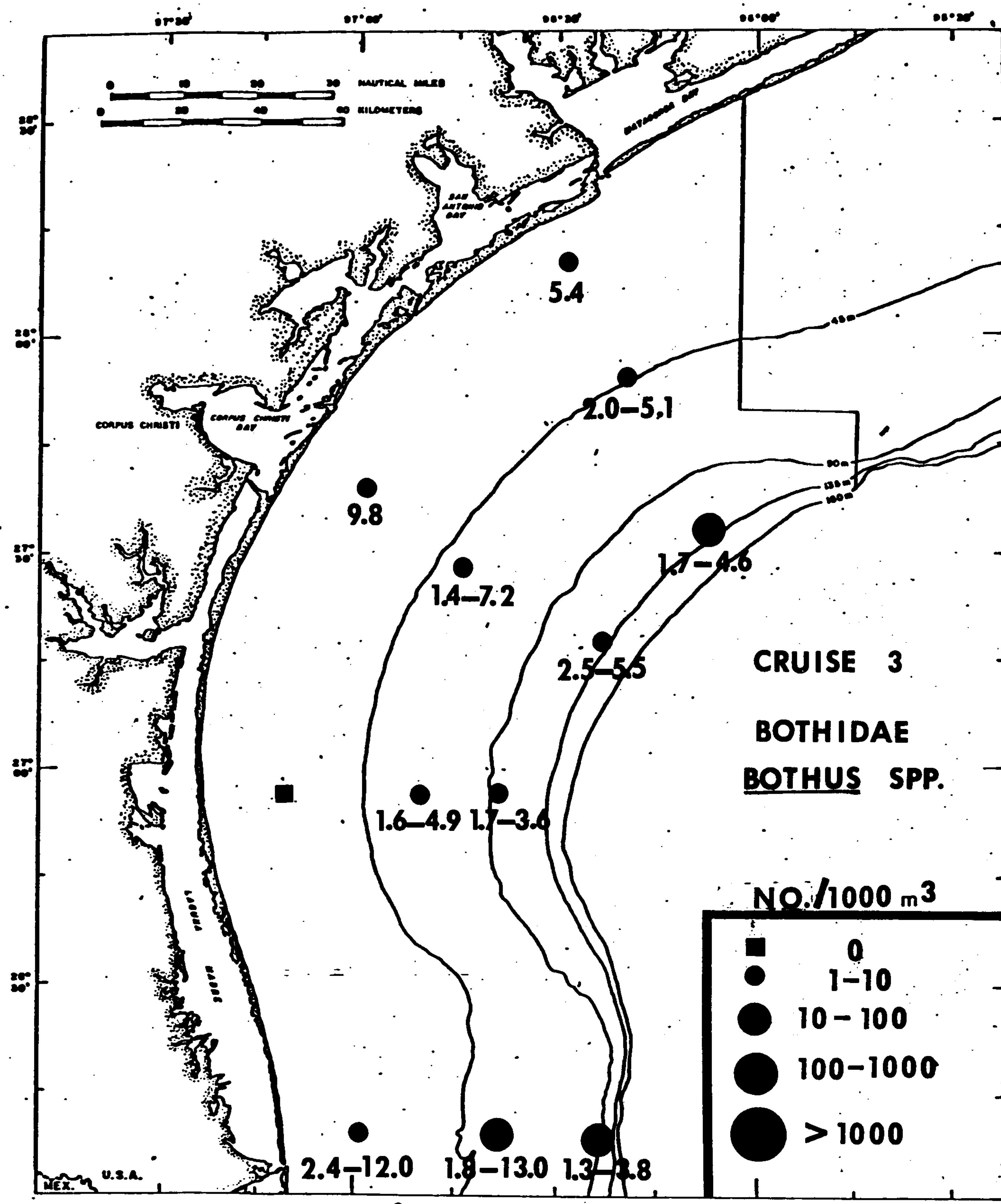


Figure 46 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Bothus spp. by transect and station on Cruise 3.

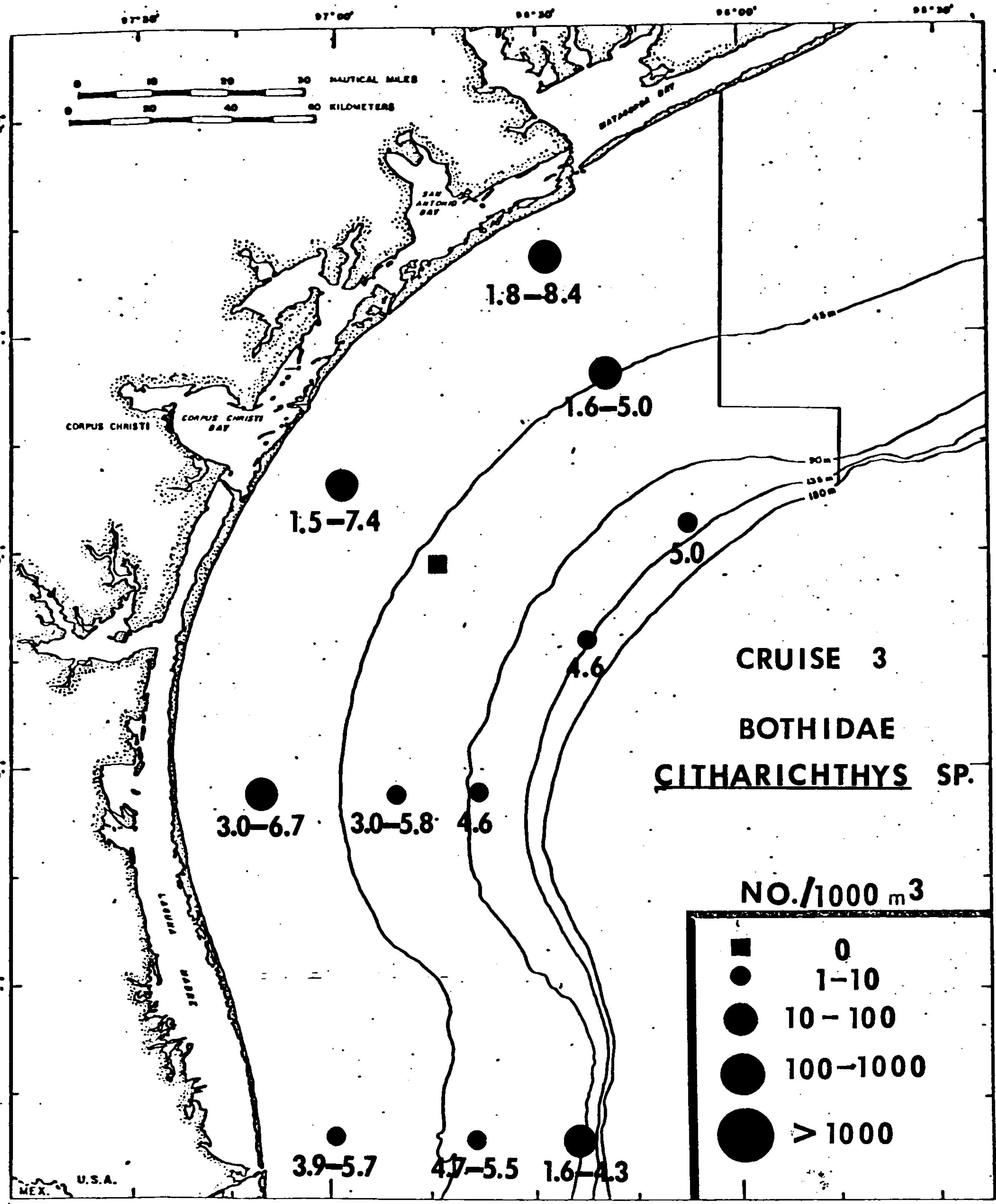


Figure 47 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of <u>Citharichthys</u> sp. by transect and station on Cruise 3.

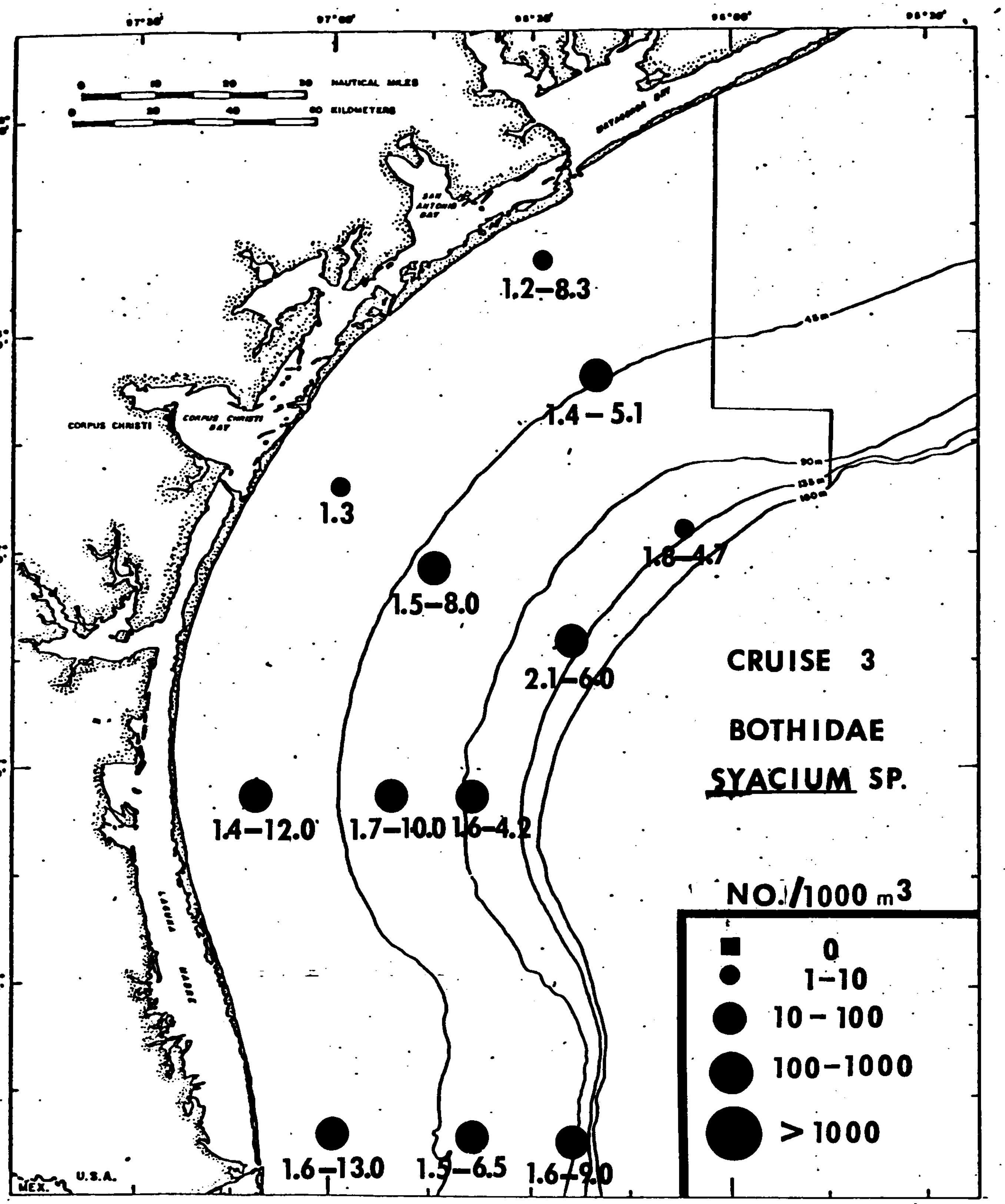


Figure 48 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of *Syacium* sp. by transect and station on Cruise 3.

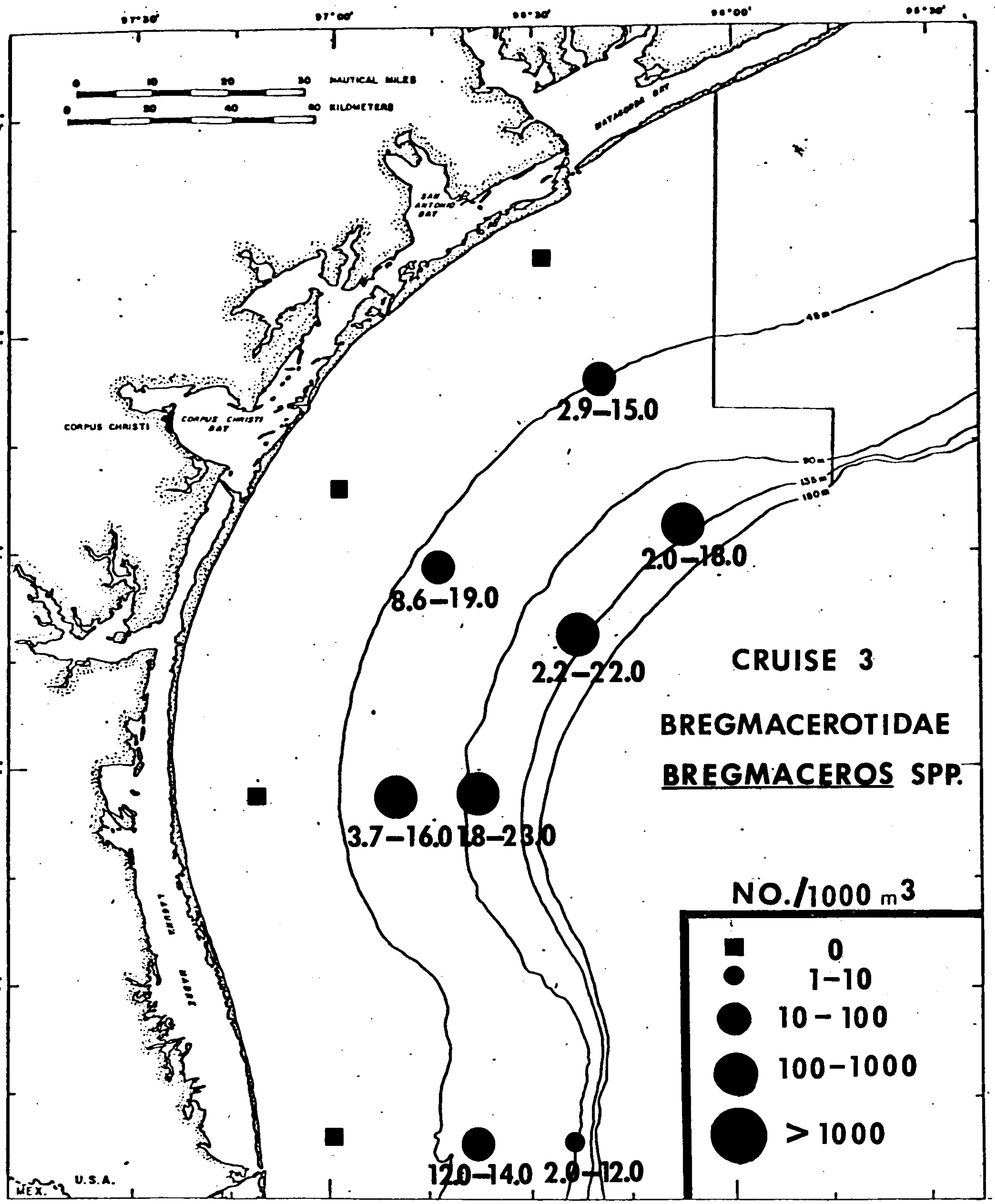


Figure 49 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of <u>Bregmaceros</u> spp. by transect and station on Cruise 3.

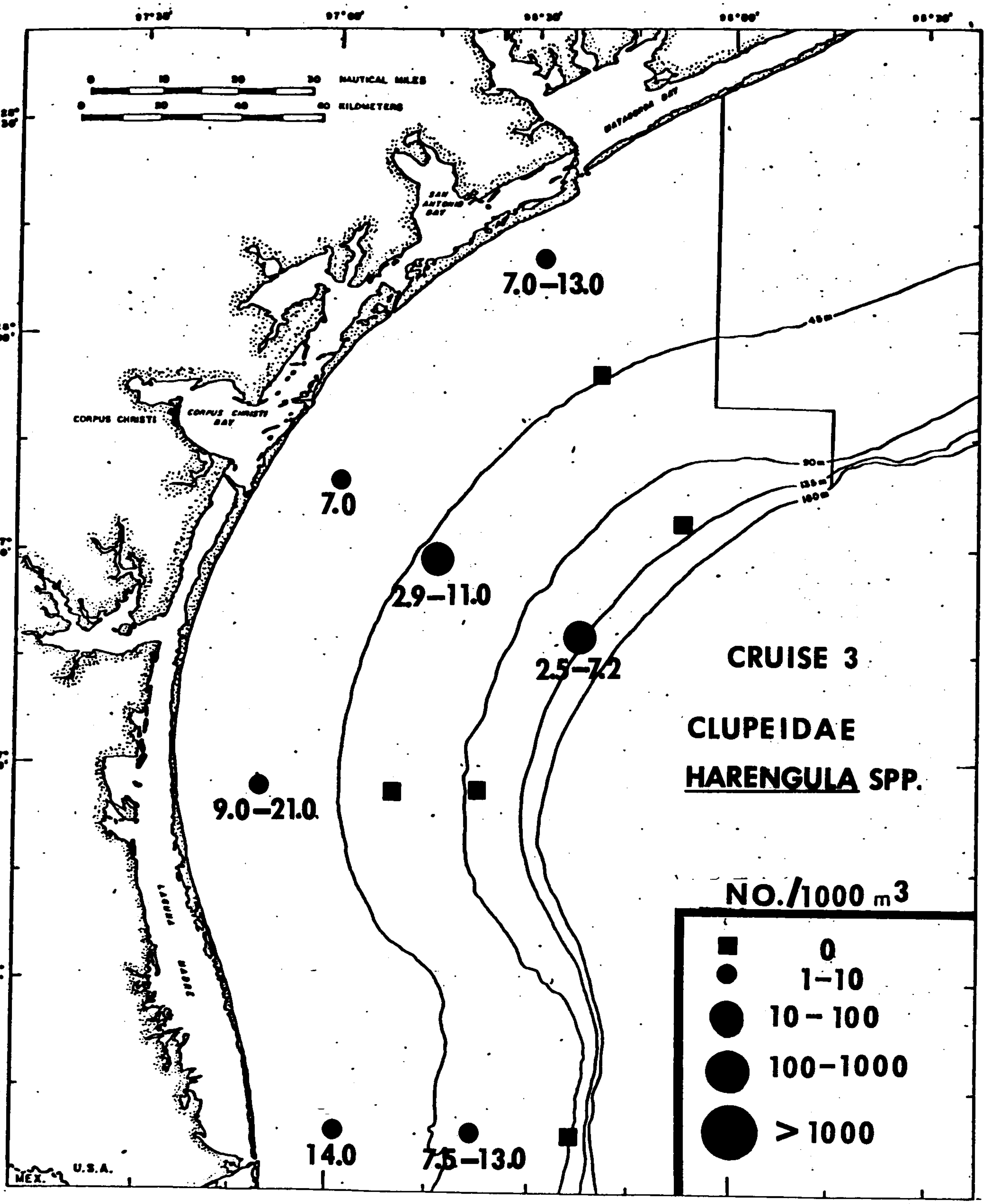


Figure 50 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Harengula spp. by transect and station on Cruise 3.

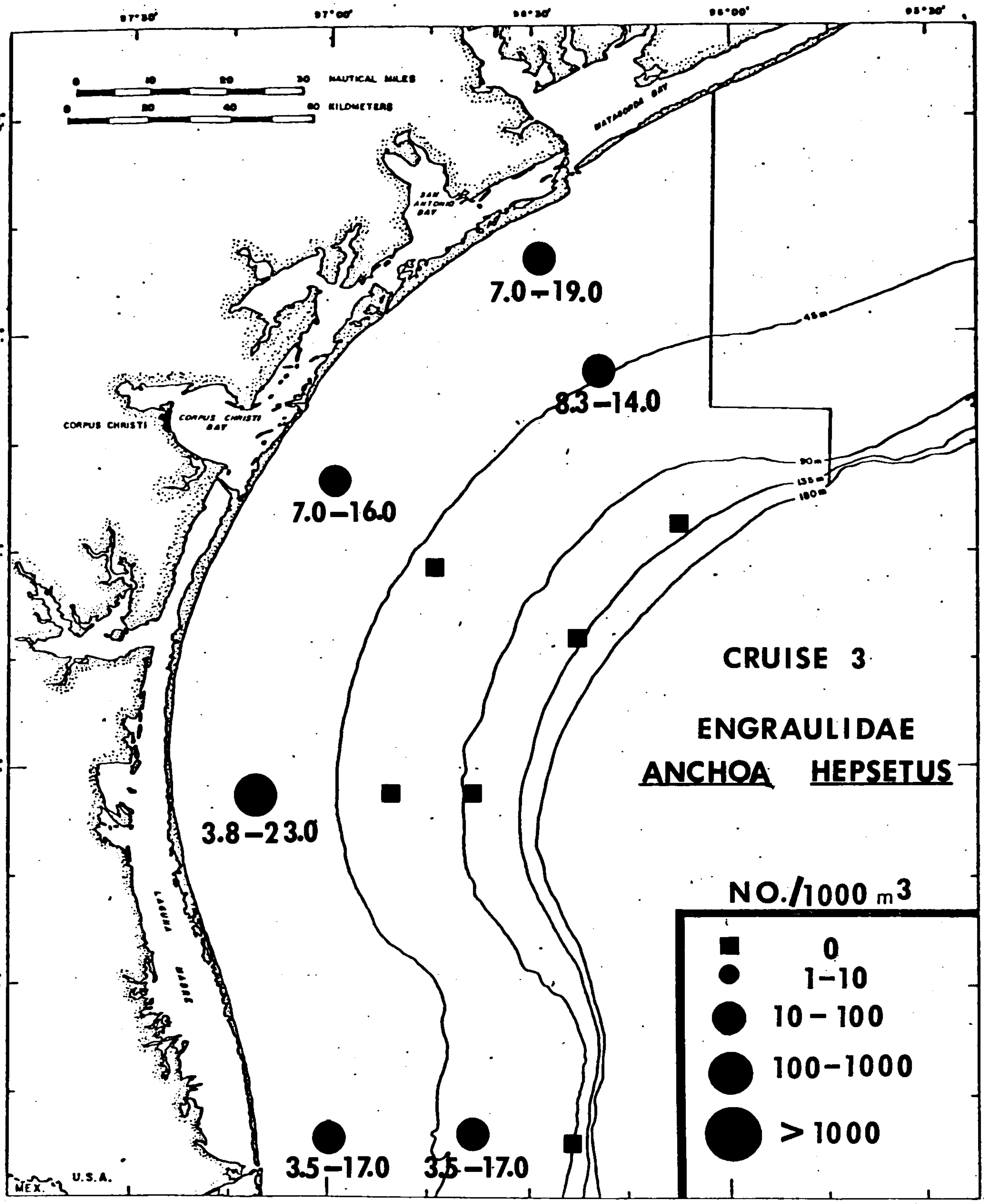


Figure 51 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Anchoa hepsetus by transect and station on Cruise 3.

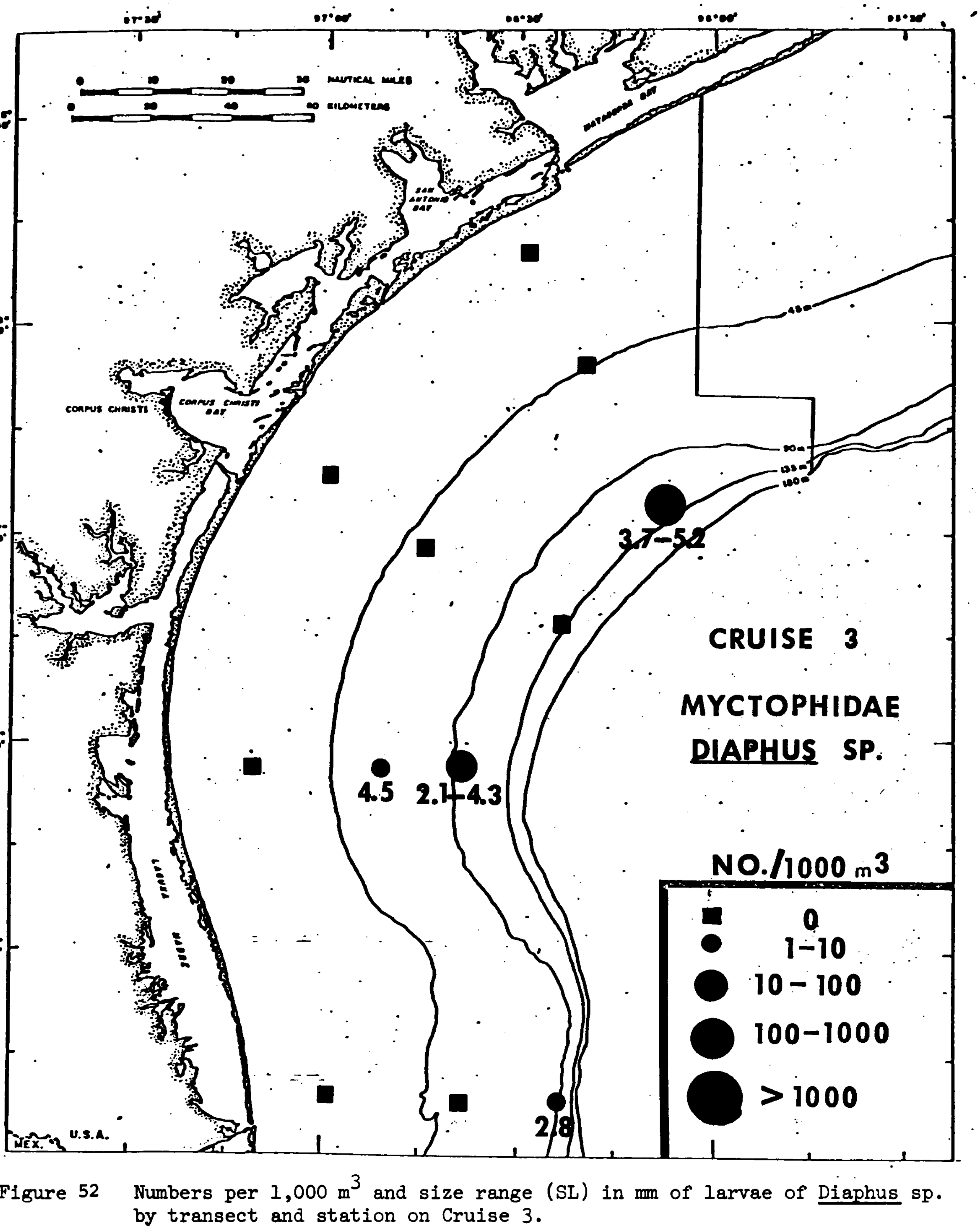


Figure 52 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Diaphus sp. by transect and station on Cruise 3.

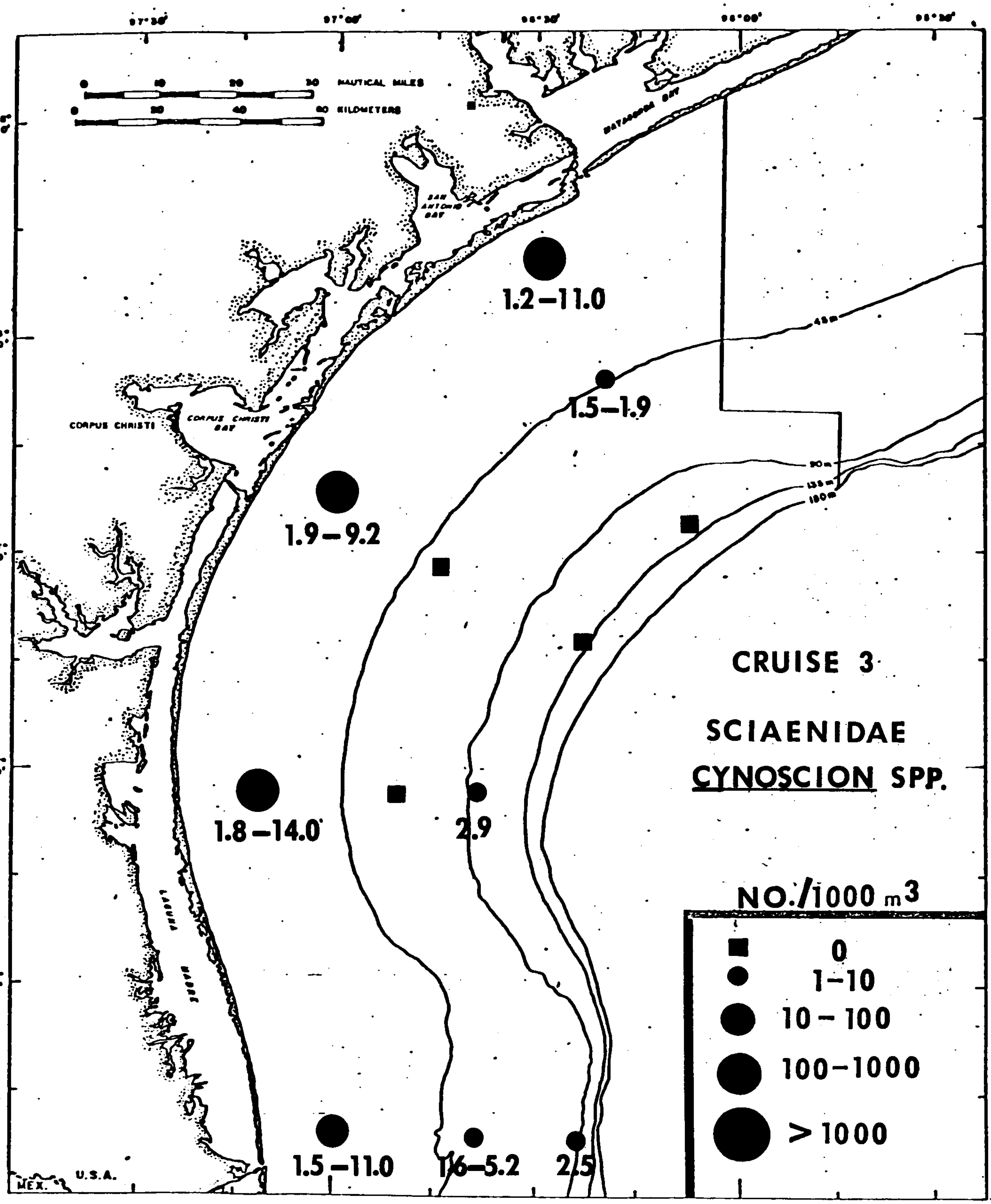


Figure 53 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of <u>Cynoscion</u> spp. by transect and station on Cruise 3.

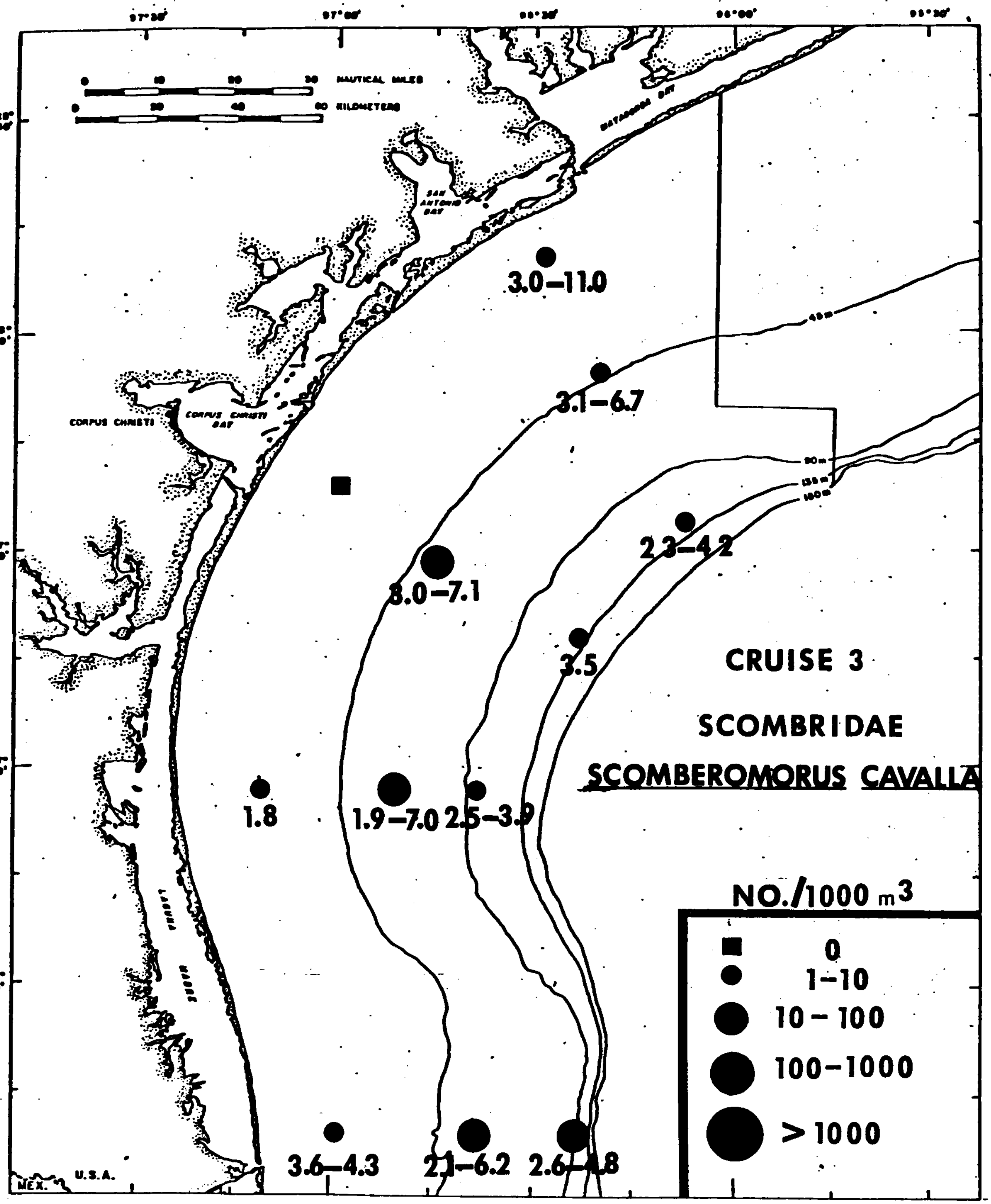


Figure 54 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Scomberomorus cavalla by transect and station on Cruise 3.

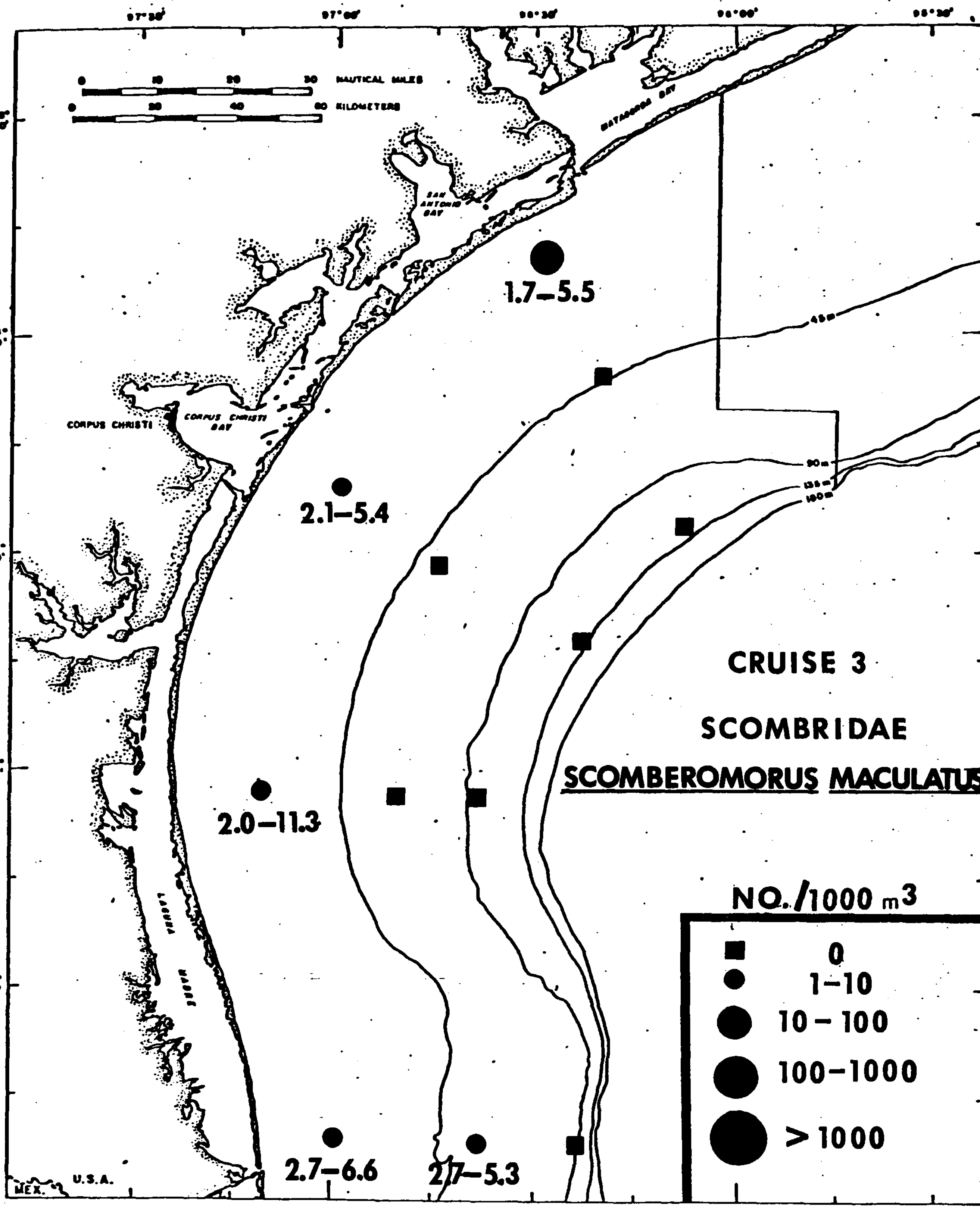


Figure 55 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Scomberomorus maculatus by transect and station on Cruise 3.

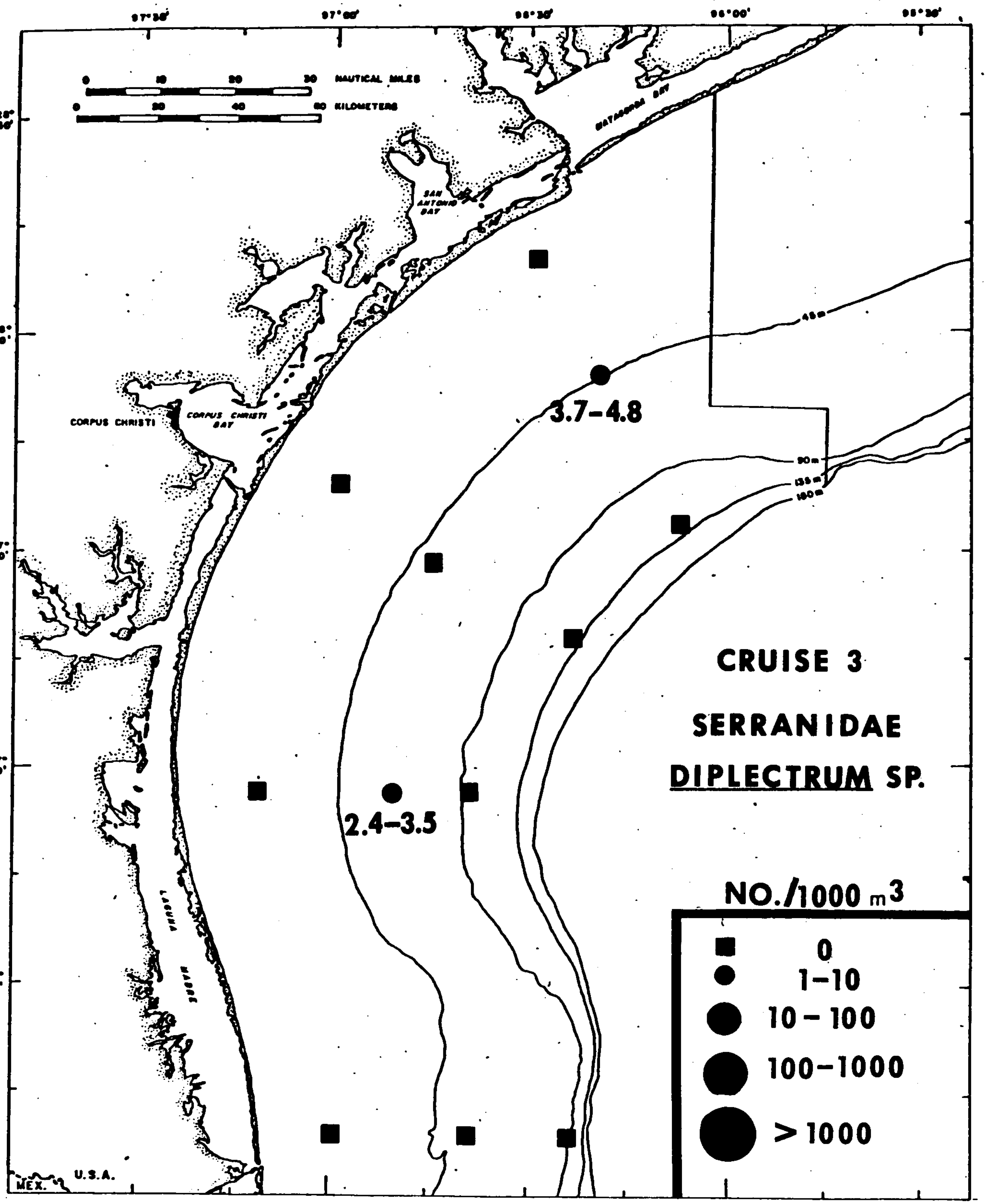


Figure 56 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of Diplectrum sp. by transect and station on Cruise 3.

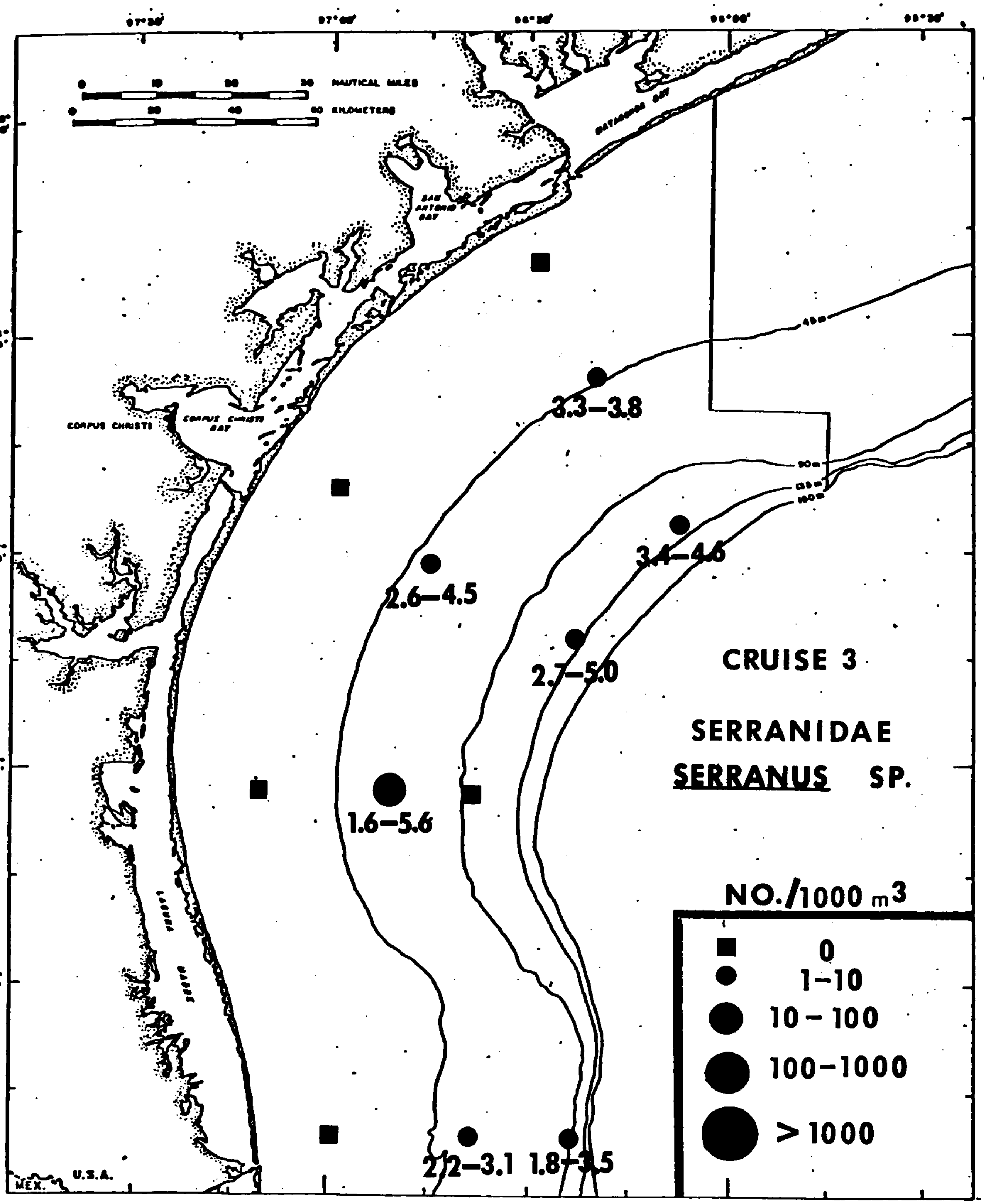


Figure 57 Numbers per 1,000 m^3 and size range (SL) in mm of larvae of <u>Serranus</u> sp. by transect and station on Cruise 3.

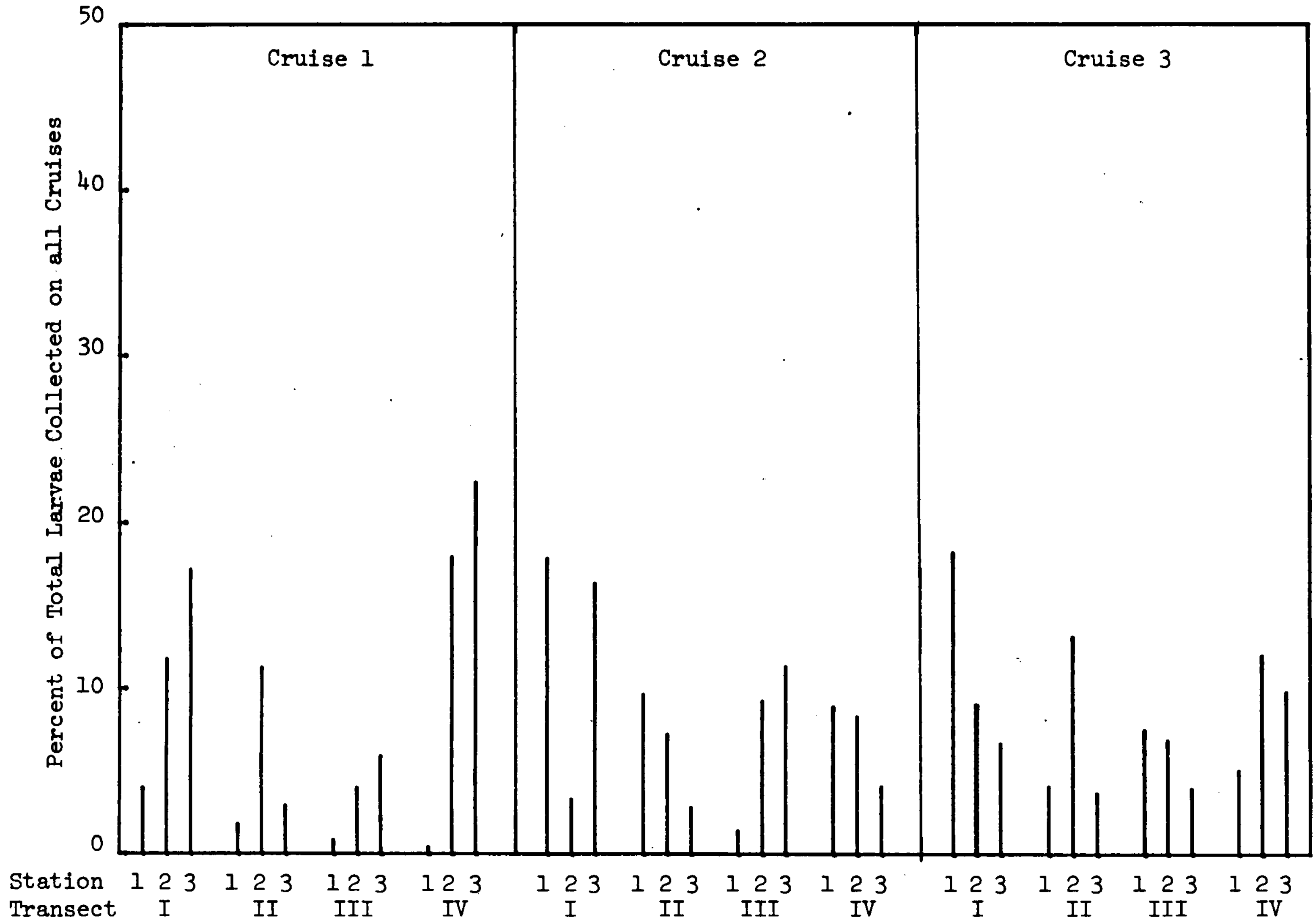


Figure 58 Percent of larvae by cruise, transect, and station.

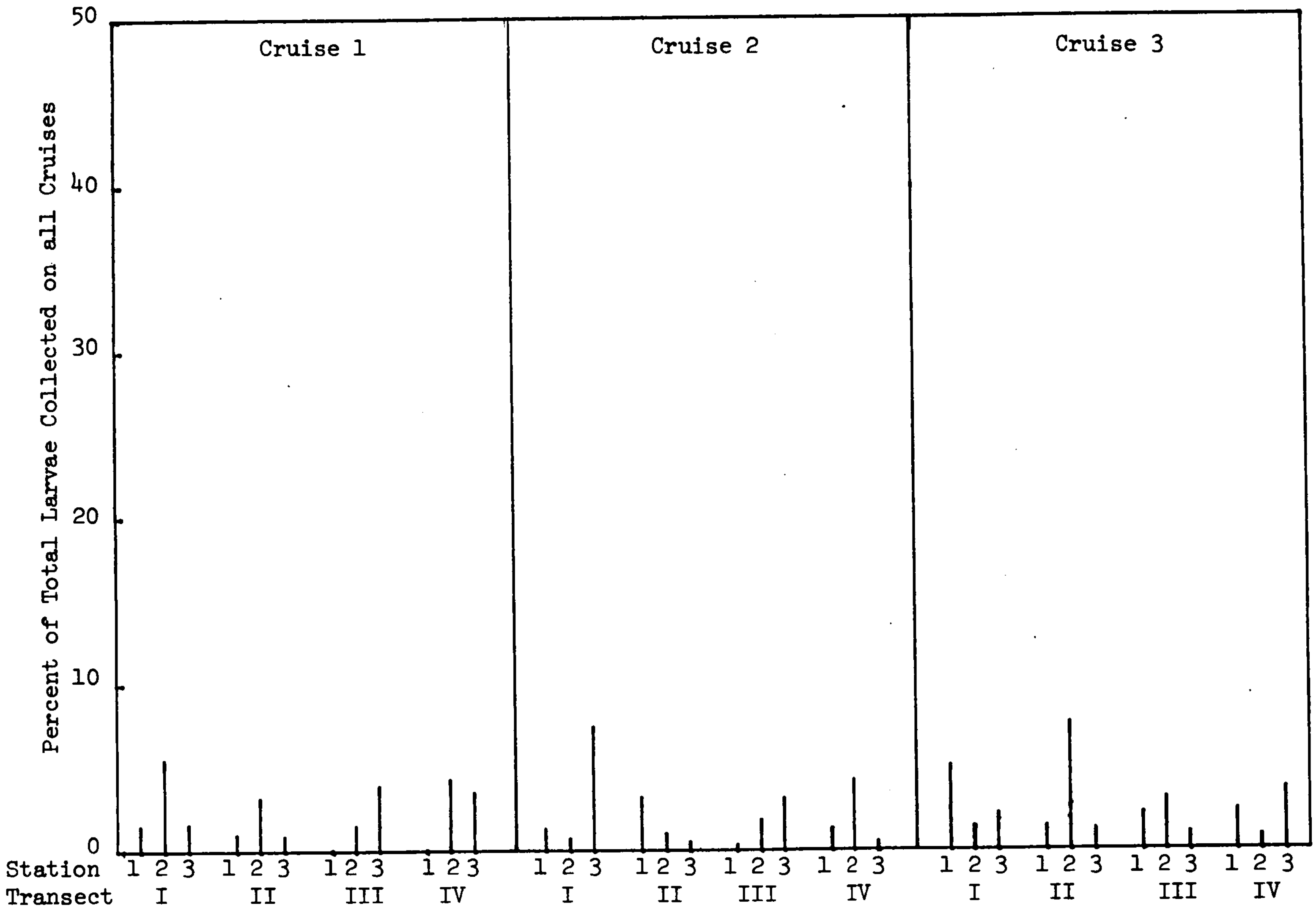


Figure 59 Percent of larvae collected during the day by cruise, transect, and station number.

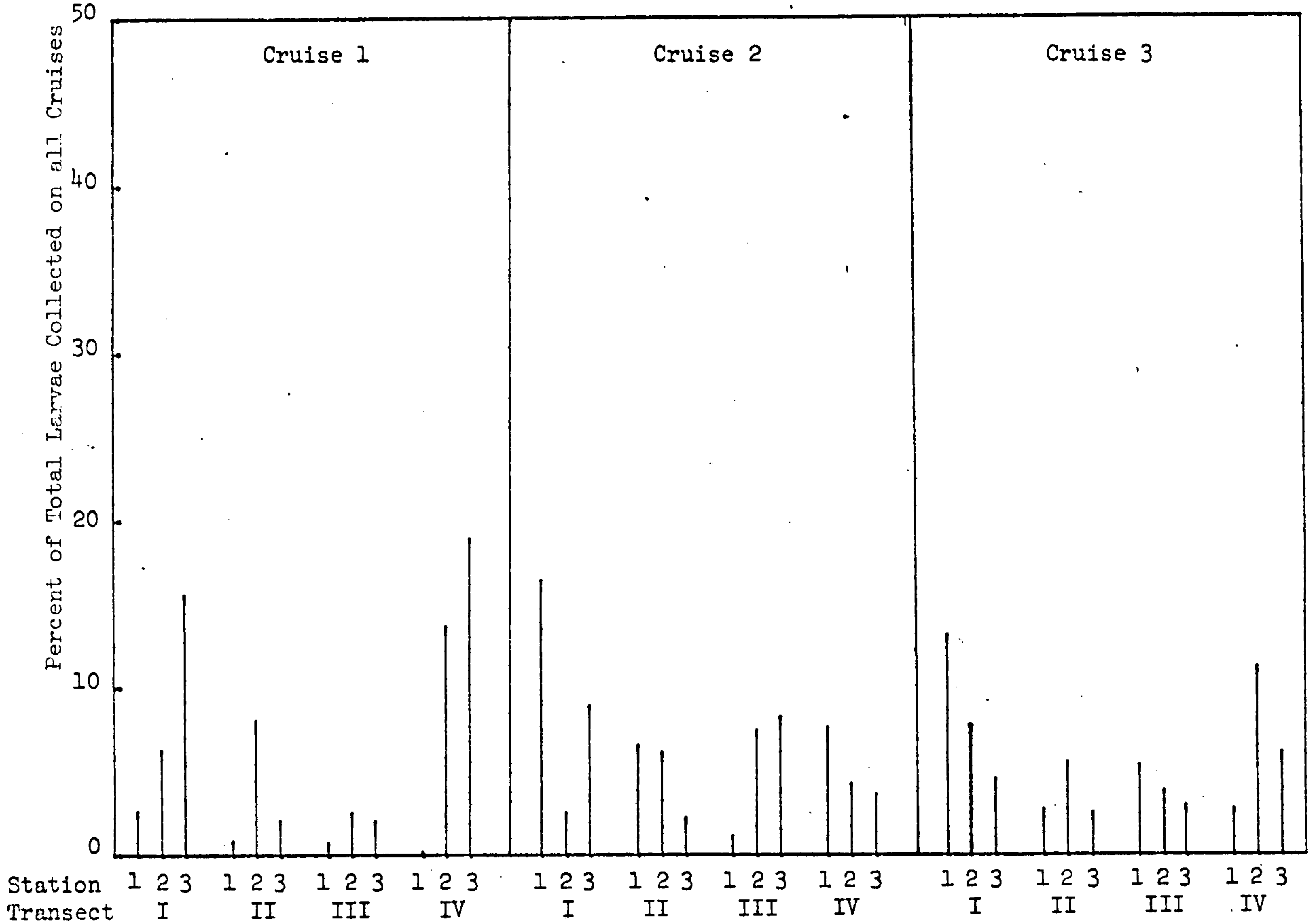


Figure 60 Percent of larvae collected at night by cruise, transect, and station number.

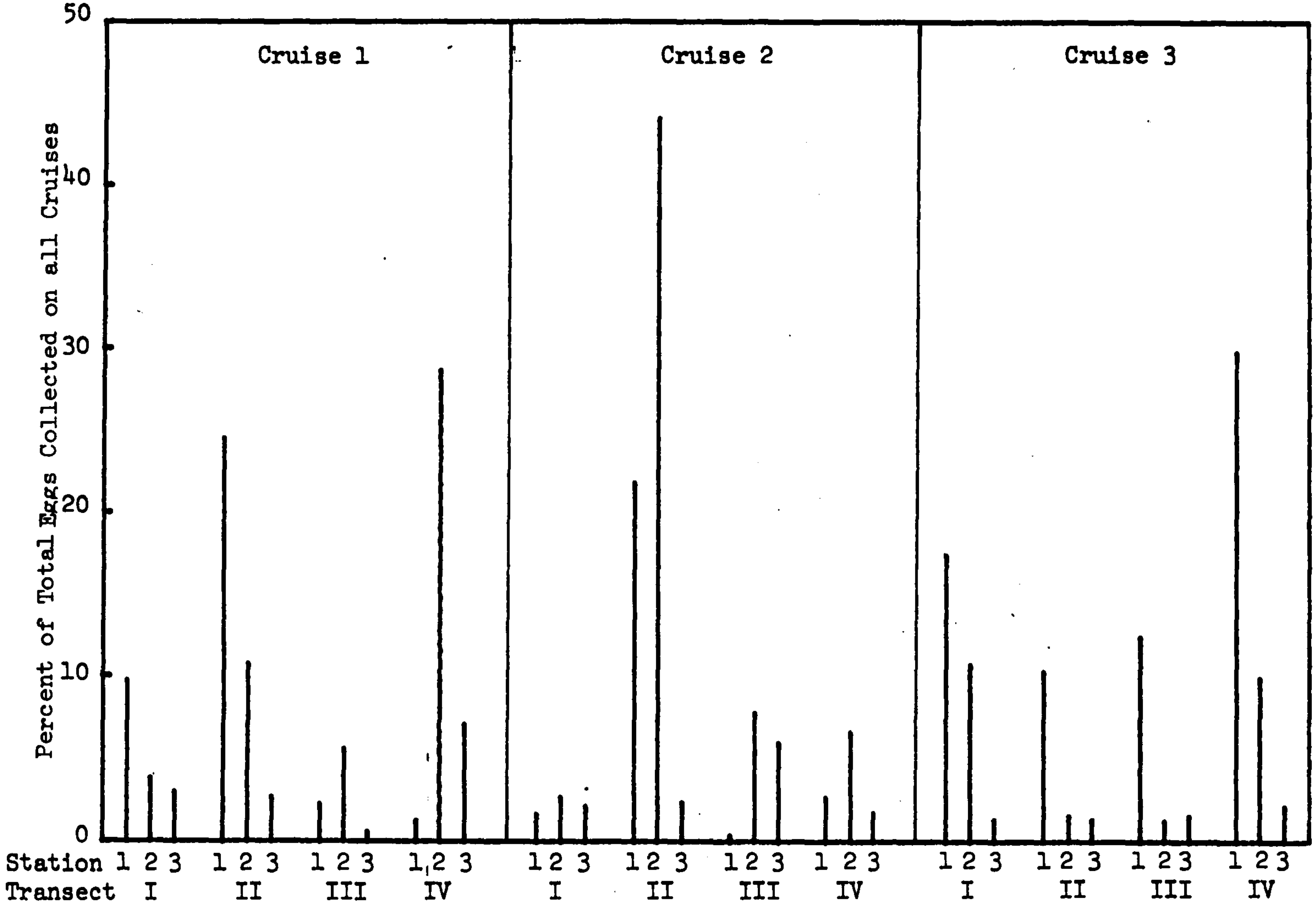


Figure 61 Percent of eggs by cruise, transect, and station.

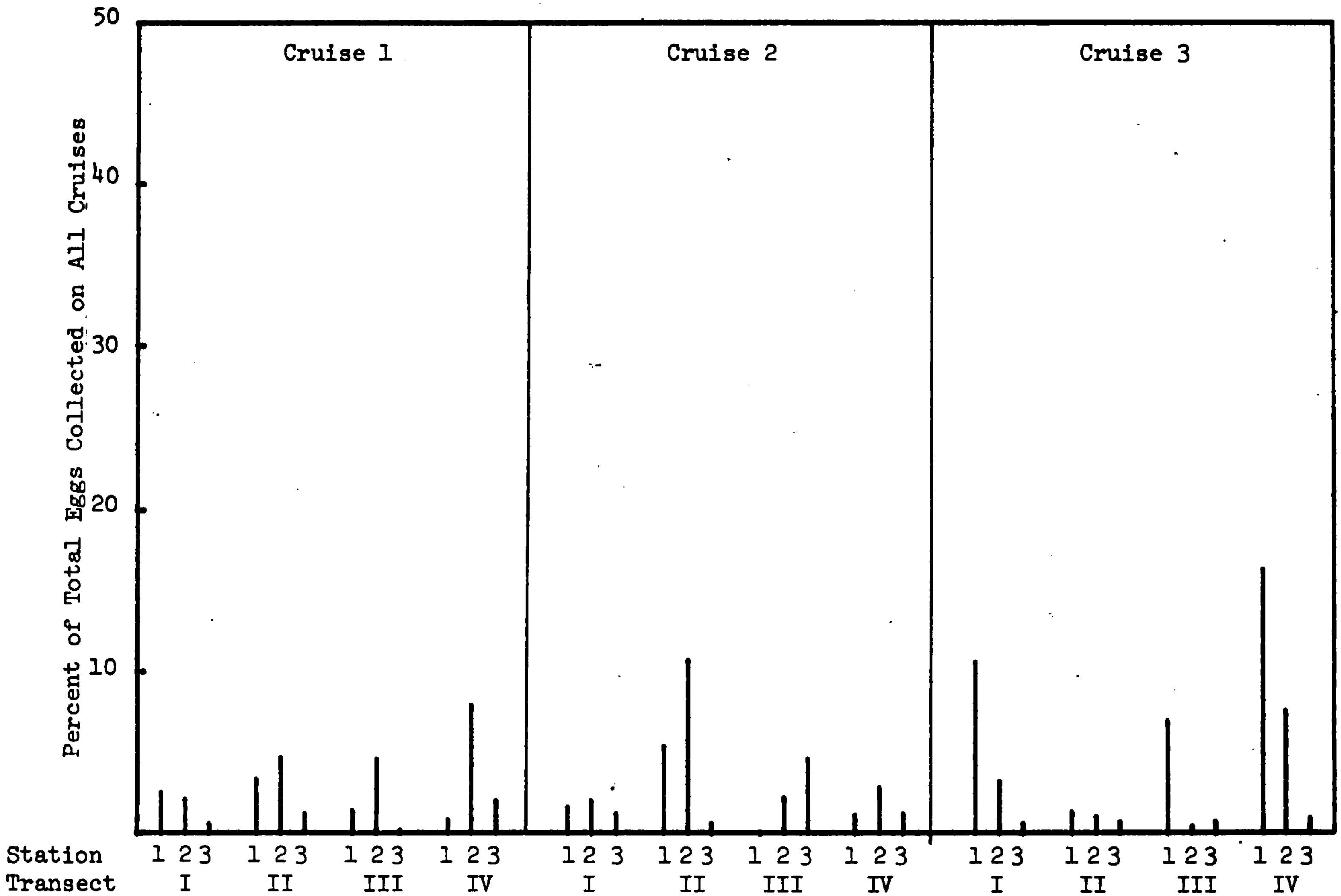


Figure 62 Percent of eggs collected during the day by cruise, transect, and station.

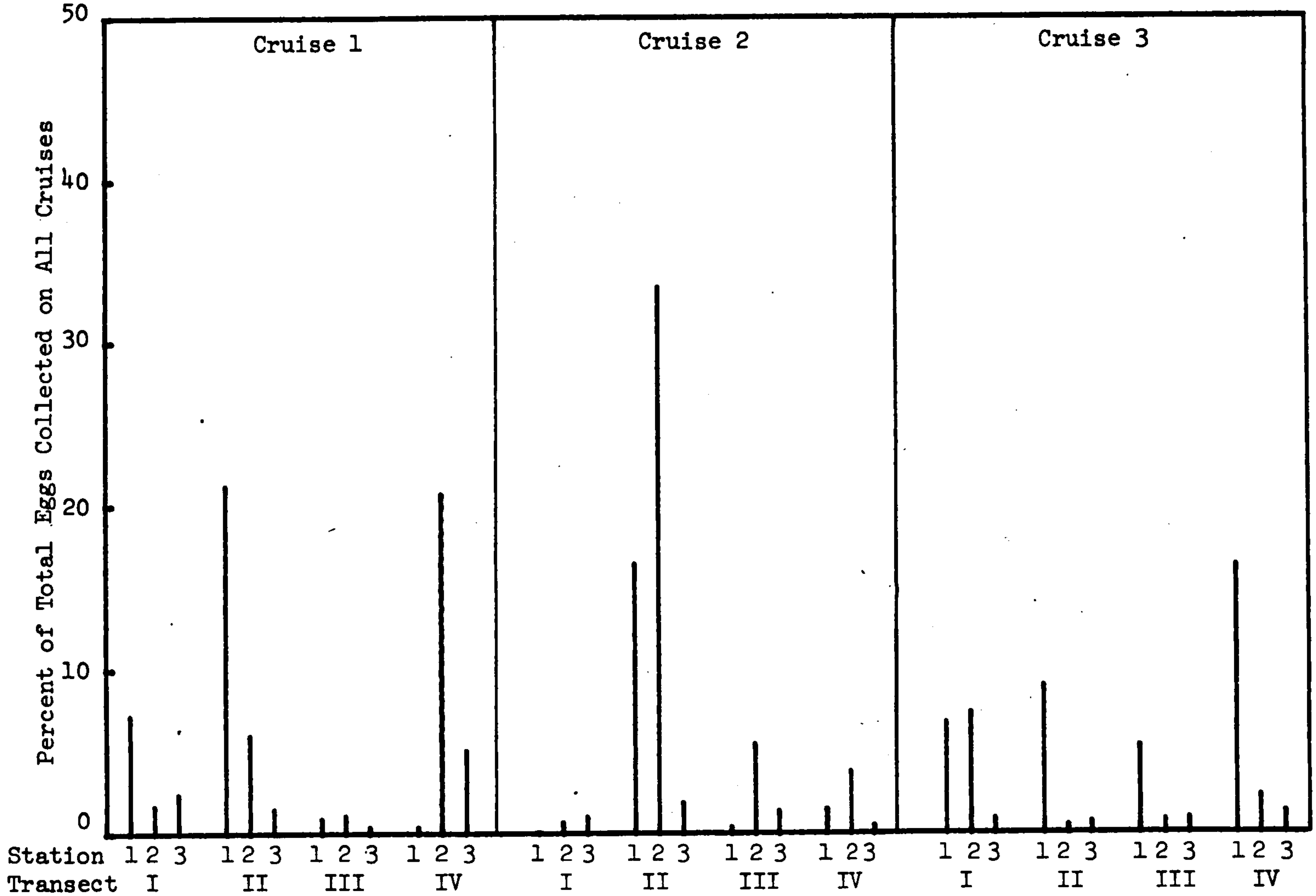


Figure 63 Percent of eggs collected at night by cruise, transect, and station.

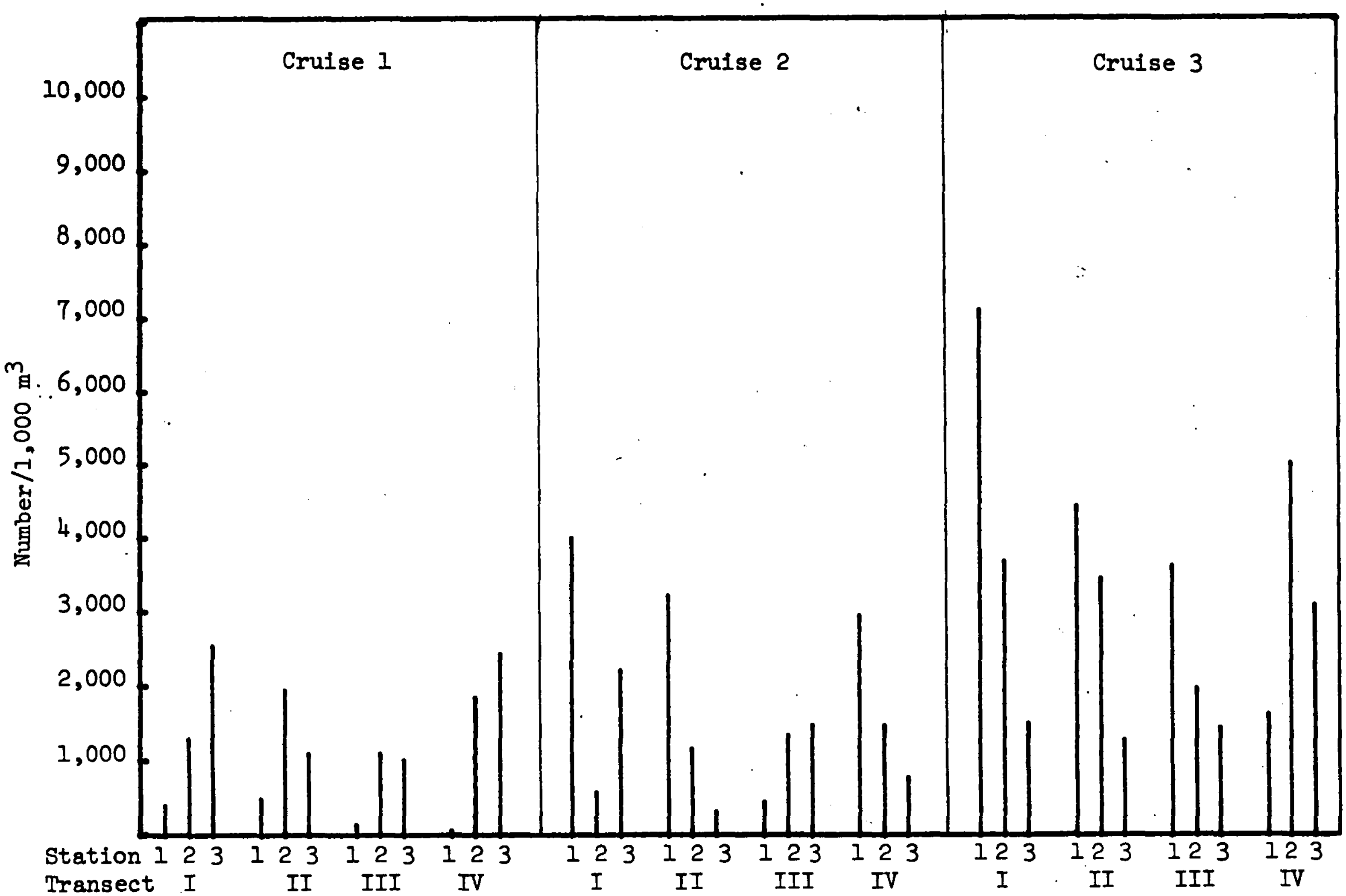


Figure 64 Number of larvae per 1,000 m^3 by cruise, transect, and station number.

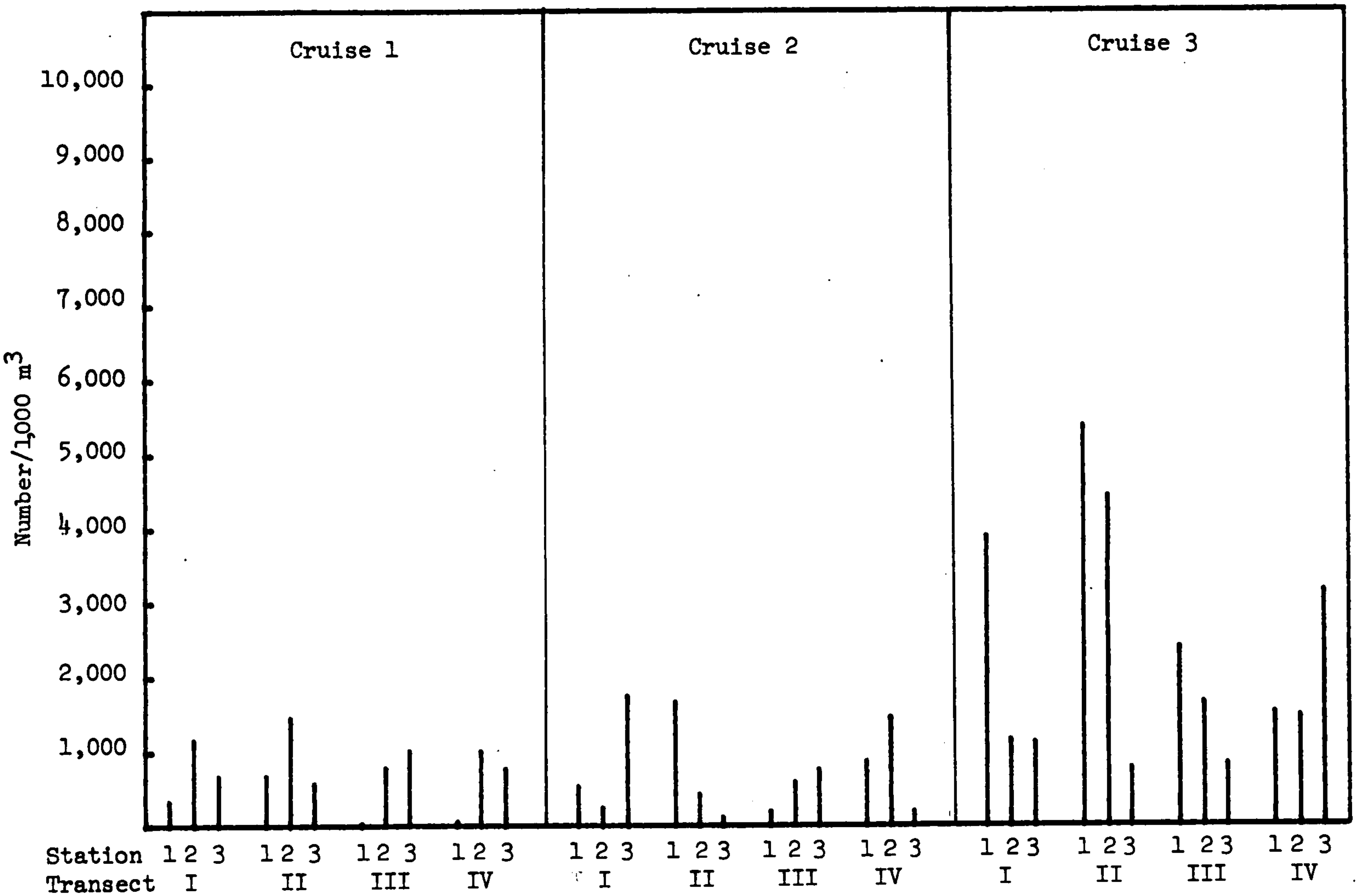


Figure 65 Number of larvae per 1,000 m^3 collected during the day by cruise, transect, and station number.

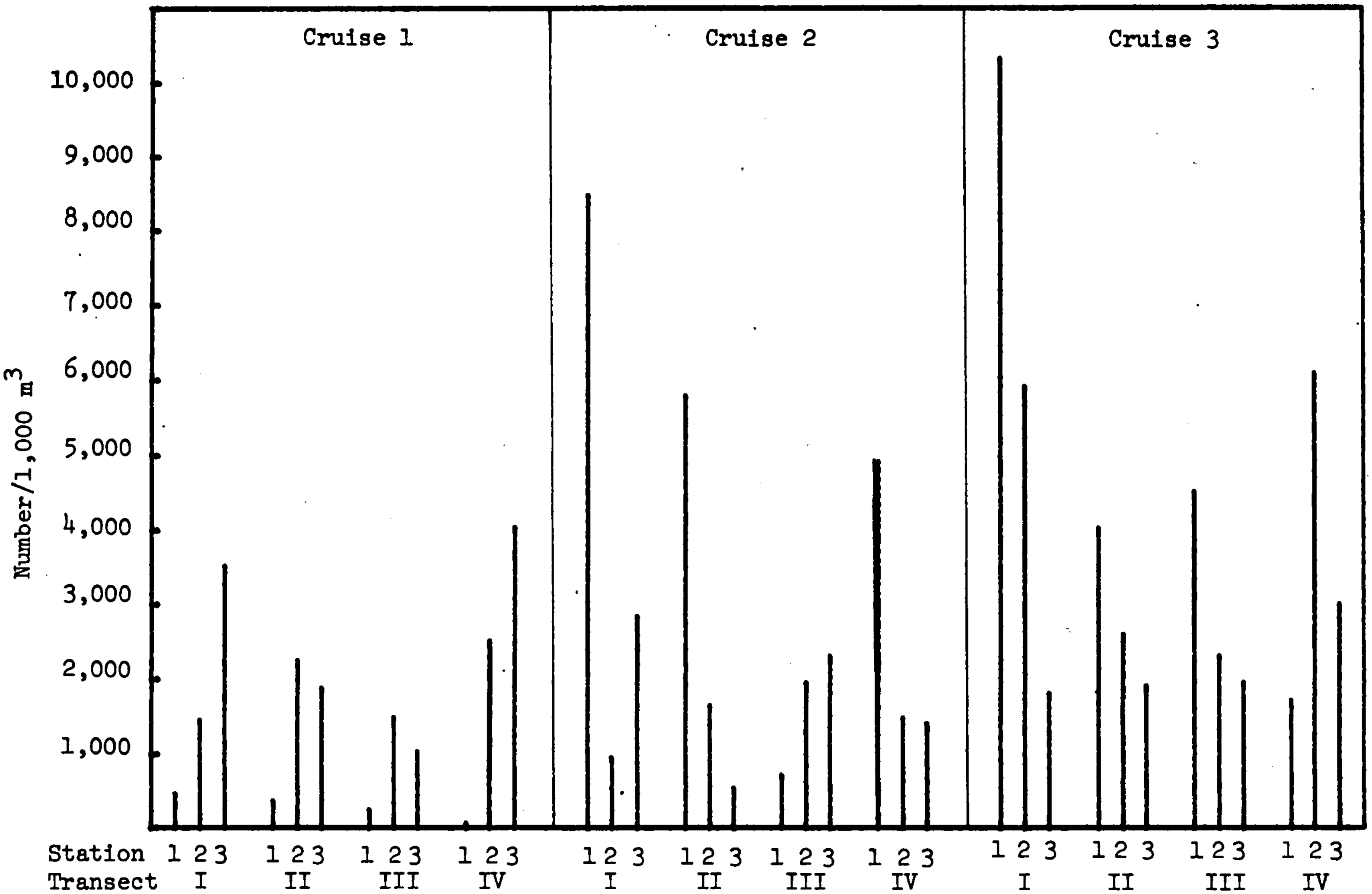


Figure 66 Number of larvae per 1,000 m^3 collected at night by cruise, transect, and station number.

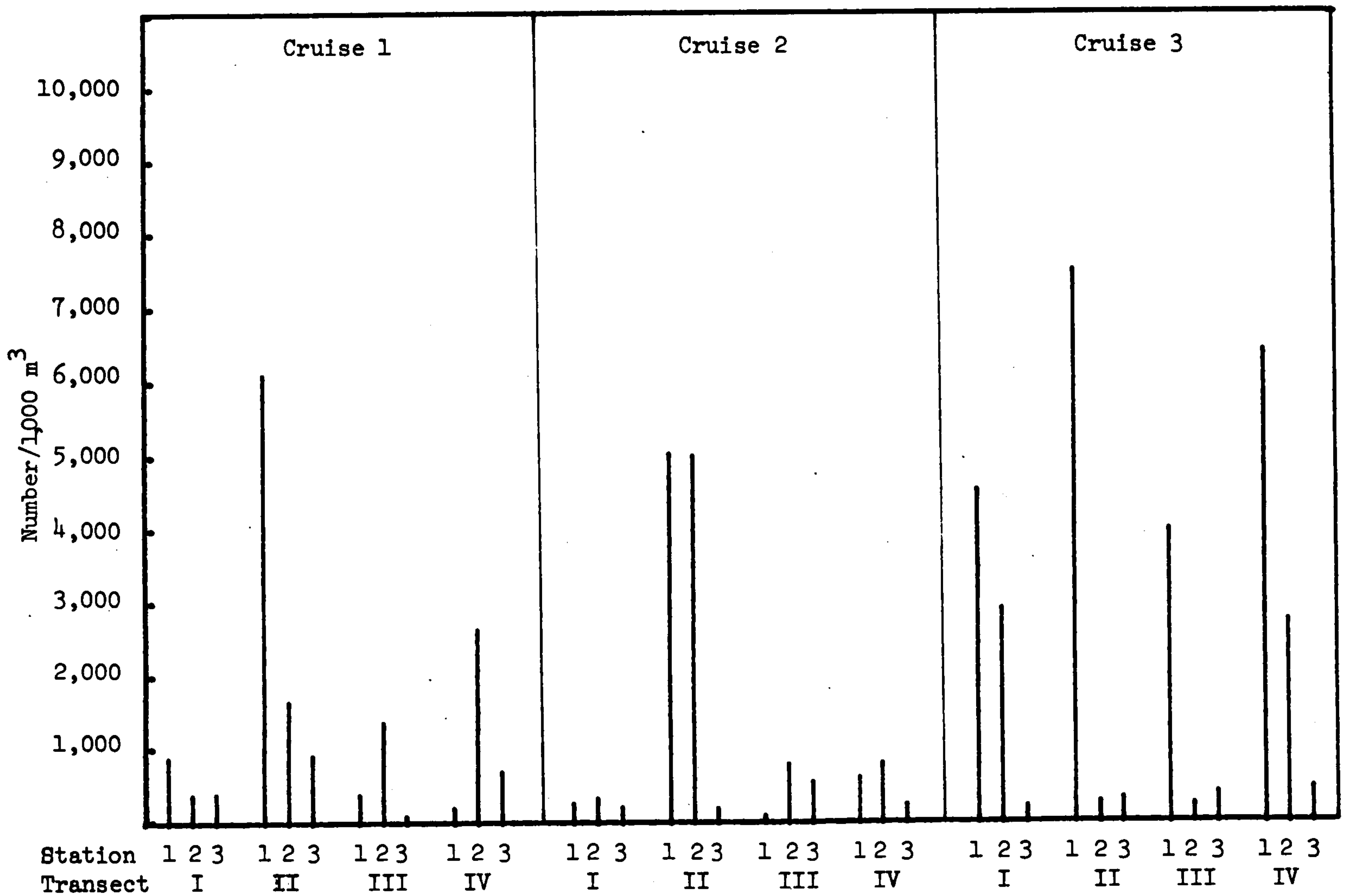


Figure 67. Number of eggs per 1,000 m^3 by cruise, transect and station.

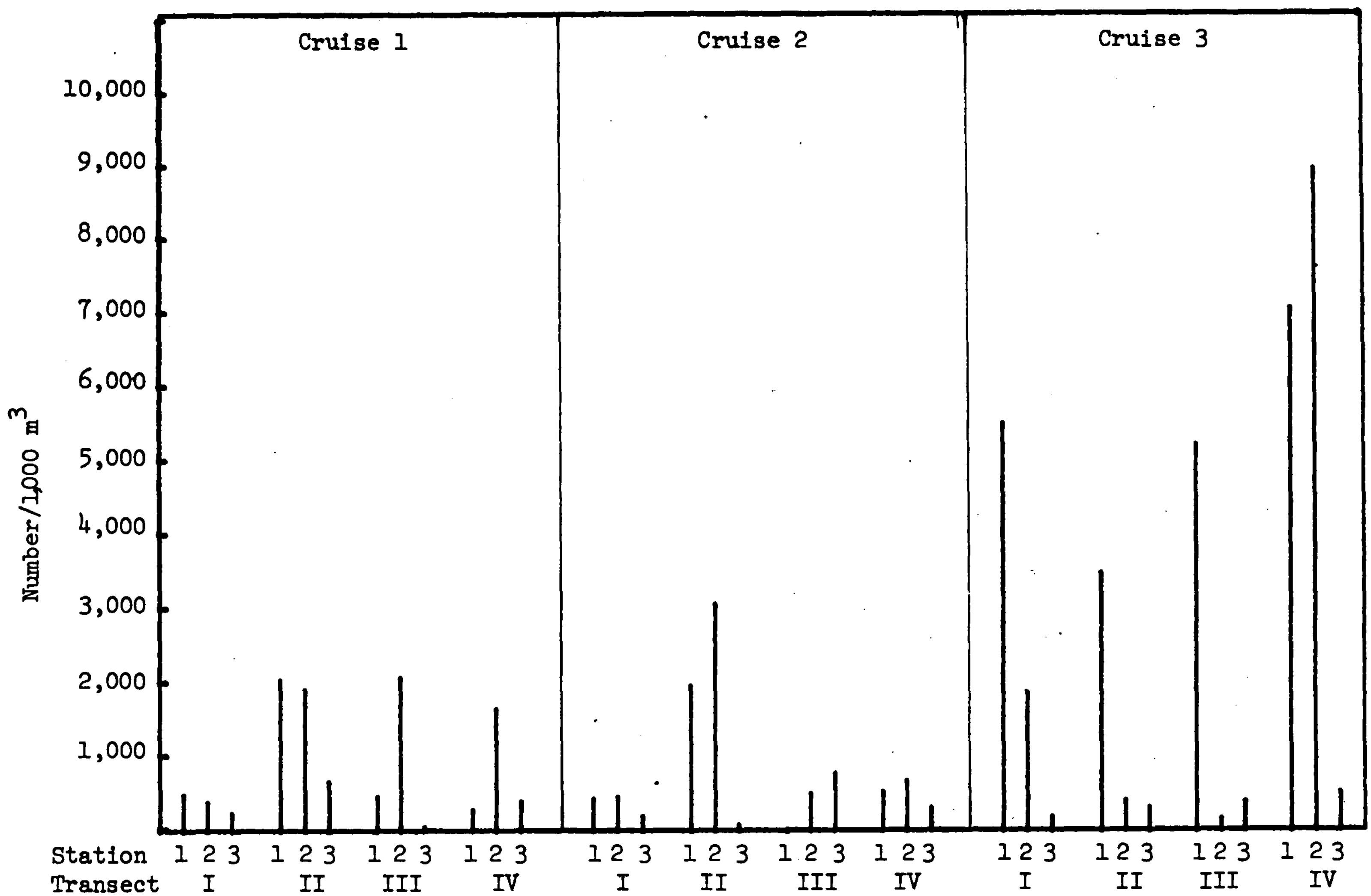


Figure 68 Number of eggs per 1,000 m^3 collected during the day by cruise, transect, and station number.

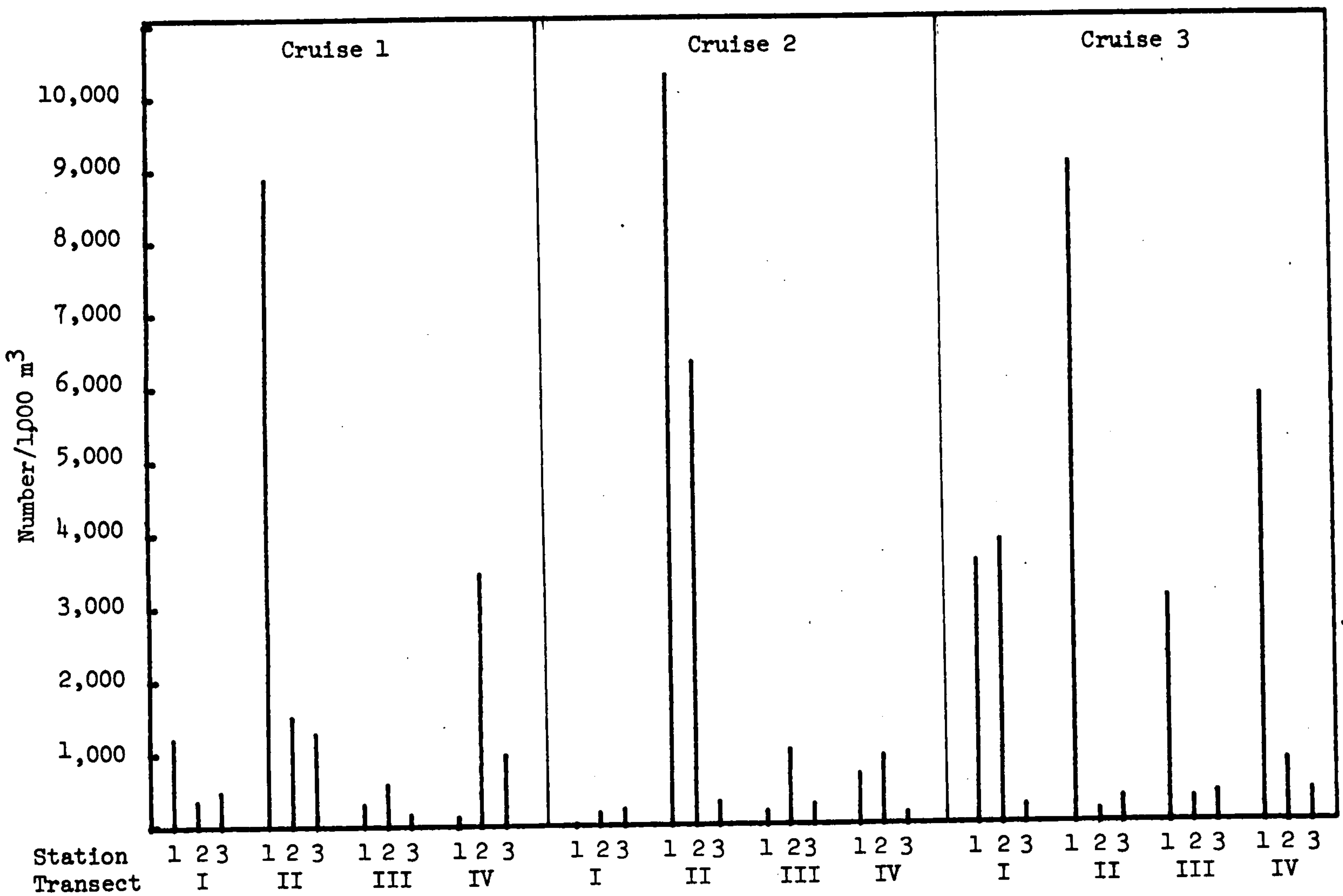


Figure 69 Number of eggs per 1000 m^3 collected at night by cruise, transect, and station number.

APPENDIX D

Ichthyofauna

Pages 307-351 are special statistical tables available from Gulf Fisheries Center upon request

LIST OF TABLES

Table 1. Overall composition of the fish fauna during winter, 7-82 meters, by percentage weight (gms) and percentage numbers.

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Synodontidae				
Saurida brasiliensis	1.62	0.06	0.31	0.19
Synodus foetens	184.90	8.41	1.94	4.57
S. poeyi	0.15	0.01	0.03	0.02
Ariidae				
Arius felis	34.19	1.33	0.36	0.47
Batrachoididae				
Porichthys porossissimus	9.09	0.62	0.29	0.70
Ogcocephalidae				
Halieutichthys aculeatus	2.43	0.15	0.36	0.85
Ophidiidae				
Lepophidium sp.	3.27	0.18	0.09	0.30
Serranidae				
Centropristis philadelphica	82.60	3.90	1.64	3.49
Serranus atrobranchus	27.75	1.38	2.10	3.61
Carangidae				
Chloroscombrus chrysurus	1.67	0.09	0.09	0.12
Trachurus lathami	5.75	0.29	0.08	0.23
Vomer setapinnis	3.07	0.16	0.08	0.24
Lutjanidae				
Lutjanus campechanus	7.68	0.39	0.13	0.35
Pristipomoides aquilonaris	116.31	6.23	1.05	3.57
Pomadasyidae				
Orthopristis chrysoptera	11.73	0.55	0.44	0.46
Sparidae				
Lagodon rhomboides	22.14	0.85	1.43	1.47
Stenotomus caprinus	297.13	13.58	7.75	15.64
Sciaenidae				
Cynoscion arenarius	170.81	8.64	5.25	7.55
C. nothus	100.47	5.68	8.20	8.63
Larimus fasciatus	1.09	0.06	0.10	0.07
Leiostomus xanthurus	62.92	2.27	1.79	1.69
Menticirrhus americanus	194.08	9.02	4.06	4.43
Micropogon undulatus	32.10	1.50	0.56	1.40
Stellifer lanceolatus	46.60	2.81	5.00	5.42

Table 1. (Continued)

Taxon	Weight (gms)	%By Weight (gms)	Number	%By Number
Mullidae				
Mullus auratus	16.73	0.87	0.32	0.96
Upeneus parvus	8.86	0.46	0.23	0.68
Trichiuridae				
Trichiurus lepturus	17.29	1.00	1.60	1.66
Stromateidae				
Peprilus burti	10.53	0.59	0.52	0.71
P. paru	11.28	0.58	0.43	0.52
Scorpaenidae				
Scorpaena calcarata	7.43	0.54	0.15	0.48
Triglidae				
Bellator militaris	3.51	0.16	0.19	0.52
Prionotus paralatus	61.37	3.33	1.77	5.42
P. rubio	30.92	1.61	0.72	1.92
P. stearnsi	1.94	0.11	0.19	0.45
Bothidae				
Cyclopsetta chittendeni	14.27	0.74	0.88	1.14
Syacium gunteri	116.92	5.61	6.12	9.17

Table 2. Overall composition of the fish fauna during spring, 7-82 meters, by percentage weight (gms) and percentage numbers.

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Clupeidae				
Opisthonema oglinum	0.57	0.04	0.01	0.03
Synodontidae				
Saurida brasiliensis	2.36	0.09	0.31	0.37
Synodus foetens	261.41	13.02	2.66	5.51
S. poeyi	1.10	0.05	0.10	0.12
Ariidae				
Arius felis	26.51	1.36	0.48	0.86
Batrachoididae				
Porichthys porossissimus	2.52	0.15	0.13	0.24
Ogcocephalidae				
Halieutichthys aculeatus	1.69	0.09	0.22	0.51
Ophidiidae				
Lepophidium sp.	1.69	0.08	0.05	0.13
Serranidae				
Centropristis philadelphica	100.89	5.02	1.77	3.54
Serranus atrobranchus	40.72	1.93	2.39	4.31
Carangidae				
Chloroscombrus chrysurus	21.99	1.29	0.73	1.46
Trachurus lathami	11.76	0.74	0.78	1.49
Vomer setapinnis	25.65	1.22	1.26	1.65
Lutjanidae				
Lutjanus campechanus	18.47	0.74	0.23	0.36
Pristipomoides aquilonaris	68.01	3.70	0.93	2.58
Rhomboplites aurorubens	0.00	0.00	0.00	0.00
Pomadasyidae				
Orthopristis chrysoptera	4.01	0.29	0.08	0.23
Sparidae				
Lagodon rhomboides	18.19	1.27	0.57	1.43
Stenotomus caprinus	253.99	10.93	6.11	13.39

Table 2 (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Sciaenidae				
Cynoscion arenarius	43.16	2.26	0.53	1.24
C. nothus	170.63	9.34	7.05	10.40
Larimus fasciatus	8.84	0.41	0.50	0.69
Leiostomus xanthurus	47.98	2.16	1.14	1.41
Menticirrhus americanus	50.92	2.75	0.68	1.30
Micropogon undulatus	89.50	3.20	3.91	3.88
Stellifer lanceolatus	18.52	0.99	0.85	1.22
Mullidae				
Mullus auratus	16.44	0.74	0.30	0.66
Upeneus parvus	14.13	0.64	0.52	0.97
Polynemidae				
Polydactylus octonemus	3.36	0.19	0.17	0.27
Trichiuridae				
Trichiurus lepturus	48.27	2.22	1.63	1.86
Stromateidae				
Peprilus burti	87.16	4.26	3.83	4.81
P. paru	10.40	0.36	0.25	0.31
Scorpaenidae				
Scorpaena calcarata	1.06	0.05	0.07	0.15
Triglidae				
Bellator militaris	6.04	0.30	0.28	0.68
Prionotus paralatus	46.02	2.19	1.41	3.44
P. rubio	18.13	0.97	0.42	0.99
P. stearnsi	11.80	0.54	1.30	2.02
Bothidae				
Cyclopsetta chittendeni	21.42	1.12	0.49	0.83
Syacium gunteri	105.23	5.54	6.00	7.71

Table 3. Overall composition of the fish fauna during summer, 7-82 meters, by percentage weight (gms) and percentage number.

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Clupeidae				
Opisthonema oglinum	1.40	0.06	0.03	0.05
Synodontidae				
Saurida brasiliensis	0.25	0.02	0.03	0.06
Synodus foetens	182.28	10.87	2.02	5.35
S. poeyi	0.00	0.00	0.00	0.00
Ariidae				
Arius felis	27.66	1.77	0.35	1.07
Batrachoididae				
Porichthys porossissimus	3.18	0.24	0.16	0.28
Ogcocephalidae				
Halieutichthys aculeatus	1.51	0.08	0.08	0.17
Ophidiidae				
Lepophidium sp.	6.82	0.43	0.13	0.35
Serranidae				
Centropristis philadelphica	54.92	3.60	0.88	2.24
Serranus atrobranchus	39.81	2.58	2.32	5.56
Carangidae				
Chloroscombrus chrysurus	8.17	0.44	0.28	0.51
Trachurus lathami	11.22	0.94	0.63	1.57
Vomer setapinnis	23.74	1.33	0.56	1.19
Lutjanidae				
Lutjanus campechanus	15.38	0.74	0.21	0.55
Pristipomoides aquilonaris	63.73	3.61	0.75	2.10
Pomadasyidae				
Orthopristis chrysoptera	9.11	0.48	0.19	0.42
Sparidae				
Lagodon rhomboides	38.92	2.41	0.72	2.19
Stenotomus caprinus	196.67	11.59	7.16	16.71

Table 3. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Sciaenidae				
Cynoscion arenarius	67.56	3.69	1.14	2.10
C. nothus	61.08	2.95	1.82	2.98
Larimus fasciatus	9.21	0.46	0.28	0.44
Leiostomus xanthurus	52.60	2.57	1.19	2.01
Meticirrhus americanus	24.33	1.48	0.28	0.59
Micropogon undulatus	201.05	9.84	6.03	10.05
Stellifer lanceolatus	9.17	0.56	0.40	0.72
Mullidae				
Mullus auratus	19.67	1.21	0.47	1.34
Upeneus parvus	21.22	1.22	0.71	1.72
Polynemidae				
Polydactylus octonemus	28.50	1.18	0.48	0.83
Trichiuridae				
Trichiurus lepturus	23.35	1.03	0.42	0.89
Stromateidae				
Peprilus burti	45.71	2.49	1.47	2.71
P. paru	0.46	0.02	0.00	0.01
Scorpaenidae				
Scorpaena calcarata	0.90	0.05	0.03	0.08
Triglidae				
Bellator militaris	0.18	0.02	0.00	0.03
Prionotus paralatus	63.04	3.82	1.95	5.30
P. rubio	19.83	1.11	0.84	1.71
P. stearnsi	7.71	0.47	0.80	1.84
Bothidae				
Cyclopsetta chittendeni	14.37	1.12	0.50	1.03
Syacium gunteri	66.02	4.32	2.92	6.04

Table 4. Overall composition of the fish fauna by fall, 7-82 meters, by percent weight (gms) and percentage number.

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Synodontidae				
Saurida brasiliensis	0.43	0.02	0.09	0.17
Synodus foetens	161.75	7.79	1.55	3.54
Ariidae				
Arius felis	48.80	1.86	1.22	1.35
Batrachoididae				
Porichthys porossissimus	7.97	0.42	0.20	0.45
Ogcocephalidae				
Halieutichthys aculeatus	4.41	0.22	0.70	1.24
Ophidiidae				
Lepophidium sp.	7.40	0.33	0.17	0.34
Serranidae				
Centropristis philadelphica	78.28	3.74	1.35	2.79
Serranus atrobranchus	26.10	1.36	1.92	4.32
Carangidae				
Chloroscombrus chrysurus	17.41	0.96	1.01	1.74
Trachurus lathami	9.14	0.49	0.26	0.62
Vomer setapinnis	10.80	0.56	0.32	0.62
Lutjanidae				
Lutjanus campechanus	13.20	0.72	0.42	0.96
Pristipomoides aquilonaris	61.58	3.55	0.72	2.44
Pomadasyidae				
Orthopristis chrysoptera	25.43	1.31	0.73	1.15
Sparidae				
Lagodon rhomboides	22.73	1.03	0.58	0.95
Stenotomus caprinus	252.26	12.68	7.05	16.51
Sciaenidae				
Cynoscion arenarius	126.38	6.14	2.24	3.72
C. nothus	128.19	6.57	7.74	7.87
Larimus fasciatus	4.13	0.23	0.09	0.09
Leiostomus xanthurus	61.73	2.86	0.85	1.52
Meticirrhus americanus	90.09	4.65	1.72	2.56
Micropogon undulatus	171.42	8.44	2.95	5.70
Stellifer lanceolatus	29.83	1.68	3.45	2.57

Table 4. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Mullidae				
Mullus auratus	19.38	0.95	0.32	0.71
Upeneus parvus	22.62	1.16	0.70	1.82
Polynemidae				
Polydactylus octonemus	3.26	0.10	0.07	0.09
Trichiuridae				
Trichiurus lepturus	19.85	0.92	0.45	0.79
Stromateidae				
Peprilus burti	68.92	4.00	2.03	4.11
P. paru	5.05	0.26	0.22	0.33
Scorpaenidae				
Scorpaena calcarata	0.53	0.03	0.04	0.07
Triglidae				
Bellator militaris	2.97	0.18	0.29	0.57
Prionotus paralatus	46.42	2.64	1.66	4.11
P. rubio	24.64	1.38	0.55	1.27
P. stearnsi	3.16	0.16	0.34	0.63
Bothidae				
Cyclopsetta chittendeni	22.51	0.98	0.51	0.95
Engyophrys senta	0.05	0.00	0.01	0.01
Syacium gunteri	125.09	6.42	6.97	10.64

Table 5. Overall composition of the fish fauna at 7 meters by percentage weight (gms) and percentage number.

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Clupeidae				
Opisthonema oglinum	3.76	0.19	0.07	0.16
Synodontidae				
Synodus foetens	24.93	1.01	0.31	0.59
Ariidae				
Arius felis	160.29	7.20	3.98	5.56
Batrachoididae				
Porichthys porossissimus	3.22	0.17	0.09	0.13
Ophidiidae				
Lepophidium sp.	0.71	0.04	0.01	0.04
Serranidae				
Centropristis philadelphica	0.33	0.01	0.02	0.03
Carangidae				
Chloroscombrus chrysurus	43.53	2.19	2.64	3.62
Trachurus lathami	0.40	0.02	0.02	0.06
Vomer setapinnis	30.29	1.46	2.20	2.78
Lutjanidae				
Lutjanus campechanus	29.38	1.33	0.40	1.03
Pomadasyidae				
Orthopristis chrysoptera	54.60	2.70	1.64	2.59
Sparidae				
Lagodon rhomboides	73.40	4.06	2.58	5.01
Stenotomus caprinus	0.62	0.03	0.04	0.09
Sciaenidae				
Cynoscion arenarius	60.58	2.99	2.71	3.39
C. nothus	182.89	9.60	16.27	15.12
Larimus fasciatus	20.36	0.97	0.67	0.79
Leiostomus xanthurus	186.36	7.97	4.71	5.96
Menticirrhus americanus	300.51	13.59	6.75	7.69
Micropogon undulatus	243.38	10.28	9.91	11.64
Stellifer lanceolatus	77.96	3.84	9.64	7.17
Mullidae				
Upeneus parvus	3.29	0.14	0.18	0.38

Table 5. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Polynemidae				
Polydactylus octonemus	26.49	1.27	0.64	1.13
Trichiuridae				
Trichiurus lepturus	22.09	1.18	1.71	1.84
Stromateidae				
Peprilus burti	53.27	2.94	2.33	3.77
P. paru	11.75	0.52	0.87	0.86
Triglidae				
Prionotus paralatus	0.40	0.02	0.02	0.03
P. rubio	2.49	0.10	0.27	0.57
Bothidae				
Cyclopsetta chittendeni	5.62	0.28	0.53	0.51
Syacium gunteri	16.49	0.87	0.85	1.60

Table 6. Overall composition of the fish fauna at 14 meters by percentage weight (gms) and percentage number.

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Synodontidae				
Synodus foetens	25.01	1.35	0.47	0.86
Ariidae				
Arius felis	36.64	1.90	0.54	0.98
Batrachoididae				
Porichthys porossissimus	2.18	0.16	0.11	0.20
Ogcocephalidae				
Halieutichthys aculeatus	1.16	0.07	0.22	0.42
Ophidiidae				
Lepophidium sp.	1.15	0.08	0.04	0.08
Serranidae				
Centropristis philadelphica	21.80	1.14	0.69	0.95
Serranus atrobranchus	3.16	0.13	0.28	0.52
Carangidae				
Chloroscombrus chrysurus	13.05	0.86	0.70	1.35
Trachurus lathami	7.05	0.39	0.35	0.71
Vomer setapinnis	14.11	0.70	0.65	1.37
Lutjanidae				
Lutjanus campechanus	10.11	0.57	0.34	0.70
Pristipomoides aquilonaris	0.78	0.03	0.03	0.05
Pomadasyidae				
Orthopristis chrysoptera	32.96	1.83	0.92	1.37
Sparidae				
Lagodon rhomboides	33.95	1.62	1.78	2.05
Stenotomus caprinus	54.82	2.75	2.51	4.37
Sciaenidae				
Cynoscion arenarius	119.31	6.05	4.81	6.51
C. nothus	188.96	11.86	14.53	17.58
Larimus fasciatus	15.55	0.84	0.76	1.08
Leiostomus xanthurus	101.01	3.89	2.47	2.81
Menticirrhus americanus	250.47	13.27	4.27	6.37
Micropogon undulatus	270.76	13.11	7.96	12.92
Stellifer lanceolatus	86.69	5.51	6.77	8.38
Mullidae				
Mullus auratus	4.97	0.22	0.09	0.19
Upeneus parvus	6.69	0.32	0.38	0.45

Table 6. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Polynemidae				
Polydactylus octonemus	17.86	0.69	0.36	0.56
Trichiuridae				
Trichiurus lepturus	38.31	1.82	1.45	1.89
Stromateidae				
Peprilus burti	30.28	2.12	1.39	2.00
P. paru	5.84	0.37	0.34	0.52
Triglidae				
Bellator militaris	0.07	0.00	0.03	0.02
Prionotus paralatus	1.14	0.07	0.07	0.13
P. rubio	7.38	0.42	0.51	0.82
Bothidae				
Cyclopsetta chittendeni	22.46	1.32	1.46	2.30
Syacium gunteri	81.15	4.67	4.28	6.98

Table 7. Overall composition of the fish fauna at 27 meters by percentage weight (gms) and percentage number.

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Synodontidae				
Saurida brasiliensis	0.50	0.03	0.08	0.10
Synodus foetens	179.18	9.92	2.87	5.29
Ariidae				
Arius felis	38.14	1.54	0.14	0.36
Batrachoididae				
Porichthys porossissimus	9.84	0.47	0.35	0.51
Ogcocephalidae				
Halieutichthys aculeatus	1.42	0.08	0.21	0.28
Ophidiidae				
Lepophidium sp.	2.95	0.18	0.10	0.16
Serranidae				
Centropristis philadelphica	55.73	3.01	1.91	2.94
Serranus atrobanchus	5.10	0.32	0.44	0.84
Carangidae				
Chloroscombrus chrysurus	9.08	0.46	0.25	0.42
Trachurus lathami	8.23	0.56	0.38	0.70
Vomer setapinnis	14.58	0.75	0.23	0.35
Lutjanidae				
Lutjanus campechanus	2.78	0.15	0.16	0.26
Pristipomoides aquilonaris	0.65	0.04	0.03	0.06
Pomadasyidae				
Orthopristis chrysoptera	1.99	0.11	0.04	0.05
Sparidae				
Lagodon rhomboides	0.51	0.04	0.01	0.05
Stenotomus caprinus	87.92	5.71	6.22	10.84
Sciaenidae				
Cynoscion arenarius	191.05	10.33	4.04	6.42
C. nothus	231.86	11.26	6.94	10.05
Larimus fasciatus	2.56	0.09	0.05	0.08
Leiostomus xanthurus	23.61	1.64	0.36	0.84
Menticirrhus americanus	20.39	1.29	0.16	0.34
Micropogon undulatus	125.44	6.38	1.99	3.90
Stellifer lanceolatus	3.61	0.24	0.18	0.36

Table 7. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Mullidae				
Mullus auratus	1.42	0.12	0.05	0.11
Upeneus parvus	1.69	0.09	0.10	0.15
Polynemidae				
Polydactylus octonemus	13.82	0.50	0.19	0.28
Trichiuridae				
Trichiurus lepturus	43.78	2.00	1.66	1.90
Stromateidae				
Peprilus burti	87.13	4.54	3.14	4.85
P. paru	6.52	0.36	0.13	0.23
Scorpaenidae				
Scorpaena calcarata	0.31	0.01	0.03	0.03
Triglidae				
Bellator militaris	0.44	0.03	0.05	0.14
Prionotus paralatus	5.51	0.37	0.31	0.57
P. rubio	21.70	1.33	0.81	1.44
P. stearnsi	0.65	0.04	0.09	0.08
Bothidae				
Cyclopsetta chittendeni	17.32	1.32	0.68	1.30
Syacium gunteri	373.71	19.23	19.91	27.63

Table 8. Overall composition of the fish fauna at 46 meters by percentage weight (gms) and percentage number.

Taxon	Weight (gms)	% By Weight (gms)	Number	Number
Synodontidae				
Saurida brasiliensis	4.10	0.16	0.65	0.19
Synodus foetens	335.36	16.65	3.37	4.66
S. poeyi	1.08	0.04	0.12	0.03
Ariidae				
Arius felis	5.76	0.34	0.02	0.97
Batrachoididae				
Porichthys porossissimus	10.64	0.83	0.24	0.42
Ogcocephalidae				
Halieutichthys aculeatus	0.48	0.02	0.07	0.72
Ophidiidae				
Lepophidium sp.	13.40	0.66	0.30	0.29
Serranidae				
Centropristis philadelphica	127.90	6.57	2.38	2.96
Serranus atrobranchus	73.92	3.97	5.53	4.48
Carangidae				
Chloroscombrus chrysurus	4.79	0.34	0.12	0.99
Trachurus lathami	13.95	1.16	0.96	0.96
Vomer setapinnis	23.92	1.38	0.32	0.89
Lutjanidae				
Lutjanus campechanus	17.72	0.74	0.39	0.59
Pristipomoides aquilonaris	18.40	1.03	0.42	2.64
Pomadasyidae				
Orthopristis chrysoptera	0.92	0.05	0.01	0.61
Sparidae				
Lagodon rhomboides	37.65	2.33	0.57	1.49
Stenotomus caprinus	372.04	16.94	11.95	15.72
Sciaenidae				
Cynoscion arenarius	122.09	5.69	1.22	3.65
C. nothus	55.29	2.31	1.04	7.28
Leiostomus xanthurus	41.51	1.90	0.42	1.67
Menticirrhus americanus	10.12	0.53	0.07	2.21
Micropogon undulatus	109.74	5.04	1.39	5.49
Stellifer lanceolatus	0.15	0.01	0.01	2.45

Table 8. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Mullidae				
Mullus auratus	9.53	0.55	0.23	0.92
Upeneus parvus	6.39	0.42	0.29	1.36
Polynemidae				
Polydactylus octonemus	0.67	0.03	0.01	0.30
Trichiuridae				
Trichiurus lepturus	35.50	1.58	0.74	1.24
Stromateidae				
Peprilus burti	74.27	3.67	2.87	3.11
P. paru	2.75	0.11	0.02	0.29
Scorpaenidae				
Scorpaena calcarata	0.98	0.04	0.08	0.18
Triglidae				
Bellator militaris	0.09	0.00	0.02	0.44
Prionotus paralatus	39.26	2.12	1.73	4.59
P. rubio	37.33	1.91	0.88	1.48
P. stearnsi	15.47	0.81	0.79	1.20
Bothidae				
Cyclopsetta chittendeni	30.59	1.34	0.40	0.99
Engyophrys senta	0.07	0.00	0.01	0.00
Syacium gunteri	78.15	4.36	4.37	8.48

Table 9. Overall composition of the fish fauna at 64 meters by percentage weight (gms) and percentage number.

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Synodontidae				
Synodus foetens	312.47	17.26	2.89	9.06
Batrachoididae				
Porichthys porossissimus	2.14	0.12	0.06	0.19
Ogcocephalidae				
Halieutichthys aculeatus	4.94	0.36	0.75	1.43
Ophidiidae				
Lepophidium sp.	0.83	0.05	0.03	0.12
Serranidae				
Centropristis philadelphica	135.78	7.33	1.56	5.08
Serranus atrobranchus	21.06	1.43	1.31	4.16
Carangidae				
Chloroscombrus chrysurus	2.36	0.10	0.03	0.07
Trachurus lathami	6.19	0.36	0.11	0.37
Vomer setapinnis	7.22	0.34	0.08	0.22
Litjanidae				
Lutjanus campechanus	9.92	0.53	0.19	0.69
Pristipomoides aquilonaris	41.78	2.18	0.39	1.11
Sparidae				
Lagodon rhomboides	3.64	0.22	0.08	0.25
Stenotomus caprinus	532.53	29.00	11.11	33.57
Sciaenidae				
Cynoscion arenarius	69.89	3.92	0.53	1.85
C. nothus	17.78	0.90	0.14	0.51
Leiostomus xanthurus	6.17	0.39	0.06	0.19
Micropogon undulatus	44.64	2.38	0.56	2.01
Mullidae				
Mullus auratus	76.92	4.09	1.50	3.94
Upeneus parvus	27.50	1.69	0.78	2.36
Trichiuridae				
Thichiurus lepturus	6.25	0.36	0.06	0.23
Stromateidae				
Peprilus burti	21.19	1.14	0.28	0.73
P. paru	2.78	0.14	0.03	0.11
Scorpaenidae				
Scorpaena calcarata	12.72	0.79	0.19	0.65

Table 9. (Continued

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Triglidae				
Bellator militaris	14.39	0.85	1.22	2.87
Prionotus paralatus	111.83	6.35	3.58	9.94
P. rubio	42.97	2.42	0.72	2.27
P. stearnsi	12.50	0.72	1.19	3.03
Bothidae				
Cyclopsetta chittendeni	3.83	0.22	0.14	0.44
Syacium gunteri	17.39	1.00	0.64	2.07

Table 10. Overall composition of the fish fauna at 73 meters by percentage weight (gms) and percentage number.

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Synodontidae				
Saurida brasiliensis	1.50	0.04	0.20	0.43
Synodus foetens	510.85	18.24	3.45	8.72
S. poeyi	0.65	0.02	0.05	0.08
Batrachoididae				
Porichthys porossissimus	3.30	0.13	0.25	0.56
Ogcocephalidae				
Halieutichthys aculeatus	11.90	0.32	1.85	1.96
Ophidiidae				
Lepophidium sp.	2.65	0.07	0.05	0.05
Serranidae				
Centropristis philadelphica	200.25	7.73	2.10	4.80
Serranus atrobranchus	57.35	2.36	3.55	7.22
Carangidae				
Trachurus lathami	24.25	1.01	0.85	1.87
Vomer setapinnis	2.30	0.07	0.05	0.08
Lutjanidae				
Lutjanus campechanus	7.25	0.24	0.10	0.16
Pristipomoides aquilonaris	98.05	3.61	0.85	1.75
Pomadasyidae				
Orthopristis chrysoptera	2.05	0.06	0.05	0.08
Sparidae				
Lagodon rhomboides	41.75	1.33	0.70	1.03
Stenotomus caprinus	1008.60	34.85	19.10	38.27
Sciaenidae				
Cynoscion arenarius	56.60	1.79	0.40	0.86
C. nothus	3.25	0.13	0.10	0.22
Leiostomus xanthurus	16.05	0.53	0.15	0.23
Micropogon undulatus	9.80	0.36	0.15	0.35
Mullidae				
Mullus auratus	76.50	2.79	1.35	2.57
Upeneus parvus	101.15	3.46	3.00	5.57
Trichiuridae				
Trichiurus lepturus	3.75	0.34	0.15	0.62

Table 10. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Stromateidae				
Peprilus burti	45.75	1.44	0.60	1.07
P. paru	30.00	0.85	0.30	0.38
Scorpaenidae				
Scorpaena calcarata	0.50	0.01	0.05	0.05
Triglidae				
Bellator militaris	10.95	0.32	0.75	1.00
Prionotus paralatus	111.30	3.93	3.25	5.60
P. rubio	22.45	1.00	0.45	1.09
P. stearnsi	15.90	0.59	1.35	2.39
Bothidae				
Cyclopsetta chittendeni	64.15	3.11	0.40	1.19
Syacium gunteri	6.90	0.24	0.25	0.50

Table 11. Overall composition of the fish fauna at 82 meters by percentage weight (gms) and percentage number.

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Synodontidae				
Saurida brasiliensis	0.05	0.00	0.03	0.03
Synodus foetens	242.23	13.97	1.69	6.18
Batrachoididae				
Porichthys porossissimus	4.28	0.23	0.23	0.72
Ogcocephalidae				
Halieutichthys aculeatus	7.67	0.44	0.67	2.07
Ophidiidae				
Lepophidium sp.	5.51	0.29	0.10	0.34
Serranidae				
Centropristis philadelphica	129.46	7.13	1.38	4.63
Serranus atrobranchus	31.15	1.92	1.64	5.23
Carangidae				
Chloroscombrus chrysurus	16.79	1.04	0.36	1.08
Trachurus lathami	11.69	0.65	0.28	0.80
Vomer setapinnis	6.56	0.36	0.08	0.30
Lutjanidae				
Lutjanus campechanus	21.74	1.29	0.10	0.48
Pristipomoides aquilonaris	213.72	12.25	1.92	7.20
Sparidae				
Stenotomus caprinus	381.46	22.77	8.08	27.63
Sciaenidae				
Cynoscion arenarius	19.56	1.27	0.13	0.66
Leiostomus xanthurus	5.46	0.34	0.05	0.21
Micropogon undulatus	3.59	0.23	0.05	0.24
Mullidae				
Mullus auratus	31.59	2.02	0.56	2.10
Upeneus parvus	61.56	3.80	1.59	4.94
Trichiuridae				
Trichiurus lepturus	2.41	0.15	0.03	0.07
Stromateidae				
Peprilus burti	46.67	3.11	1.23	3.00
P. paru	4.49	0.20	0.03	0.08

Table 11. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Scorpaenidae				
Scorpaena calcarata	5.90	0.58	0.10	0.48
Triglidae				
Bellator militaris	1.62	0.11	0.10	0.26
Prionotus paralatus	154.36	9.39	4.00	13.17
P. rubio	53.59	2.96	0.97	3.42
P. stearnsi	5.26	0.33	0.51	1.54
Bothidae				
Cyclopsetta chittendeni	1.67	0.09	0.10	0.26
Syacium gunteri	2.69	0.18	0.10	0.30

Table 12. Composition of the fish fauna collected at a depth of 110 meters within the "study area".

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Rajidae	55	.10	1	.10
Raja texana	55	.10	1	.10
Congridae	35	.07	1	.10
Neoconger mucronatus	35	.07	1	.10
Synodontidae	3,273	6.18	25	2.44
Synodus foetens	3,273	6.18	25	2.44
Batrachoididae	95	.18	5	.49
Porichthys porosissimus	95	.18	5	.49
Ogcocephalidae	265	.50	32	3.12
Halieutichthys aculeatus	192	.36	25	2.44
Ogcocephalus sp.	73	.14	7	.68
Gadidae	2,459	4.65	27	2.64
Urophycis cirratus	439	.83	6	.59
U. floridanus	1,212	2.29	14	1.37
U. sp.	808	1.53	7	.68
Ophidiidae	295	.56	4	.39
Lepophidium sp.	295	.56	4	.39
Serranidae	5,005	9.44	193	18.86
Centropristis philadelphica	1,300	2.45	16	1.57
Diplectrum formosum	160	.30	2	.20
Pikea mexicana	18	.03	1	.10
Serranus atrobranchus	3,527	6.66	174	16.99
Branchiostegidae	578	1.09	6	.59
Caulolatilis cyanops	83	.16	1	.10
Caulolatilis sp.	495	.93	5	.49
Carangidae	395	.75	5	.49
Trachurus lathami	395	.75	5	.49
Lutjanidae	17,758	33.51	205	20.04
Lutjanus campechanus	223	.42	2	.20
Pristipomoides aquilonaris	17,535	33.09	203	19.84
Sparidae	5,817	10.98	125	12.21
Stenotomus caprinus	5,817	10.98	125	12.21
Pomodasyidae	45	.09	1	.10
Orthopristis chrysopterus	45	.09	1	.10

Table 12. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Sciaenidae	2,782	5.35	33	3.23
Cynoscion arenarius	1,595	3.10	11	1.07
Cynoscion nothus	172	.33	2	.20
Equetus acuminatus	189	.36	4	.39
Equetus umbrosus	220	.42	2	.20
Equetus sp.	276	.52	4	.39
Micropogon undulatus	330	.62	10	.98
Mullidae	1,434	2.71	30	2.93
Mullus auratus	868	1.64	16	1.56
Upeneus parvus	566	1.07	14	1.37
Labridae	680	1.28	8	.79
Hemipteronotus novacula	680	1.28	8	.79
Uranoscopidae	80	.15	2	.20
Kathetostoma albigutta	80	.15	2	.20
Stromateidae	996	1.88	14	1.37
Peprilus burti	996	1.88	14	1.37
Scorpaenidae	405	.76	13	1.28
Scorpaena calcarata	55	.10	2	.20
Scorpaena sp.	116	.22	6	.59
Pontinus longispinis	234	.44	5	.49
Triglidae	7,179	13.55	204	19.93
Bellator militaris	425	.80	10	.98
Prionotus martis	18	.03	1	.10
Prionotus paralatus	6,591	12.44	187	18.26
Prionotus salmonicolor	24	.05	1	.10
Prionotus rubio	96	.18	3	.29
Prionotus stearnsi	25	.05	2	.20
Bothidae	2,629	4.96	67	6.57
Ancylopsetta dilecta	514	.97	7	.68
Cyclopsetta chittendeni	712	1.34	4	.39
Etropus crossotus	154	.29	6	.59
Syacium gunteri	259	.49	10	1.00
Trichopsetta ventralis	990	1.87	40	3.91
Soleidae	36	.07	2	.20
Achirus lineatus	36	.07	2	.20

Table 12. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Tetraodontidae	209	.39	4	.40
Lagocephalus laevigatus	139	.26	2	.20
Sphoeroides dorsalis	70	.13	2	.20
Unidentified	490	.93	17	1.66
TOTALS	52,995	100	1024	100

Table 13. Composition of the fish fauna collected at a depth of 110 meters outside the "study area".

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Rajidae	500	.35	3	.12
Raja laevis	55	.04	1	.04
Raja olseni	155	.11	1	.04
Raja texana	290	.20	1	.04
Congridae	48	.03	4	.16
Neoconger mucronatus	16	.01	1	.04
Neoconger sp.	32	.02	2	.08
Uroconger syringinus	0	0	1	.04
Synodontidae	13,147	9.18	80	3.03
Synodus foetens	13,147	9.18	80	3.03
Ariidae	375	.26	3	.11
Arius felis	375	.26	3	.11
Batrachoididae	187	.13	9	.34
Porichthys porosissimus	187	.13	9	.34
Antennariidae	82	.06	1	.04
Antennarius radiosus	82	.06	1	.04
Ogcocephalidae	1,177	.82	84	3.19
Halieutichthys aculeatus	463	.32	64	2.43
Ogcocephalus sp.	714	.50	20	.76
Gadidae	3,360	2.35	32	1.22
Urophycis cirratus	1,309	.91	12	.46
U. floridanus	1,557	1.09	14	.53
U. sp	494	.35	6	.23
Ophidiidae	255	.18	5	.19
Lepophidium sp.	255	.18	5	.19
Macrouridae	557	.39	34	1.29
Nezumia bairdi	557	.39	34	1.29
Serranidae	8,185	5.72	211	8.00
Centropristis philadelphica	5,578	3.89	67	2.54
Centropristis striata	70	.05	1	.04
Diplectrum bivittatum	6	.01	1	.04
Epinephelus flavolimbatus	42	.03	1	.04
Pikea mexicana	150	.11	5	.19
Serranus atrobranchus	2,339	1.63	136	5.15

Table 13. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	% By Number
Priacanthidae	550	.38	4	.15
Priacanthus arenatus	550	.38	4	.15
Branchiostegidae	1,121	.78	11	.42
Caulolatilis cyanops	662	.46	5	.19
Caulolatilis sp.	459	.32	6	.23
Carangidae	2,828	1.97	49	1.86
Chloroscombrus chrysurus	548	.38	7	.27
Trachurus lathami	2,182	1.52	41	1.55
Vomer setapinnis	98	.07	1	.04
Lutjanidae	21,249	14.84	232	8.79
Lutjanus campechanus	260	.18	3	.11
Ocyurus chrysurus	94	.07	1	.04
Pristipomoides aquilonaris	20,895	14.59	228	8.64
Sparidae	43,523	30.39	978	37.06
Stenotomus caprinus	43,523	30.39	978	37.06
Sciaenidae	5,059	3.54	31	1.18
Cynoscion arenarius	3,450	2.41	14	.53
Cynoscion nothus	300	.21	1	.04
Equetus acuminatus	62	.04	1	.04
Equetus sp.	80	.06	2	.08
Leiostomus xanthurus	268	.19	3	.11
Menticirrhus americanus	250	.18	2	.08
Micropogon undulatus	649	.45	8	.30
Mullidae	2,621	1.83	76	2.88
Mullus auratus	1,276	.89	21	.80
Upeneus parvus	1,345	.94	55	2.08
Labridae	1,502	1.05	10	.38
Hemipteronotus novacula	1,502	1.05	10	.38
Percophididae	58	.04	1	.04
Bembrops gobiodes	58	.04	1	.04
Uranoscopidae	163	.11	2	.08
Kathetostoma albigutta	163	.11	2	.08
Trichiuridae	348	.24	3	.11
Trichiurus lepturus	348	.24	3	.11
Stromateidae	3,628	2.54	34	1.29
Peprilus alepidotus	1,285	.90	8	.30
Peprilus burti	2,343	1.64	26	.99

Table 13. (Continued)

Taxon	Weight (gms)	% By Weight (gms)	Number	Number
Scorpaenidae	1,541	1.07	47	1.79
Scorpaena calcarata	292	.20	10	.38
Scorpaena sp.	260	.18	7	.27
Pontinus longispinis	944	.66	28	1.06
Pontinus sp.	45	.03	2	.08
Triglidae	19,190	13.50	467	17.70
Bellator militaris	140	.10	4	.15
Peristedion miniatum	614	.43	19	.72
Peristedion sp.	478	.33	16	.61
Prionotus paralatus	9,491	6.63	247	9.36
Prionotus rubio	7,720	5.39	117	4.43
Prionotus stearnsi	747	.52	64	2.43
Bothidae	5,293	3.70	134	5.09
Ancylopsetta dilecta	1,052	.73	15	.57
Ancylopseta quadrocellata	265	.19	2	.08
Cyclopsetta chittendeni	1,055	.74	7	.27
Etropus crossotus	92	.06	3	.11
Syacium gunteri	313	.22	12	.46
Trichopsetta ventralis	2,516	1.76	95	3.60
Soleidae	20	.01	1	.04
Achirus lineatus	20	.01	1	.04
Cynoglossidae	85	.06	4	.15
Symphurus diomedianus	35	.02	1	.04
Symphurus plagiusa	50	.04	3	.11
Balistidae	109	.08	3	.12
Balistes capriscus	57	.04	1	.04
Monacanthus hispidus	52	.04	2	.08
Tetraodontidae	338	.23	5	.19
Lagocephalus laevigatus	263	.18	3	.11
Sphoeroides dorsalis	75	.05	2	.08
Unidentified	6,115	4.27	80	3.03
Totals	143,214	100	2,638	100

APPENDIX E

Marine Recreational Fisheries

LIST OF TABLES

CODE FOR APPENDIX TABLES

Boat hours fished = number of hours the boat was involved in fishing.

No. fishermen = number of fishermen that were aboard the boat.

Res = residence of the fishermen

1 In-county resident

2 Non in-county Texas resident

3 Non Texas resident

Time of week

1 Weekday excluding holidays

2 Weekend-day including weekday holidays

Number caught - black space indicates zero catch

Gulf hake - should be gulf kingfish

Ribbonfish - should be Atlantic cutlassfish

Summer flounder - should be southern flounder

APPENDIX
TABLE 1. Number of boats exiting and entering the tidal pass by boat type, section, date, and time of week in the Port Aransas and Port Isabel regions.

BOAT TYPE and SECTION	DATE	WEEKDAY (1) or WEEKEND-DAY (2)	Number of boats EXITING	Number of boats ENTERING
INBOARD				
MUSTANG IS.	5 3 75	2	22	19
	5 9 75	1	2	1
	5 13 75	1	35	36
	5 24 75	2	51	51
	6 1 75	2	124	107
	6 6 75	1	10	10
	6 9 75	1	34	34
	6 29 75	2	173	167
	7 2 75	1	55	55
	7 16 75	1	33	33
	7 17 75	1	48	48
	7 21 75	1	55	55
	7 31 75	1	52	52
	8 11 75	2	80	80
	8 15 75	1	88	88
	8 20 75	1	63	63
	8 24 75	2	265	261
	9 6 75	2	58	58
	9 9 75	1	9	9
	9 16 75	1	20	20
	9 21 75	2	28	28
	10 9 75	1	8	7
	10 11 75	2	86	83
	10 21 75	1	6	6
	10 26 75	2	0	0
	10 28 75	1	3	3
	11 1 75	2	11	11
LOWER-PADRE	5 24 75	2	10	17
	6 1 75	2	13	46
	6 5 75	1	5	6
	6 9 75	1	4	6
	6 22 75	2	10	22
	6 29 75	2	9	42
	7 3 75	1	19	14
	7 16 75	1	7	7
	7 19 75	2	39	35
	7 21 75	1	12	13
	8 2 75	2	39	32
	8 10 75	2	41	29
	8 15 75	1	18	16
	8 20 75	1	16	14
	8 24 75	2	37	29
	9 7 75	2	9	5

APPENDIX
TABLE 1. (cont.)

BOAT TYPE and SECTION	DATE	WEEKDAY (1) or WEEKEND-DAY (2)	Number of boats EXITING	ENTERING
	9 9 75	1	3	2
	9 16 75	1	9	10
	9 21 75	2	29	27
	10 9 75	1	8	8
	10 11 75	2	39	42
	10 21 75	1	5	5
	10 26 75	2	0	0
	10 29 75	1	10	10
	11 1 75	2	7	7
OUTBOARD MUSTANG IS.	5 3 75	2	17	14
	5 9 75	1	0	0
	5 13 75	1	26	26
	5 24 75	2	18	18
	6 1 75	2	62	52
	6 6 75	1	6	6
	6 9 75	1	20	20
	6 29 75	2	76	92
	7 2 75	1	39	39
	7 16 75	1	3	3
	7 17 75	1	24	24
	7 21 75	1	36	36
	7 31 75	1	25	25
	8 11 75	2	2	2
	8 15 75	1	42	42
	8 20 75	1	26	26
	8 24 75	2	111	133
	9 6 75	2	13	13
	9 9 75	1	0	0
	9 16 75	1	10	10
	9 21 75	2	0	0
	10 9 75	1	20	20
	10 11 75	2	61	56
	10 21 75	1	12	12
	10 26 75	2	0	0
	10 28 75	1	15	13
	11 1 75	2	5	5
LOWER-PADRE	5 24 75	2	17	10
	6 1 75	2	45	14
	6 5 75	1	6	5
	6 9 75	1	6	3
	6 22 75	2	18	7
	6 29 75	2	41	9
	7 3 75	1	16	21
	7 16 75	1	2	2
	7 19 75	2	17	13

APPENDIX
TABLE 1. (cont.)

BOAT TYPE and SECTION	DATE	WEEKDAY (1) or WEEKEND-DAY (2)	Number of boats EXITING	Number of boats ENTERING
	7 21 75	1	14	10
	8 2 75	2	13	12
	8 10 75	2	13	4
	8 15 75	1	4	2
	8 20 75	1	10	10
	8 24 75	2	14	13
	9 7 75	2	3	3
	9 9 75	1	1	1
	9 16 75	1	4	3
	9 21 75	2	9	7
	10 9 75	1	5	3
	10 11 75	2	24	24
	10 21 75	1	3	3
	10 26 75	2	0	0
	10 29 75	1	5	6
	11 1 75	2	3	3
HEADBOAT				
MUSTANG IS.	5 3 75	2	3	3
	5 9 75	1	0	0
	5 13 75	1	0	0
	5 24 75	2	4	4
	6 1 75	2	5	4
	6 6 75	1	6	5
	6 9 75	1	7	7
	6 29 75	2	6	6
	7 2 75	1	6	6
	7 16 75	1	6	6
	7 17 75	1	9	9
	7 21 75	1	9	9
	7 31 75	1	6	6
	8 11 75	2	8	8
	8 15 75	1	6	6
	8 20 75	1	7	7
	8 24 75	2	7	7
	9 6 75	2	6	6
	9 9 75	1	3	3
	9 16 75	1	3	3
	9 21 75	2	5	5
	10 9 75	1	3	3
	10 11 75	2	7	7
	10 21 75	1	4	4
	10 26 75	2	0	0
	10 28 75	1	3	3
	11 1 75	2	5	5
LOWER-PADRE	5 24 75	2	0	0
	6 1 75	2	0	0

APPENDIX
TABLE 1. (cont.)

BOAT TYPE and SECTION	DATE	WEEKDAY (1) or WEEKEND-DAY (2)	Number of boats EXITING	Number of boats ENTERING
	6 5 75	1	0	0
	6 9 75	1	0	0
	6 22 75	2	2	2
	6 29 75	2	2	2
	7 3 75	1	0	0
	7 16 75	1	4	4
	7 19 75	2	4	3
	7 21 75	1	4	4
	8 2 75	2	0	0
	8 10 75	2	4	3
	8 15 75	1	3	3
	8 20 75	1	6	6
	8 24 75	2	4	3
	9 7 75	2	1	1
	9 9 75	1	1	1
	9 16 75	1	1	1
	9 21 75	2	0	0
	10 9 75	1	1	1
	10 11 75	2	2	2
	10 21 75	1	2	2
	10 26 75	2	0	0
	10 29 75	1	2	2
	11 1 75	2	2	2

APPENDIX
TABLE 2. Mean counts of fishermen and active rods by fishery, section, date, and time of week in the Port Aransas and Port Isabel regions.

FISHERY and SECTION	DATE	WEEKDAY (1) or WEEKEND-DAY (2)	Mean numbers of FISHERMEN	Mean numbers of ACTIVE RODS
JETTY				
MUSTANG IS.	3 5 75	2	47.9	50.3
	9 5 75	1	8.1	8.9
	13 5 75	1	19.4	20.4
	24 5 75	2	22.1	23.6
	5 6 75	1	34.4	35.6
	9 6 75	1	12.1	12.4
	29 6 75	2	45.6	45.6
	2 7 75	1	25.0	25.0
	16 7 75	1	23.0	23.1
	17 7 75	1	21.4	21.4
	21 7 75	1	17.7	17.7
	31 7 75	1	25.7	26.1
	10 8 75	2	65.0	69.6
	15 8 75	1	18.9	19.6
	20 8 75	1	12.4	12.6
	24 8 75	2	30.9	30.9
	6 9 75	2	32.4	36.3
	9 9 75	1	5.9	7.0
	16 9 75	1	10.3	10.3
	21 9 75	2	26.3	26.6
	9 10 75	1	10.4	10.7
	11 10 75	2	43.1	44.9
	21 10 75	1	24.9	24.9
	26 10 75	2	6.6	6.6
	28 10 75	1	26.0	28.3
	1 11 75	2	46.6	46.6
LOWER-PADRE	24 5 75	2	56.1	56.9
	1 6 75	2	67.3	69.4
	5 6 75	1	29.4	31.1
	9 6 75	1	24.3	24.3
	22 6 75	2	58.1	59.7
	29 6 75	2	56.3	56.3
	3 7 75	1	22.4	22.7
	16 7 75	1	33.7	34.3
	19 7 75	2	45.7	46.3
	21 7 75	1	27.9	27.9
	2 8 75	2	57.9	59.4
	10 8 75	1	59.6	60.9
	15 8 75	1	23.3	23.3
	20 8 75	1	16.1	16.1
	24 8 75	2	37.9	40.0
	7 9 75	2	43.3	43.4
	9 9 75	1	10.7	10.7
	16 9 75	1	19.9	20.1

APPENDIX
TABLE 2. (cont.)

FISHERY and SECTION	DATE	WEEKDAY (1) or WEEKEND-DAY (2)	Mean numbers of FISHERMEN	Mean numbers of ACTIVE RODS
	21 9 75	2	30.0	30.1
	9 10 75	1	21.9	22.7
	11 10 75	2	36.0	37.7
	21 10 75	1	20.0	20.0
	26 10 75	2	14.3	14.3
	29 10 75	1	29.7	29.7
	1 11 75	2	15.6	17.6
PIER 1 MUSTANG IS.	5 4 75	2	21.5	23.5
	5 10 75	2	12.0	12.5
	5 15 75	1	16.5	20.0
	5 17 75	1	50.5	59.5
	5 27 75	1	14.0	14.5
	6 7 75	2	26.5	29.0
	6 13 75	1	25.5	26.5
	6 21 75	2	34.0	37.0
	6 24 75	1	25.0	25.0
	7 5 75	2	52.0	56.0
	7 7 75	1	21.5	22.0
	7 20 75	2	31.5	32.0
	7 25 75	1	31.5	32.0
	7 27 75	2	44.0	46.5
	8 10 75	2	41.0	42.5
	8 15 75	1	25.0	27.0
	8 22 75	1	16.0	17.0
	8 23 75	2	21.0	24.5
	9 10 75	1	8.5	9.5
	9 13 75	2	3.0	3.0
	9 20 75	2	18.5	20.0
	9 23 75	1	10.5	10.5
	10 4 75	2	25.0	30.0
	10 6 75	1	12.0	14.5
	10 18 75	2	25.5	28.0
	10 20 75	1	23.0	24.0
	10 31 75	1	44.5	47.0
	11 4 75	1	25.5	28.0
PIER 2 MUSTANG IS.	5 4 75	2	88.5	97.0
	5 10 75	2	34.0	36.0
	5 15 75	1	17.0	35.5
	5 17 75	1	77.5	89.0
	5 27 75	1	38.0	40.5
	6 7 75	2	65.5	68.0
	6 13 75	1	31.5	33.0
	6 21 75	2	69.0	77.0
	6 24 75	1	45.0	51.0

APPENDIX
TABLE 2. (cont.)

FISHERY and SECTION	DATE	WEEKDAY (1) or WEEKEND-DAY (2)	Mean numbers of FISHERMEN	Mean numbers of ACTIVE RODS
	7 5 75	2	119.5	125.0
	7 7 75	1	33.0	33.0
	7 20 75	2	65.5	75.0
	7 25 75	1	64.5	71.0
	7 27 75	2	67.5	58.0
	8 10 75	2	127.5	135.0
	8 15 75	1	59.0	70.0
	8 22 75	1	35.0	29.5
	8 23 75	2	81.5	58.5
	9 10 75	1	28.0	33.5
	9 13 75	2	56.0	63.0
	9 20 75	2	43.5	52.5
	9 23 75	1	22.0	26.5
	10 4 75	2	81.0	101.5
	10 6 75	1	47.5	52.5
	10 18 75	2	92.5	105.0
	10 20 75	1	55.5	59.5
	10 31 75	1	54.0	58.5
	11 4 75	1	64.0	74.5
PIER 3 LOWER-PADRE	6 24 75	1	5.0	5.0
	7 5 75	2	0.0	0.0
	7 7 75	1	9.0	9.0
	7 20 75	2	5.0	6.0
	7 25 75	1	2.0	2.0
	8 14 75	1	11.0	11.0
	8 17 75	2	0.0	0.0
	9 10 75	1	0.0	0.0
	9 13 75	2	0.5	0.5
	9 20 75	2	1.5	1.5
	9 23 75	1	0.0	0.0
	10 18 75	2	10.5	10.5
	10 20 75	1	4.0	6.5
	10 31 75	1	1.0	1.0
	11 4 75	1	1.5	1.5
BEACH MUSTANG IS.	5 4 75	2	34.0	44.0
	5 10 75	2	18.0	18.0
	5 15 75	1	20.0	22.0
	5 17 75	2	58.0	61.0
	5 27 75	1	23.5	25.0
	6 7 75	2	61.5	62.5
	6 13 75	1	29.5	30.5
	6 21 75	2	36.5	37.5
	6 24 75	1	57.0	59.0
	7 5 75	2	176.0	195.5

APPENDIX
TABLE 2. (cont.)

FISHERY and SECTION	DATE	WEEKDAY (1) or WEEKEND-DAY (2)	Mean numbers of FISHERMEN	Mean numbers of ACTIVE RODS
	7 7 75	1	17.5	17.5
	7 20 75	2	27.5	29.0
	7 25 75	1	20.0	21.5
	7 27 75	2	46.0	46.0
	8 10 75	2	88.0	97.0
	8 15 75	1	24.5	25.5
	8 22 75	1	39.5	41.0
	8 23 75	2	79.0	81.0
	9 10 75	1	9.5	9.5
	9 13 75	2	38.5	43.0
	9 20 75	2	60.0	63.5
	9 23 75	1	5.5	5.5
	10 4 75	2	73.0	76.5
	10 6 75	1	47.0	50.0
	10 18 75	2	86.0	90.0
	10 20 75	1	80.0	85.0
	10 31 75	1	91.5	97.0
UPPER-PADRE	5 18 75	2	53.5	58.5
	5 20 75	1	3.5	3.5
	5 28 75	1	4.5	5.5
	6 8 75	2	24.5	26.5
	6 14 75	2	44.0	46.0
	6 27 75	1	7.0	6.5
	7 6 75	2	53.0	58.0
	7 15 75	1	12.0	16.5
	7 19 75	2	49.0	60.5
	7 24 75	1	11.5	12.0
	8 2 75	2	34.0	43.0
	8 11 75	1	14.0	15.0
	8 17 75	2	87.5	96.0
	8 28 75	1	3.5	4.5
	9 6 75	2	71.5	99.0
	9 11 75	1	5.5	7.0
	9 17 75	1	13.0	14.0
	9 28 75	2	110.5	132.5
	10 5 75	2	81.0	104.5
	10 10 75	2	27.0	32.0
	10 14 75	1	8.5	10.0
	10 19 75	2	109.5	155.0
	10 27 75	1	29.5	48.5
	10 29 75	1	36.0	42.5
MID-PADRE	8 28 75	1	4.0	4.0
	9 11 75	1	3.5	4.5
	9 28 75	2	11.0	11.5

APPENDIX
TABLE 2. (cont.)

FISHERY and SECTION	DATE	WEEKDAY (1) or WEEKEND-DAY (2)	Mean numbers of FISHERMEN	Mean numbers of ACTIVE RODS
	10 10 75	1	1.0	1.0
	10 19 75	2	16.0	22.5
LOWER-PADRE	6 7 75	2	26.0	28.0
	6 13 75	1	14.5	16.5
	6 21 75	2	24.5	26.0
	6 24 75	1	34.5	38.5
	7 5 75	2	58.0	59.0
	7 7 75	1	18.0	19.0
	7 20 75	2	20.0	20.0
	7 25 75	1	23.5	24.0
	7 27 75	2	26.5	26.5
	8 14 75	1	16.5	16.5
	8 17 75	2	44.5	47.5
	8 22 75	1	15.5	18.5
	8 23 75	2	22.0	23.5
	9 10 75	1	15.0	15.5
	9 13 75	2	15.5	17.0
	9 20 75	2	49.0	52.5
	10 18 75	2	29.5	34.5
	10 20 75	1	10.5	10.5

APPENDIX F

Billfishes

LIST OF TABLES

LIST OF CHARTS

Table 1.--Effort expended for billfish fishing off Port Aransas.

	1972	1973	1974	1975
Months for which data were available				March
				April
	May	May		May
	June	June	June	June
	July	July	July	July
	August	August	August	August
	September	September	September	September
	October	October	October	October
		November		
Total hours fished by all boats	1,482.4	810.9	1,298.3	2,389.7

Table 2.--Number of billfishes caught and recorded off Port Aransas.

Year	Blue Marlin	White Marlin	Sailfish	Total
1972	38	8	62	108
1973	16	6	11	33
1974	44	21	92	157
1975	23	4	235	262

Table 3.--Catch-per-hour for billfishes off Port Aransas.

Year	Blue Marlin	White Marlin	Sailfish	All Billfish
1972	.026	.005	.041	.072
1973	.020	.007	.014	.041
1974	.034	.016	.071	.121
1975	.010	.002	.098	.110

Table 4.--Weights (lbs.) of billfishes caught off Port Aransas.

	1972	1973	1974	1975
Blue Marlin				
Largest	439.5	407	462	540
Smallest	107	76	51	119
Average	224.5	197.7	226.3	265.9
White Marlin				
Largest	85	58	74	65
Smallest	40	40	39	35
Average	57.5	48.3	52.5	51.5
Sailfish				
Largest	95	62	70	74
Smallest	25	40	26	2.5
Average	45.5	53.3	43.6	43.6

Table 5.--Sex ratios of billfishes caught off Port Aransas (Some billfishes did not have their sex determined.).

	1972	1973	1974	1975
Blue Marlin				
No. of F: No. of M	4:10	3:0	2:1	6:3
No. of F per M	0.4:1	-	2:1	2:1
White Marlin				
No. of F: No. of M	*	2:1	*	1:0
No. of F per M		2:1		*
Sailfish				
No. of F: No. of M	12:2	5:0	3:1	50:19
No. of F per M	6:1	-	3:1	2.6:1

*None were sexed.

Table 6.--Hours trolled, number of raises, and raises per hour of billfishes by time of day off Port Aransas, 1972.

Hour	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700
Hours trolled	2	13.25	104.75	205.5	229	233.5	231.75	207.75	90.75	16	3
Blue Marlin											
No. Raised	0	0	3	4	18	8	8	8	3	4	0
Raises/hour	0	0	.029	.019	.079	.034	.035	.039	.033	.250	0
White Marlin											
No. Raised	0	0	1	3	1	0	6	5	0	2	0
Raises/hour	0	0	.010	.015	.004	0	.026	.024	0	.125	0
Sailfish											
No. Raised	0	0	8	21	17	16	15	20	11	1	0
Raises/hour	0	0	.076	.102	.074	.069	.065	.096	.121	.062	0
All Billfishes											
No. Raised	0	0	12	28	36	24	30	33	14	7	0
Raises/hour	0	0	.115	.136	.157	.103	.129	.159	.154	.437	0

Table 7.--Hours trolled, number hooked, and number hooked per hour by time of day for billfishes off Port Aransas.

Hour	0900	1000	1100	1200	1300	1400	1500	1600	1700
1973									
Hours trolled	27.25	118.90	125.00	127.00	126.60	119.30	65.50	9.50	1.50
Blue Marlin									
No. Hooked	0	2	4	1	2	2	3	0	1
No. Hooked/hr.	0	.016	.032	.008	.016	.017	.046	0	.667
White Marlin									
No. Hooked	0	0	1	0	2	1	2	0	0
No. Hooked/hr.	0	0	.008	0	.016	.008	.031	0	0
Sailfish									
No. Hooked	2	2	4	0	5	4	2	5	1
No. Hooked/hr.	.073	.016	.032	0	.039	.034	.031	.526	.667
All Billfishes									
No. Hooked	2	4	9	1	9	7	7	5	2
No. Hooked/hr.	.073	.034	.072	.008	.071	.059	.107	.526	1.333

Table 7.--Hours trolled, number hooked, and number hooked per hour by time of day for billfishes off Port Aransas. (Cont'd)

Hour	0900	1000	1100	1200	1300	1400	1500	1600	1700
1974									
Hours trolled	143.25	225.00	235.75	230.00	228.50	210.75	82.25	21.50	6.50
Blue Marlin									
No. Hooked	3	10	7	11	13	11	4	0	0
No. Hooked/hr.	.021	.044	.030	.048	.057	.052	.049	0	0
White Marlin									
No. Hooked	1	1	9	3	6	2	1	0	1
No. Hooked/hr.	.007	.004	.038	.013	.026	.009	.012	0	.154
Sailfish									
No. Hooked	7	26	23	19	14	8	3	2	1
No. Hooked/hr.	.049	.116	.096	.083	.061	.038	.036	.093	.154
All Billfishes									
No. Hooked	11	37	39	33	33	21	8	2	2
No. Hooked/hr.	.077	.164	.165	.143	.144	.100	.097	.093	.308

Table 8.--Number of billfishes raised in blue, blue-green, and green water off Port Aransas.

	Blue water			Blue-green water			Green water			Total number of fish raised		
	BM	WM	SF	BM	WM	SF	BM	WM	SF	BM	WM	SF
1972												
No. of fish raised	63	21	120	0	2	0	1	1	0	64	24	120
% of total raised	98	88	100	0	8	0	2	4	0			
1973												
No. of fish raised	30	7	36	2	0	1	2	0	2	34	7	39
% of total raised	88	100	92	6	0	3	6	0	5			
1974												
No. fish raised	91	27	152	6	2	9	3	1	11	100	30	172
% of total raised	91	90	88	6	7	5	3	3	6			

ıle 9--Number of billfishes raised in various surface conditions off Port Aransas.

	Open Water			Lines or Rips			Scattered Grass			Grass Patches			Other			Total Number Raised		
	BM	WM	SF	BM	WM	SF	BM	WM	SF	BM	WM	SF	BM	WM	SF	BM	WM	SF
'2																		
'o. Fish Raised	60	23	117	0	0	0	1	1	0	0	0	0	0	0	3	61	24	120
of Total Raised	98	96	98	0	0	0	2	4	0	0	0	0	0	0	2			
3																		
o. Fish Raised	29	7	34	0	0	1	0	0	0	0	0	0	0	0	1	29	7	36
of Total Raised	100	100	94	0	0	3	0	0	0	0	0	0	0	0	3			
4																		
o. Fish Raised	91	28	146	7	1	11	0	0	0	0	0	0	2	1	16	100	30	173
of Total Raised	91	93	84	7	3	6	0	0	0	0	0	0	2	3	9			

Table 10.--Number of billfishes hooked and number hooked per day with various baits off Port Aransas.

	Mullet	Ballyhoo	Bonito Strip	Others
1972				
No. of days bait was used	225	62	1	11
Blue Marlin				
No. Hooked	43	1	0	2
No. Hooked per day	.191	.016	0	.182
White Marlin				
No. Hooked	16	3	0	0
No. Hooked per day	.071	.048	0	0
Sailfish				
No. Hooked	72	13	0	4
No. Hooked per day	.032	.210	0	.364
1973				
No. of days bait was used	41	9	0	7
Blue Marlin				
No. Hooked	18	0	-	1
No. Nooked per day	.439	0	-	.143
White Marlin				
No. Hooked	6	0	-	0
No. Hooked per day	.146	0	-	0
Sailfish				
No. Hooked	15	7	-	5
No. Hooked per day	.366	.778	-	.714
1974				
No. of days bait was used	201	49	0	38
Blue Marlin				
No. Hooked	46	3	-	8
No. Hooked per day	.229	.061	-	.211
White Marlin				
No. Hooked	17	5	-	2
No. Hooked per day	.085	.102	-	.053
Sailfish				
No. Hooked	80	21	-	10
No. Hooked per day	.398	.429	-	.263

Table 11.--Billfishes raised, hooked, and boated by biweekly periods, Port Aransas, 1972.

	Blue Marlin			White Marlin			Sailfish			Unidentified Billfish	
	R	H	B	R	H	B	R	H	B	R	H
May 3-16	0	0	0	2	1	1	0	0	0	0	0
May 17-30	8	6	5	0	0	0	0	0	0	0	0
May 31-June 13	2	2	2	1	1	1	0	0	0	0	0
June 14-27	6	5	5	4	4	4	1	1	1	0	0
June 28-July 11	17	17	9	1	0	0	17	17	16	0	0
July 12-25	15	9	9	4	0	0	6	5	5	1	0
July 26-Aug 8	0	0	0	0	0	0	7	7	7	0	0
Aug 9-22	5	5	4	1	1	0	22	17	15	0	0
Aug 23-Sept 5	7	5	3	10	7	6	18	14	14	0	0
Sept 6-19	7	4	2	6	3	3	14	8	8	0	0
Sept 20-Oct 3	0	0	0	1	1	1	14	6	6	0	0
Oct 4-17	0	0	0	0	0	0	34	17	14	0	0
Oct 18-31	0	0	0	0	0	0	0	0	0	0	0
Totals	73	53	39	30	18	16	133	92	86	1	0
% of Raised		72.6	53.4		60	53.3		69.2	64.7		
% of Hooked			73.6			88.9			93.5		

R = Raised
H = Hooked
B = Boated (includes releases)

Table 12.--Billfishes raised, hooked, and boated by biweekly periods, Port Aransas, 1973.

	Blue Marlin			White Marlin			Sailfish			Unidentified Billfish	
	R	H	B	R	H	B	R	H	B	R	H
May 30-June 12	5	2	2	0	0	0	2	1	1	2	0
June 13-26	0	0	0	0	0	0	0	0	0	0	0
June 27-July 10	17	11	8	1	1	1	5	3	1	0	0
July 11-24	3	0	0	0	0	0	16	11	9	0	0
July 25-Aug 7	3	2	1	1	1	1	4	2	2	0	0
Aug 8-21	0	0	0	2	1	1	7	7	7	0	0
Aug 22-Sept 4	7	2	2	4	3	3	13	5	5	0	0
Totals	35	17	13	8	6	6	47	29	25	2	0
% of Raised		48.6	37.1		75.0	75.0		61.7	53.2		
% of Hooked			76.5			100.0			86.2		

R = Raised
H = Hooked
B = Boated (includes releases)

Table 13.--Billfishes raised, hooked, and boated by biweekly periods, Port Aransas, 1974.

	Blue Marlin			White Marlin			Sailfish			Unidentified Billfish	
	R	H	B	R	H	B	R	H	B	R	H
June 12-25	5	4	2	1	1	0	12	9	6	2	0
June 26-July 9	66	39	29	8	3	3	30	16	15	8	1
July 10-23	8	5	5	17	13	13	49	43	43	1	0
July 24-Aug 6	12	3	2	3	3	2	5	4	4	0	0
Aug 7-20	7	4	3	1	0	0	15	7	4	0	0
Aug 21-Sept 3	3	2	2	0	0	0	21	8	8	0	0
Sept 4-17	4	2	0	2	2	2	35	14	13	0	0
Sept 18-Oct 1	0	0	0	0	0	0	4	4	4	0	0
Oct 2-15	2	1	1	2	2	2	11	7	4	0	0
Totals	107	60	44	34	24	22	182	112	101	11	1
% of Raised		56.1	41.1		70.6	64.7		61.5	55.5		9.1
% of Hooked			73.3			91.7			90.2		

R = Raised
H = Hooked
B = Boated (includes releases)

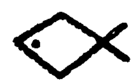
Table 14. Data from billfish tournaments held at Port Mansfield and Port Isabel in 1975.

Location	Port Mansfield	Port Isabel
Dates	July 25-26, 1975	August 7-9, 1975
No. of boats	9	25
Total hours fished	76.1	407.5
Blue marlin		
Raised	2	3
Hooked	2	1
Boated	2	0
White marlin		
Raised	1	4
Hooked	1	3
Boated	1	1
Sailfish		
Raised	0	35
Hooked	0	29
Boated	0	23

1972

EXPLANATION OF SYMBOLS FOR FOLLOWING CHARTS

The fishing areas are bound by heavy black lines. No fish were raised in squares without symbols.



0.001 to 0.349 fish raised per hour

0.350 to 0.699 fish raised per hour

0.700 or more fish raised per hour

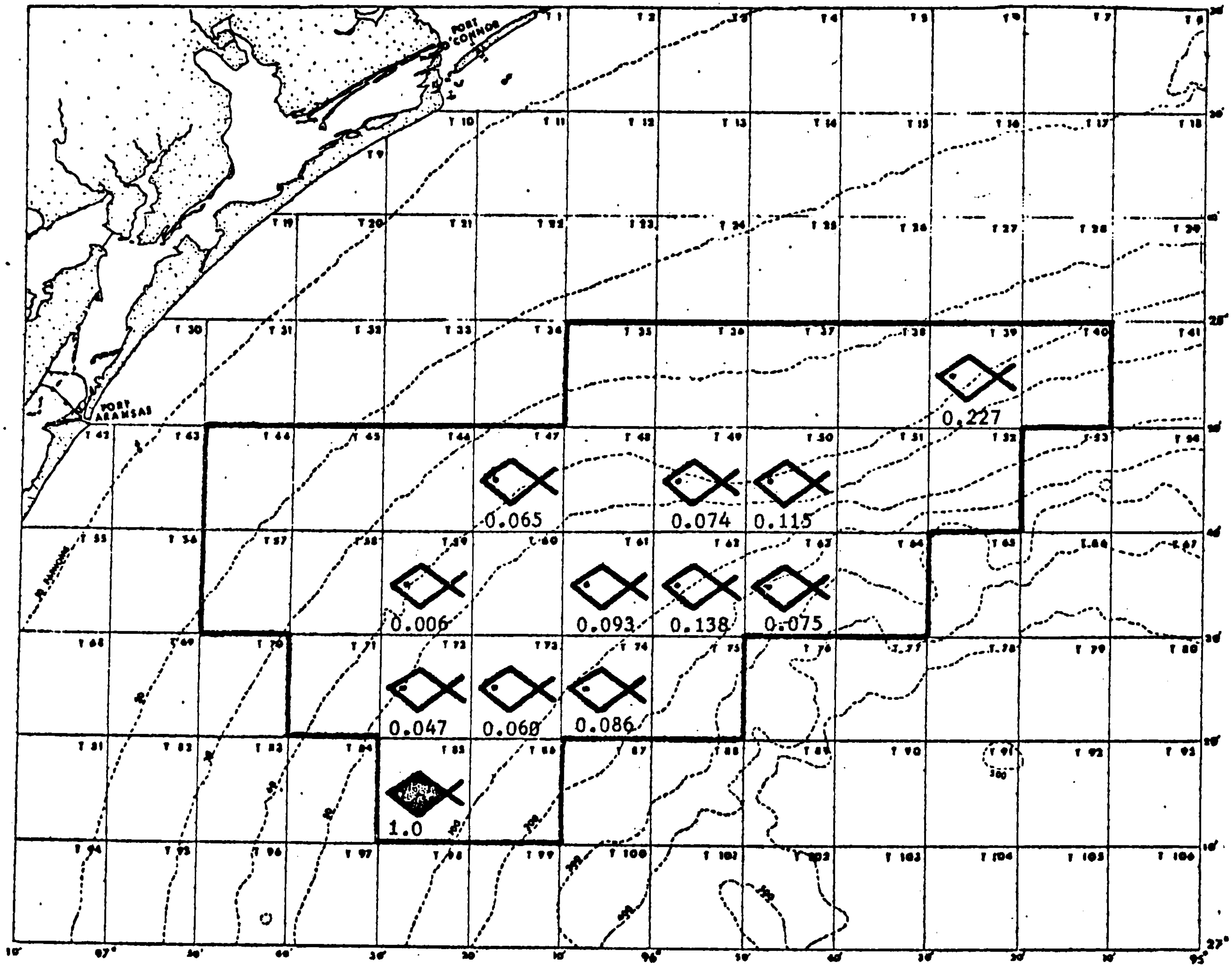


CHART 72-1. RELATIVE ABUNDANCE OF BLUE MARLIN OFF PORT ARANSAS BY TEN-MINUTE SQUARES FOR ENTIRE SEASON OF 1972.

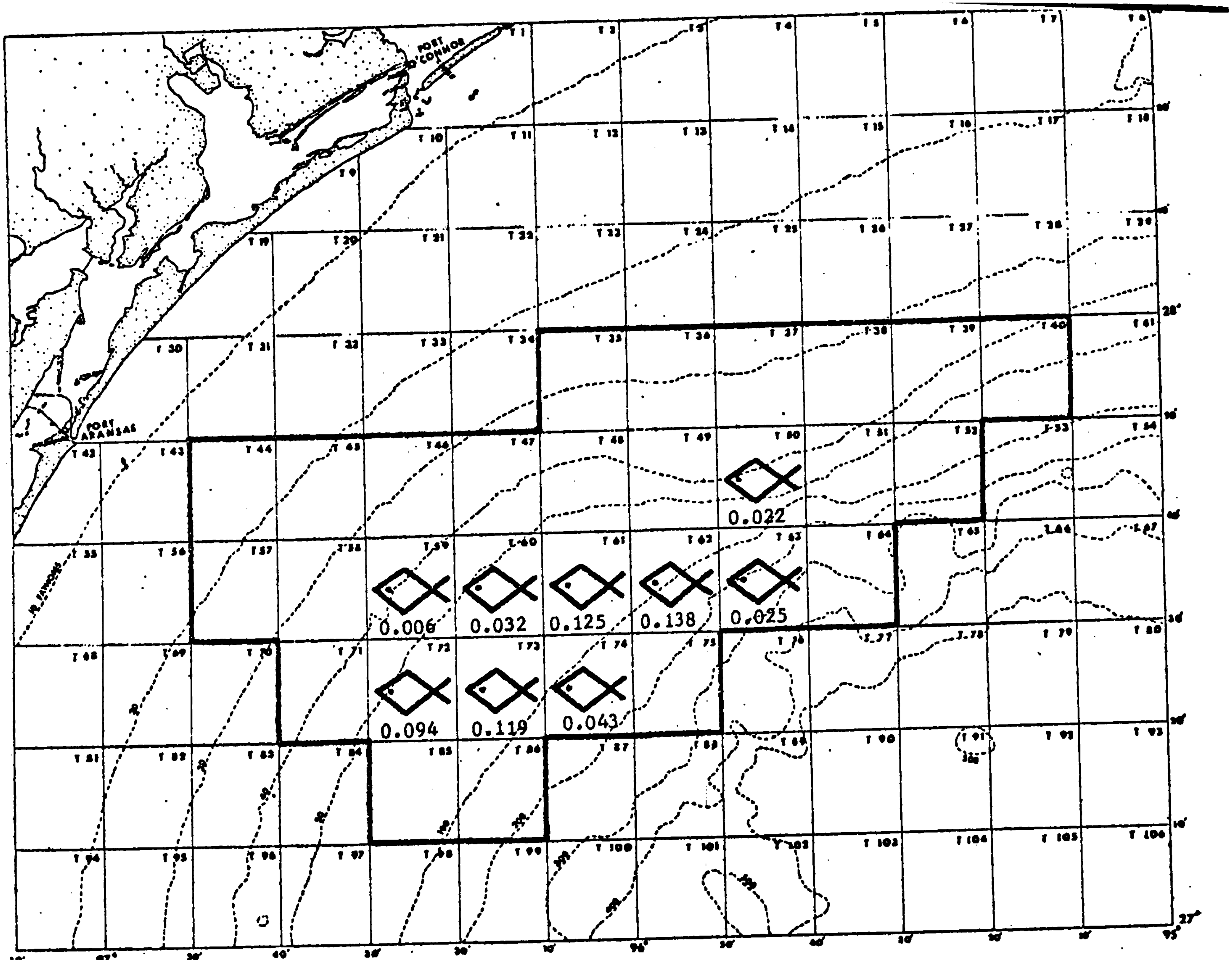


CHART 72-2. RELATIVE ABUNDANCE OF WHITE MARLIN OFF PORT ARANSAS BY TEN-MINUTE SQUARES FOR ENTIRE SEASON OF 1972.

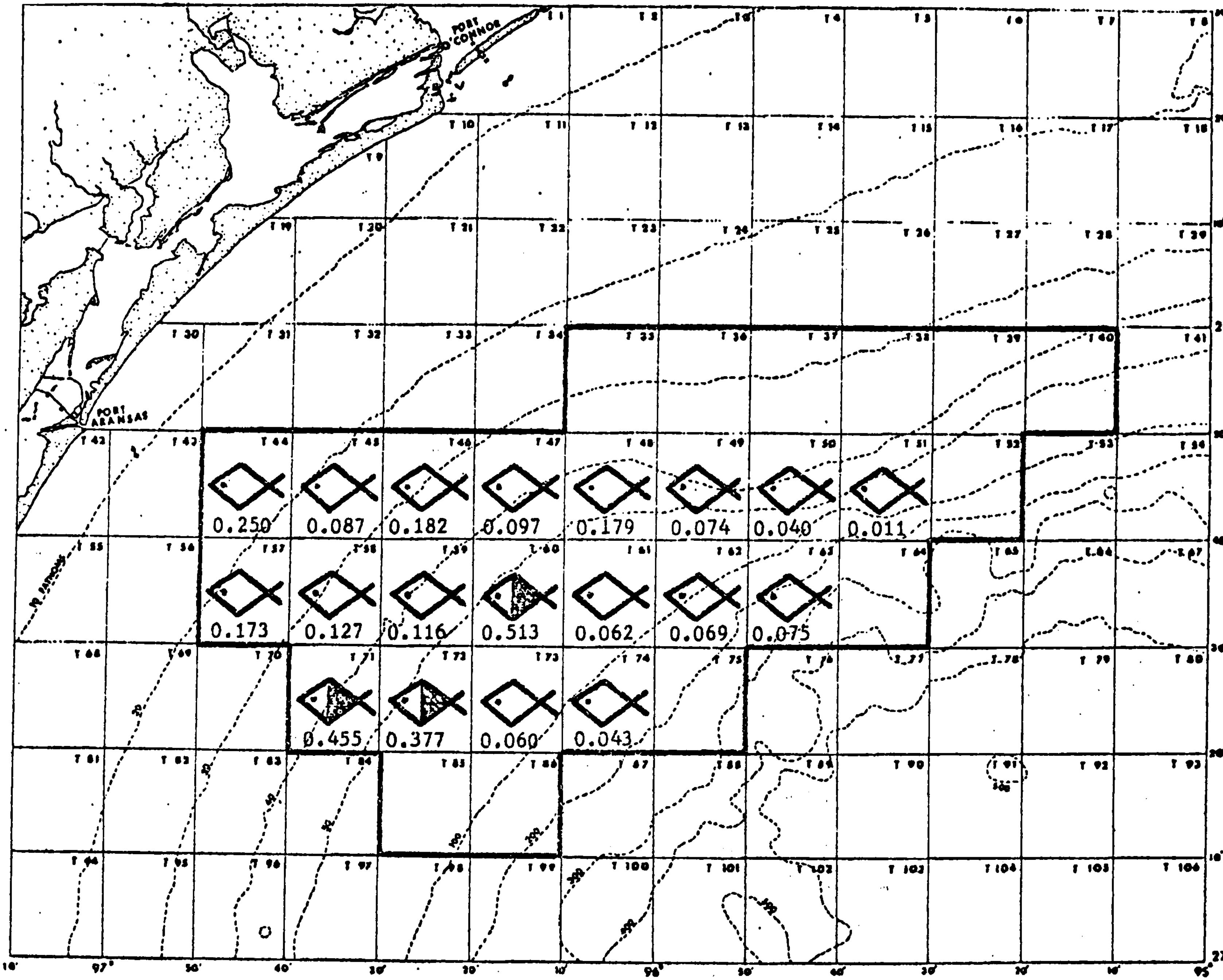


CHART 72-3. RELATIVE ABUNDANCE OF SAILFISH OFF PORT ARANSAS BY TEN-MINUTE SQUARES FOR ENTIRE SEASON OF 1972.

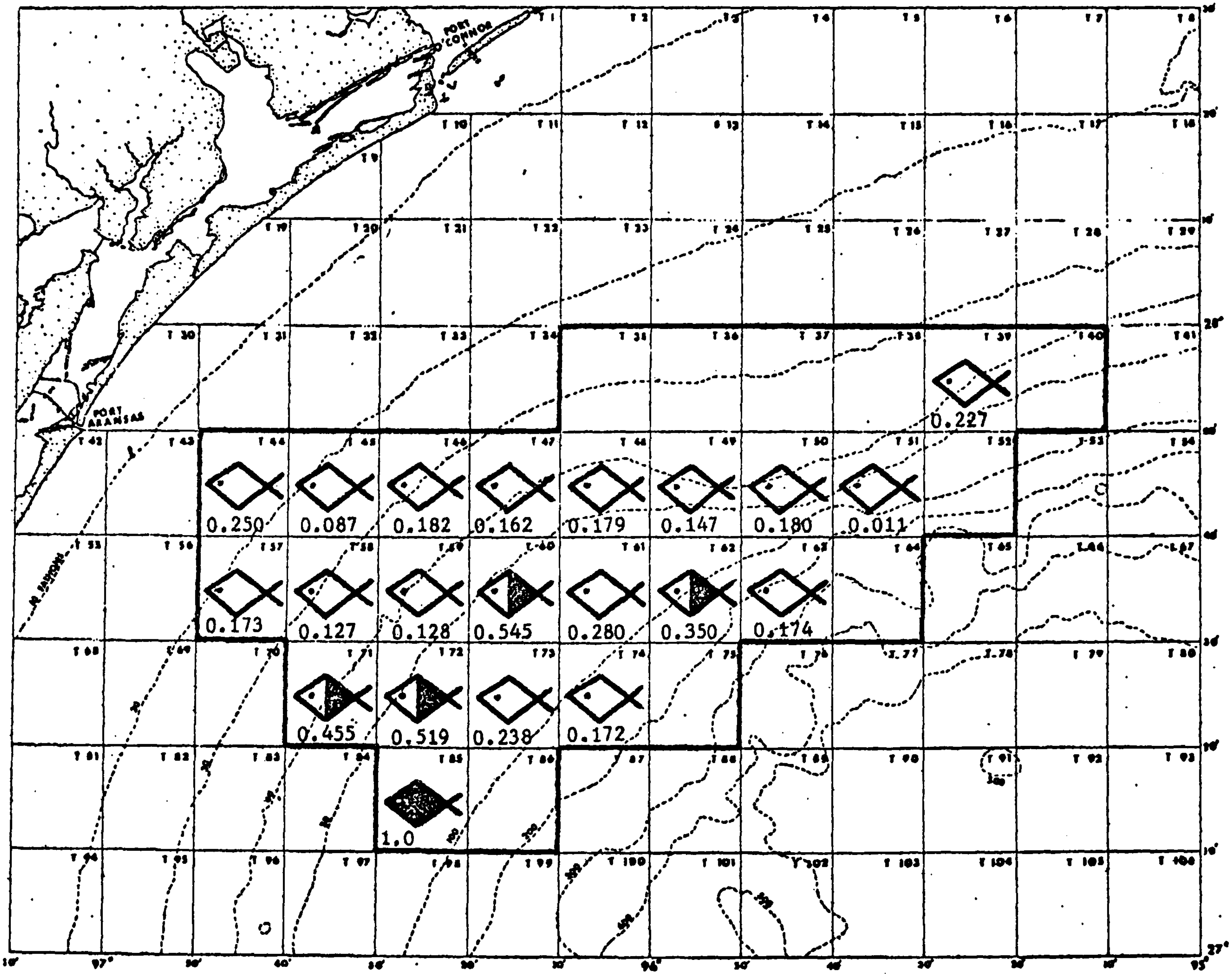
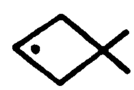


CHART 72-4. RELATIVE ABUNDANCE OF TOTAL BILLFISH OFF PORT ARANSAS BY TEN-MINUTE SQUARES FOR ENTIRE SEASON OF 1972.

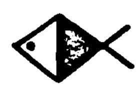
1973

EXPLANATION OF SYMBOLS FOR FOLLOWING CHARTS

The fishing areas are bound by heavy black lines. No fish were raised in squares without symbols.



0.001 to 0.119 fish raised per hour



0.120 to 0.239 fish raised per hour

0.240 or more fish raised per hour

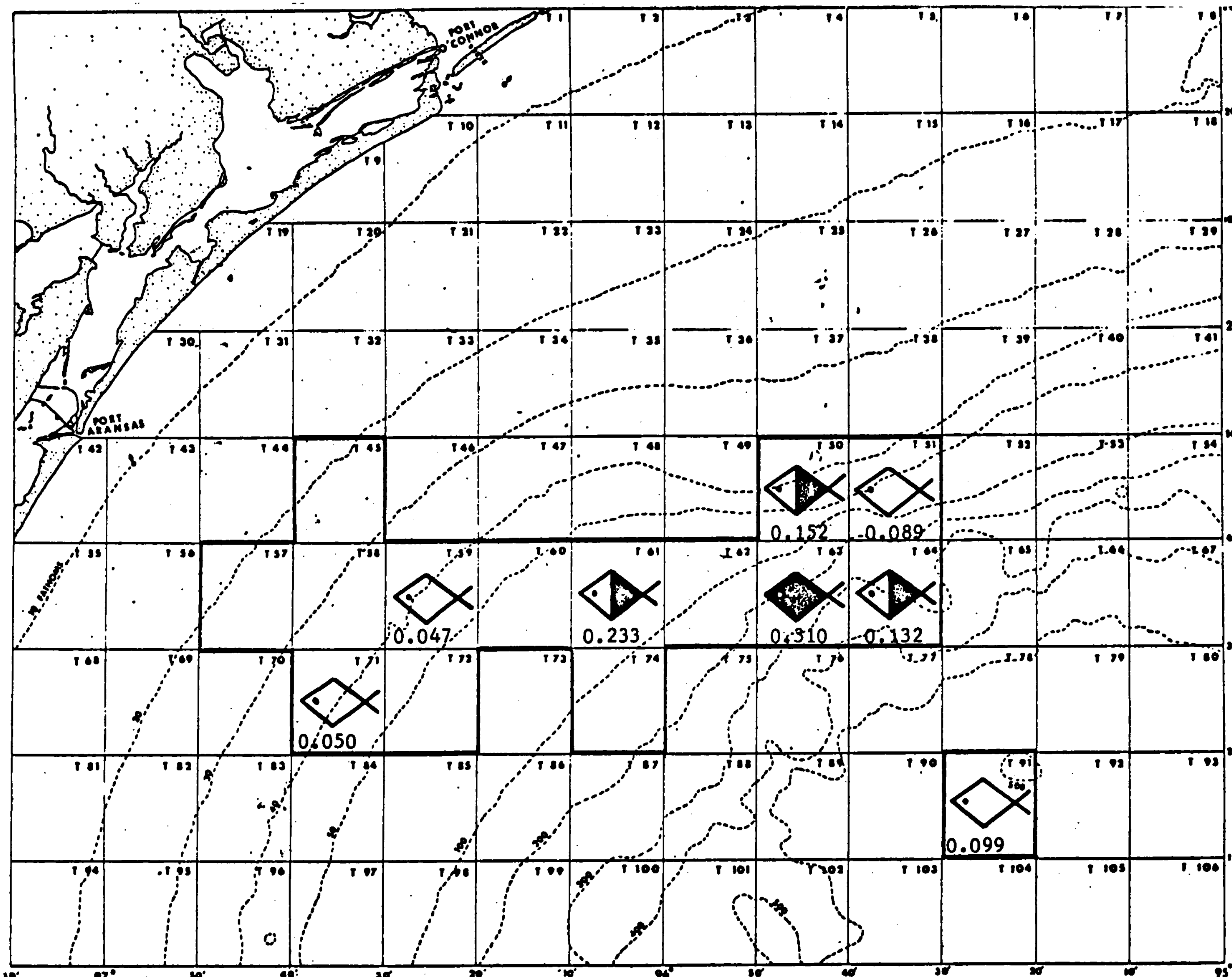


CHART 73-1. RELATIVE ABUNDANCE OF BLUE MARLIN OFF PORT ARANSAS
BY TEN-MINUTE SQUARES FOR ENTIRE SEASON OF 1973.

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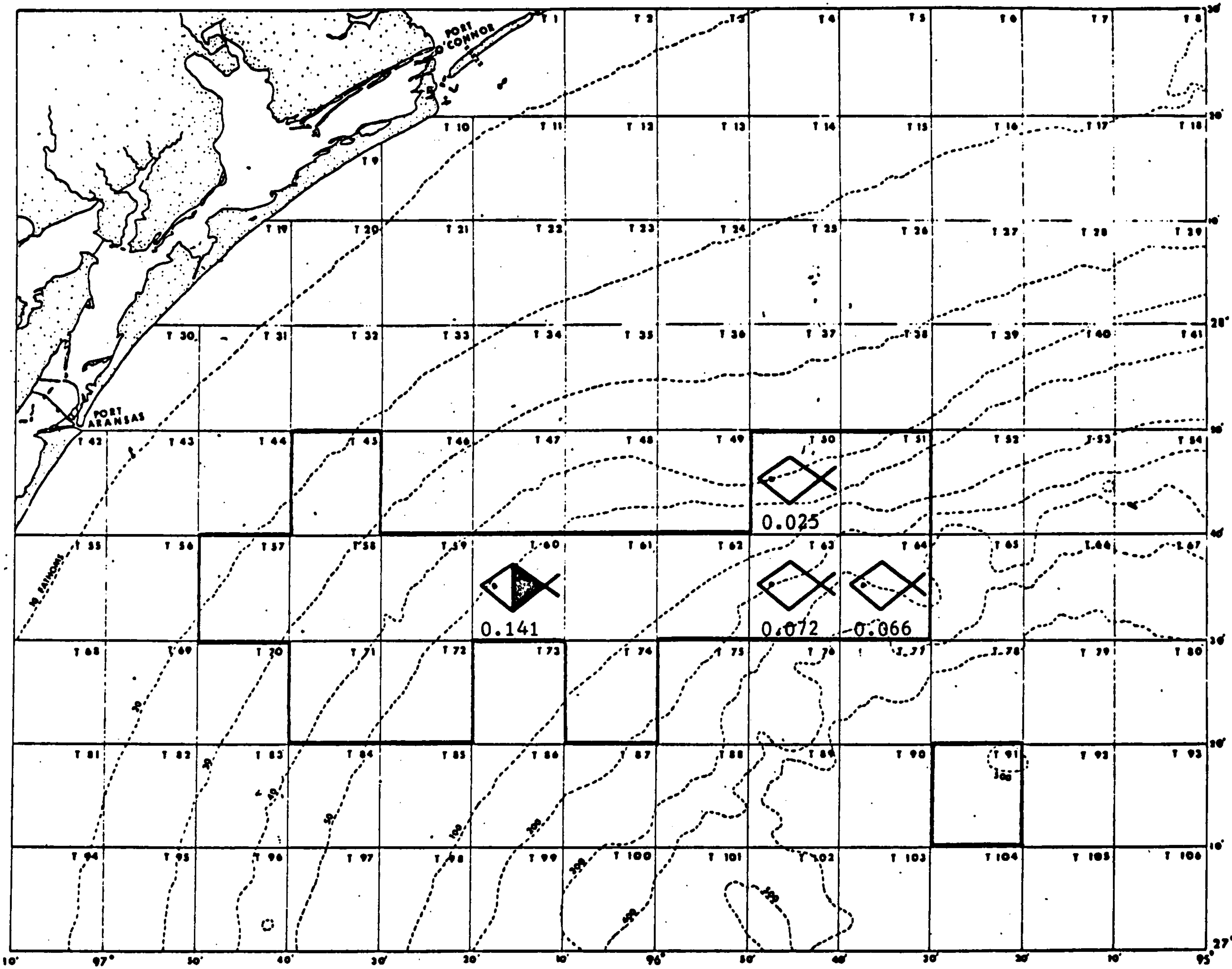


CHART 73-2. RELATIVE ABUNDANCE OF WHITE MARLIN OFF PORT ARANSAS BY TEN-MINUTE SQUARES FOR ENTIRE SEASON OF 1973.

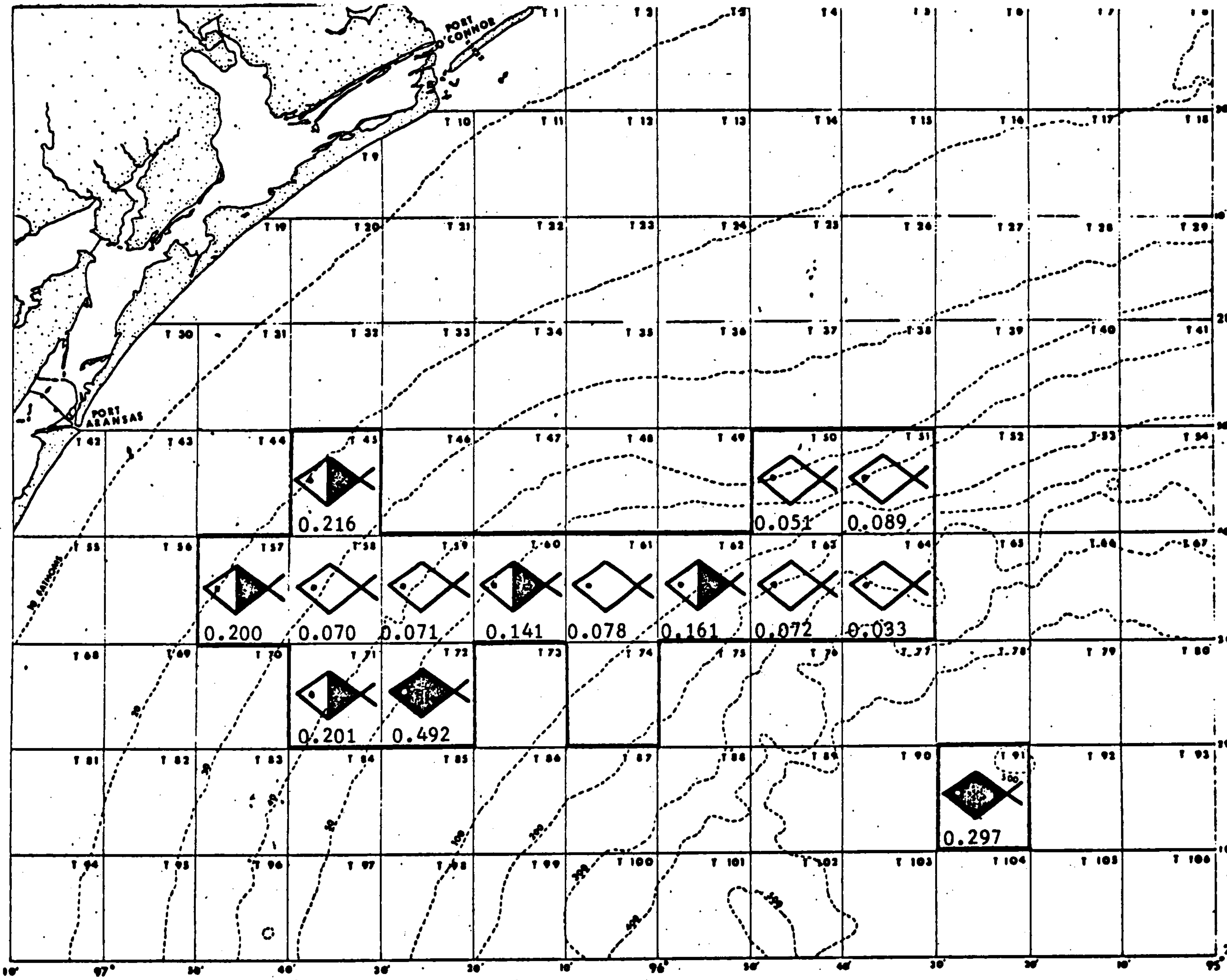


CHART 73-3. RELATIVE ABUNDANCE OF SAILFISH OFF PORT ARANSAS BY TEN-MINUTE SQUARES FOR ENTIRE SEASON OF 1973.

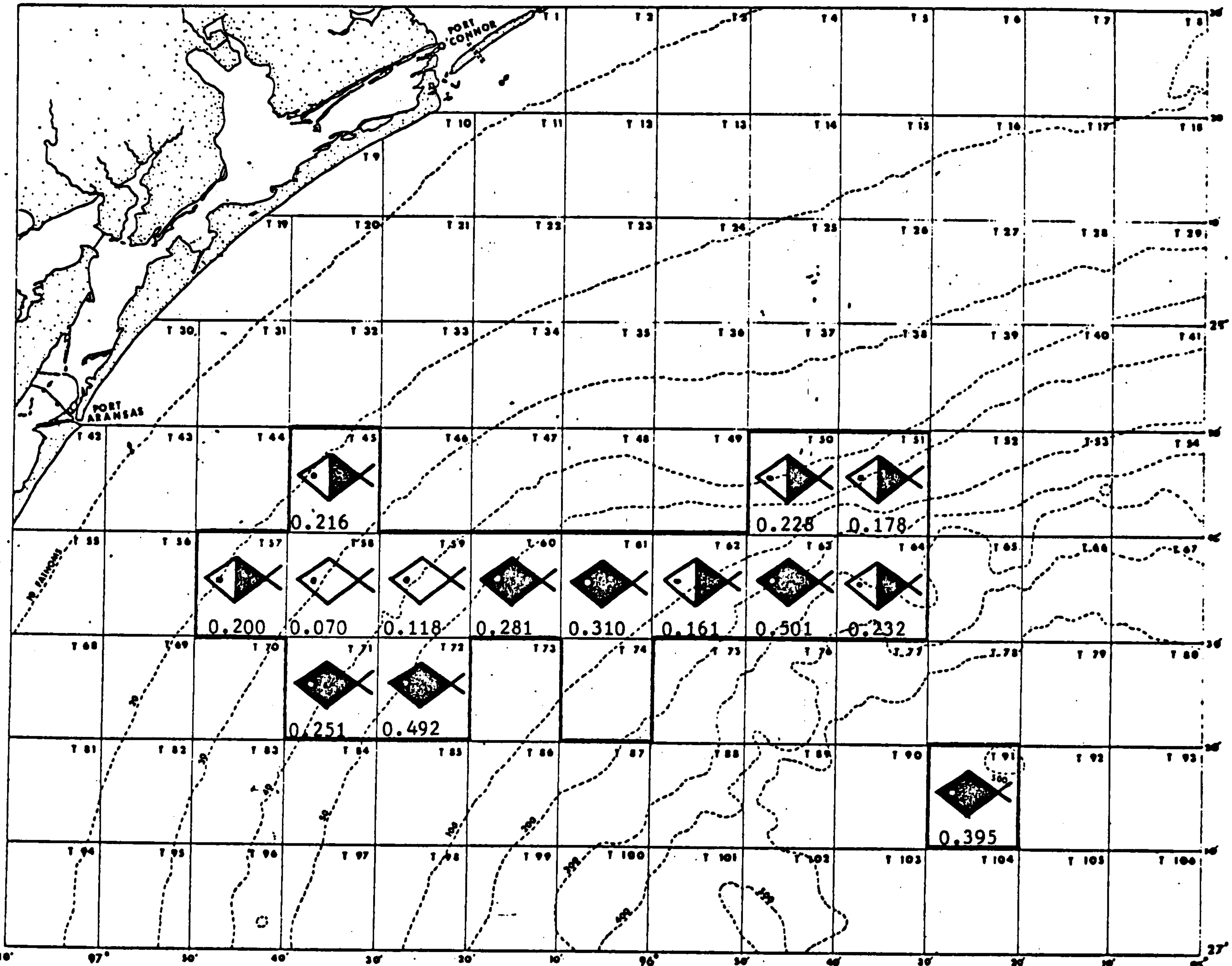


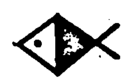
CHART 73-4. RELATIVE ABUNDANCE OF TOTAL BILLFISH OFF PORT ARANSAS BY TEN-MINUTE SQUARES FOR ENTIRE SEASON OF 1973.

1974

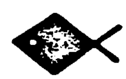
EXPLANATION OF SYMBOLS FOR FOLLOWING CHARTS

The fishing areas are bound by heavy black lines. No fish were raised in squares without symbols.

0.001 to 0.179 fish raised per hour



0.180 to 0.359 fish raised per hour



0.360 or more fish raised per hour

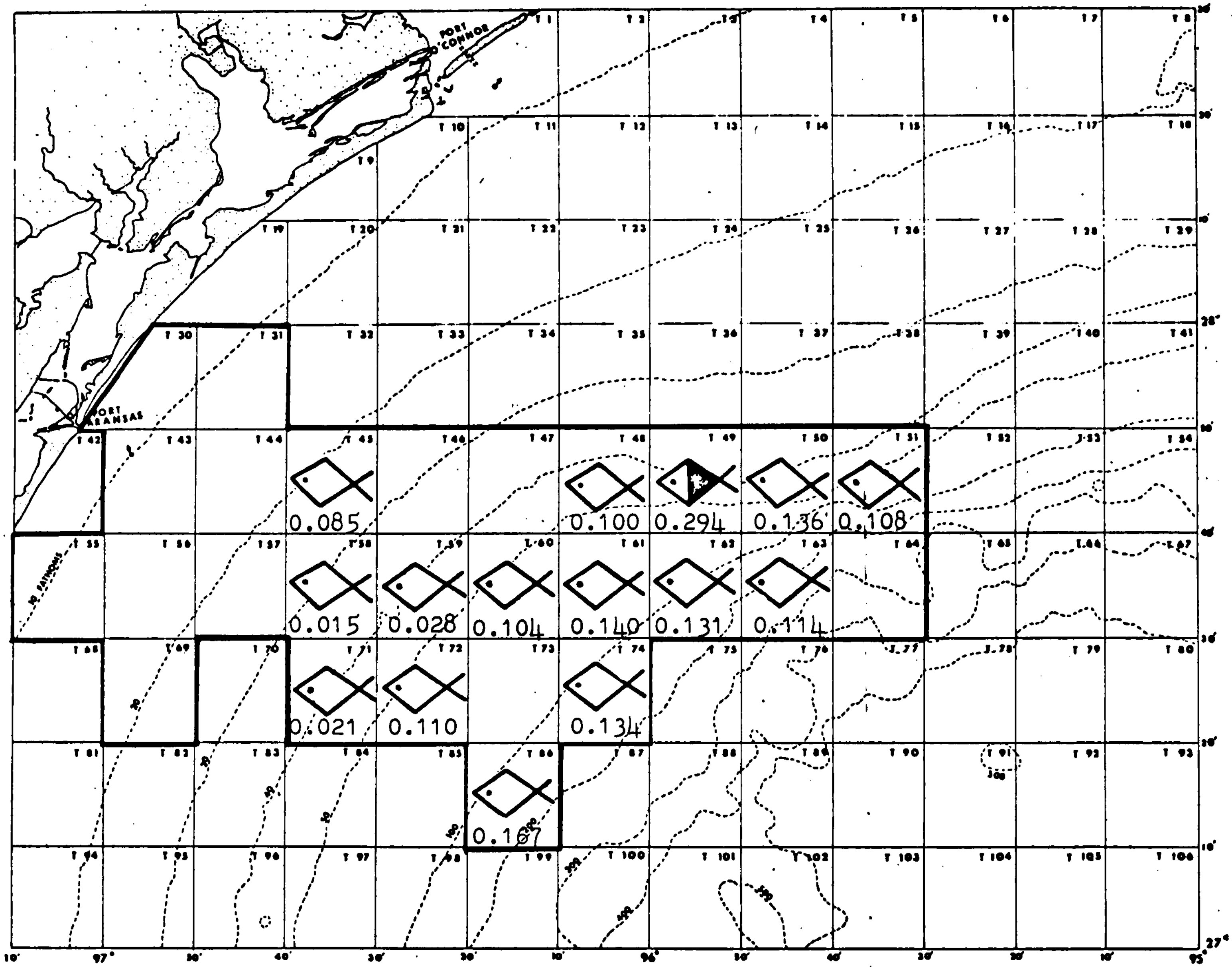


CHART 74-1. RELATIVE ABUNDANCE OF BLUE MARLIN OFF PORT ARANSAS BY TEN-MINUTE SQUARES FOR ENTIRE OF 1974.

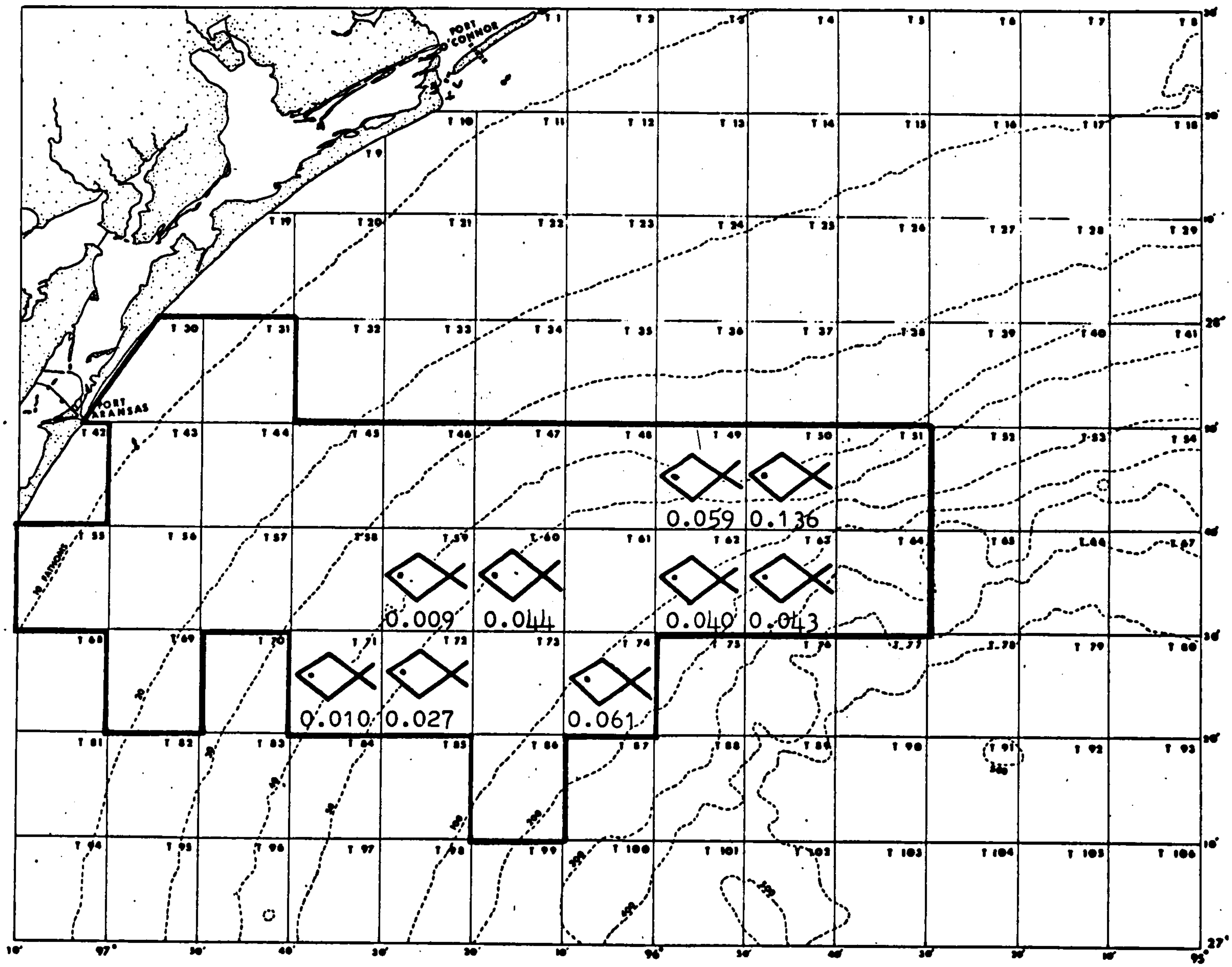


CHART 74-2. RELATIVE ABUNDANCE OF WHITE MARLIN OFF PORT ARANSAS BY TEN-MINUTE SQUARES FOR ENTIRE SEASON OF 1974.

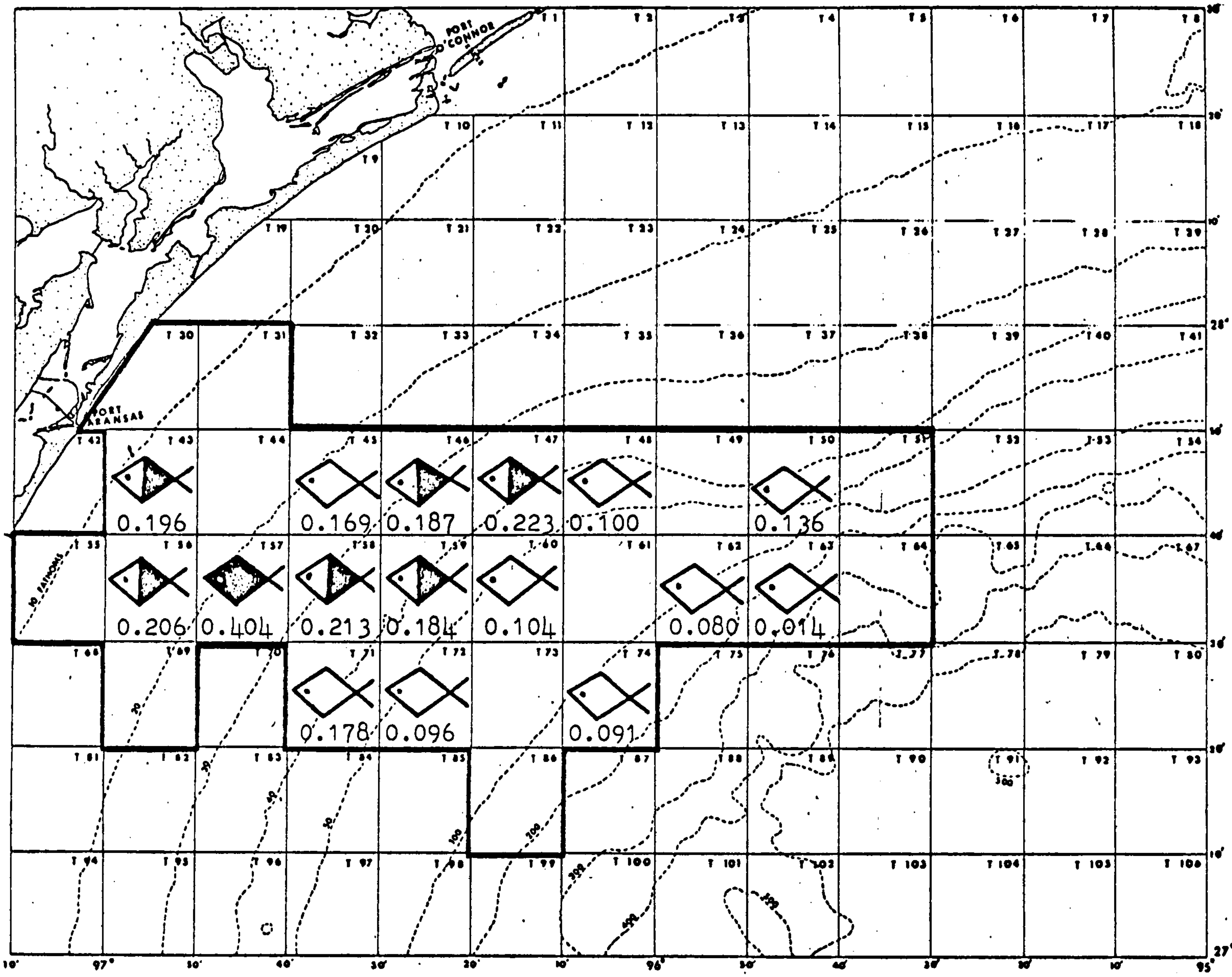


CHART 74-3. RELATIVE ABUNDANCE OF SAILFISH OFF PORT ARANSAS BY TEN-MINUTE SQUARES FOR ENTIRE SEASON OF 1974.

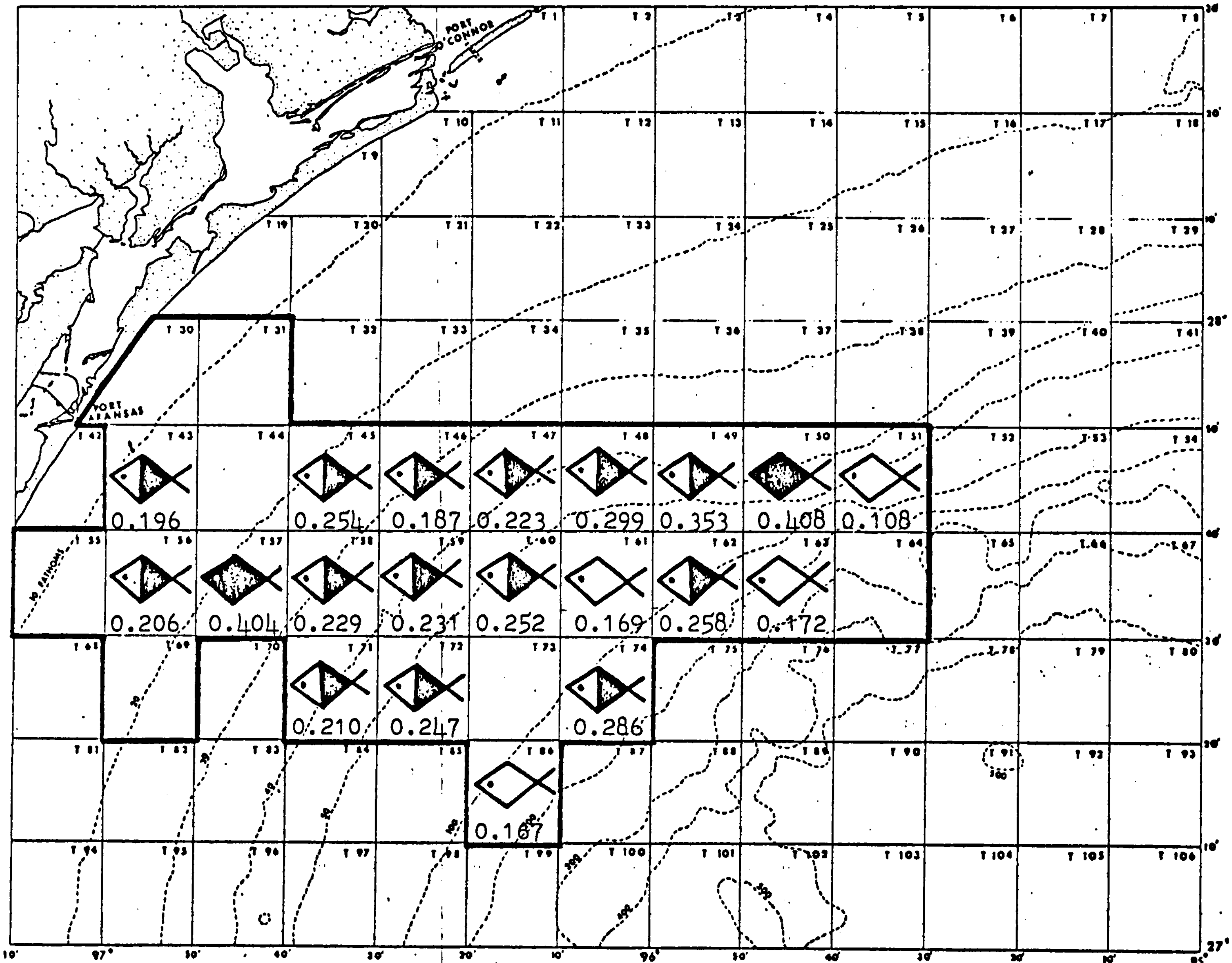


CHART 74-4. RELATIVE ABUNDANCE OF TOTAL BILLFISH OFF PORT ARANSAS BY TEN-MINUTE SQUARES FOR ENTIRE SEASON OF 1974.

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.