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Carolina Power & Light Company

BRUNSWICK STEAM ELECTRIC PLANT
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Summary

The long-term biological program conducted since the conclusion of the intensive Cape Fear studies in 1978 continues to document the lack of any observable impact on the fish and shellfish populations of the Cape Fear estuary as a result of the operation of the BSEP. The completion in mid-1983 of the modifications required by the plant's NPDES permit will further lessen the probability that any impact would be detected.

The majority of the more abundant fish larvae collected in the CFE is spawned offshore, but utilizes various sections of the estuary as primary nursery grounds. These fish, which include the commercially important spot, croaker, flounder, mullet, seatrout, menhaden, and shrimp, pass by the plant on their way to primary nursery areas. Some of these larvae pass through the plant with the plant's cooling water (i.e., they are entrained). The remaining larvae have a chance of growing to become juveniles by reaching the nursery grounds although many more will be flushed from the estuary or die before finding relative safety in the high marsh areas.

Trend analyses of larval densities over the past five years showed an overall increase. Flounder densities showed a general decrease (12%), but this was the result of poor recruitment in 1980; densities in 1981 rebounded to 1977 levels. Menhaden also showed a general decline (12%), but appear to be on the rise with excellent recruitment in 1981. Anchovies showed only a slight decrease. All remaining species showed increases of 1% to 27% over the past five years. These increases are strong evidence that the plant is not interfering with the recruitment of larvae into and distribution throughout the CFE. The flow reduction scheme to be instituted next year will reduce entrainment by an average of 34% and as much as 45% for some winter species. This will further assure that entrainment will not impact the estuary.

Walden Creek is the tidal creek closest to the plant and would in all probability be the first to show signs of reduced juvenile populations if recruitment to it was being affected. High marsh studies, however, showed that Walden Creek is highly productive and even equals or exceeds Baldhead Creek in terms of catch per unit effort (CPUE). The high marsh study also documented the existence of a density gradient that increases toward the headwaters of the creek. Certain species actually distribute themselves preferentially within the creek and even throughout the estuary. Flounder, bay anchovy, and Atlantic croaker in particular utilize the low saline upstream areas well away from the plant.

In 1979-1980, the nekton study showed that the stations in the freshwater drainage canal and the intake canal consistently yielded higher catches. These man-made canals were acting as nursery areas and providing additional areas for juvenile fish production. Those juveniles living in the intake canal, however, were subject to being impinged and in fact contributed to increased impingement during the first few years of plant operations.

During the past few years, a temporary diversion device reduced impingement substantially before its effectiveness was reduced by biofouling and undercutting. The installation of the permanent diversion structure by the end of 1982 should maintain similar reductions throughout the year. Installation of fine mesh screening on the travelling screens should increase survival of these organisms that are being impinged.

The biological monitoring studies continue to show that the larvae of the commercially important offshore spawners are able to enter the estuary, distribute to their preferred nursery grounds, and mature without being affected by plant operations. The completion of the reduced flow modifications and the installation of fine mesh screening and the permanent diversion device should assure that any reduction in Cape Fear stocks is not a result of the BSEP.

1.0 INTRODUCTION

In early January 1981, Carolina Power & Light Company (CP&L) successfully reached a settlement with the North Carolina Division of Environmental Management (DEM) and the U. S. Environmental Protection Agency (EPA) which eliminated the need for construction of cooling towers at the Brunswick Steam Electric Plant (BSEP) near Southport, North Carolina. This settlement culminated over a decade of research by scientists examining many facets of the Cape Fear estuary (CFE) ecosystem.

The four main conditions of the settlement, described in more detail by Hogarth and Nichols (1981), involve three major modifications to the plant's cooling water system. The first is the implementation of a flow reduction scheme that results in a 25% to 45% reduction in the amount of cooling water used by the plant. The 45% reduction occurs during the winter when the intake water temperatures are lowest; conversely, the least reduction occurs in late summer when the water temperatures reach their maxima. Flow reduction will be implemented by throttling or completely securing one or more of the four circulating water intake pumps on each unit. Partial flow reduction was initiated as of June 1, 1981, and full compliance will occur by July 1, 1983.

The second modification involves the installation of a diversion device or fence across the mouth of the intake canal to prevent larger fish and shellfish from entering the canal and being impinged at the plant. The salient features of this device are its construction in a "V" shape that directs organisms away from the canal and the use of 9.4 mm (0.38 in) copper-nickel (Cu-Ni) mesh to reduce biofouling. A preliminary diversion device installed in early 1979 was initially successful in reducing impingement (CP&L 1980a). The structure's failure later in the year was primarily a result of biofouling and undercutting--two problems that were taken into consideration in the design of the new diversion device. This new structure is scheduled to be completed by January 1, 1983, and studies will be conducted to determine its effectiveness.

2.0 REVIEW OF PRIOR STUDIES

The ongoing studies of the Cape Fear estuary with emphasis on the effect of the BSEP once-through circulating water system were initiated as early as 1968. These studies can be divided into three groups, pre-1976, 1976-1978, and post-1978, although some studies may overlap more than one group. The bulk of the data was presented in a multi-volume report entitled the BSEP Cape Fear Studies (CFS). A synthesis of the data of these reports was presented in the Interpretive Report (CP&L 1980b).

2.1 Studies Conducted Prior to 1976

Baseline studies were conducted prior to initial plant operation. These studies examined many different components of the ecosystem (phytoplankton, zooplankton, water chemistry, nekton, benthos, etc.) and were concentrated in the immediate area of the intake and discharge canals. The earliest studies involved water movement within the estuary and were conducted by Dr. J. H. Carpenter (Carpenter 1968). In 1969, Dr. J. E. Hobbie of North Carolina State University (NSCU) began the first biological monitoring of the estuary and described the primary faunal assemblages (Hobbie 1971). In 1971 Dr. B. J. Copeland assumed leadership of the NCSU program. He continued the broad-based reconnaissance of the estuary and coauthored a number of reports on the estuary over the next several years (Copeland and Birkhead 1972, 1973a, 1973b). Dr. R. G. Hodson joined the program and directed studies involving the characterization of the larval and postlarval fish populations (Copeland et al. 1974a, 1974b, 1974c, Copeland and Hodson 1977). During these studies, larval samples were collected every two weeks from the lower Cape Fear estuary at the surface and the bottom over four consecutive tides.

Dr. F. J. Schwartz, University of North Carolina Institute of Marine Science (UNC), initiated studies of the juvenile and adult fishes of the lower Cape Fear estuary in early 1973. Trawl and gill net samples were intensively collected from the lower estuary through-

out the spring and fall and sporadically during the summer and winter (Schwartz 1974, Schwartz et al. 1975).

Carolina Power & Light Company began studies to examine the organisms drawn in with the cooling water and trapped against the traveling screens when the first intake pump was started on January 19, 1974. During the first year, all impinged organisms were counted (CP&L 1974, 1975a). Starting in 1975, impinged organisms were examined over one 24-hour period each week (CP&L 1977b). During the remaining six days, impinged organisms were returned to the estuary.

Entrainment studies were also initiated as soon as the intake pumps began pumping water through the plant. Samples were initially collected at each slack tide (four times) over a 24-hour period each month (Copeland et al. 1975). The interval between sampling dates was later shortened to two weeks (Hodson, Schneider, and Copeland 1977).

Studies on primary productivity of smooth cordgrass *Spartina alterniflora* began in 1973 (Seneca and Stroud 1973). Emphasis was placed on the areas in the immediate vicinity of the intake and discharge canals with an objective of ultimately discerning any impact due to construction or plant operation. This study continued until 1979 with reports issued at the completion of each year's work (Seneca et al. 1974, 1975, 1976, 1977, 1979, 1980).

Additional nekton studies were conducted in Dutchman Creek (Copeland and Birkhead 1973a; Birkhead et al. 1977) and a borrow pit area near the discharge canal (CP&L 1975b, 1977a). Short-term studies were also conducted on sonic tagging (Huish and Benedict 1976), shrimp movement (MacPherson et al. 1976, 1977), swimming speeds of fishes (Rulifson and Huish 1975), and clam biology (Williams 1978). A table listing the reports from these and other studies can be found in the Cape Fear Studies, Interpretive Report (CP&L 1980b).

2.2 The Two-Year Intensive Study, September 1976-August 1978

After the EPA adjudicatory hearing in June 1976, the Cape Fear studies were significantly expanded and modified to focus more precisely on how ocean-spawned larvae entered and utilized the Cape Fear estuary.

The river larval fish program conducted by NCSU was expanded to include 25 stations ranging from the mouth of the river to the vicinity of Wilmington. Replicate samples were collected at the surface and the bottom over four consecutive tides every two weeks. Additionally, intensive sampling was conducted hourly over a 24-hour period at three transects during the periods of peak larval abundance. These and other special studies are described in more detail in Volume VII of the Cape Fear Studies (Copeland et al. 1979).

The nekton studies conducted by UNC were also expanded upriver to include 22 stations. Samples were collected intensively during the spring and fall, with monthly sampling trips the remainder of the year. The data collected in this study are presented in Volumes XIV and XV of the Cape Fear Studies (Schwartz et al. 1979a-g).

A new study involving the utilization of shallow marsh areas by ocean-spawned larvae was conducted by Dr. M. P. Weinstein. Seines and rotenone (a fish toxicant) were used at 17 stations throughout the estuary (Weinstein 1979a). North Carolina State University also conducted studies in the marsh areas of three tidal creeks (Hodson 1979).

Entrainment studies continued to be conducted by NCSU. Replicate samples were collected weekly in the discharge sluiceway at intervals of approximately every three hours over a 24-hour period (Copeland et al. 1979).

Carolina Power & Light Company continued to collect data on impingement according to the same schedule and methodology as used

previously (CP&L 1979d). Carolina Power & Light Company also conducted a Tucker trawl study in the lower river. Larval samples were collected hourly at five depths over a 24-hour period on four separate dates in 19[illegible]ing the period of peak larval recruitment (CP&L 1979e). The tucker trawl study was conducted in spring of 1979 but was included as part of the Cape Fear Studies (CP&L 1980a).

In addition to these studies, Dr. Carpenter conducted further hydrological studies in the Cape Fear River (Carpenter and Yonts 1979). Dr. Weinstein investigated larval movement in the main stem of the river (Weinstein 1979b), and NCSU examined temperature tolerance of spot (Hodson, Fechhelm, and Monroe 1979). Carolina Power & Light Company conducted larval fish studies in the ocean near the discharge area (CP&L 1979c), tidal studies (CP&L 1979a), and thermal studies (CP&L 1979b).

2.3 Studies Conducted After September 1978

At the conclusion of the intensive two-year study, a long-term monitoring program was started by CP&L. This program included reduced river larval fish, nekton, and high marsh studies, while the impingement and entrainment studies remained unchanged. A preliminary report covering data collected during part of 1979 was issued as a supplement to the Cape Fear Studies (CP&L 1980a). A further description of the results from these studies is contained in the remainder of this report.

3.0 LARVAL FISH

3.1 Introduction

3.1.1 River Larval Fish

CP&L has conducted a program to monitor the temporal and spatial distribution of the larval stages of fish, shrimp, and crabs in the CFE since September 1978. Trends in distribution, relative abundance, and growth of larvae moving through the estuary were determined through this study. Study results were compared to data collected by NCSU from October 1976 to September 1978. The NCSU data are reported by Copeland et al. (1979).

The majority of recreationally and commercially important fish larvae captured in the CFE, with the exception of the estuarine-spawned anchovies, is transient. These larvae, spawned offshore, utilize the marshes and creek channels to avoid predation and feed in the high nutrient environment until they reach a size where they are capable of surviving and/or reproducing in the ocean. It is while entering the estuary as larvae and postlarvae, depending mainly on the river currents for transportation, that the greatest number of these organisms was most susceptible to entrainment. By monitoring larval densities in the river above and below the intake area, any impact which may be attributable to plant operation may be detected.

Previous studies have shown two periods of peak abundance of larvae in the CFE (Copeland et al. 1979). One peak occurs from May to September (summer) of each year, consisting mainly of bay anchovies *Anchoa mitchilli*, striped anchovies *A. hepsetus*, weakfish *Cynoscion regalis*, spotted seatrout *C. nebulosus*, and gobies *Gobiosoma* spp. and *Gobionellus* spp. The second peak starts in October and continues through April of each year (winter), consisting of spot *Leiostomus xanthurus*, croaker *Micropogonias undulatus*, southern flounder *Paralichthys lethostigma*, summer flounder *P. dentatus*, a few gulf flounder *P. albigutta*, Atlantic menhaden *Brevoortia tyrannus*, striped mullet *Mugil cephalus*, and white mullet *M. curema*. The three species

of penaeid shrimp overlap these periods of abundance, with brown shrimp *Penaeus aztecus* generally occurring in the late winter to early spring, and white shrimp *P. setiferus* and pink shrimp *P. duorarum* occurring during the summer and into the fall. For reporting purposes, a winter larval fish year will be considered to start in September and end in August, and a summer larval fish year will be considered to start in January and end in December.

Data from September 1978 through May 1979 were reported in the 1979 monitoring report (CP&L 1980a). The current report contains data from June 1979 through August 1981. All tables and figures include the 1976 through 1981 data to allow comparisons among the five years.

3.1.2 Discrete Depth Sampling (Tucker Trawl)

The majority of the larval samples collected as part of the BSEP comprehensive biological studies of the CFE was taken from surface and bottom depths. In 1979 a discrete depth sampling program was initiated to further define larval density distribution by depth (CP&L 1979e). This program was conducted during the peak of larval recruitment into the estuary by the winter spawners and was repeated in the spring of 1981.

3.2 Methods

3.2.1 River Larval Fish Sampling

<u>Program Changes</u>

Several changes have been implemented since the 1979 report. A review of the program showed that sampling effort could be reduced in several ways without losing the ability to see population shifts. These changes, their justification, and the number of sample decrease (if any) were as follows:

Beginning January 1980, only night samples were collected. Greater numbers of organisms were caught at night than during the day (Copeland et al. 1979) (Figure 3.1). This is a result of the larvae moving toward the surface during nighttime and toward the bottom during the daytime. This diurnal migration would make more larvae available to be sampled at night than during the day. Because larger numbers of organisms are collected at night, there was no loss of information concerning seasonality or abundance trends. Collecting samples only at night decreased the number of samples by one half.

Beginning January 1981, station 21 (Intake Canal) and station 27 (Midchannel, near buoy 23) (Figure 3.2) were no longer sampled. Station 21 was dropped because a diversion screen was built across the mouth of the intake canal which would affect populations in the canal. Also, no matter what density of organisms came into the canal, the best indication of the plant effect could be seen in entrainment sampling. Station 27 was excluded because the remaining five mid-channel stations should show spatial and temporal distributions without this station. Dropping these two stations reduced the number of samples by eight each trip.

In 1981, summer samples were reduced by sampling only once a month during June, July, and August. This was done because summer samples are composed mainly of anchovies and gobies. From 1978 to 1981, these species accounted for an average of 66% of all fish collected (Table 3.1). Because of the large numbers collected, little information would be lost by reducing the number of summer samples. This reduction of three trips resulted in 84 less samples per year.

These changes in the sampling program reduced the number of river larval fish samples collected from 1872 to 644, while maintaining the objective of the program.

Station Description

The seven station numbers and locations are the same as described in CP&L (1980a). The river was divided into four areas moving upstream from the mouth, allowing comparisons to be made between different areas. An "*" designates a midchannel station with a water depth of 12 m (40 ft) at mean low water (mlw). Stations were grouped as follows: (Figure 3.2)

Area A - Lower Estuary

Station 11 - Located in Dutchman Creek approximately 1 km (0.6 mi) upstream from its intersection with the Intracoastal Waterway. This is a shallow water station with a mean low water depth of 1 to 2 m (3.3 to 6.6 ft).

Station 18* - Located in the ship channel, south of buoy 15, where the river passes between Battery Island and Southport. This is the closest station to the ocean and the only permanent station in the monitoring program that was not sampled in the NCSU study.

Area B - Mouth of Intake Canal

Station 24 - Located in Walden Creek immediately downstream from the old highway (River Road) bridge. This station is approximately 2.4 km (1.5 mi) upstream from the intersection of the intake canal and the creek. Water depth is 1.5 to 3 m (5 to 10 ft) at mlw.

Station 25* - Located in the river channel north of buoy 19, where the intake canal meets the river channel. Station 25 is approximately 5 km (3.1 mi) from the BSEP intake structure.

Area C - Middle Estuary

Station 37* - Located in the river channel south of buoy 29, about 10.6 km (6.6 mi) upriver from Station 25. At this location, the

Intracoastal Waterway branches off the river channel to the northeast through Snows Cut.

Area D - Upper Estuary

<u>Station 34*</u> - Located in the river channel north of buoy 37, about 17.4 km (10.8 mi) upriver from station 25. The north channel from Snows Cut joins the river channel at this point.

<u>Station 41*</u> - Located in the river channel south of buoy 43, in the vicinity of Campbell Island about 22.5 km (14 mi) upriver from Station 25. This is the uppermost station in the monitoring program.

<u>Sampling Procedure</u>

Surface and bottom samples were collected biweekly in the CFE (Table 3.2). Stations were sampled once during the night. Sampling was begun at least an hour after sunset. To better identify any effects associated with tidal flow, sampling trips were scheduled to sample on alternat tidal directions. Therefore, if the first trip was taken during an ebb tide, the next trip would be taken during a flood tide. This schedule caused trips to be more or less than 14 days apart. The time for a complete sampling trip depended upon the weather and the amount of detritus in the samples, but usually all seven stations were sampled within a 5-hour period. Twenty-eight samples were collected during each trip unless mechanical problems or bad weather prohibited continuation of a trip.

Samples were collected with 505 micron mesh, 1 m (39 in) diameter plankton nets with a 3:1 taper. The surface nets were attached to 80 cm (31.5 in) square frames which were fastened by a pivot to the deck of the boat (Figure 3.3). Two surface nets, one on each side of the boat, were simultaneously fished for five minutes approximately 15 cm (6 in) below the surface of the water to provide replicate samples.

Simultaneous five-minute replicate bottom samples were obtained using a sled on which a frame containing two 505 micron mesh plankton nets was mounted. The nets were attached side by side in 104 cm (40.9 in) high by 51.4 cm (20.23 in) wide openings. The sled kept the nets approximately 15 cm (6 in) above the bottom (Figure 3.3). Further description and performance data of this gear were reported by Hodson et al. (1981). Salinity (ppt) and temperature (°C) measurements were taken from the surface and bottom at each station using a Yellow Springs Instrument Company Model 43TD telethermometer and an American Optical Model 10419 refractometer. Bottom water samples were collected with a 2-liter (0.53 gal) Kemmerer water sampler. Surface water samples were collected in a bucket. All instruments were calibrated on a routine schedule. The volume of water filtered during a tow was determined from General Oceanics Model 2030 flowmeters which were suspended in the mouth of each net. Stations were resampled if there was more than a 2000 revolution difference between the flow meters in replicate nets or if there were less than 3000 revolutions recorded on any meter. Nets were washed after each tow using forced water from a water pump and hose to prevent contamination between stations. Each sample was preserved in approximately 10% formalin in numbered plastic jars.

In the laboratory the preserved samples were washed with water in a 500-micron sieve to remove the formalin. All fish larvae and post-larvae, penaeid shrimp postlarvae, portunid crab megalops, and blue crabs *Callinectes sapidus* were removed using a 3X magnifying lamp or a fluorescent tray illuminator. Organisms were identified to the lowest practical taxon (Table 3.3). Prior to September 1, 1979, lengths for the CP&L monitoring program were recorded using total length (TL). Standard length (SL) has been recorded since that time. To permit length comparisons with previous studies, a conversion equation was used to compute standard length from total length (Table 3.4). Organisms larger than established cutoff lengths (Table 3.5) were omitted from analyses.

Data were coded on standardized forms and entered on computer file. Data were then run through a verification program until all errors were corrected. The data set was then analyzed using Statistical Analysis System (SAS).

Densities were reported as the number of organisms per thousand cubic meters of water. Logarithmic transformations were of the form $y = \log_{10}$ (density + 1) for larval fish data. Mean $\log_{10}$ (density + 1) were plotted for trend analysis and used for ANOVA and Duncan's multiple range test. Mean densities, plotted on a logarithmic scale, were used for seasonal abundance. Further discussion of statistical rationale was reported by Copeland et al. (1979).

To ensure accuracy and consistency in identifying, measuring, and counting organisms, a quality control check was performed on each set of samples. At least 10% of the sorted and identified samples were reprocessed by a technician other than the original processor. A discrepancy greater than 10% in the count or constant errors in identification caused the sample set to be resorted or reidentified. All verifications, records, and data are permanently stored in the BSEP vault as part of the Biology Unit's Quality Assurance Program.

3.2.2 Discrete Depth Sampling

Discrete depth samples were collected by using a half-meter Tucker trawl and a double-trip mechanism, which allowed the net to be opened and closed at a specific depth. The objective of the discrete depth sampling was to determine the vertical distribution of organisms for comparison with entrainment. Sampling was concentrated over a short time span during peak recruitment of the representative finfish species. The 480 samples collected, numbers of organisms present, and objective of the program precluded the use of meter nets as used in the larval fish program.

In 1979 sampling was conducted in the vicinity of buoy 19 (station 25) in the Wilmington Ship Channel (Figure 3.2). Using one

boat, a maximum of 120 five-minute tows were taken on each of four 24-hour sampling periods.

Program Changes

The 1981 program uses the same methodology as the 1979 program, except that a second station was added further upriver. This station (34) was located in the ships channel between bouys 37 and 40 (Figure 3.2). The lower station (25) was retained from the 1979 study. The two stations were sampled at approximately the same time (adjusting for tidal lag) using two separate boats and coordinating efforts between the two.

Sampling Procedure

Each boat was rigged with a half-meter Tucker trawl with a 505μ mesh net and cup which was towed at five depths: 1, 3, 5, 7, and 9 m. The exact sampling depth was calculated with the formula $\cos A = b/h$, where A = tow angle (angle from perpendicular of wire attached to Tucker trawl), b = depth, and h = cable length (Table 3.6). The tow angle was measured with an inclinometer which was attached to the tow cable; cable length was determined by a readout on a snatch block meter wheel (Figure 3.4).

All tows were taken against the tide to ensure proper net alignment. A General Oceanics model 2030 flowmeter was mounted in the mouth of the net to determine the amount of water filtered (Figure 3.5). Salinity (ppt) and temperature (°C) measurements were made prior to the start of each series at all five depths using a Beckman induction salinometer. When the sampling depth was reached, a messenger was sent down the tow cable and the double trip mechanism tripped to open the net (Figure 3.5). The net was towed open for 5 minutes and again the double trip mechanism was tripped by a messenger to close the net and the entire trawl was then raised. Meter readings were taken immediately to determine the number of revolutions recorded. If the reading was less than 3000 revolutions, the sample was retaken.

Nets were washed after each tow using forced water from a water pump and hose to prevent contamination between depths.

A total of 120 five-minute tows (24 per depth) was scheduled at each station on each of the two 24-hour sampling periods: round 1 (March 2-3) and round 2 (March 5-6) of 1981.

In other larval studies in the CFE, day/night and tidal effects, along with their interactions, accounted for a large portion of the observed variability (Copeland, Hodson, and Monroe 1979; Weinstein 1979). For both the 1979 and 1981 programs, day/night, tidal effects, and their interactions were balanced in the sampling design by repeating the depth sampling sequence of 1-9, 9-1, 9-1, 1-9 m (set) six times in each 24-hour period (round) and by starting at a different tidal stage at the beginning of the second 24-hour period. This design, by balancing (and thus negating) the effects of tide and photoperiod, would allow the strongest examination of larval distribution by depth.

The 1979 variables were: round (one 24-hour period), set (depth sampling sequence of 1-9, 9-1, 9-1, 1-9 m), and depth (1, 3, 5, 7, and 9 m). In 1981 each round (24-hour period) was analyzed separately so the variables were changed to: set (4 series, 1-9, 9-1, 9-1, 1-9 m), series (depth sampling sequence of either 1-9 or 9-1), and depth (1, 3, 5, 7, and 9 m). All 1979 data were rerun with the same variables as 1981 data.

All samples were preserved in approximately 10 percent formalin and returned to the laboratory for processing using the same laboratory and Quality Assurance procedures described in 3.2.1.

The density (number/1000m^3) of spot, croaker, flounder, mullet, pinfish, bay anchovy, Atlantic menhaden, and total fish was calculated and then analyzed with a general linear model regression analysis. All data were transformed to $\log_{10}$ (number per 1000m^3 + 1) for analysis.

3.3 Results and Discussion

3.3.1 River Larval Fish Sampling

Hydrography

Temperature

The water temperatures recorded during this reporting period ranged from a low of 3.0°C (37°F) on January 13, 1981, to a high of 30°C (86°F) on July 29, 1980 (Table 3.7). Little difference was observed between stations or surface and bottom readings during each trip (Figure 3.6). This is consistent with previous years (Copeland et al. 1979).

Salinity

Salinity gradients produced by tidal mixing are responsible for the typical circulation in a moderately stratified estuary (Pritchard 1967). This two-layered circulation and subsequent upstream movement of bottom water no[illegible] of the Snows Marsh area was observed in dye tracer studies (Carpenter and Yonts 1979). "It has also been found that, as a result of the impact of salinity and temperature on shrimp growth and behavior, hydrologic conditions in the nursery are a major factor in shrimp survival and population size" (Hunt et al. 1979). Because of the importance of circulation in carrying organisms into the estuary and the behavior of organisms in the estuary responding to changing salinity, surface and bottom salinity data for each station from September 1976 through August 1981 are presented in Figures 3.7 through 3.11. As in the past, bottom salinities were higher than surface salinities, except at station 11 where surface and bottom hydrography are essentially the same because of the shallow depth. Salinities decreased upriver: lowest salinities of 0 ppt were reported at station 41, the uppermost station; highest salinities of 35 ppt were recorded near the mouth of the river at station 18. Periods of low salinity occurred during January, March, and September

of 1979, January and March of 1980, and January and June of 1981, corresponding to periods of heavy rain (Figure 3.12). On September 4 and 5, 1979, Hurricane David passed through North Carolina producing approximately six inches of rain as recorded at the BSEP meteorological tower. This heavy rainfall produced a drop in salinity at all stations during trip 27 (September 11, 1979) (Figure 3.10). The effects of decreases in salinity are discussed later in this report.

Dominant Species

Between September 1978 and August 1981, 105 species of larval fish, shrimp, and crabs were identified from the Cape Fear estuary (Table 3.1). The ten genera analyzed represented 89% of the total mean density of organisms collected during the same period. Anchovies represented 47%; gobies, 20%; croaker, 10%; spot, 5%; shrimp, 4%; menhaden, 1%; and flounder, mullet, and seatrout each less than 1%. Anchovies were included because they spend most of their life in the estuary (Hildebrand and Cable 1930) and are used as food by other species. Gobies were included because of the large numbers collected.

Temporal Distribution of Larvae

The seasonal occurrence of larval fish in the Cape Fear estuary from June 1979 through August 1981 was consistent with previous years.

Croaker larvae/postlarvae were collected in the estuary from the beginning of September until early May. Several periods of peak abundance were seen during this time. Mean densities were $266/1000m^3$ in 1979, $377/1000m^3$ in 1980, and $271/1000m^3$ in 1981 (Figure 3.13).

Flounder larvae/postlarvae, which includes three species--southern, summer, and gulf--were seen as early as December. The main recruitment was from the middle of January until late March and early April. Mean densities were $57/1000m^3$ in 1979, $5/1000m^3$ in 1980, and $14/1000m^3$ in 1981 (Figure 3.14).

Spot larvae/postlarvae first appeared near the end of December and were collected until the middle of May. Mean densities were 199/1000m^3 in 1979, 175/1000m^3 in 1980, and 160/1000m^3 in 1981 (Figure 3.15).

Mullet larvae/postlarvae, which included both striped and white mullet, were collected from the end of December until the middle of April. Mean densities were 19/1000m^3 in 1979, 3/1000m^3 in 1980, and 13/1000m^3 in 1981 (Figure 3.16).

Menhaden larvae/postarvae were collected from the middle of December until the end of May, but the peak abundance was from February through April. Mean densities were 57/1000m^3 in 1979, 16/1000m^3 in 1980, and 141/1000m^3 in 1981 (Figure 3.17).

Seatrout larvae/postlarvae, which included weakfish and spotted seatrout, appeared from May until the middle of October. Mean densities were 25/1000m^3 in 1979, 28/1000m^3 in 1980, and 44/1000m^3 in 1981 (Figure 3.18).

Anchovy larvae/postlarvae, which included both bay and striped anchovies, were most abundant from May until August, but were collected throughout the year. Mean densities were 1.34 X 10^3/1000m^3 in 1979, 3.25 X 10^3/ 1000m^3 in 1980, and 1.45 X 10^3/1000m^3 in 1981 (Figure 3.19).

Shrimp included all three penaeid species: brown, pink, and white shrimp. Brown shrimp postlarvae were collected from February until May. Pink and white shrimp larvae entered the estuary in May and were collected until December. Mean densities for brown shrimp were 35/ 1000m^3 in [illegible] 26/1000m^3 in 1980, and 29/1000m^3 in 1981 (Figure 3.20). Mean densities for pink and white shrimp were 193/1000^3 in 1979, 236/1000m^3 in 1980, and 126/1000m^3 in 1981.

Although the mean density of postlarval brown shrimp in 1981 was greater than the mean density of postlarval brown shrimp in 1980, there was considerable difference in the survival of these two cohorts.

As seen in Figure 3.20, the 1981 spawn was earlier than the 1980 spawn. Large numbers of larvae were in the estuary in early March 1981, probably due to the warmer water temperatures and higher salinities. Hunt et al. (1979) showed temperature and salinity greatly influenced brown shrimp harvest. But in contrast to 1980 when both salinity, temperature, and shrimp mean density showed a steady rise during April, the 1981 hydrography data indicated steep drops in temperature (3/23/81) and salinity (4/3/81) (Figures 3.6 and 3.7-3.11). This caused a severe drop in post larval shrimp mean density in April which never recovered. The 1981 commercial catch of brown shrimp in North Carolina was indicative of how severe [illegible] larval mortality was. The total catch for the entire year was approximately 1.5 million pounds. This compares with a 25-year average [illegible] million pounds per year. The decreased 1981 catch was even more noticeable because the previous year (1980) was a near record 9 million pounds. (UNC Seagrant, August 1981).

Goby larvae and postlarvae included both *Gobiosoma* spp. and *Gobionellus* spp. *Gobiosoma* spp. were most abundant from late April through October. Mean densities were 672/1000m^3 in 1979, 693/1000m^3 in 1980, and 1.44 X 10^3/1000m^3 in 1981 (Figure 3.21). *Gobionellus* spp. were most abundant from mid-March through November. Mean densities were 9/1000m^3 in 1979, 8/1000m^3 in 1980, and 9/1000m^3 in 1981 (Figure 3.22).

The mean density of all fish collected in 1981, 1.33 X 10^3/1000m^3, represented a 51% decrease over the total fish density seen in the Cape Fear River in 1980 (Figure 3.23). This was due largely to the decreased numbers of anchovies collected during the summer of 1981. Long-term trends are presented later in this report.

Spatial Distribution

As stated earlier, larvae utilize the net upstream movement of the bottom layer of water to move and retain their position upstream. This behavior, in addition to the benthic tendencies of such species

as spot, croaker, flounder, and seatrout, was indicated by the larger numbers of these larvae captured with the bottom nets than with the surface nets (Figure 3.24). Larvae of surface feeding fish such as menhaden and mullet have historically been collected in larger numbers with the surface nets (Figure 3.25).

Looking at the analyses of variance of larval fish (Tables 3.8 through 3.10), three observations can be made. One is the appearance of large numbers of croaker upstream in areas 'C' and 'D'. The other species tend to be found in more saline water, downriver in areas 'A' and 'B', with station 11 (Dutchman Creek) having the greatest densities of larvae (Table 3.10). The second observation is that of steep declines in density in area 'D'. As stated earlier, this is a reaction of larvae to decreased salinity produced by freshwater runoff. An example of this behavior occurred in March 1980 when zero salinities were recorded at the upriver stations, 34 and 41 (Figure 3.10). This caused a steep decline in croaker densities in area 'D' as seen in Figure 3.26. At the same time an increase in density occurred in area 'C' indicating the larvae were "pushed" down the river by the lower salinities. Spot and menhaden exhibited the same behavior.

These movements of larvae in response to salinity seem to indicate that the distribution of larvae in the estuary is affected more by salinity than by water withdrawn by the BSEP.

Length Frequency

Duncan's multiple range test was used to analyze mean lengths of fish collected in the mid-channel stations between September 1980 and August 1981 (Table 3.11).

As expected, smaller larvae were collected during the beginning of their respective recruitment periods and increased in size with time.

Another discernible pattern seen in Table 3.11 is the occurrence of larger larvae in the upriver stations. This is expected since the larvae were growing as they entered the estuary, moved upriver, and established residence there.

Duncan's multiple range comparisons of stations over the past five years (Tables 3.8 through 3.10) indicate that the BSEP is not measurably or observably preventing larvae from passing through, and congregating in, Walden Creek (station 24). During the past five years, flounder, spot, mullet, and brown shrimp densities have not been significantly different between Walden Creek and Dutchman Creek (station 11), but these two stations had significantly higher densities for these species than other stations. Total fish densities during the last five years have not been significantly different in Walden Creek than from station 18 downriver or station 25, in the river channel near the intake canal.

This information, with the upriver density data previously discussed shows larvae entered the estuary, moved up the river past the plant, and as in the case of croaker, utilized the upriver areas in significant numbers. This would seem to indicate that any impact to larval populations would be limited to the area of the intake canal and does not affect the main channel movement of larvae to upriver nursery areas.

Trend Analysis 1977-1981

Density plots (mean $\log_{10}$ [density + 1], all stations inclusive) for the 11 analysis species and total organisms collected from September 1976 through August 1981 are presented in Figures 3.27 through 3.38. This was done only to assess overall increases or decreases for the five-year period. Table 3.12 summarizes these analyses and includes the percent change per year for each species. All trends discussed below compare data from September 1976 through August 1981 (larval years 1977-1981).

There are only four yearly values plotted for the summer species (anchovies [Figure 3.27], *Gobiosoma* spp. [Figure 3.28], pink and white shrimp [Figure 3.29], and seatrout [Figure 3.30]). The 1978 summer samples were not analyzed because they had deteriorated. These samples had been stored outside in uninsulated sheds for over a year, because of a backlog of the large number samples collected by NCSU from 1976 to 1978.

Croaker larvae showed an overall increase between September 1976 and August 1981 (Figure 3.31). 1980 densities were the lowest during that time (Table 3.8). The mean density during the five years was $267/1000m^3$.

Brown shrimp have shown considerable yearly variation caused primarily by freshwater flow during March and April. Greatest densities occurred in 1979 and lowest densities in 1978. There has been an overall increase in brown shrimp larvae during the past five years with a mean density of $25/1000m^3$ (Figure 3.32). As reported earlier, however, brown shrimp larvae are highly sensitive to changes in salinity and water temperature. Because of this, mean densities of larvae do not reflect the mortality rate which can occur when larvae from the ocean enter areas subject to acute changes in temperature and salinity.

Pink and white shrimp densities indicate only a slight increase overall, but 1980 densities were significantly higher than other years and 1981 was lower (Figure 3.29). The mean density for this five-year period was $172/1000m^3$.

Spot have a five-year mean density of $184/1000m^3$. Like pink and white shrimp, Figure 3.33 shows a linear regression with little slope, although 1980 densities were significantly higher than other years (Table 3.8).

Mullet mean density for the five-year period was only $9/1000m^3$ with an overall increase shown (Figure 3.34). Analysis indicates 1979 and 1981 densities were significantly higher than other years (Table 3.8).

Flounder densities showed considerable variation during the five-year period, with a mean density of $27/1000m^3$ (Figure 3.35). Analysis indicates an overall decrease over the years, with 1980 densities significantly lower than other years (Table 3.8).

Menhaden mean densities also indicate an overall decrease over the years (Figure 3.36). The mean density for the period was $73/1000m^3$.

Gobionellus spp. showed considerable variation during the five-year period, with a mean density of $8/1000m^3$ (Figure 3.37). There was an overall increase in density with 1981 being significantly higher than previous years (Table 3.9).

The mean density for all fish collected during the past five years was $1.62 \times 10^3/1000m^3$. 1980 densities were significantly higher, attributable to the large number of anchovies collected that year (Table 3.10). Trend analysis indicates an increase of total larval fish densities in the Cape Fear River during the past five years (Figure 3.38). This would seem to negate the idea that the operation of the BSEP is having a detrimental effect on population densities by reducing future reproduction stock.

3.3.2 Discrete Depth Sampling

Hydrography

Temperature

There were no adverse weather conditions or excessive rains prior to or during the 1981 sampling period.

Water temperature averages ranged from a high of 12.3°C to a low of 10.2°C at station 25. At station 34 averages ranged from a high of 12.4°C to a low of 10.5°C (Figure 3.39). Water temperatures were generally higher on the surface and lower on the bottom.

Salinity

Salinity averages ranged from a low of 18.6 ppt to a high of 26.0 ppt at station 25. At station 34 salinity averages ranged from a low of 8.6 ppt to a high of 16.8 ppt. The lowest salinities were recorded at the surface (1 m) near low tide while the highest salinities were recorded at 9 m near high tide (Figure 3.40). Due to the almost identical averages of salinity at all five depths (1, 3, 5, 7, and 9 m) on round 2 (March 5-6, day), a temporary instrument malfunction is suspected. Most individual data sheets for that period only show a 0.3 (ppt) difference between surface and bottom, and this is an improbable condition over different tide stages.

Densities

Overall densities in 1981 were substantially lower than in 1979 (Table 3.13). All species showed lower densities with total fish 28.8% lower at station 25 and 29.9% lower at station 34 than in 1979. Croaker was the only fish collected in any substantial numbers, and their density was still only 27% of 1979 density at station 25 and 50.4% of that at station 34. The higher numbers at station 34 indicates recruitment may have stopped earlier in 1981 and the fish were already moving to areas of lower salinity. While the distributions discussed below were statistically significant, the low sample sizes (relative to the 1979 study) make drawing conclusions tenuous.

Figures 3.41 through 3.48 show larval densities during the 1981 study, and changes in the densities from tidal and photoperiod influences.

The 1979 data showed there was a significant difference between depths on all rounds at station 25 for bay anchovy with larger densities at the lower depths (Table 3.14). In comparison, the 1981 data showed no clear distribution pattern at station 25 on either round (Table 3.15). There was a significant difference at station 34 on both rounds, with larger densities at the lower depths (Figure 3.41).

Croaker showed the same trends for depth in 1981 as in 1979 (Tables 3.14 and 3.15). There was a significant difference at both stations on both rounds in 1981 and for all trips at station 25 in 1979 with the larger densities being at ., 9, and 5 meters but not always in that order (Figure 3.42). Although croaker densities were lower in 1981 than in 1979, they were still the highest of all analyzed and were the dominant species.

Flounder showed the same trends for depth in 1981 as in 1979 (Tables 3.14 and 3.15). All stations and rounds showed a significant difference for depth with larger densities at 9 and 7 m respectively, except station 34, round 2 (7 and 9 m) and station 25, round 2 (9 and 5 m) (Figure 3.43).

Menhaden had extremely low densities in 1979 and were even lower in 1981 (Tables 3.14 and 3.15). Consequently, any statistically significant trends may result more from these low numbers than from real biological patterns. Round 1, station 25, 1979 shows no significant difference in depth, but rounds 2, 3, and 4 show differences by depth. Depths 5 and 7 m showed higher densities on rounds 2 and 3, and 9 and 7 m being higher on round 4. This may result from round 4 having extremely low salinities because of excessively high rains just prior to that round. 1981 data shows no significant difference in depth at station 25, round 1 and station 34, round 2, but there was a significant difference at station 25, round 2 and station 34, round 1. The highest densities were at 7, 9, and 5 m respectively at station 34, and 9, 5, and 7 m respectively at station 25 (Figure 3.44). Again, it must be emphasized that these observations were made on very low density numbers.

The 1979 data for mullet showed a significant difference among depths with 7, 9, and 5 m, showing the highest densities but not necessarily in that order (Figure 3.45). Although mullet were analyzed in 1979, these were also very low numbers and 1981 data show only 2.1% and 2.2% of that density at stations 25 and 34 respectively (Tables 3.13). The 1981 data shows no significant difference in depth

at any station or round, but the extremely low numbers probably make this observation meaningless (Tables 3.14 and 3.15).

1981 data shows no significant difference among depth for pinfish at either station or round as did 1979 data except for station 25, round 2 showing a significant difference (Tables 3.14 and 3.15). The highest densities were at 5, 7, and 9 m respectively (Figure 3.46).

1979 spot data showed a significant difference in depth on all rounds, except round 3, with the highest densities at the lower depths (Tables 3.14). 1981 data was virtually the same as 1979, except that round 1, station 25, was the only one that was not significantly different (Table 3.15). The highest densities were at 5, 7, and 9 m, but not necessarily in that order (Figure 3.47). As with the other fish, the density numbers were substantially lower for 1981 with station 25 showing only 13.8% and station 34 only 8.9% of the 1979 data (Table 3.13).

In both years significant differences were found among depth for total fish (Tables 3.14 and 3.15). The trend for all species analyzed was for densities to be highest near the bottom of the channel (9 and 7 m) but not necessarily the bottom (Figure 3.48).

Interactions

The analysis shows that set-by-depth interactions for 1981 were significant for spot and croaker on all rounds (Table 3.15). This was true also for total fish, but again this was probably due to the fact that croaker density numbers were the highest and probably weighted the results.

Mullet showed no significant difference in set-by-depth interactions on any round in 1981 (Table 3.15).

Bay anchovy showed a significant difference in set-by-depth interactions on both rounds at station 25 and on round 1 at station 34

in 1981 but showed no significant difference on round 2 at station 34 (Table 3.15).

Flounder, menhaden, and pinfish showed no definite trends in set-by-depth interactions at all in 1981. In some cases there was a significant difference and in others there was none. This again was probably due to low numbers in the 1981 data (Table 3.15).

Vertical Distribution

As in 1979, the vertical distribution curves for 1981 showed different trends for day and night. Maximum densities generally occur at the lower depths during the day, with larvae moving up in the water column at night (Figures 3.41 through 3.48). Larvae densities tend to be more evenly distributed at night when river larval monitoring is being conducted.

The 1979 analysis showed that round-by-depth interactions were significant for spot and croaker and that their vertical distribution was different on round 4 than it was on the other rounds (Table 3.14). High freshwater flow occurred on round 4 which considerably reduced the salinity in the study area. There was little change in the vertical distribution of the other species despite the influence of high freshwater flow.

Behaviorial Model

Although the 1981 program was designed to balance (i.e., negate) day/night and tide stage effects, statistical analyses showed significant effects of both these variables on larval densities. Because of these interactions, a behavioral model was developed in addition to the general linear model (regression) discussed above. Variables were changed to show day/night and tidal influence, as well as depth, and included period (day/night), tide (8 stages), and depth (1, 3, 5, 7, and 9 m) (Table 3.16).

The model shows that there is a significant difference in period for both rounds at both stations (25 and 34) for both bay anchovy and croaker and also total fish, with night greater than day.

It also showed that there was no significant difference between periods on either round at station 34 for menhaden, mullet, and pinfish. The opposite was true at station 25 as it showed there was a significant difference between periods for mullet and pinfish on both rounds and on round 2 for menhaden with night again showing larger densities. Flounder and spot showed no trends. Again, it must be mentioned that this model is also based on low numbers.

The data also show that there was a significant difference between tides for all 7 species and total fish analyzed on round 1, station 25. The data showed the same results on round 2, station 25, except that flounder and mullet showed no significant difference among tides.

Further upriver at station 34, the pattern changes somewhat with only flounder and mullet showing a significant difference between tide stages on round 1. The other 5 species and total fish showed no significant difference between tide stages. Round 2 data were different with bay anchovy, croaker, flounder, and total fish showing a significant difference between tide stages. The other 4 species (menhaden, mullet, pinfish, and spot) showed no significant difference between tide stages. In most cases, where there was a significant difference, tide stages 8, 1, and 2 (HS, HO, and MO) showed the largest densities. This observation may in actuality be misleading. Prior to and during the 1982 studies which were conducted in late February and early March 1982, there was an approximate 20-30 minute discrepancy between tide table correction factors being used in prior years and the actual tide times at station 25 (bouy 19). The actual tide stages were occurring later than the correction table indicated. This condition was magnified even more so further upriver at station 34. The actual lag time there at low tide was approximately 1 hour and 20 minutes. If this was also true in 1981, the actual tide stages would, in most cases, be

shifted back one tide stage. In other words, instead of tide stages 8, 1, and 2 showing the highest densities, they in actuality would be tide stages 7, 8, and 1. This observation would be more in line with the accepted theory that, as transients, the larvae rely on ... er currents for transportation upriver. If on the other hand the highest densities were on the tide stages of high in, high slack, and high out, the larvae would not be going very far, as the in and out would virtually nullify each other, and the slack is standing still.

The 1982 sampling program was set up and conducted on a corrected tide schedule and by actual observation of the tides. Further tide studies are planned to get a better idea as to how accurate these observations were and adjust all sampling schedules accordingly.

3.4 Summary

3.4.1 River Larval Fish Sampling

Collection of larval and postlarval stages of fish, shrimp, and crabs in the CFE has been continued by CP&L. These data are used to monitor the temporal and spatial distribution of larvae in the CFE. Trends in distribution, relative abundance, and size of the larvae can be observed by comparing data from previous years.

Ten different genera of larval and postlarval fish and shrimp were chosen for analyses because of their recreational and/or commercial value. Of these, anchovies (two species), pink and white shrimp, seatrout (two species), and *Gobiosoma* spp. (two species) occur during the summer (May to September); spot, croaker, flounder (three species), menhaden, mullet (two species), and brown shrimp occur during the winter (December to April). *Gobionellus* spp. (three species) overlapped these periods. These twenty species accounted for approximately 80 percent of the total number collected during 1981. This was consistent with previous years.

The appearance and duration of species seen in the CFE in 1981 was consistent with previous years.

Heavy freshwater flow down the Cape Fear River caused by rainfall runoff produced variable salinity readings between stations and surface to bottom readings at each station. Low salinity upriver will cause larvae to be concentrated downriver. This appears to be the most important factor affecting river larval fish densities and abundance.

Croaker, spot, *Gobiosoma* spp., anchovies, pink and white shrimp 1981 densities were less than 1980 densities while mullet, flounder, menhaden, *Gobionellus* spp., brown shrimp, and seatrout densities were greater in 1981 than 1980.

Density trends for river larval species between 1976 and 1981 show all species except menhaden and flounder to be increasing.

Growth, abundance, and movement of larvae through the Cape Fear River estuary have not been adversely affected by operation of the BSEP.

3.4.2 Discrete Depth Sampling

Discrete depth sampling was expanded in 1981 to include both downriver and upriver stations (25 and 34). The program, while designed to balance out day/night and tidal effects, showed strong effects from both these variables, and so both the experimental model and a behavioral model were used to analyze data. Densities in 1981 were much smaller than those in 1979 (approximately 29% of the 1979 densities). While several comparisons were statistically significant, many of these were felt to be a result of the small densities and were considered dubious.

In general, the study showed vertical distribution curves of bay anchovy, menhaden, mullet, pinfish and spot larval to be quadratic, that is, concentrated near, but not on the bottom. Bay anchovy and

spot deviate from this at night and have the highest densities near the surface. Flounder and croaker are mostly linear with their maximum densities on the bottom and minimum densities at the surface.

The data illustrate that most species are more abundant in the bottom half of the water column. Because of this, they are able to move upstream with the net nontidal drift in the lower layer.

TABLE 3.1 MEAN DENSITY (NUMBER PER 1000 CUBIC METERS) AND PERCENT TOTAL OF FISH, PENAEID SHRIMP AND CRABS COLLECTED IN THE CAPE FEAR RIVER, SEPTEMBER 1978 TO AUGUST 1981.

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	SEP 78 - AUG 79 DENSITY	SEP 78 - AUG 79 %	SEP 79 - AUG 80 DENSITY	SEP 79 - AUG 80 %	SEP 80 - AUG 81 DENSITY	SEP 80 - AUG 81 %
ELOPIDAE	TARPONS	*	*	*	*	*	*
ELOPS SAURUS	LADYFISH	0.024	0.00	0.014	0.00	0.071	0.00
ELOPS SAURUS(LEPTOCEPHALUS)	LADYFISH(LEPTOCEPHALUS)	0.483	0.03	0.180	0.01	0.754	0.05
MEGALOPS ATLANTICUS	TARPON	0.017	0.00	0.094	0.00	0.000	0.00
MEGALOPS ATLANTICUS(LEPTOCEPHA	TARPON(LEPTOCEPHALUS)	0.009	0.00	0.089	0.00	0.000	0.00
ANGUILLIDAE	FRESHWATER EELS	*	*	*	*	*	*
ANGUILLA ROSTRATA	AMERICAN EEL	0.786	0.05	0.648	0.02	1.187	0.08
CONGRIDAE	CONGER EELS	*	*	*	*	*	*
CONGER OCEANICUS	CONGER EEL	0.006	0.00	0.000	0.00	0.017	0.00
OPHICHTHIDAE	SNAKE EELS	*	*	*	*	*	*
MYROPHIS PUNCTATUS	SPECKLED WORM EEL	0.203	0.01	0.724	0.02	0.402	0.03
MYROPHIS PUNCTATUS(LEPTOCEPHAL	SPECKLED WORM EEL(LEPTO.)	0.398	0.03	2.837	0.09	7.331	0.47
OPHICHTHUS GOMESI	SHRIMP EEL	0.080	0.01	0.106	0.00	0.029	0.00
OPHICHTHUS OCELLATUS	PALESPOTTED EEL	0.000	0.00	0.000	0.00	0.000	0.00
CLUPEIDAE	HERRINGS	0.000	0.00	0.209	0.01	0.009	0.00
ALOSA SP.	SHAD UNID.(ALOSA)	0.030	0.00	0.006	0.00	0.060	0.00
ALOSA AESTIVALIS	BLUEBACK HERRING	0.005	0.00	0.006	0.00	0.000	0.00
ALOSA SAPIDISSIMA	AMERICAN SHAD	0.000	0.00	0.000	0.00	0.000	0.00
BREVOORTIA TYRANNUS	ATLANTIC MENHADEN	13.850	0.92	4.098	0.13	37.780	2.42
OPISTHONEMA OGLINUM	ATLANTIC THREAD HERRING	0.000	0.00	0.008	0.00	0.000	0.00
ENGRAULIDAE	ANCHOVIES	*	*	*	*	*	*
ANCHOA SP.	ANCHOVY UNID.(ANCHOA)	311.449	20.74	996.612	32.57	288.497	18.47
ANCHOA HEPSETUS	STRIPED ANCHOVY	9.193	0.61	32.091	1.05	9.047	0.58
ANCHOA MITCHILLI	BAY ANCHOVY	335.211	22.32	913.456	29.85	218.547	13.99
SYNODONTIDAE	LIZARDFISHES	*	*	*	*	*	*
SYNODUS FOETENS	INSHORE LIZARDFISH	0.149	0.01	0.100	0.00	0.104	0.01
CYPRINIDAE	CARPS AND MINNOWS	0.006	0.00	0.000	0.00	0.000	0.00
CYPRINUS CARPIO	COMMON CARP	0.046	0.00	1.257	0.04	0.000	0.00
APHREDODERIDAE	PIRATE PERCHES	*	*	*	*	*	*
APHREDODERUS SAYANUS	PIRATE PERCH	0.000	0.00	0.051	0.00	0.000	0.00
BATRACHOIDIDAE	TOADFISHES	*	*	*	*	*	*
OPSANUS TAU	OYSTER TOADFISH	0.021	0.00	0.032	0.00	0.000	0.00
GOBIESOCIDAE	CLINGFISHES	*	*	*	*	*	*
GOBIESOX STRUMOSUS	SKILLETFISH	0.824	0.05	2.135	0.07	4.742	0.30
LOPHIIDAE	GOOSEFISHES	*	*	*	*	*	*
LOPHIUS AMERICANUS	GOOSEFISH	0.000	0.00	0.007	0.00	0.000	0.00
GADIDAE	CODFISHES	0.000	0.00	0.000	0.00	0.000	0.00
UROPHYCIS FLORIDANA	SOUTHERN HAKE	0.000	0.00	0.000	0.00	0.000	0.00
UROPHYCIS REGIA	SPOTTED HAKE	0.004	0.00	0.000	0.00	0.006	0.00
OPHIDIIDAE	CUSK-EELS	0.000	0.00	0.021	0.00	0.000	0.00
OPHIDION WELSHI	CRESTED CUSK-EEL	0.000	0.00	0.000	0.00	0.000	0.00

TABLE 3.1 (CONTINUED).

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	SEP 78 - AUG 79 DENSITY	%	SEP 79 - AUG 80 DENSITY	%	SEP 80 - AUG 81 DENSITY	%
EXOCOETIDAE	FLYINGFISHES	*	*	*	*	*	*
HYPORHAMPHUS UNIFASCIATUS	HALFBEAK	0.000	0.00	0.104	0.00	0.020	0.00
BELONIDAE	NEEDLEFISHES	*	*	*	*	*	*
STRONGYLURA MARINA	ATLANTIC NEEDLEFISH	0.013	0.00	0.000	0.00	0.007	0.00
CYPRINODONTIDAE	KILLIFISHES	0.014	0.00	0.047	0.00	0.006	0.00
FUNDULUS HETEROCLITUS	MUMMICHOG	0.000	0.00	0.026	0.00	0.009	0.00
ATHERINIDAE	SILVERSIDES	56.333	3.75	11.177	0.37	24.597	1.57
MEMBRAS MARTINICA	ROUGH SILVERSIDE	0.005	0.00	0.049	0.00	0.000	0.00
MENIDIA BERYLLINA	INLAND SILVERSIDE	0.000	0.00	0.000	0.00	0.000	0.00
MENIDIA MENIDIA	ATLANTIC SILVERSIDE	0.031	0.00	0.000	0.00	0.000	0.00
SYNGNATHIDAE	PIPEFISHES	*	*	*	*	*	*
HIPPOCAMPUS ERECTUS	LINED SEAHORSE	0.000	0.00	0.000	0.00	0.016	0.00
SYNGNATHUS SP.	PIPEFISH UNID.(SYNGNATHUS)	0.047	0.00	0.034	0.00	0.930	0.06
SYNGNATHUS FUSCUS	NORTHERN PIPEFISH	0.338	0.02	0.337	0.01	1.098	0.07
SYNGNATHUS LOUISIANAE	CHAIN PIPEFISH	0.241	0.02	0.706	0.02	0.864	0.06
PERCICHTHYIDAE	TEMPERATE BASSES	*	*	*	*	*	*
MORONE SP.	TEMPERATE BASS UNID.(MORONE)	0.000	0.00	0.006	0.00	0.006	0.00
SERRANIDAE	SEA BASSES	0.000	0.00	0.000	0.00	0.107	0.01
EPINEPHELUS SP.	GROUPER UNID.(EPINEPHELUS)	0.008	0.00	0.900	0.00	0.000	0.00
MYCTEROPERCA SP.(LARVAE)	GROUPER LARVAE(MYCTEROPERCA)	0.013	0.00	0.000	0.00	0.000	0.00
CENTRARCHIDAE	SUNFISHES	*	*	*	*	*	*
LEPOMIS SP.	SUNFISH UNID.(LEPOMIS)	0.010	0.00	0.000	0.00	0.000	0.00
LEPOMIS GULOSUS	WARMOUTH	0.007	0.00	0.000	0.00	0.000	0.00
PERCIDAE	PERCHES	0.000	0.00	0.019	0.00	0.000	0.00
ETHEOSTOMA SP.	DARTER UNID.(ETHEOSTOMA)	0.000	0.00	0.007	0.00	0.000	0.00
PERCA FLAVESCENS	YELLOW PERCH	0.011	0.00	0.000	0.00	0.000	0.00
POMATOMIDAE	BLUEFISHES	*	*	*	*	*	*
POMATOMUS SALTATRIX	BLUEFISH	0.000	0.00	0.000	0.00	0.000	0.00
CARANGIDAE	JACKS	0.228	0.02	0.370	0.01	0.375	0.02
CARANX CRYSOS	BLUE RUNNER	0.009	0.00	0.000	0.00	0.000	0.00
CARANX HIPPOS	CREVALLE JACK	0.000	0.00	0.000	0.00	0.000	0.00
CHLOROSCOMBRUS CHRYSURUS	ATLANTIC BUMPER	0.060	0.00	0.038	0.00	0.083	0.01
SELENE VOMER	LOOKDOWN	0.000	0.00	0.000	0.00	0.000	0.00
TRACHINOTUS FALCATUS	PERMIT	0.000	0.00	0.008	0.00	0.000	0.00
LUTJANIDAE	SNAPPERS	0.005	0.00	0.000	0.00	0.000	0.00
LUTJANUS GRISEUS	GRAY SNAPPER	0.021	0.00	0.031	0.00	0.015	0.00
GERREIDAE	MOJARRAS	0.019	0.00	0.230	0.01	0.212	0.01
EUCINOSTOMUS SP.	MOJARRA UNID.(EUCINOSTOMUS)	0.160	0.01	0.197	0.01	0.000	0.00
EUCINOSTOMUS ARGENTEUS	SPOTFIN MOJARRA	0.000	0.00	0.000	0.00	0.000	0.00
EUCINOSTOMUS LEFROYI	MOTTLED MOJARRA	0.006	0.00	0.000	0.00	0.000	0.00
HAEMULIDAE	GRUNTS	*	*	*	*	*	*
ORTHOPRISTIS CHRYSOPTERA	PIGFISH	0.301	0.02	0.309	0.01	5.600	0.36

TABLE 3.1 (CONTINUED).

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	SEP 78 - AUG 79 DENSITY	SEP 78 - AUG 79 %	SEP 79 - AUG 80 DENSITY	SEP 79 - AUG 80 %	SEP 80 - AUG 81 DENSITY	SEP 80 - AUG 81 %
SPARIDAE	PORGIES	*	*	*	*	*	*
ARCHOSARGUS PROBATOCEPHALUS	SHEEPSHEAD	0.007	0.00	0.074	0.00	0.099	0.01
LAGODON RHOMBOIDES	PINFISH	8.202	0.55	0.631	0.02	6.048	0.39
SCIAENIDAE	DRUMS	0.039	0.00	0.060	0.00	0.073	0.00
BAIRDIELLA CHRYSOURA	SILVER PERCH	2.140	0.14	5.353	0.17	3.285	0.21
CYNOSCION NEBULOSUS	SPOTTED SEATROUT	1.567	0.10	1.442	0.05	0.298	0.02
CYNOSCION REGALIS	WEAKFISH	8.596	0.57	13.116	0.43	11.782	0.75
LARIMUS FASCIATUS	BANDED DRUM	0.000	0.00	0.000	0.00	0.000	0.00
LEIOSTOMUS XANTHURUS	SPOT	111.299	7.41	73.573	2.40	74.672	4.78
MENTICIRRHUS SP.	KINGFISH UNID. (MENTICIRRHUS)	0.249	0.02	1.197	0.04	0.536	0.03
MENTICIRRHUS AMERICANUS	SOUTHERN KINGFISH	0.030	0.00	0.000	0.00	0.000	0.00
MENTICIRRHUS SAXATILIS	NORTHERN KINGFISH	0.006	0.00	0.000	0.00	0.000	0.00
MICROPOGONIAS UNDULATUS	ATLANTIC CROAKER	168.501	11.22	219.590	7.18	191.531	12.26
POGONIAS CROMIS	BLACK DRUM	0.437	0.03	4.761	0.16	2.187	0.14
SCIAENOPS OCELLATUS	RED DRUM	0.082	0.01	0.195	0.01	0.354	0.02
STELLIFER LANCEOLATUS	STAR DRUM	0.161	0.01	1.241	0.04	0.255	0.02
EPHIPPIDAE	SPADEFISHES	*	*	*	*	*	*
CHAETODIPTERUS FABER	ATLANTIC SPADEFISH	0.000	0.00	0.039	0.00	0.033	0.00
LABRIDAE	WRASSES	*	*	*	*	*	*
TAUTOGA ONITIS	TAUTOG	0.006	0.00	0.000	0.00	0.000	0.00
MUGILIDAE	MULLETS	*	*	*	*	*	*
MUGIL CEPHALUS	STRIPED MULLET	6.910	0.46	0.998	0.03	4.258	0.27
MUGIL CUREMA	WHITE MULLET	0.009	0.00	0.165	0.01	0.203	0.01
URANOSCOPIDAE	STARGAZERS	0.000	0.00	0.000	0.00	0.002	0.00
ASTROSCOPUS SP.	STARGAZER UNID. (ASTROSCOPUS)	0.000	0.00	0.020	0.00	0.000	0.00
ASTROSCOPUS GUTTATUS	NORTHERN STARGAZER	0.000	0.00	0.006	0.00	0.060	0.00
ASTROSCOPUS Y-GRAECUM	SOUTHERN STARGAZER	0.000	0.00	0.000	0.00	0.000	0.00
BLENNIIDAE	COMBTOOTH BLENNIES	8.180	0.54	9.640	0.32	15.618	1.00
CHASMODES BOSQUIANUS	STRIPED BLENNY	0.000	0.00	0.000	0.00	0.000	0.00
HYPSOBLENNIUS HENTZI	FEATHER BLENNY	0.000	0.00	0.000	0.00	0.000	0.00
ELEOTRIDAE	SLEEPERS	*	*	*	*	*	*
DORMITATOR MACULATUS	FAT SLEEPER	0.116	0.01	0.619	0.02	0.262	0.02
ELEOTRIS PISONIS	SPINYCHEEK SLEEPER	0.005	0.00	0.015	0.00	0.013	0.00
GOBIIDAE	GOBIES	*	*	*	*	*	*
GOBIONELLUS SP.	GOBY UNID. (GOBIONELLUS)	8.128	0.54	7.874	0.26	5.839	0.37
GOBIONELLUS BOLEOSOMA	DARTER GOBY	0.868	0.06	0.007	0.00	0.000	0.00
GOBIONELLUS HASTATUS	SHARPTAIL GOBY	0.027	0.00	0.014	0.00	0.000	0.00
GOBIONELLUS SHUFELDTI	FRESHWATER GOBY	0.040	0.00	0.000	0.00	0.000	0.00
GOBIOSOMA SP.	GOBY UNID. (GOBIOSOMA)	300.415	20.00	381.099	12.45	399.092	25.55
GOBIOSOMA BOSCI	NAKED GOBY	0.009	0.00	0.009	0.00	0.000	0.00
GOBIOSOMA GINSBURGI	SEABOARD GOBY	0.003	0.01	0.012	0.00	0.000	0.00
MICROGOBIUS SP.	GOBY UNID. (MICROGOBIUS)	8.514	0.57	13.006	0.43	4.830	0.31

TABLE 3.1 (CONTINUED).

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	SEP 78 - AUG 79 DENSITY	SEP 78 - AUG 79 %	SEP 79 - AUG 80 DENSITY	SEP 79 - AUG 80 %	SEP 80 - AUG 81 DENSITY	SEP 80 - AUG 81 %
SCOMBRIDAE	MACKERELS	*	*	*	*	*	*
SCOMBEROMORUS MACULATUS	SPANISH MACKEREL	0.000	0.00	0.007	0.00	0.000	0.00
STROMATEIDAE	BUTTERFISHES	*	*	*	*	*	*
PEPRILUS ALEPIDOTUS	HARVESTFISH	0.025	0.00	0.130	0.00	0.051	0.00
PEPRILUS TRIACANTHUS	BUTTERFISH	0.000	0.00	0.015	0.00	0.013	0.00
TRIGLIDAE	SEAROBINS	*	*	*	*	*	*
PRIONOTUS SP.	SEAROBIN UNID.(PRIONOTUS)	0.247	0.02	0.502	0.02	0.828	0.05
PRIONOTUS CAROLINUS	NORTHERN SEAROBIN	0.000	0.00	0.000	0.00	0.000	0.00
PRIONOTUS SCITULUS	LEOPARD SEAROBIN	0.007	0.00	0.000	0.00	0.000	0.00
PRIONOTUS TRIBULUS	BIGHEAD SEAROBIN	0.083	0.01	0.058	0.00	0.000	0.00
BOTHIDAE	LEFTEYE FLOUNDERS	0.008	0.00	0.019	0.00	0.021	0.00
ANCYLOPSETTA QUADROCELLATA	OCELLATED FLOUNDER	0.000	0.00	0.000	0.00	0.000	0.00
CITHARICHTHYS SP.	WHIFF UNID.(CITHARICHTHYS)	0.313	0.02	0.658	0.02	0.602	0.04
CITHARICHTHYS SPILOPTERUS	BAY WHIFF	0.022	0.00	0.034	0.00	0.009	0.00
ETROPUS CROSSOTUS	FRINGED FLOUNDER	0.043	0.00	0.101	0.00	0.000	0.00
PARALICHTHYS SP.	FLOUNDER UNID.(PARALICHTHYS)	15.002	1.00	1.655	0.05	4.524	0.29
PARALICHTHYS ALBIGUTTA	GULF FLOUNDER	0.445	0.03	0.000	0.00	0.000	0.00
PARALICHTHYS DENTATUS	SUMMER FLOUNDER	0.062	0.00	0.010	0.00	0.000	0.00
PARALICHTHYS LETHOSTIGMA	SOUTHERN FLOUNDER	2.945	0.20	0.006	0.00	0.060	0.00
SCOPHTHALMUS AQUOSUS	WINDOWPANE	0.017	0.00	0.032	0.00	0.092	0.01
SOLEIDAE	SOLES	*	*	*	*	*	*
TRINECTES MACULATUS	HOGCHOKER	1.513	0.10	6.732	0.22	2.097	0.13
CYNOGLOSSIDAE	TONGUEFISHES	*	*	*	*	*	*
SYMPHURUS SP.	TONGUEFISH UNID.(SYMPHURUS)	0.043	0.00	0.016	0.00	0.015	0.00
SYMPHURUS CIVITATUS	OFFSHORE TONGUEFISH	0.018	0.00	0.458	0.01	0.048	0.00
SYMPHURUS PLAGIUSA	BLACKCHEEK TONGUEFISH	2.268	0.15	6.782	0.22	1.487	0.10
BALISTIDAE	LEATHERJACKETS	*	*	*	*	*	*
MONACANTHUS HISPIDUS	PLANEHEAD FILEFISH	0.062	0.00	0.052	0.00	0.025	0.00
OSTRACIIDAE	BOXFISHES	0.000	0.00	0.000	0.00	0.019	0.00
TETRAODONTIDAE	PUFFERS	0.000	0.00	0.000	0.00	0.007	0.00
SPHOEROIDES MACULATUS	NORTHERN PUFFER	0.010	0.00	0.034	0.00	0.028	0.00
DIODONTIDAE	PORCUPINEFISHES	*	*	*	*	*	*
CHILOMYCTERUS SCHOEPFI	STRIPED BURRFISH	0.000	0.00	0.027	0.00	0.000	0.00
FISH UNID.	FISH UNID.	0.052	0.00	0.007	0.00	0.025	0.00
PENAEIDAE	PENAEID SHRIMP	0.016	0.00	0.050	0.00	0.000	0.00
PENAEUS SP.(ADULT)	PENAEUS (ADULT)	0.075	0.01	0.581	0.02	0.000	0.00
PENAEUS SP.(POSTLARVAE)	PENAEUS (POSTLARVAE)	63.398	4.22	126.092	4.12	52.088	3.33
PENAEUS AZTECUS	BROWN SHRIMP	0.000	0.00	0.009	0.00	0.000	0.00
PENAEUS DUORARUM	PINK SHRIMP	0.000	0.00	0.015	0.00	0.000	0.00
PENAEUS SETIFERUS	WHITE SHRIMP	0.000	0.00	0.000	0.00	0.009	0.00
TRACHYPENEUS SP.(POSTLARVAE)	TRACHYPENEUS (POSTLARVAE)	8.236	0.55	0.065	0.00	0.000	0.00
TRACHYPENEUS CONSTRICTUS	T-CON OR HARDBACK SHRIMP	6.597	0.44	10.586	0.35	7.092	0.45

TABLE 3.1 (CONTINUED).

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	SEP 78 - AUG 79 DENSITY	%	SEP 79 - AUG 80 DENSITY	%	SEP 80 - AUG 81 DENSITY	%
PORTUNIDAE	SWIMMING CRABS	3.571	0.24	11.558	0.38	8.589	0.55
PORTUNIDAE(MEGALOPS)	SWIMMING CRABS (MEGALOPS)	31.068	2.07	188.373	6.16	160.240	10.26
PORTUNUS SP.	SWIMMING CRABS	0.000	0.00	0.000	0.09	0.019	0.00
CALLINECTES SP.	BLUE CRABS	0.575	0.04	2.026	0.07	0.615	0.04
	ALL SPECIES	1501.981	99.97	3059.922	99.96	1562.276	99.98
	EFFORTS	932		607		736	

Table 3.2 Trip number, date, efforts, and analysis periods for river larval fish program, 1976-1981.

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WINTER ANALYSIS WEEK	SUMMER ANALYSIS YEAR	SUMMER ANALYSIS WEEK
1	27OCT76	256	77	4	76	22
2	09NOV76	33	77	5	76	23
3	23NOV76	301	77	6	76	24
4	07DEC76	105	77	7	76	25
5	21DEC76	224	77	8	76	26
6	04JAN77	56	77	9	77	1
7	18JAN77	363	77	10	77	2
8	01FEB77	377	77	11	77	3
9	15FEB77	359	77	12	77	4
10	01MAR77	272	77	13	77	5
11	15MAR77	351	77	14	77	6
12	29MAR77	343	77	15	77	7
13	13APR77	353	77	16	77	8
14	26APR77	332	77	17	77	9
15	10MAY77	366	77	18	77	10
16	24MAY77	311	77	19	77	11
17	07JUN77	377	77	20	77	12
18	21JUN77	349	77	21	77	13
19	06JUL77	347	77	22	77	14
20	19JUL77	329	77	23	77	15
21	02AUG77	364	77	24	77	16
22	16AUG77	332	77	25	77	17
23	30AUG77	382	77	26	77	18

TABLE 3.2 (Continued)

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WINTER ANALYSIS WEEK	SUMMER ANALYSIS YEAR	SUMMER ANALYSIS WEEK
24	13SEP77	373	78	1	77	19
26	11OCT77	292	78	3	77	21
28	08NOV77	370	78	5	77	23
30	07DEC77	383	78	7	77	25
32	04JAN78	360	78	9	78	1
33	17JAN78	344	78	10	78	2
34	31JAN78	362	78	11	78	3
35	14FEB78	360	78	12	78	4
36	28FEB78	359	78	13	78	5
37	15MAR78	238	78	14	78	6
38	29MAR78	354	78	15	78	7
39	11APR78	96	78	16	78	8
40	25APR78	362	78	17	78	9
41	10MAY78	373	78	18	78	10
43	06JUN78	368	78	20	78	12
49	9AUG78	337	78	26	78	18

TABLE 3.2 (Continued)

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WINTER ANALYSIS WEEK	SUMMER ANALYSIS YEAR	SUMMER ANALYSIS WEEK
50	12SEP78	72	79	1	78	19
51	26SEP78	72	79	2	78	20
52	10OCT78	71	79	3	78	21
53	24OCT78	72	79	4	78	22
54	07NOV78	72	79	5	78	23
55	21NOV78	72	79	6	78	24
56	05DEC78	68	79	7	78	25
57	18DEC78	64	79	8	78	26
58	04JAN79	65	79	9	79	1
59	16JAN79	72	79	10	79	2
60	30JAN79	80	79	11	79	3
61	13FEB79	80	79	12	79	4
62	27FEB79	78	79	13	79	5
63	13MAR79	80	79	14	79	6
64	27MAR79	80	79	15	79	7
65	10APR79	76	79	16	79	8
66	24APR79	78	79	17	79	9
67	08MAY79	71	79	18	79	10
68	22MAY79	72	79	19	79	11
69	05JUN79	64	79	20	79	12
70	19JUN79	70	79	21	79	13
71	03JUL79	71	79	22	79	14
72	17JUL79	71	79	23	79	15
73	31JUL79	64	79	24	79	16
74	14AUG79	36	79	25	79	17
75	28AUG79	70	79	26	79	18

TABLE 3.2 (Continued)

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WINTER ANALYSIS WEEK	SUMMER ANALYSIS YEAR	SUMMER ANALYSIS WEEK
76	11SEP79	36	80	1	79	19
77	25SEP79	36	80	2	79	20
78	23OCT79	36	80	4	79	22
79	06NOV79	35	80	5	79	23
80	20NOV79	12	80	6	79	24
81	04DEC79	72	80	7	79	25
82	02JAN80	36	80	9	80	1
83	15JAN80	36	80	10	80	2
84	29JAN80	36	80	11	80	3
85	12FEB80	36	80	12	80	4
86	26FEB80	35	80	13	80	5
87	11MAR80	36	80	14	80	6
88	24MAR80	35	80	15	80	7
89	09APR80	16	80	16	80	8
90	22APR80	36	80	17	80	9
91	05MAY80	36	80	18	80	10
92	20MAY80	36	80	19	80	11
93	03JUN80	36	80	20	80	12
94	17JUN80	36	80	21	80	13
95	01JUL80	36	80	22	80	14
96	15JUL80	30	80	23	80	15
97	29JUL80	32	80	24	80	16
98	12AUG80	36	80	25	80	17
99	26AUG80	36	80	26	80	18

TABLE 3.2 (Continued)

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WEEK	SUMMER ANALYSIS YEAR	WEEK
100	09SEP80	36	81	1	80	19
101	23SEP80	36	81	2	80	20
102	06OCT80	36	81	3	80	21
103	21OCT80	36	81	4	80	22
104	05NOV80	36	81	5	80	23
105	19NOV80	36	81	6	80	24
106	04DEC80	36	81	7	80	25
107	19DEC80	36	81	8	80	26
108	05JAN81	28	81	9	81	1
109	13JAN81	28	81	10	81	2
110	27JAN81	28	81	11	81	3
111	12FEB81	28	81	12	81	4
112	23FEB81	28	81	13	81	5
113	11MAR81	28	81	14	81	6
114	23MAR81	28	81	15	81	7
115	03APR81	28	81	16	81	8
116	16APR81	28	81	17	81	9
117	29APR81	28	81	18	81	10
118	09MAY81	28	81	18	81	10
119	15MAY81	28	81	19	81	11
120	21MAY81	28	81	19	81	11
121	10JUN81	28	81	21	81	13
122	16JUL81	28	81	23	81	15
123	10AUG81	28	81	25	81	17

Table 3.3 Identification Cutoff Lengths

Clupeidae:	Less than 11 mm (SL) to family, 11 mm (SL) and above to species
Anchoa sp.:	Less than 11 mm (SL) to genus, 11 mm (SL) and above to species
Gerreidae:	Less than 20 mm (SL) to family, 20 mm (SL) and above to genus if possible
Gobiosoma sp.:	15 mm (SL) and below to family, above 15 mm (SL) to species
Gobionellus sp.:	25 mm (SL) and below to family, above 25 mm (SL) to species
Microgobius sp.:	All lengths to genus only
Triglidae:	Less than 20 mm (SL) to faimily, 20 mm and above to species if possible
Blenniidae:	20 mm (SL) and below to family, above 20 mm (SL) to species
Atherinidae:	20 mm (SL) and below to family, above 20 mm (SL) to species
Paralichthys sp.:	20 mm (SL) and below to genus, above 20 mm (SL) to species
Citharichthys sp.:	All lengths to genus only
Etropus sp.:	All lengths to genus only
Penaeus sp.:	20 mm (SL) and below to genus, above 20 mm (SL) to species
Portunidae:	10 mm (SL) and below to family, above 10 mm (SL) to genus (Callinectes sp.)
Carangidae:	10 mm (SL) and below to family, above 10 mm (SL) to species

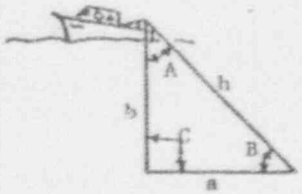
Table 3.4 Standard length conversion from total length
Standard Length = A + B (Total Length)

Species	A	B	R^2	No. Fish
Spot	1.1026	0.7850	.98	50
Croaker	0.5592	0.7751	.92	125
Menhaden	0.3151	0.8699	.85	25
Flounder	0.7477	0.7643	.83	25
Mullet	-0.1232	0.8421	.95	25
Anchovy	1.3392	0.7972	.99	25
Weakfish	0.5928	0.7270	.[illegible]9	25

Table 3.5 Standard length (mm) cut-off limits for fishes and shrimp collected from entrained water and from the estuary. Family or generic names only are listed if all species in that group had the same cut-off length.

Taxonomic Name	Common Name	Cut-off Length (mm)
Anchoa sp.	Anchovies	30
Anguilla rostrata	American eel	99
Atherinidae	Silversides	20
Blenniidae	Combtooth blennies	20
Bothidae	Lefteye flounders	20
Carangidae	Jacks & Pompanos	20
Centrarchidae	Sunfishes	20
Chaetodipterus faber	Atlantic Spadefish	20
Chilomycterus sp.	Porcupine fishes	20
Clupeidae	Herrings, Shads, Menhaden	35
Cynoglossidae	Tonguefishes	20
Cyprinidae	Minnows	20
Cyprinodontidae	Killifishes	20
Eleotridae	Sleepers	25
Elopidae	Tarpons	99
Exocoetidae	Flying fishes & Halfbeaks	50
Gadidae	Hakes	30
Gambusia affinis	Mosquitofish	15
Gerreidae	Mojarras	20
Gobiesox strumosus	Skilletfish	15
Gobionellus sp.	Gobies	25
Gobiosoma sp.	Gobies	15
Lutjanidae	Snappers	20
Monacanthus hispidus	Planehead filefish	25
Mugil sp.	Mullets	30
Ophichthidae	Snake eels	99
Ophidiidae	Cusk-eels	25
Opsanus tau	Oyster toadfish	20
Orthopristis chrysoptera	Pigfish	20
Penaeidae	Shrimp	15
Percichthyidae	Temperate Basses	20
Pomatomus saltatrix	Bluefish	20
Sciaenidae	Drums	25
Scombridae	Mackerels	30
Serranidae	Sea basses	20
Sparidae	Porgies	20
Sphoeroides maculatus	Northern Puffer	20
Stromateidae	Butterfishes	20
Strongylura sp.	Needlefishes	50
Syngnathidae	Pipefish	50
Synodus foetens	Inshore lizardfish	50
Triglidae	Searobins	20
Trinectes maculatus	Hogchoker	20
Uranoscopidae	Stargazers	20

Table 3.6 Depth determination chart for discrete depth sampling.



$\cos A = \frac{b}{h}$

h = Cable Length
b = Depth
A = Tow Angle

$(\cos A)h = b$

(h) meter	Tow Angle (function of boat speed and drag) COS A											
	20	25	30	35	40	45	50	55	60	65	70	75
4	3.8	3.6	3.5	3.3	3.1	2.8	2.6	2.3	2.0	1.7	1.4	1.0
5	4.7	4.5	4.3	4.1	3.8	3.5	3.2	2.9	2.5	2.1	1.7	1.3
6	5.6	5.4	5.2	4.9	4.6	4.2	3.9	3.4	3.0	2.5	2.1	1.6
7	6.6	6.3	6.1	5.7	5.4	4.9	4.5	4.0	3.5	3.0	2.4	1.8
8	7.5	7.2	6.9	6.6	6.1	5.7	5.1	4.6	4.0	3.4	2.7	2.1
9	8.5	8.2	7.8	7.4	6.9	6.4	5.8	5.2	4.5	3.8	3.1	2.3
10	9.4	9.1	8.7	8.2	7.7	7.1	6.4	5.7	5.0	4.2	3.4	2.6
11	10.3	10.0	9.5	9.0	8.4	7.8	7.1	6.3	5.5	4.6	3.8	2.8
12	11.2	10.9	10.4	9.8	9.2	8.5	7.7	6.9	6.0	5.1	4.1	3.1
13	12.2	11.8	11.3	10.6	10.0	9.2	8.4	7.5	6.5	5.5	4.4	3.4
14	13.2	12.7	12.1	11.5	10.7	9.9	9.0	8.0	7.0	5.9	4.8	3.6
15	14.1	13.6	13.0	12.3	11.5	10.6	9.6	8.6	7.5	6.3	5.1	3.9
16						11.3	10.3	9.2	8.0	6.8	5.5	4.1
17							10.9	9.8	8.5	7.2	5.8	4.4
18							11.6	10.3	9.0	7.6	6.2	4.7
19								10.9	9.5	8.0	6.5	4.9
20								11.5	10.0	8.5	6.8	5.2
21									10.5	8.9	7.2	5.4
22									11.0	9.3	7.5	5.7
23									11.5	9.7	7.9	6.0
24										10.1	8.2	6.2
25										10.6	8.6	6.5
26										11.0	8.9	6.7
27										11.4	9.2	7.0
28											9.6	7.2
29											9.9	7.5
30											10.3	7.8
31											10.6	8.0
32											10.9	8.3
33											11.3	8.5
34											11.6	8.8
35											12.0	9.1
36											12.3	9.3
37												9.6
38												9.8
39												10.1

TABLE 3.7 DAILY STATISTICS ON TEMPERATURE AND SALINITY FOR RIVER LARVAL, SEPTEMBER 1978-AUGUST 1981.

DATE	WATER TEMPERATURE MIN	MEAN	MAX	N	SALINITY MIN	MEAN	MAX	N
12SEP78	26.0	27.0	27.6	72	8.2	21.6	32.0	72
26SEP78	23.0	24.7	26.0	72	16.0	25.3	31.0	72
10OCT78	19.3	20.4	21.2	72	15.4	25.9	31.2	72
24OCT78	17.0	18.8	19.7	72	16.0	27.7	36.0	72
07NOV78	17.0	17.4	18.0	72	18.0	27.5	31.0	72
21NOV78	16.0	16.8	17.0	72	16.0	28.0	35.0	72
05DEC78	15.0	16.2	18.0	68	2.0	18.9	30.0	68
18DEC78	10.0	10.8	12.0	32	6.0	19.0	30.0	64
04JAN79	8.0	8.6	9.5	72	0.0	11.3	22.0	72
16JAN79	6.0	8.0	9.5	72	0.0	8.5	24.0	72
30JAN79	6.0	6.9	8.0	79	0.0	6.9	26.0	79
13FEB79	4.5	5.9	7.0	80	0.0	14.4	29.0	80
27FEB79	7.5	8.9	11.0	78	0.0	8.4	28.0	78
13MAR79	11.5	12.4	14.0	80	0.0	5.6	27.0	80
27MAR79	13.0	13.8	16.0	80	0.0	9.8	26.0	80
10APR79	15.0	17.1	19.0	77	0.0	7.3	29.0	77
24APR79	15.0	20.1	22.0	79	1.0	14.1	28.0	79
08MAY79	21.0	21.6	23.5	71	4.0	15.1	24.0	71
22MAY79	20.0	22.6	25.0	72	0.0	8.1	25.0	72
05JUN79	22.0	23.5	25.0	64	1.0	13.8	25.0	64
19JUN79	23.0	23.9	25.0	72	0.0	10.5	23.0	72
03JUL79	25.0	26.1	28.0	72	4.0	16.7	26.0	72
17JUL79	25.5	28.3	30.0	72	12.0	23.5	30.0	72
31JUL79	28.0	28.7	30.0	64	3.0	15.6	28.0	64
14AUG79	27.0	27.4	28.0	36	10.0	21.9	32.0	36
28AUG79	27.0	28.1	29.0	72	14.0	24.6	33.0	72
11SEP79	23.5	24.7	25.0	36	0.0	6.6	32.0	36
25SEP79	22.0	23.0	24.0	36	4.0	16.0	31.0	36
23OCT79	21.5	22.4	24.0	36	9.0	19.8	31.0	36
06NOV79	16.0	16.9	17.5	36	6.0	20.3	30.0	36
20NOV79	14.5	14.8	15.0	12	7.0	10.7	16.0	12
04DEC79	10.0	11.7	14.0	72	0.0	12.1	28.0	72
02JAN80	9.0	10.6	12.0	36	2.0	16.9	28.0	36
15JAN80	11.0	11.1	12.0	36	0.0	12.3	20.0	36
29JAN80	8.8	9.8	11.0	36	0.0	9.8	30.0	36
12FEB80	5.0	6.0	8.0	36	2.0	11.1	29.0	36
26FEB80	8.0	8.8	10.0	36	0.0	10.3	28.0	36
11MAR80	8.0	9.5	12.8	36	0.0	5.2	20.0	36
24MAR80	12.0	14.6	17.0	36	0.0	7.1	24.0	36
09APR80	17.0	18.1	19.0	16	0.0	3.5	14.0	16
22APR80	17.0	17.8	20.0	36	0.0	11.1	25.0	36
05MAY80	19.0	20.4	22.0	36	2.0	15.0	30.0	36

TABLE 3.7 (CONTINUED)

DATE	WATER TEMPERATURE MIN	MEAN	MAX	N	SALINITY MIN	MEAN	MAX	N
20MAY80	23.5	24.9	26.3	36	7.0	22.3	32.0	36
03JUN80	25.0	25.9	27.0	36	3.0	15.6	30.0	36
17JUN80	22.0	24.9	26.0	36	14.0	24.0	32.0	36
01JUL80	26.7	27.3	28.0	36	5.0	20.1	34.0	36
15JUL80	28.0	28.4	29.0	32	10.0	21.9	32.0	32
29JUL80	.	.	.	0	12.0	23.5	32.0	36
12AUG80	26.1	29.0	29.9	36	14.0	25.8	33.0	36
26AUG80	23.0	25.3	26.0	36	24.0	29.5	35.0	36
09SEP80	27.2	27.8	28.2	36	22.0	30.6	35.0	36
23SEP80	23.0	27.1	28.0	36	19.0	27.6	32.0	36
06OCT80	21.5	24.1	29.0	12	12.0	22.5	29.0	36
21OCT80	20.0	21.1	22.1	36	12.0	23.2	32.0	36
05NOV80	16.0	16.8	18.0	36	14.0	24.8	32.0	36
19NOV80	10.5	13.7	15.0	36	14.0	22.8	30.0	36
04DEC80	9.5	10.4	11.5	36	11.0	22.4	32.0	36
19DEC80	10.1	10.6	11.2	36	10.0	21.3	32.0	36
05JAN81	5.0	5.8	7.0	28	0.0	12.1	26.0	28
13JAN81	3.0	4.1	5.0	28	2.0	13.6	26.0	28
27JAN81	6.1	7.0	7.6	28	6.0	21.6	32.0	28
12FEB81	5.0	6.1	7.9	28	0.0	13.5	28.0	28
23FEB81	9.5	10.1	10.5	14	0.0	10.0	22.0	14
11MAR81	12.0	12.4	13.3	28	0.0	13.9	28.0	28
23MAR81	10.0	10.3	11.0	28	8.0	20.3	32.0	28
03APR81	14.5	15.2	17.0	28	4.0	14.4	26.0	28
16APR81	17.0	18.5	19.1	28	8.0	21.3	32.0	28
29APR81	18.0	21.2	23.0	28	14.0	22.8	32.0	28
09MAY81	17.9	18.3	18.8	28	18.0	26.5	34.0	28
15MAY81	21.5	22.3	24.0	28	12.0	23.5	31.0	28
21MAY81	20.0	20.4	20.5	28	13.0	22.9	32.0	28
10JUN81	18.1	27.5	29.9	28	4.0	15.9	30.0	28
14JUL81	28.2	28.8	29.0	28	12.0	23.9	34.0	28
10AUG81	27.5	28.3	29.0	28	5.0	16.4	26.0	28

Table 3.8 Results of ANOVA and Duncan's multiple range comparison for winter river larval fish. September 1976 - August 1981

SPECIES	CROAKER
Year	***
Duncan's MR for year	80 81 78 79 77
Week	***
Duncan's MR for week	12 9 13 10 11 16 7 15 4 8 14 6 5 17 2 3
Depth	*** B > S
Station	***
Duncan's MR for station	34 41 37 27 25 18 21 24 11
$\overline{Log}$	1.553
S^2	0.376
R^2	0.652

SPECIES	FLOUNDER
Year	***
Duncan's MR for year	79 78 81 77 80
Week	***
Duncan's MR for week	13 12 14 15 11 10 9 8
Depth	*** B > S
Station	***
Duncan's MR for station	11 24 41 27 25 34 18 37 21
$\overline{Log}$	0.317
S^2	0.326
R^2	0.671

NS Not significant - $p > .05$
* $.01 < p \leq .05$
** $.001 < p \leq .01$
*** $p \leq .001$

Table 3.8 (continued)

SPECIES	SPOT
Year	***
Duncan's MR for year	80 79 77 78 81
Week	***
Duncan's MR for week	13 14 12 15 16 11 10 9 17 18 8
Depth	** B > S
Station	***
Duncan's MR for station	11 24 21 25 27 10 34 37 41
$\overline{Log}$	1.524
S^2	0.321
R^2	0.707

SPECIES	MULLET
Year	***
Duncan's MR for year	81 79 78 80 77
Week	***
Duncan's MR for week	13 14 12 9 11 15 10 8
Depth	*** S > B
Station	***
Duncan's MR for station	24 11 21 25 34 18 41 37 27
$\overline{Log}$	0.325
S^2	0.165
R^2	0.566

NS Not significant - $p > .05$
* $.01 < p \leq .05$
** $.001 < p \leq .01$
*** $p \leq .001$

Table 3.8 (continued)

SPECIES	MENHADEN
Year	***
Duncan's MR for year	77 81 78 79 80
Week	***
Duncan's MR for week	16 15 17 14 13 18
Depth	* S = B
Station	***
Duncan's MR for station	41 34 11 24 37 27 18 25 21
$\overline{Log}$	0.965
S^2	0.326
R^2	0.671

SPECIES	BROWN SHRIMP
Year	***
Duncan's MR for year	81 79 80 77 78
Week	***
Duncan's MR for week	16 15 19 17 18 14 13 12
Depth	*** S > B
Station	***
Duncan's MR for station	11 24 21 18 25 37 27 34 41
$\overline{Log}$	0.618
S^2	.213
R^2	0.704

NS Not significant - $p > .05$
* $.01 < p \leq .05$
** $.001 < p \leq .01$
*** $p \leq .001$

Table 3.9 Results of ANOVA and Duncan's multiple range comparison for summer river larval fish. September 1976 - August 1981.

SPECIES	SEATROUT
Year	***
Duncan's MR for year	81 80 79 77
Week	***
Duncan's MR for week	13 14 16 12 11 17 15 18 10 19 20 21
Depth	*** B > S
Station	***
Duncan's MR for station	18 37 25 11 27 41 34 24 21
$\overline{Log}$	0.770
S^2	0.294
R^2	0.581

SPECIES	ANCHOVIES
Year	***
Duncan's MR for year	80 77 81 79
Week	***
Duncan's MR for week	14 15 13 16 12 11 17 18 19 10 20 21 22 9
Depth	*** B > S
Station	***
Duncan's MR for station	11 18 25 27 24 37 21 34 41
$\overline{Log}$	2.407
S^2	0.256
R^2	0.822

NS Not significant - $p > .05$
* $.01 < p \leq .05$
** $.001 < p \leq .01$
*** $p \leq .001$

Table 3.9 (continued)

SPECIES	*Gobionellus* spp.
Year	***
Duncan's MR for year	81 78 80 79 77
Week	***
Duncan's MR for week	22 23 11 20 8 24 25 10 7 21 9 13 15 12 6 14 16 18 17 19
Depth	* S > B
Station	***
Duncan's MR for station	11 24 21 25 18 27 37 34 41
$\overline{Log}$	0.364
S^2	0.199
R^2	0.441

NS Not significant - $p > .05$
* $.01 < p \leq .05$
** $.001 < p \leq .01$
*** $p < .001$

Table 3.10 Results of ANOVA and Duncan's multiple range comparison for river larval fish. September 1976 - August 1981.

SPECIES	TOTAL FISH
Year	***
Duncan's MR for year	80 81 77 79 78
Week	***
Duncan's MR for week	22 21 23 20 24 19 25 26 13 18 16 12 14 15 1 17 2 10 9 11 4 7 3 8 6 5
Depth	*** B > S
Station	***
Duncan's MR for station	11 24 18 25 27 37 34 21 41
$\overline{\text{Log}}$	2.560
S^2	0.186
R^2	0.719

Table 3.11 Duncan's multiple range test for variable length by midchannel station and month - September 1980 to August 1981

CROAKER

1980

Station:	18	25	37	34	41
Mean Length:	9.8	10.5	10.9	11.1	11.3

Month:	9	10	11	4	12	1	3	2
Mean Length:	6.6	9.3	10.3	11.5	11.6	12.0	12.4	12.7

1981

Station:	18	25	41	37	34
Mean Length:	9.7	10.1	11.1	11.1	11.3

Month:	9	10	11	12	1	3	2	4
Mean Length:	6.9	8.2	10.7	11.3	11.7	11.8	11.8	12.1

FLOUNDER

1980

Station:	18	25	41	34	37
Mean Length:	9.5	9.7	11.2	11.3	11.4

Month:	12	1	2	3	4
Mean Length:	8.5	9.5	10.6	11.6	12.7

1981

Station:	25	34	18	41	37
Mean Length:	10.5	11.2	11.4	12.0	12.0

Month:	12	1	3	2	4
Mean Length:	9.0	10.5	11.7	11.9	12.8

SPOT

1980

Station:	37	18	25	41	34
Mean Length:	11.9	12.3	13.2	13.8	15.9

Month:	12	5	1	2	4	3
Mean Length:	8.7	10.2	12.6	14.5	14.6	15.7

1981

Station:	25	18	37	34	41
Mean Length:	15.9	16.5	17.9	18.2	19.6

Month:	12	1	2	4	3	5
Mean Length:	9.0	13.8	17.2	19.9	21.4	25.0

Table 3.11 (continued)

MULLET

1980

Station:	18	34	25	37	41
Mean Length:	21.0	21.1	21.7	22.0	23.0

Month:	1	2	3
Mean Length:	20.7	22.2	22.3

1981

Station:	37	25	18	34	41
Mean Length:	20.9	22.7	22.7	22.7	23.2

Month:	1	2	3
Mean Length:	21.9	22.1	23.2

MENHADEN

1980

Station:	41	18	25	34	37
Mean Length:	23.2	23.7	24.3	24.5	25.5

Month:	5	4	2	3
Mean Length:	22.3	22.7	25.7	26.5

1981

Station:	18	25	37	41	34
Mean Length:	25.9	26.1	26.7	27.1	27.1

Month:	4	2	3
Mean Length:	25.9	26.9	27.0

BROWN SHRIMP

1980

Station:	25	37	18	34	41
Mean Length:	10.5	10.6	10.6	10.8	11.2

Month:	5	2	3	4
Mean Length:	10.1	10.5	11.0	11.6

1981

Station:	18	34	37	25	41
Mean Length:	10.0	10.2	10.3	10.6	10.7

Month:	5	4	3
Mean Length:	8.9	11.1	11.1

Table 3.11 (continued)

SEATROUT

1980

Station:	18	25	34	41	37
Mean Length:	5.0	5.3	6.8	8.4	8.4

Month:	5	8	6	7	9
Mean Length:	5.7	6.4	6.6	6.6	9.1

1981

Station:	18	25	41	37	34
Mean Length:	5.3	5.5	6.6	7.2	11.2

Month:	9	5	8	6	7	10
Mean Length:	4.1	5.5	6.5	7.8	9.3	13.0

ANCHOVIES

1980

Station:	18	25	37	34	41
Mean Length:	11.4	13.5	14.7	16.9	18.4

Month:	5	6	7	8	9	4	10
Mean Length:	7.9	10.2	13.6	15.7	18.8	20.1	20.3

1981

Station:	18	25	37	41	34
Mean Length:	12.6	13.4	15.1	16.1	16.5

Month:	4	5	6	7	9	10	8
Mean Length:	7.9	8.9	9.6	12.4	20.98	21.4	21.9

PINK & WHITE SHRIMP

1980

Station:	37	18	34	25	41
Mean Length:	7.3	7.5	7.5	7.7	7.7

Month:	6	8	7	9
Mean Length:	7.3	7.4	7.6	7.9

1981

Station:	18	25	34	41	37
Mean Length:	7.5	7.7	7.8	7.9	8.0

Month:	7	8	6	9
Mean Length:	7.5	7.6	7.7	8.3

Table 3.11 (continued)

Gobiosoma spp.

1980

Station:	18	34	37	41	25	
Mean Length:	5.5	5.7	6.0	6.3	6.8	
Month:	5	6	7	8	9	10
Mean Length:	4.0	4.9	5.4	5.4	9.3	9.8

1981

Station:	18	25	37	34	41	
Mean Length:	5.4	5.6	5.6	6.0	6.1	
Month:	5	8	7	6	9	10
Mean Length:	4.3	4.5	4.7	5.1	5.3	10.2

Gobionellus spp.

1980

Station:	18	25	41	34	37					
Mean Length:	9.3	9.5	9.7	9.9	10.1					
Month:	8	7	6	3	10	12	9	4	11	5
Mean Length:	8.0	8.1	8.7	9.3	9.3	9.9	10.0	10.6	10.9	11.1

1981

Station:	25	18	34	31	37					
Mean Length:	9.5	9.5	9.6	10.0	11.0					
Month:	7	6	9	11	12	3	5	10	4	8
Mean Length:	8.0	8.3	8.9	9.5	9.9	10.1	10.2	10.5	10.9	15.0

Table 3.12 River Larval Trend Analysis, 1976-1981

Species	Mean Squares: Linear Trend	Mean Squares: Deviation From Linear Trend	Mean Squares: Error	Percent Change Per Year
Gobiosoma spp.	0.05614	0.01043	0.0156	+20
Croaker	0.10826*	0.0364	0.01451	+27
Seatrout	0.02663	0.00308	0.01051	+14
Brown shrimp	0.7501	0.02573	0.02230	+22
Mullet	0.05371*	0.01135	0.00838	+18
Total fish	0.02692*	0.02936**	0.00354	+13
Gobionellus spp.	0.02977*	0.00394	0.00368	+14
Pk. & wh. shrimp	0.01106	0.08403	0.2365	+ 9
Anchovies	0.00171	0.05496*	0.01040	- 3
Spot	0.00006	0.01452	0.00698	+ 1
Flounder	0.02928	0.08593**	0.01192	-12
Menhaden	0.02815	0.05615	0.02795	-12

* Significance level = 0.05
** Significance level = 0.01

Table 3.13 Density ($\log_{10}$) comparisons from 1979 and 1981 discrete depth sampling program.

Location		Spot	Croaker	Flounder	Mullet	Pinfish	Bay Anchovy	Menhaden	Total Fish
STA 25 (1979)	$\bar{X}$(N=476)	2.293	2.450	1.756	0.789	1.449	---	---	2.916
	$\bar{G}$(#/1000m^3)	195.3	280.8	56.0	5.2	27.1	13.15	10.3	823.2
STA 25 (1981)	$\bar{X}$(N=240)	1.4477	1..868	0.6851	0.0442	0.8588	0.9537	0.8549	2.3774
	$\bar{G}$(#/1000m^3)	27.05	76.05	3.84	0.11	6.22	7.99	6.16	237.45
STA 34 (1981)	$\bar{X}$(N=240)	1.2670	2.154	1.0584	0.0509	0.4469	1.0796	0.6432	2.3932
	$\bar{G}$(E/1000m^3)	17.53	141.56	10.44	0.12	1.80	11.01	3.40	246.29

$\bar{X} = \log_{10}(G+1)$

$\bar{G}$ = density (number/1000m^3)

Table 3.14 ANOVA (experimental model) for 1979 discrete depth sampling by station and round.

Station 25 Round 1

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Pinfish	Spot	Total
Set	5	*	*	NS	*	NS	*	NS	NS
Duncan's MR		413256	326451		134265		231645		
Series	3	NS	NS	NS	NS	NS	NS	NS	NS
Duncan's MR									
Set * Series	15	NS	NS	***	NS	NS	*	NS	NS
Depth	4	***	***	***	NS	*	NS	***	***
Duncan's MR		57931	79531	97531		79531		35971	79531
Set * Depth	20	***	***	***	NS	NS	NS	*	NS
Series * Depth	12	NS	NS	NS	NS	NS	NS	NS	NS
MSE	60	0.4649	0.1615	0.2533	0.5108	0.3330	0.4033	0.2613	0.1539
F		***	***	***	*	*	**	**	***
R^2		0.7563	0.8208	0.8370	0.6126	0.6198	0.6826	0.6929	0.7218
$\overline{Log}$		1.3322	2.4152	1.6410	0.8851	0.8081	1.0869	2.1651	2.8660
$\bar{X}$		112.6109	493.3144	160.4465	29.0332	16.2891	38.6764	278.7047	1155.0474
$\bar{G}$		20.4882	259.1357	42.7522	6.6754	5.4284	11.2152	145.2514	733.5139

NS $p > .05$, not significant
* $0.01 < p \leq 0.05$
** $0.001 < p \leq 0.01$
*** $p \leq .001$

MSE Mean Square Error
F PR > F
R^2 $\frac{SSR}{SST}$
$\overline{Log}$ Log Density Mean
$\bar{X}$ Density Mean
$\bar{G}$ Antilog ($\overline{Log}$) - 1

Table 3.14 (Continued)

Station 25 Round 2

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Pinfish	Spot	Total
Set	5	**	**	***	NS	NS	**	**	**
Duncan's MR		365241	532641	465312			356421	436512	356421
Series	3	NS	NS	NS	NS	NS	NS	NS	NS
Duncan's MR									
Set * Series	15	**	**	**	**	NS	NS	NS	**
Depth	4	***	***	***	*	**	*	**	***
Duncan's MR		57931	79531	97531	57193	75931	57931	57391	57931
Set * Depth	29	NS	*	***	NS	*	*	**	***
Series * Depth	12	NS	NS	NS	NS	NS	NS	NS	NS
MSE	60	0.4782	0.2298	0.2195	0.3843	0.4306	0.3357	0.251[illegible]	0.0824
F_2		***	***	***	*	**	*	***	***
R^2		0.7505	0.7580	0.8197	0.6312	0.6635	0.6292	0.7017	0.8158
$\overline{Log}$		0.9886	2.3410	1.6971	1.3154	0.9206	1.8396	2.3344	2.9529
$\bar{X}$		79.5876	513.8222	134.9803	52.6684	41.5017	145.5761	469.1283	1450.7058
$\bar{G}$		8.7409	218.2805	48.7852	19.6728	7.3291	68.1194	214.9733	896.2222

NS $p > .05$, not significant
* $0.01 < p \leq 0.05$
** $0.001 < p \leq 0.01$
*** $p \leq .001$

MSE Mean Square Error
F_2 PR > F
R^2 $\frac{SSR}{SST}$
$\overline{Log}$ Log Density Mean
$\bar{X}$ Density Mean
$\bar{G}$ Antilog ($\overline{Log}$) - 1

Table 3.14 (Continued)

Station 25 Round 3

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Pinfish	Spot	Total
Set	5	*	**	NS	**	NS	NS	*	**
Duncan's MR		341625	436512		134265			421365	412365
Series	3	NS	NS	NS	NS	NS	NS	NS	NS
Duncan's MR									
Set * Series	15	***	NS	*	**	NS	NS	*	NS
Depth	4	***	***	***	***	**	NS	NS	***
Duncan's MR		75931	79531	97531	57931	79531			79531
Set * Depth	20	NS	**	**	NS	NS	***	***	***
Series * Depth	12	NS	NS	NS	NS	NS	NS	NS	NS
MSE	60	0.2751	0.1301	0.2247	0.3166	0.5682	0.2508	0.1753	0.0772
F_2		***	***	***	***	NS	**	***	***
R^2		0.8213	0.8052	0.7883	0.7512	0.4668	0.6699	0.7405	0.7802
$\overline{Log}$		1.1089	2.5182	1.7444	0.8585	0.9443	1.8104	2.4104	3.0078
$\bar{X}$		61.3705	613.9077	154.1524	28.3184	23.7274	137.0839	509.9487	1550.4321
$\bar{G}$		11.8499	328.7615	54.5137	6.2194	7.7963	63.6249	256.2764	1017.1224

NS	$p > .05$, not significant
*	$0.01 < p \leq 0.05$
**	$0.001 < p \leq 0.01$
***	$p \leq .001$

MSE	Mean Square Error
F_2	PR > F
R^2	$\frac{SSR}{SST}$
$\overline{Log}$	Log Density Mean
$\bar{X}$	Density Mean
$\bar{G}$	Antilog ($\overline{Log}$) - 1

Table 3.14 (Continued)

Station 25 Round 4

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Pinfish	Spot	Total
Set	5	**	**	**	NS	NS	NS	*	**
Duncan's MR		5 1436	536241	524613				253146	523641
Series	3	NS	NS	NS	NS	NS	NS	NS	*
Duncan's MR									3241
Set * Series	15	NS	NS	*	NS	NS	**	NS	NS
Depth	4	**	***	***	***	***	NS	***	***
Duncan's MR		97513	97531	97531	97531	79531		97531	97531
Set * Depth	20	NS	***	**	*	NS	NS	*	***
Series * Depth	12	NS	NS	NS	NS	NS	NS	NS	NS
MSE	60	0.3783	0.1504	0.2663	0.4094	0.3323	0.4589	0.1933	0.0760
F		**	***	***	**	NS	**	**	***
R^2		0.6553	0.9107	0.8273	0.6600	0.5831	0.6502	0.6748	0.8787
$\overline{Log}$		1.0983	2.4977	1.9093	0.9835	0.4805	1.0305	2.2292	2.9444
$\overline{X}$		30.7080	995.3083	278.2075	30.4498	8.3627	36.7920	326.7691	1737.6340
$\overline{G}$		11.5401	313.5575	80.1521	8.6272	2.0234	9.7275	168.5118	878.8325

NS $p > .05$, not significant
* $0.01 < p \leq 0.05$
** $0.001 < p \leq 0.01$
*** $p \leq .001$

MSE Mean Square Error
F PR > F
R^2 $\frac{SSR}{SST}$
$\overline{Log}$ Log Density Mean
$\overline{X}$ Density Mean
$\overline{G}$ Antilog ($\overline{Log}$) - 1

Table 3.15 ANOVA (experimental model) for 1981 discrete depth sampling by station and round.

Station 25 Round 1

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Pinfish	Spot	Total
Set	5	**	***	*	NS	NS	**	***	***
Duncan's MR		452316	345261	542316			524361	526431	532461
Series	3	NS	NS	NS	NS	NS	NS	NS	NS
Duncan's MR									
Set * Series	15	**	*	**	NS	**	*	*	**
Depth	4	*	***	***	NS	NS	NS	NS	***
Duncan's MR		59731	97531	97513					97531
Set * Depth	20	***	***	**	NS	NS	**	***	***
Series * Depth	12	NS	**	NS	NS	NS	NS	NS	NS
MSE	60	0.2819	0.1501	0.2832	0.3362	0.0364	0.2579	0.2255	0.0956
F		***	***	***	NS	*	***	***	***
R^2		0.7948	0.9194	0.7404	0.5754	0.6068	0.7352	0.8465	0.9008
$\overline{Log}$		0.9864	2.0680	0.8403	0.5652	0.0439	0.6058	1.2622	2.4196
$\bar{X}$		37.3632	400.3059	21.3973	9.4511	0.5015	13.2778	70.0409	586.2804
$\bar{G}$		8.6917	115.9499	5.9231	2.6745	0.1064	3.0346	17.2894	261.4218

NS	$p > .05$, not significant
*	$0.01 < p \leq 0.05$
**	$0.001 < p \leq 0.01$
***	$p \leq .001$

MSE	Mean Square Error
F	PR > F
R^2	$\frac{SSR}{SST}$
$\overline{Log}$	Log Density Mean
$\bar{X}$	Density Mean
$\bar{G}$	Antilog ($\overline{Log}$) - 1

Table 3.15 (Continued)

Station 25 Round 2

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Tinfish	Spot	Total
Set	5	**	*	*	***	NS	***	***	***
Duncan's MR		653421	653412	653421	364521		364521	634512	634512
Series	3	NS	NS	NS	NS	NS	NS	NS	NS
Duncan's MR									
Set * Series	15	*	***	NS	**	***	NS	NS	NS
Depth	4	NS	***	***	*	NS	NS	***	***
Duncan's MR			97531	95713	95731			57931	97531
Set * Depth	20	**	***	NS	**	NS	NS	***	***
Series * Depth	12	NS	NS	NS	NS	NS	NS	NS	NS
MSE	60	0.2644	0.1437	0.2582	0.2821	0.0318	0.3265	0.3047	0.1139
F_2		***	***	*	***	*	***	***	***
R^2		0.7369	0.8[illegible]	0.6368	0.7939	0.6331	0.7581	0.7892	0.8631
$\overline{Log}$		0.9157	1.7057	0.5300	1.1446	0.0444	1.1118	1.6333	2.3358
$\bar{X}$		20.8472	118.4095	7.6839	61.0225	0.4349	48.5281	134.7217	417.6655
$\bar{G}$		7.2357	49.7809	2.3884	12.9508	0.1076	11.9360	41.9833	215.6706

NS $p > .05$, not significant
* $0.01 < p \leq 0.05$
** $0.001 < p < 0.01$
*** $p \leq .001$

MSE Mean Square Error
F_2 PF > F
R^2 $\frac{SSR}{SST}$
$\overline{Log}$ Log Density Mean
$\bar{X}$ Density Mean
$\bar{G}$ Antilog ($\overline{Log}$) - 1

Table 3.15 (Continued)

Station 34 Round 1

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Pinfish	Spot	Total
Set	5	NS	**	*	**	NS	NS	*	***
Duncan's MR			432561	245136	245163			423516	432561
Series	3	NS	NS	NS	NS	NS	NS	NS	NS
Duncan's MR									
Set * Series	15	NS	NS	NS	NS	NS	NS	NS	NS
Depth	4	***	***	***	*	NS	NS	***	***
Duncan's MR		79531	97531	97531	79531			79531	97531
Set * Depth	20	***	***	NS	*	NS	**	***	***
Series * Depth	12	NS	NS	NS	NS	NS	NS	NS	NS
MSE	60	0.2496	0.2437	0.4351	0.2431	0.0462	0.2828	0.3697	0.2364
F_2		***	***	***	*	NS	NS	***	***
R^2		0.7769	0.8582	0.7019	0.6383	0.4571	0.5966	0.7196	0.8420
$\overline{Log}$		1.1781	2.1328	1.1568	0.6597	0.0424	0.4666	1.1102	2.3430
$\overline{X}$		38.2927	409.0947	61.7162	8.5468	0.4297	7.0058	49.2786	584.1873
$\overline{G}$		14.0695	134.4769	13.3483	3.5677	0.1026	1.9282	11.8884	219.2927

NS p > .05, not significant
* $0.01 < p \leq 0.05$
** $0.001 < p \leq 0.01$
*** $p \leq .001$

MSE Mean Square Error
F_2 PR > F
R^2 $\frac{SSR}{SST}$
$\overline{Log}$ Log Density Mean
$\overline{X}$ Density Mean
$\overline{G}$ Antilog ($\overline{Log}$) - 1

Table 3.15 (Continued)

Station 34 Round 2

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Pinfish	Spot	Total
Set	5	NS	***	**	NS	NS	*	*	**
Duncan's MR			654321	643512			643512	645312	645321
Series	3	NS	NS	NS	NS	NS	NS	NS	NS
Duncan's MR									
Set * Series	15	**	*	*	NS	NS	NS	NS	**
Depth	4	***	***	**	NS	NS	NS	***	***
Duncan's MR		79531	79531	79531				97531	79531
Set * Depth	20	NS	***	*	NS	NS	*	***	***
Series * Depth	12	NS	NS	NS	NS	NS	*	NS	NS
MSE	60	0.2150	0.1580	0.2415	0.3111	0.0498	0.2177	0.2496	0.1028
F		***	***	***	NS	NS	*	***	***
R^2		0.7375	0.8963	0.7272	0.4983	0.5063	0.6163	0.7533	0.8791
$\overline{Log}$		0.9811	2.1752	0.9601	0.6268	0.0594	0.4272	1.4255	2.4435
$\overline{X}$		19.8600	455.0506	21.7274	7.5137	0.4807	4.8317	74.4748	597.4759
$\overline{G}$		8.5741	148.6925	8.1222	3.2345	0.1466	1.6742	25.6379	276.6515

NS $p > .05$, not significant
* $0.01 < p \leq 0.05$
** $0.001 < p \leq 0.01$
*** $p \leq .001$

MSE Mean Square Error
F PR > F
R^2 $\frac{SSR}{SST}$
$\overline{Log}$ Log Density Mean
$\overline{X}$ Density Mean
$\overline{G}$ Antilog $(\overline{Log})$ - 1

Table 3.16 ANOVA (behavioral model) for 1981 discrete depth sampling by station and round.

Station 25 Round 1

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Pinfish	Spot	Total
Period	1	***	***	**	NS	***	**	NS	***
Duncan's MR		N D	N D	N D		N D	N D		N D
Tide	7	*	**	**	*	***	***	***	***
Duncan's MR		71826543	24817356	81265734	12784536	81426573	81273564	82134576	82143756
Period * Tide	7	NS	*	NS	NS	***	NS	**	*
Depth	4	NS	***	*	NS	NS	NS	NS	***
Duncan's MR			97531	97513					97531
Period * Depth	4	***	***	**	NS	NS	NS	***	***
Tide * Depth	28	NS	NS	NS	NS	***	NS	NS	NS
Period * Tide * Depth	28	NS	NS	NS	NS	***	NS	NS	NS
MSE	40	0.3881	0.3365	0.4425	0.3970	0.0143	0.3612	0.2734	0.1625
F_2		**	***	NS	NS	***	NS	***	***
R^2		0.8117	0.8795	0.7295	0.6657	0.8969	0.7527	0.8759	0.8877
$\overline{Log}$		0.9864	2.0680	0.8403	0.5652	0.0440	0.6058	1.2622	2.4190
$\bar{X}$		37.3632	400.3059	21.3973	9.4511	0.5015	13.2778	70.0409	586.2804
$\bar{G}$		8.6917	115.9499	5.9231	2.6745	0.1064	3.0346	17.2894	261.4218

NS	$p > .05$, not significant
*	$0.01 < p \leq 0.05$
**	$0.001 < p \leq 0.01$
***	$p \leq .001$

MSE	Mean Square Error
F_2	PR > F
R^2	$\frac{SSR}{SST}$
$\overline{Log}$	Log Density Mean
$\bar{X}$	Density Mean
$\bar{G}$	Antilog $(\overline{Log})$ - 1

Tide	Code
1	HS
2	HO
3	MO
4	LO
5	LS
6	LI
7	MI
8	HI

Table 3.16 (Continued)

Station 25 Round 2

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Pinfish	Spot	Total
Period	1	***	***	NS	***	*	***	***	***
Duncan's MR		N D	N D		N D	N D	N D	N D	N D
Tide	7	***	***	NS	***	NS	***	***	***
Duncan's MR		81765243	18263475		18253467		81236574	81235467	81236457
Period * Tide	7	**	***	NS	*	NS	NS	NS	***
Depth	4	NS	***	**	*	NS	NS	***	***
Duncan's MR			97531	95713	95731			57931	97531
Period * Depth	4	***	***	NS	***	NS	*	***	***
Tide * Depth	28	NS	NS	NS	NS	NS	NS	NS	**
Period * Tide * Depth	28	NS	NS	NS	NS	NS	NS	NS	**
MSE	40	0.2640	0.1625	0.3533	0.2548	0.0572	0.2674	0.2792	0.0647
F		**	***	NS	***	NS	***	***	***
R^2		0.8249	0.9007	0.6687	0.8759	0.5611	0.8679	0.8712	0.9481
$\overline{Log}$		0.9157	1.7057	0.5390	1.1446	0.0444	1.1118	1.6333	2.3358
$\bar{X}$		20.8472	118.4095	7.6839	61.0225	0.4349	48.5280	134.7218	417.6655
$\bar{G}$		7.2357	49.7809	2.3884	12.9508	0.1076	11.9360	41.9833	215.6706

NS p > .05, not significant
* $0.01 < p \leq 0.05$
** $0.001 < p \leq 0.001$
*** $p \leq .001$

MSE Mean Square Error
F PR > F
R^2 $\frac{SSR}{SST}$
$\overline{Log}$ Log Density Mean
$\bar{X}$ Density Mean
$\bar{G}$ Antilog $(\overline{Log})$ - 1

Tide	Code
1	HS
2	HO
3	MO
4	LO
5	LS
6	LI
7	MI
8	HI

Table 3.16 (Continued)

Station 34 Round 1

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Pinfish	Spot	Total
Period	1	*	***	*	NS	NS	NS	NS	***
Duncan's MR		N D	N D	N D					N D
Tide	7	NS	NS	***	**	NS	NS	NS	NS
Duncan's MR				87126354	82175634				
Period * Tide	7	NS	NS	NS	*	NS	NS	**	NS
Depth	4	***	***	***	**	NS	NS	***	***
Duncan's MR		79531	97531	97531	79531			79531	97531
Period * Depth	4	***	**	***	***	NS	***	***	***
Tide * Depth	28	NS	NS	NS	NS	*	NS	NS	NS
Period * Tide * Depth	28	NS	NS	NS	NS	*	NS	NS	NS
MSE	40	0.2645	0.1905	0.3602	0.2077	0.0293	0.2581	0.3256	0.2426
F		***	***	***	*	*	NS	***	***
R^2		0.8424	0.9261	0.8355	0.7939	0.,702	0.7545	0.8354	0.8919
$\overline{Log}$		1.1781	2.1328	1.1568	0.6597	0.0424	0.4666	1.1102	2.3430
$\bar{X}$		38.2927	409.0948	61.7162	8.5466	0.4297	7.0058	49.2786	58.1873
$\bar{G}$		14.0695	134.4769	13.3483	3.5677	0.1026	1.9282	11.8884	219.2927

NS	p > .05, not significant
*	$0.01 < p \leq 0.05$
**	$0.001 < p \leq 0.01$
***	$p \leq .001$

MSE	Mean Square Error
F	PR > F
R^2	$\frac{SSR}{SST}$
$\overline{Log}$	Log Density Mean
$\bar{X}$	Density Mean
$\bar{G}$	Antilog ($\overline{Log}$) - 1

Tide	Code
1	HS
2	HO
3	MO
4	LO
5	LS
6	LI
7	MI
8	HI

Table 3.16 (Continued)

Station 34 Round 2

Source	df	Bay Anchovy	Croaker	Flounder	Menhaden	Mullet	Pinfish	Spot	Total
Period	1	***	***	***	NS	NS	NS	***	***
Duncan's MR		N D	N D	N D				N D	N D
Tide	7	***	***	***	NS	NS	NS	NS	***
Duncan's MR		57641823	75684123	87162345					75861423
Period * Tide	7	**	*	*	NS	NS	NS	NS	***
Depth	4	***	***	**	NS	NS	NS	***	***
Duncan's MR		79531	79531	79531				97531	79531
Period * Depth	4	**	***	***	**	NS	*	***	***
Tide * Depth	28	**	**	NS	NS	NS	NS	NS	NS
Period * Tide * Depth	28	***	NS	NS	NS	NS	NS	NS	NS
MSE	40	0.1062	0.1174	0.2311	0.2845	0.0567	0.2614	0.3352	0.0653
F		***	***	**	NS	NS	NS	*	***
R^2		0.9136	0.9486	0.8260	0.6941	0.6255	0.6929	0.7792	0.9488
$\overline{Log}$		0.9811	2.1752	0.9601	0.6268	0.0594	0.4272	1.4255	2.4635
$\bar{X}$		19.8600	455.0596	21.7274	7.5137	0.4807	4.8317	74.4748	597.4759
G		8.5741	148.6925	8.1222	3.2345	0.1466	1.6742	25.6379	276.6515

NS $p > .05$, not significant
* $0.01 < p \leq 0.05$
** $0.001 < p \leq 0.01$
*** $p \leq .001$

MSE Mean Square Error
F PR > F
R^2 $\frac{SSR}{SST}$
$\overline{Log}$ Log Density Mean
$\bar{X}$ Density Mean
G Antilog ($\overline{Log}$) - 1

Tide	Code
1	HS
2	HO
3	MO
4	LO
5	LS
6	LI
7	MI
8	HI

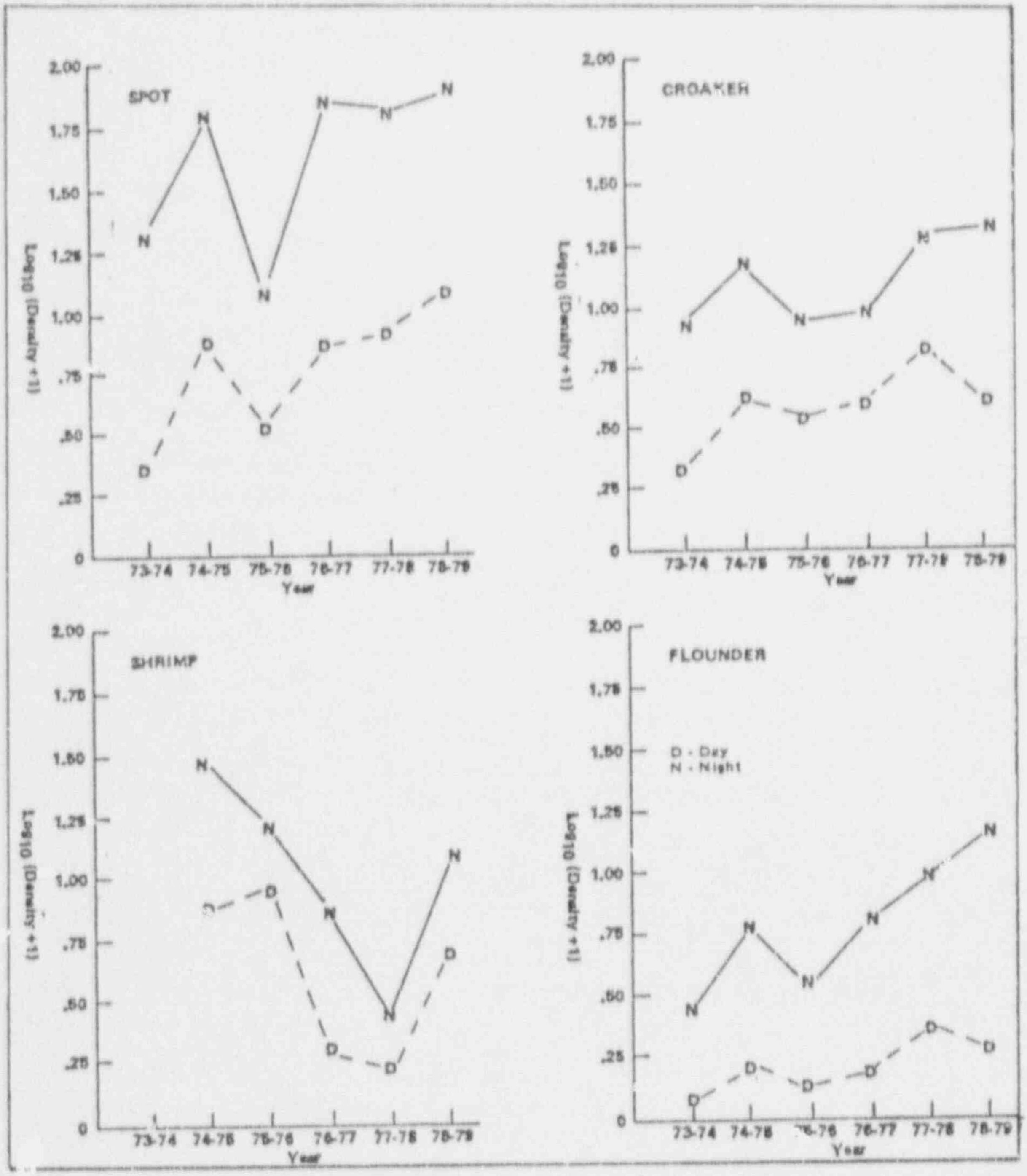


Figure 3.1 Mean $\log_{10}$ (density +1) by day/night for selected species, 1973-1979.

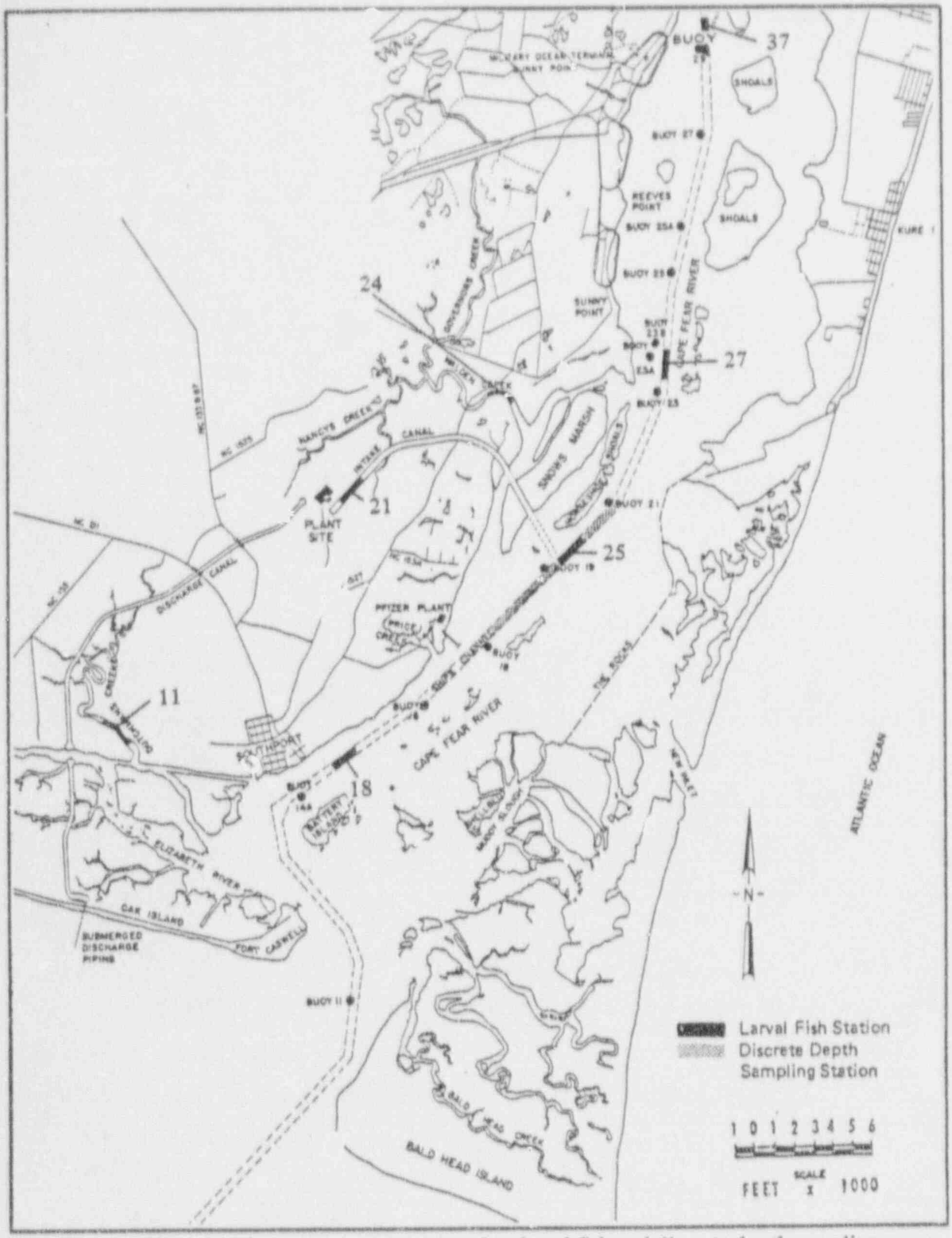


Figure 3.2 CP&L monitoring stations -- river larval fish and discrete depth sampling programs (Sheet 1 of 2).

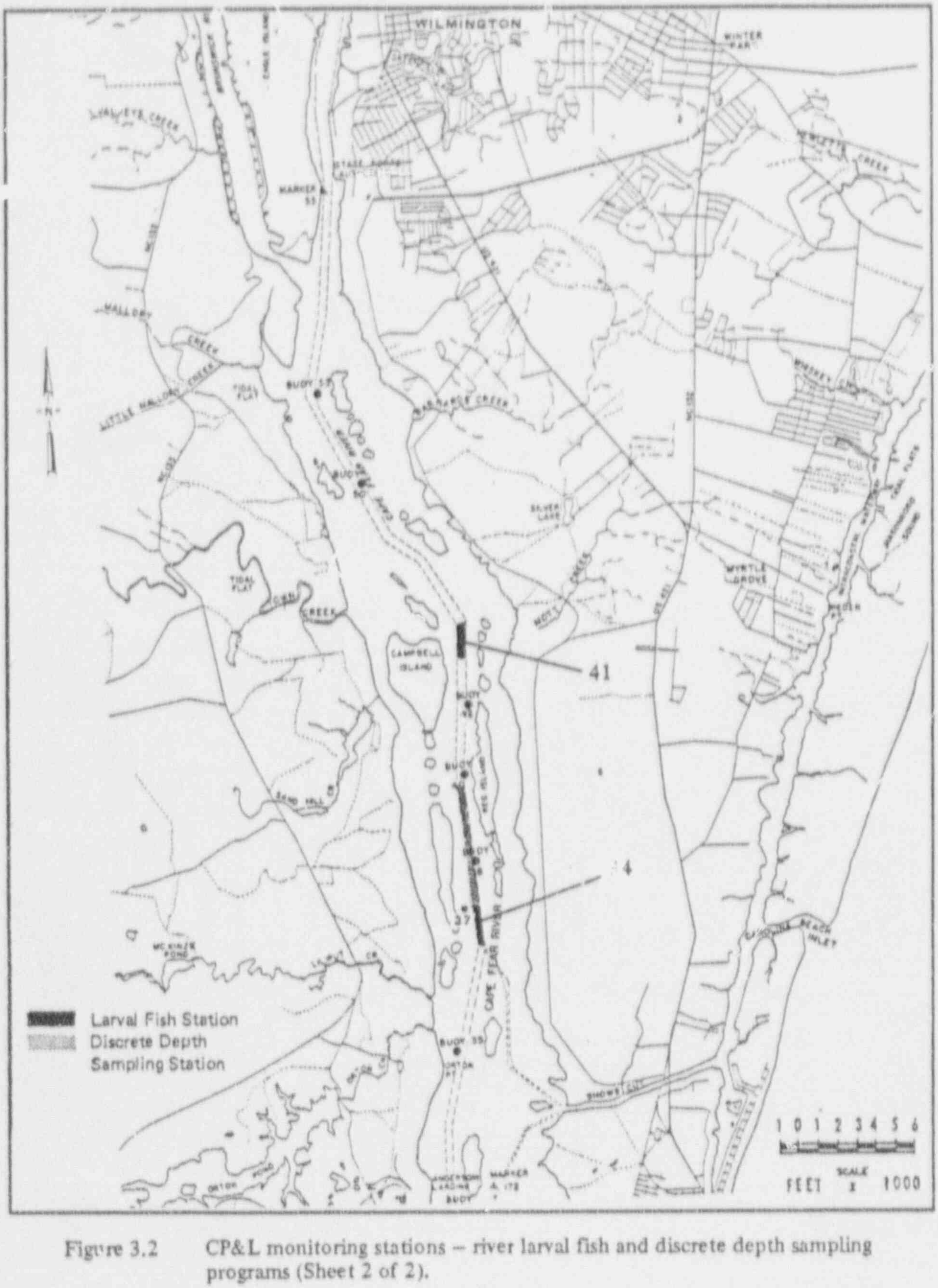


Figure 3.2 CP&L monitoring stations – river larval fish and discrete depth sampling programs (Sheet 2 of 2).

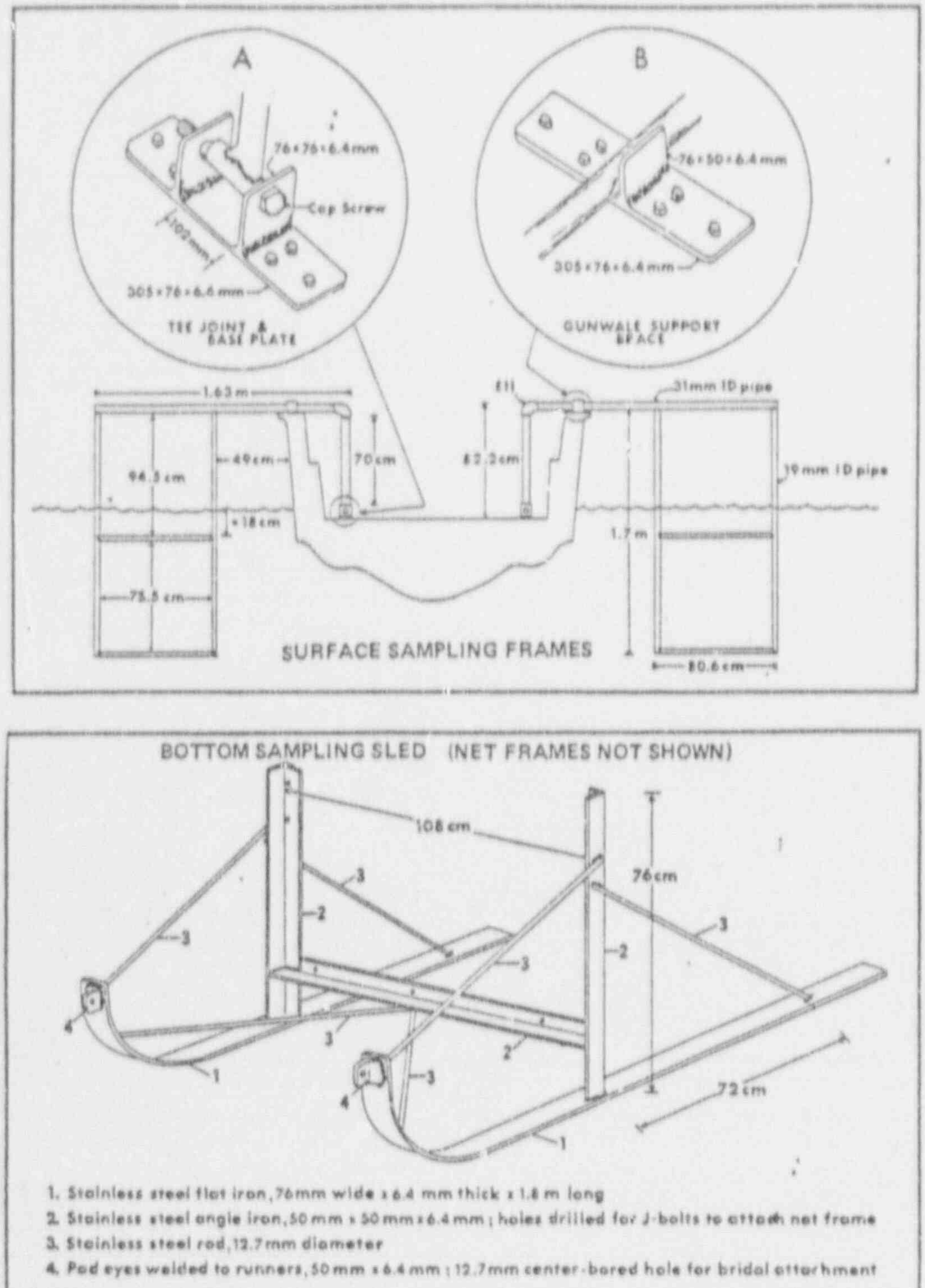


Figure 3.3 River larval fish sampling gear. (Hodson et al, 1981).

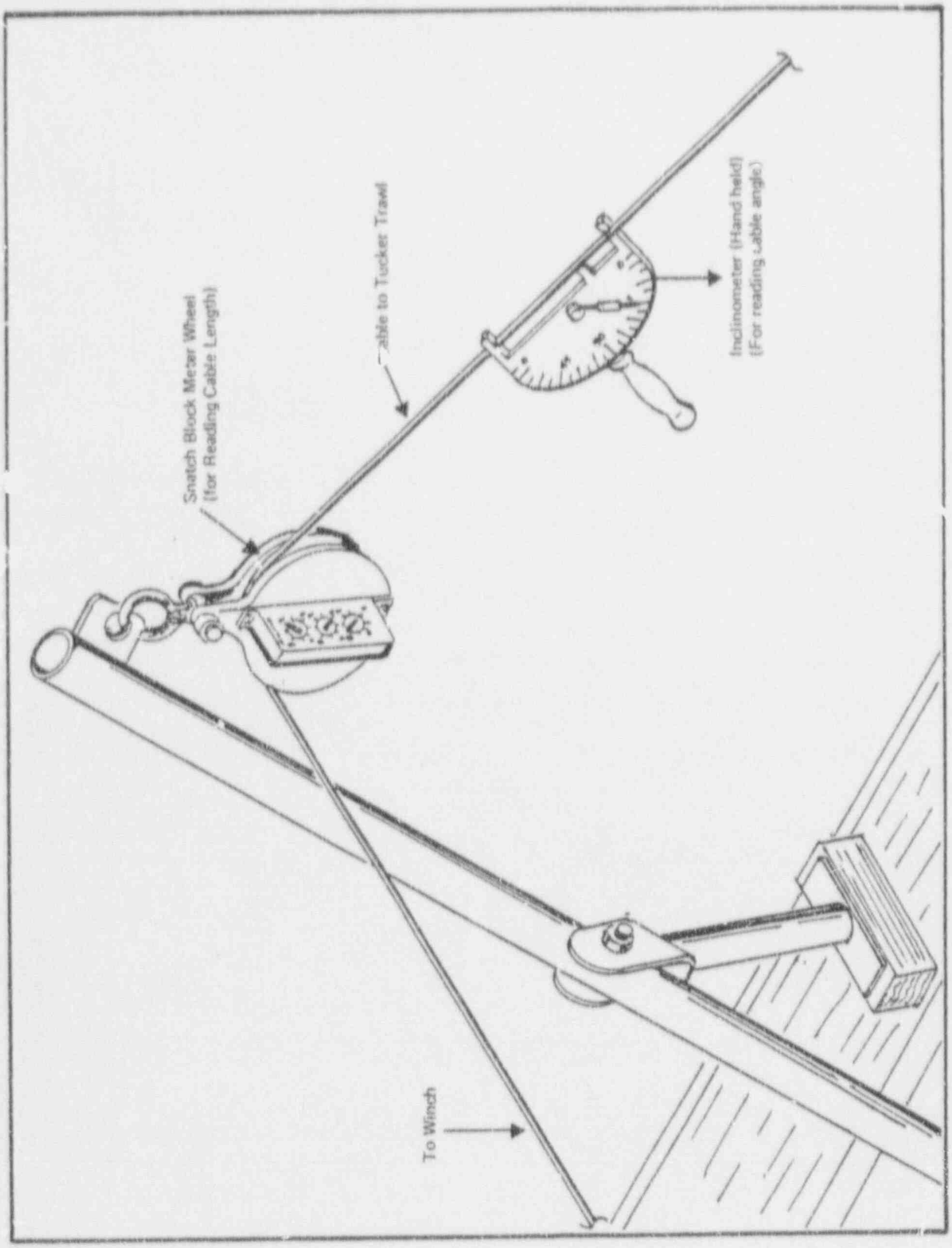


Figure 3.4 Inclinometer and Snatch Block Meter Wheel

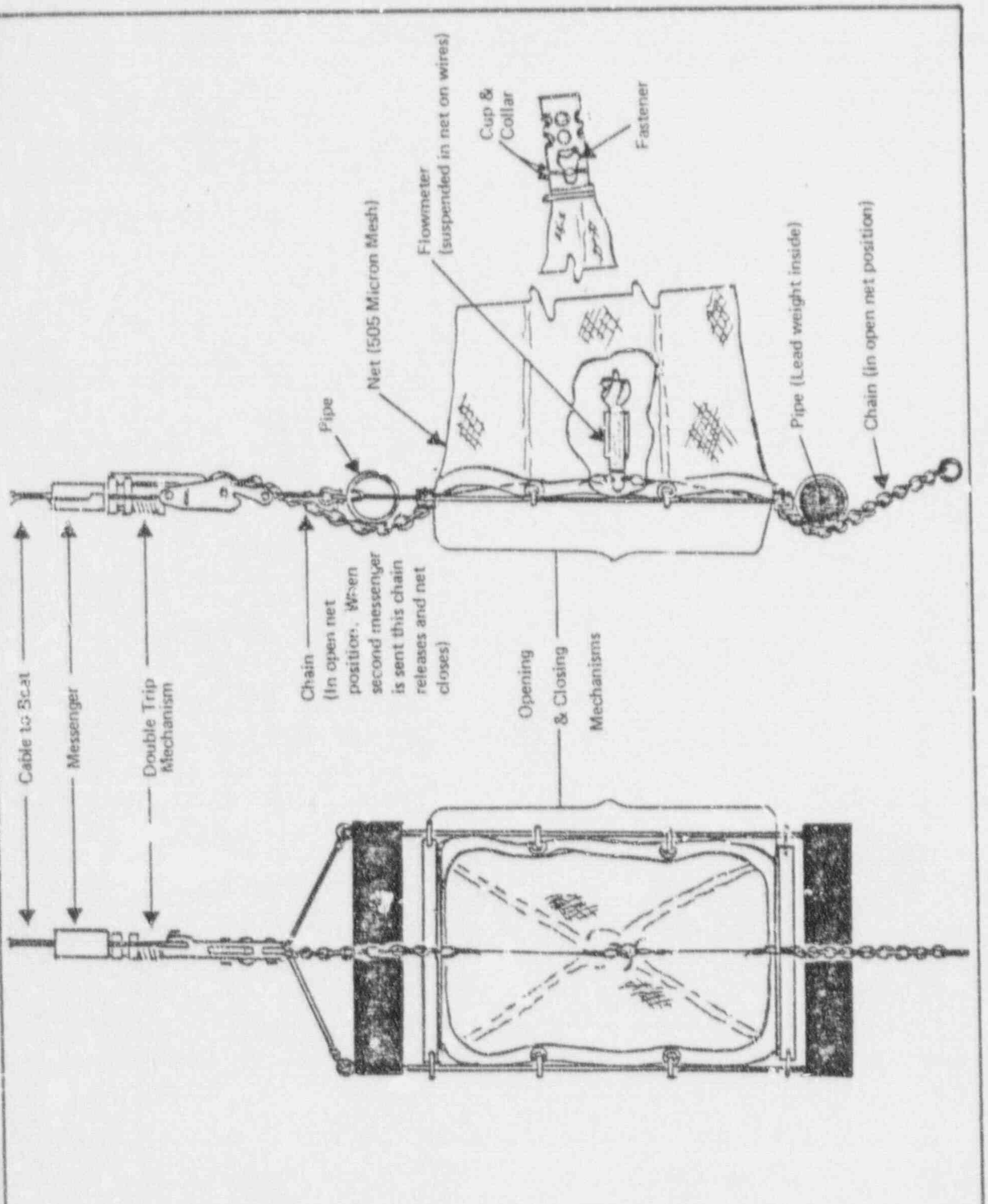


Figure 3.5 Tucker trawl gear including trip mechanism and flowmeter.

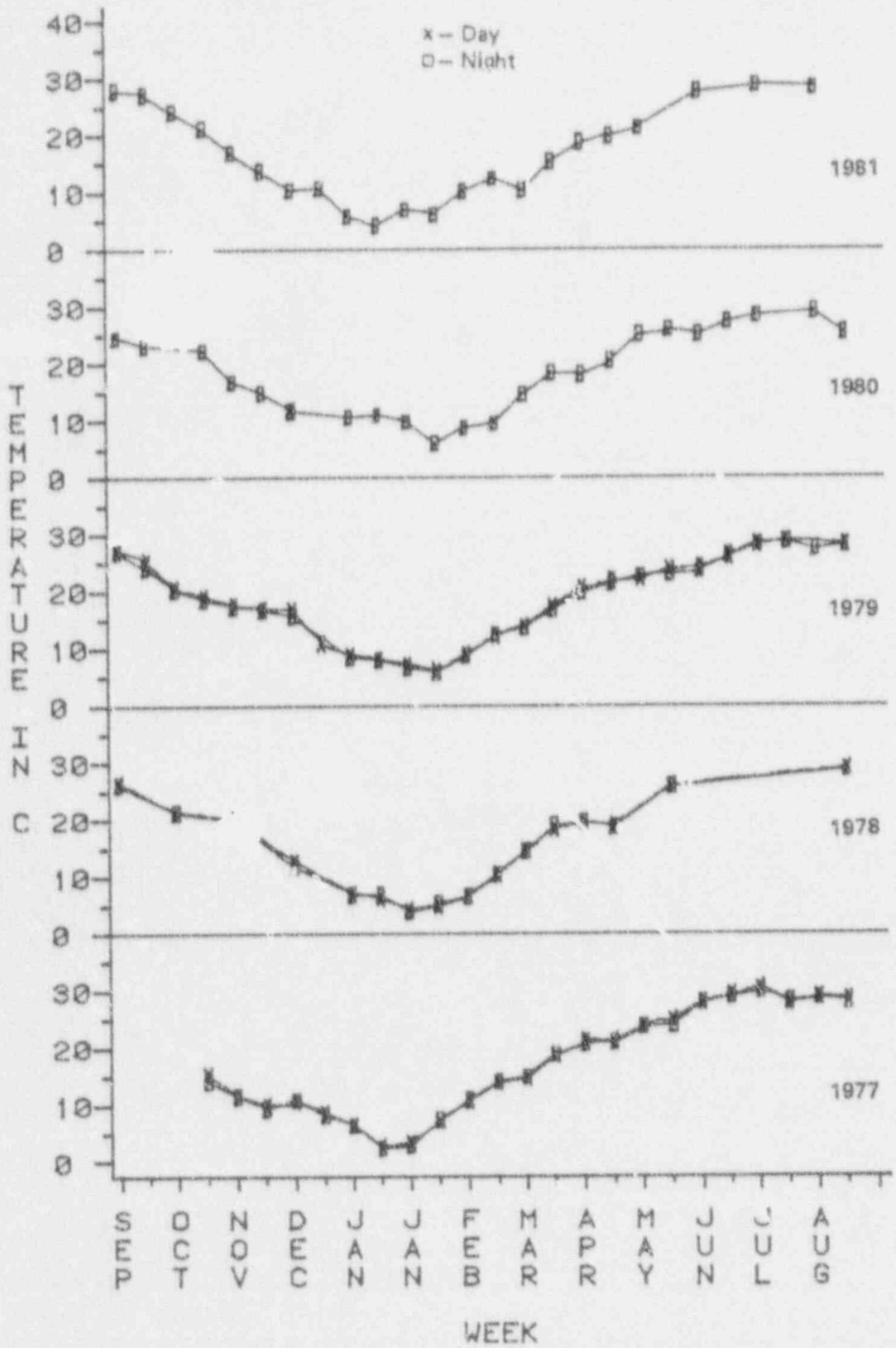


Figure 3.6 Mean water temperature by year for river larval fish program. September 1976 to August 1981.

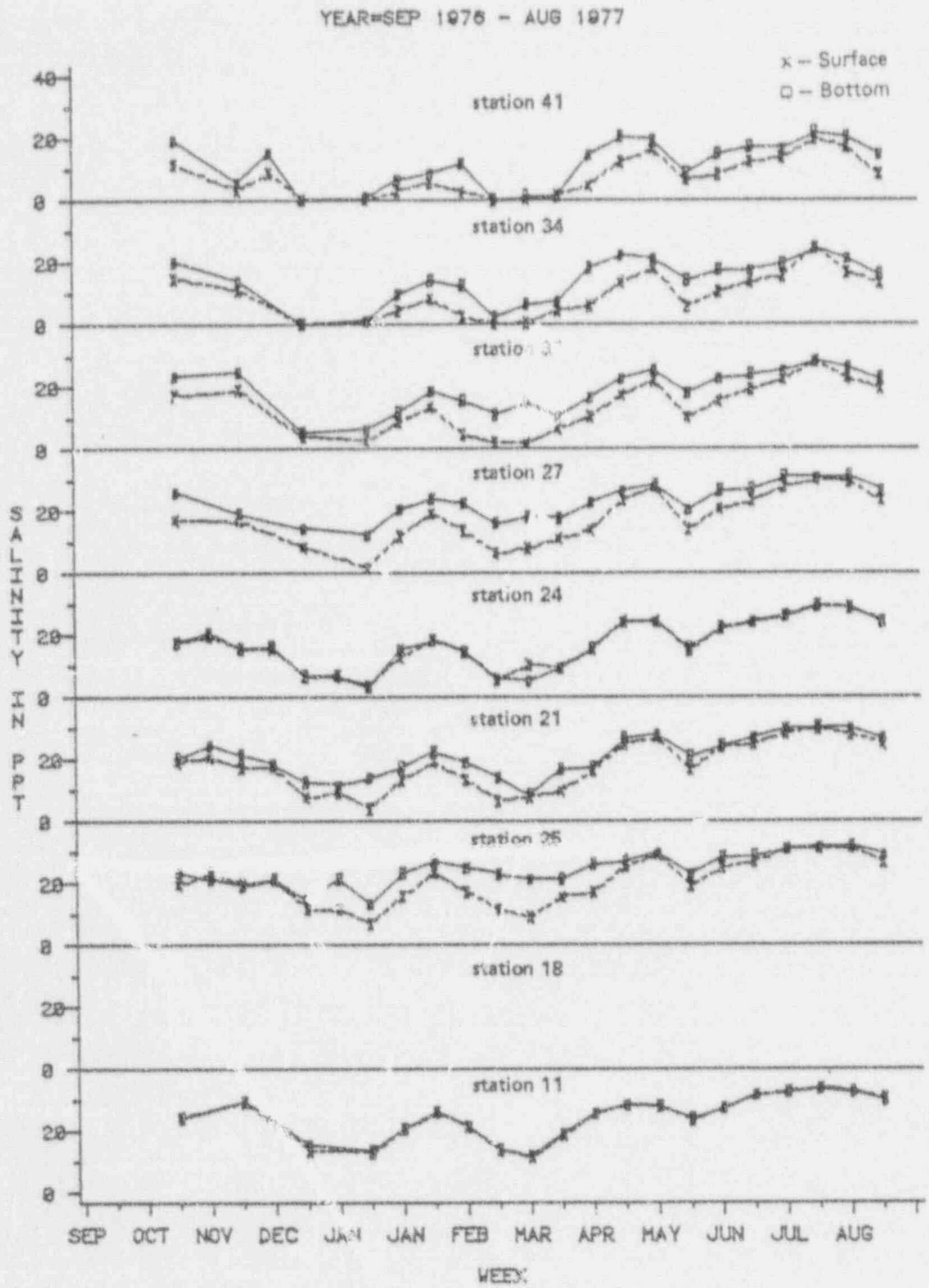


Figure 3.7 Mean salinity by month for river larval fish stations, September 1976 to August 1977.

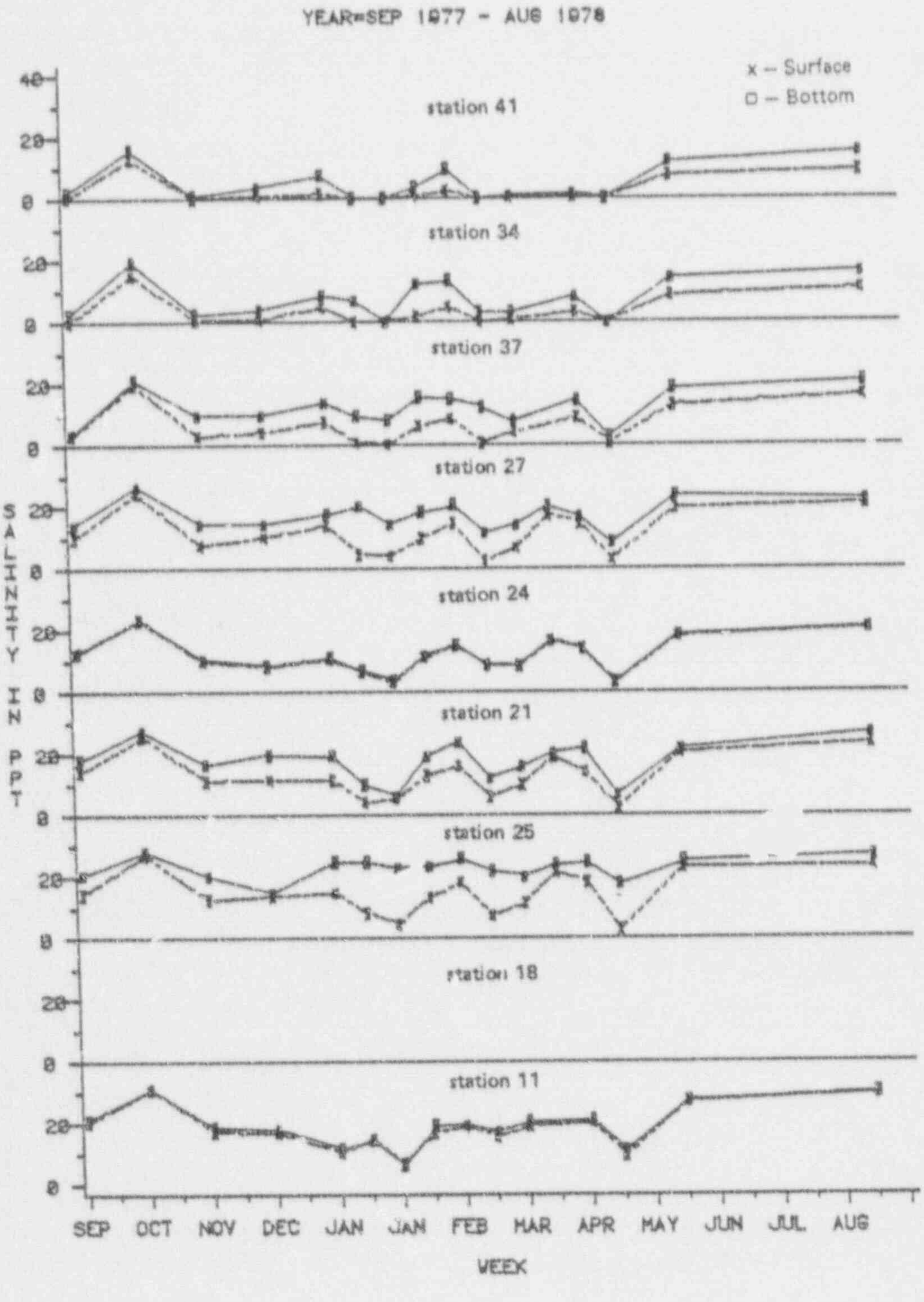


Figure 3.8 Mean salinity by month for river larval fish stations, September 1977 to August 1978.

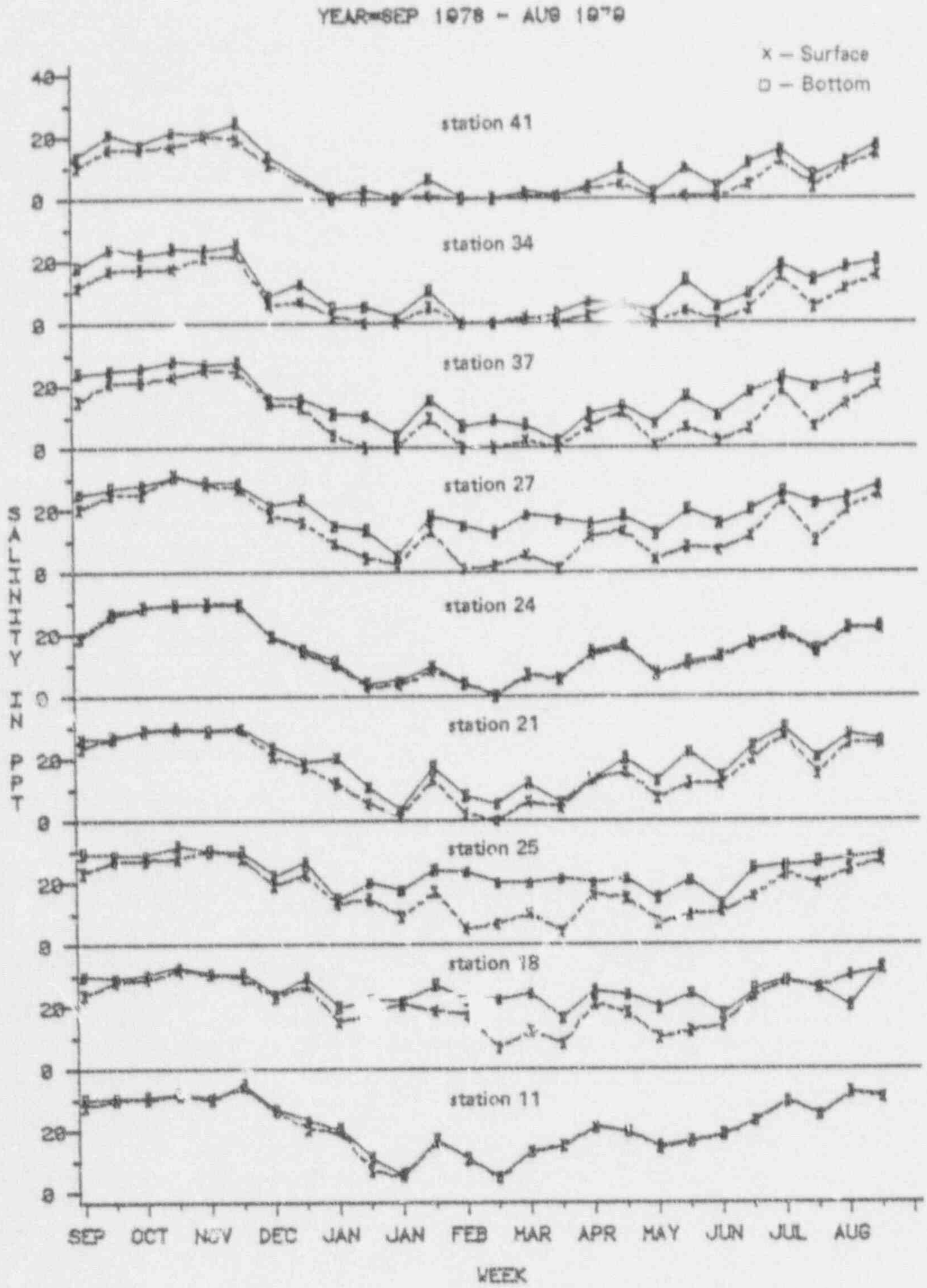


Figure 3.9 Mean salinity by month for river larval fish stations, September 1978 to August 1979.

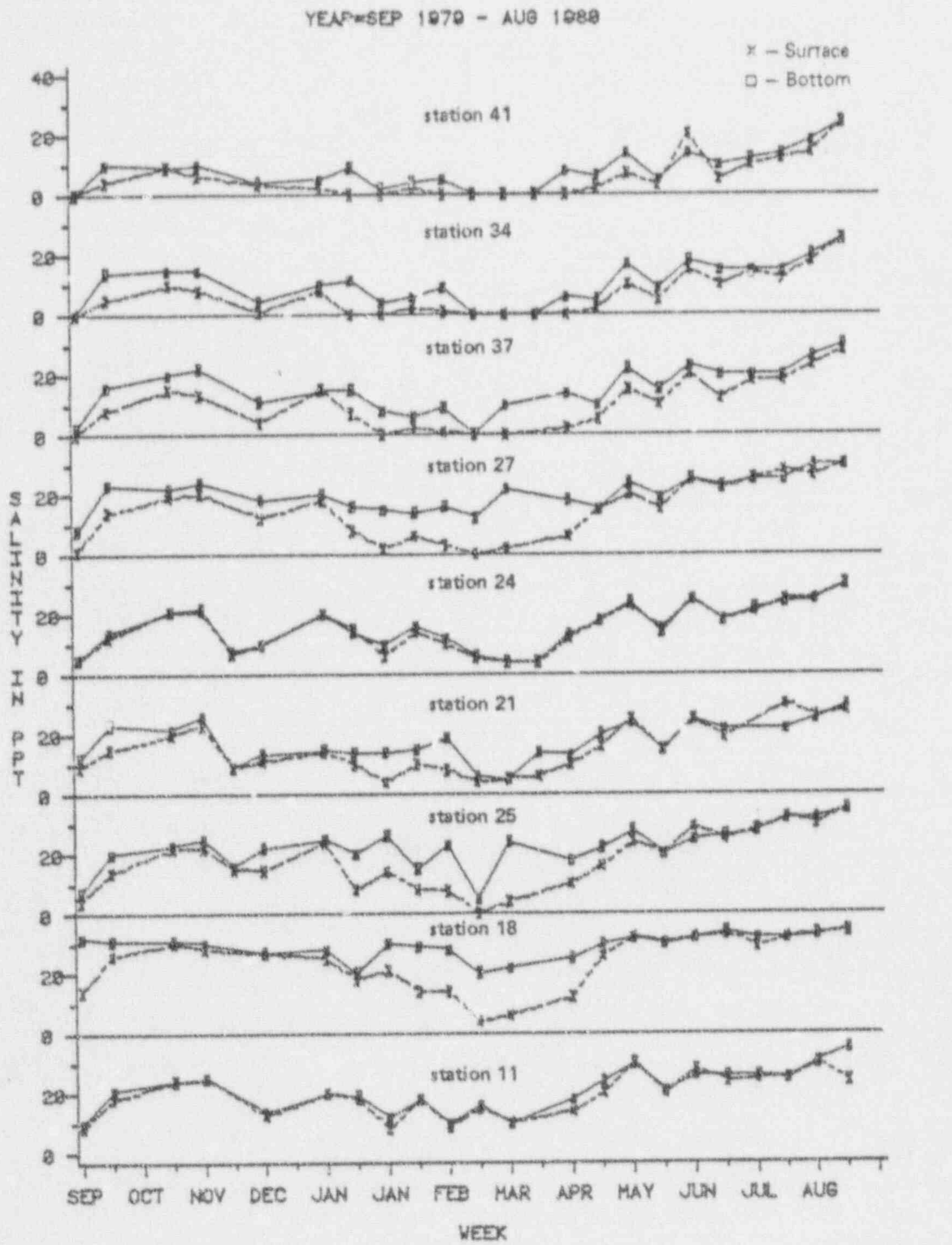


Figure 3.10 Mean salinity by month for river larval fish stations, September 1979 to August 1980.

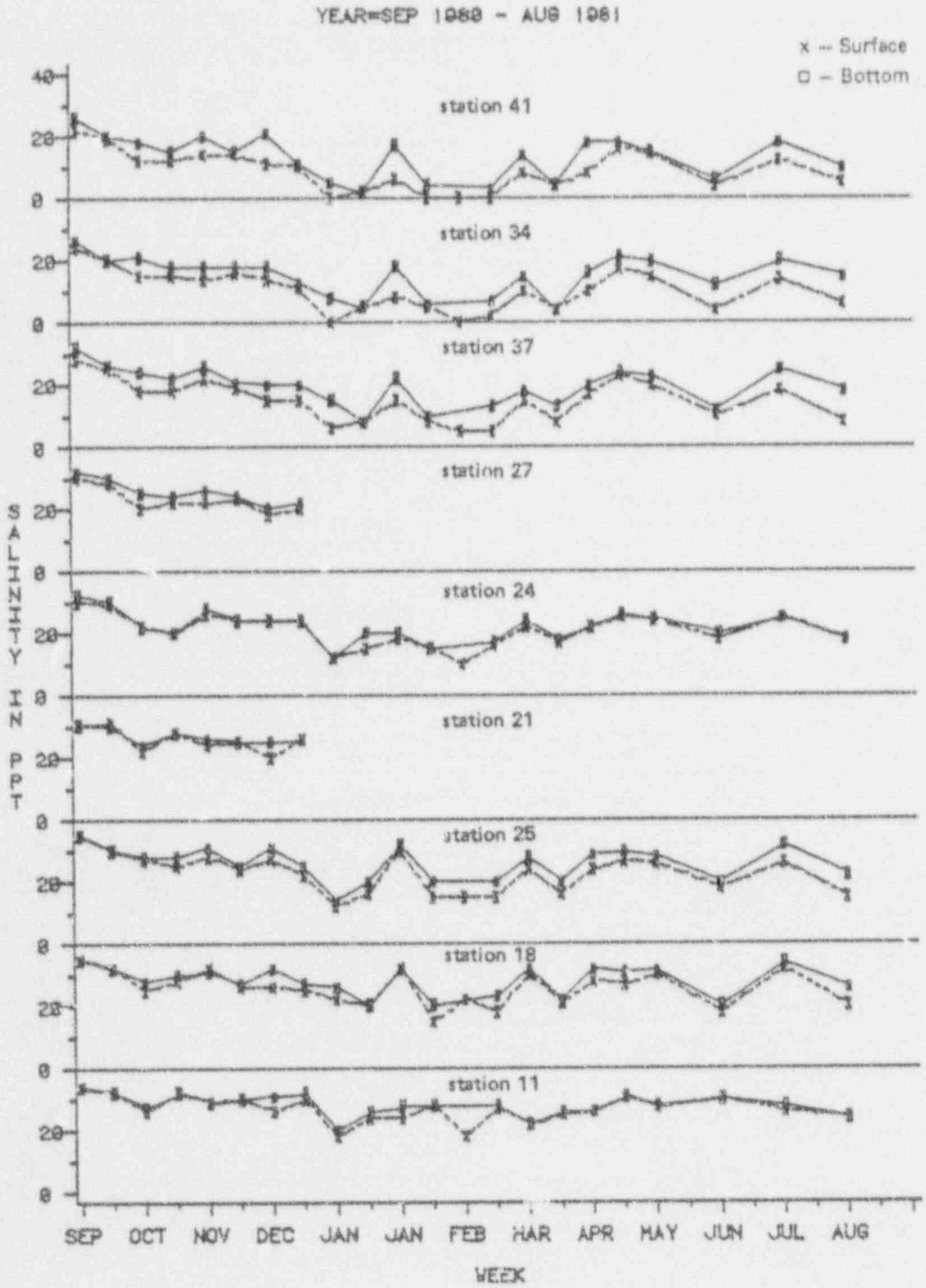


Figure 3.11 Mean salinity by month for river larval fish stations, September 1980 to August 1981.

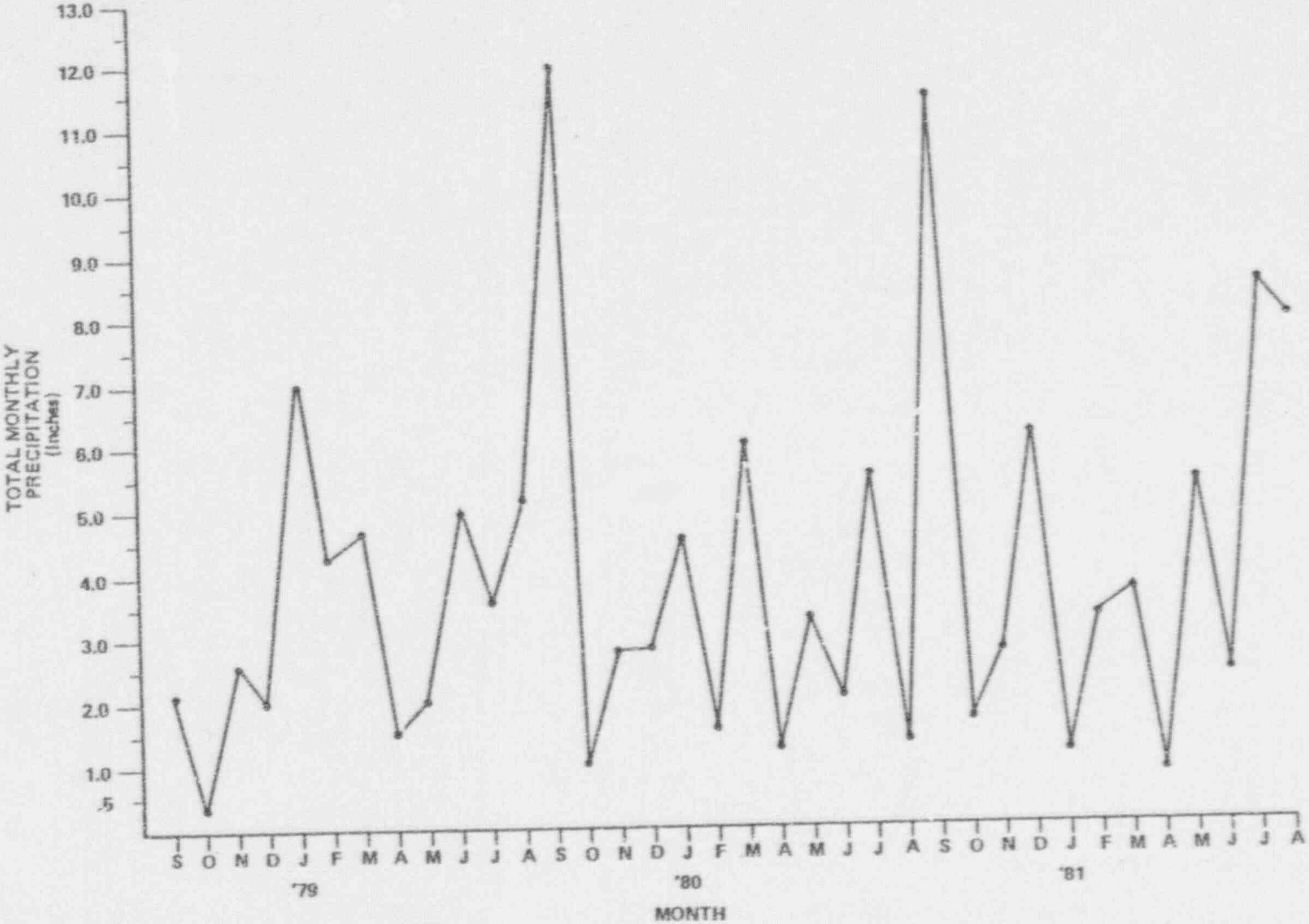


Figure 3.12 Total monthly precipitation recorded at the Brunswick Steam Electric Plant, September 1978 to August 1981.

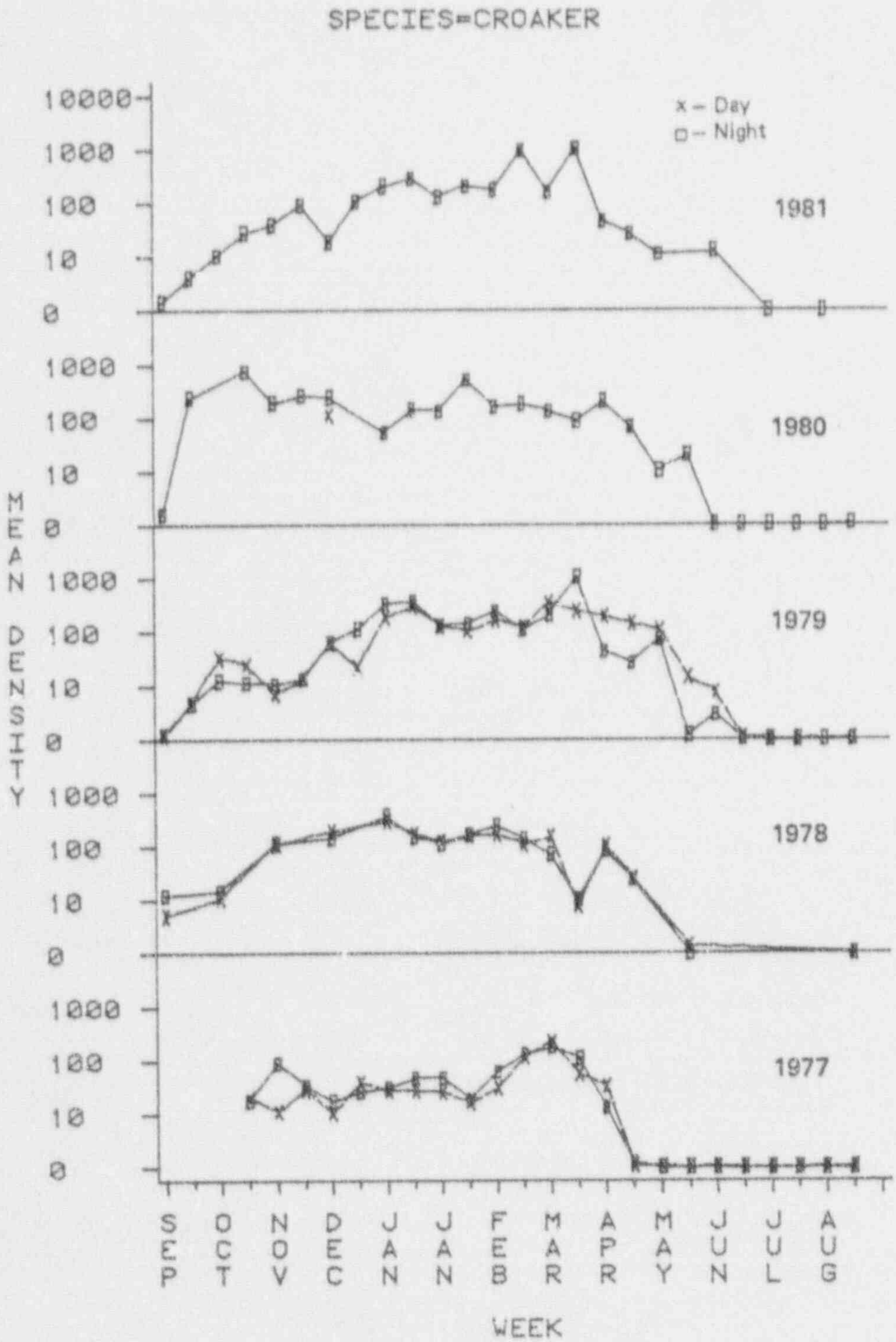


Figure 3.13 Mean density by analysis week for river larval fish program, croaker, September 1976 - August 1981.

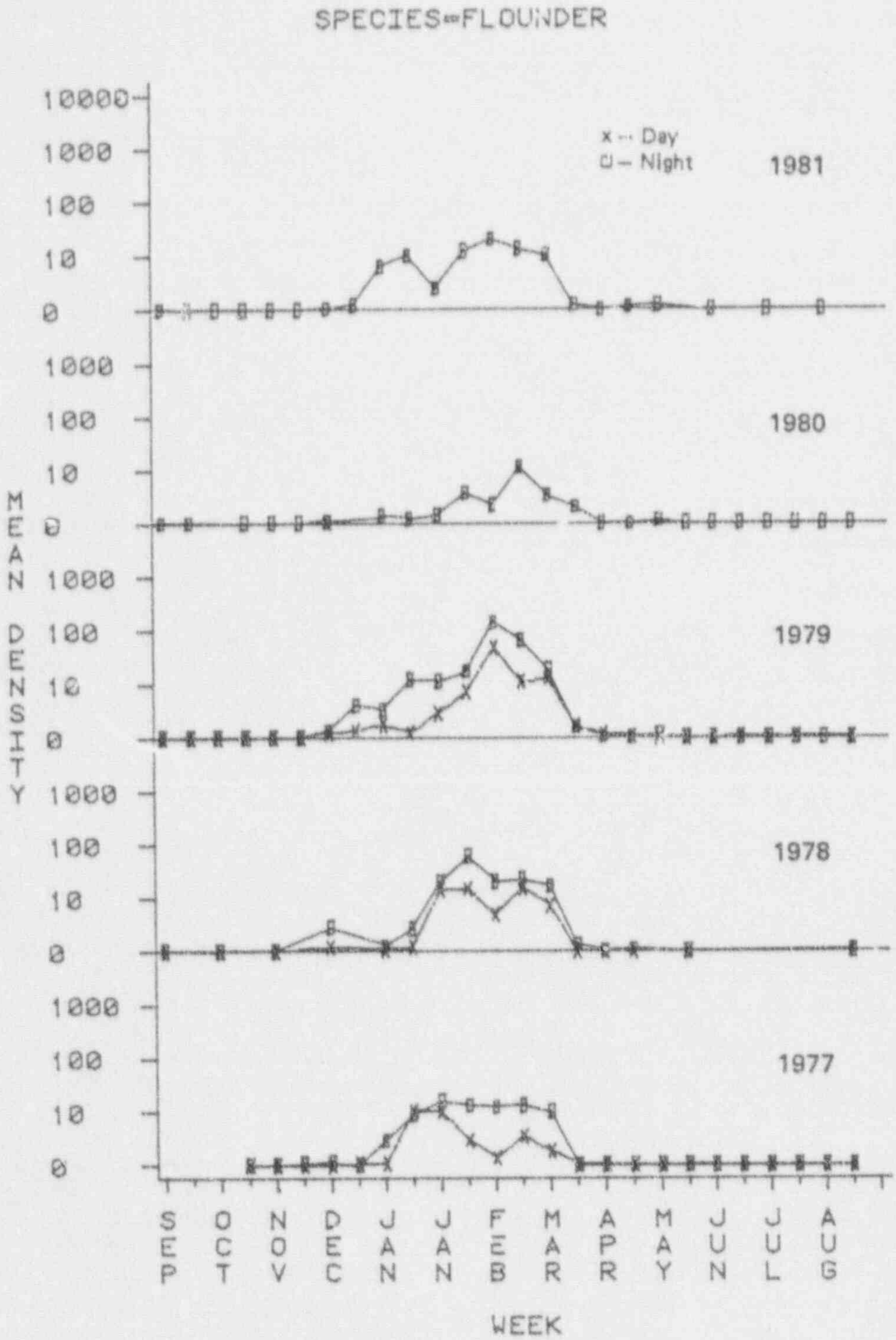


Figure 3.14 Mean density by analysis week for river larval fish program, flounder, September 1976 - August 1981.

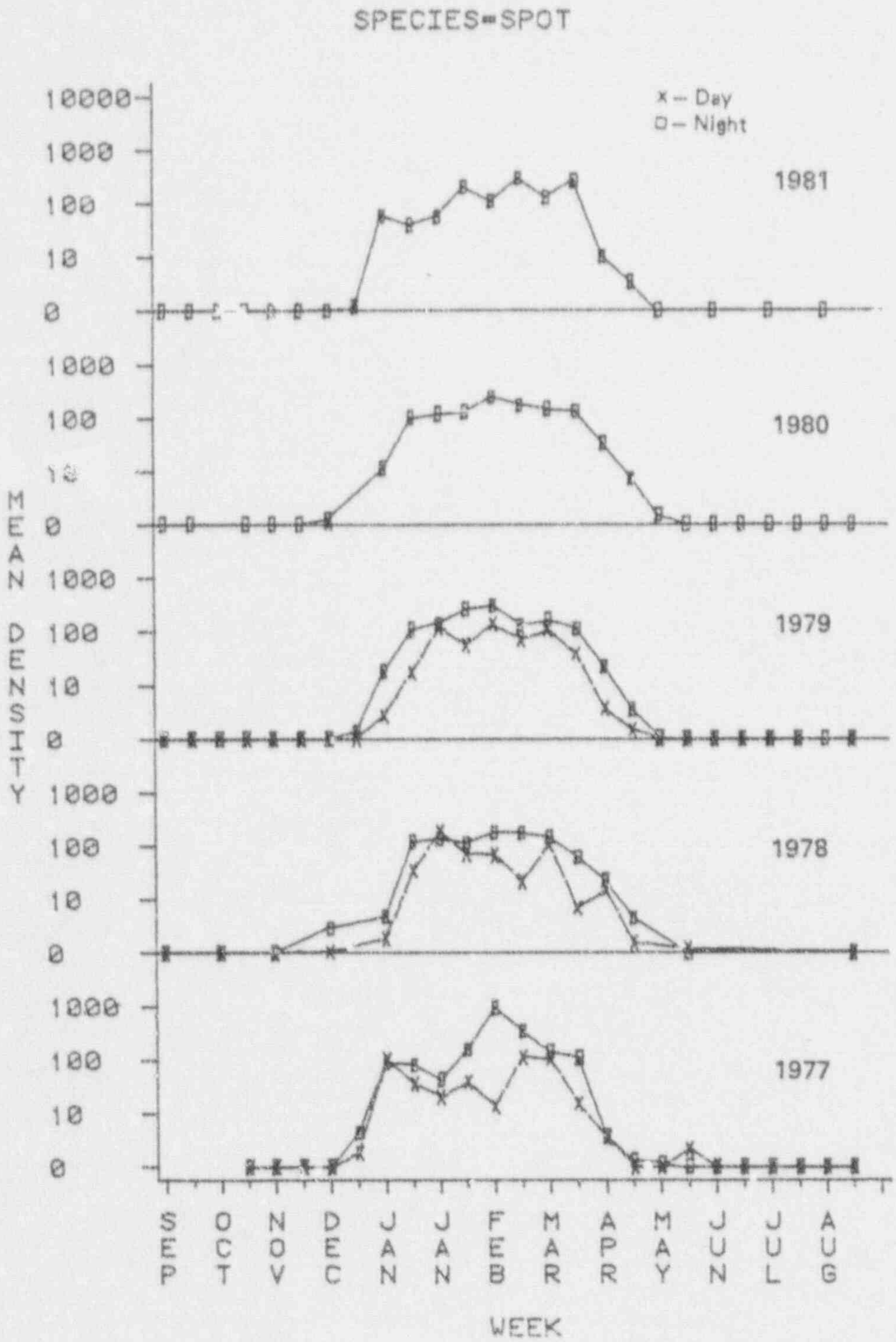


Figure 3.15 Mean density by analysis week for river larval fish program, spot, September 1976 - August 1981.

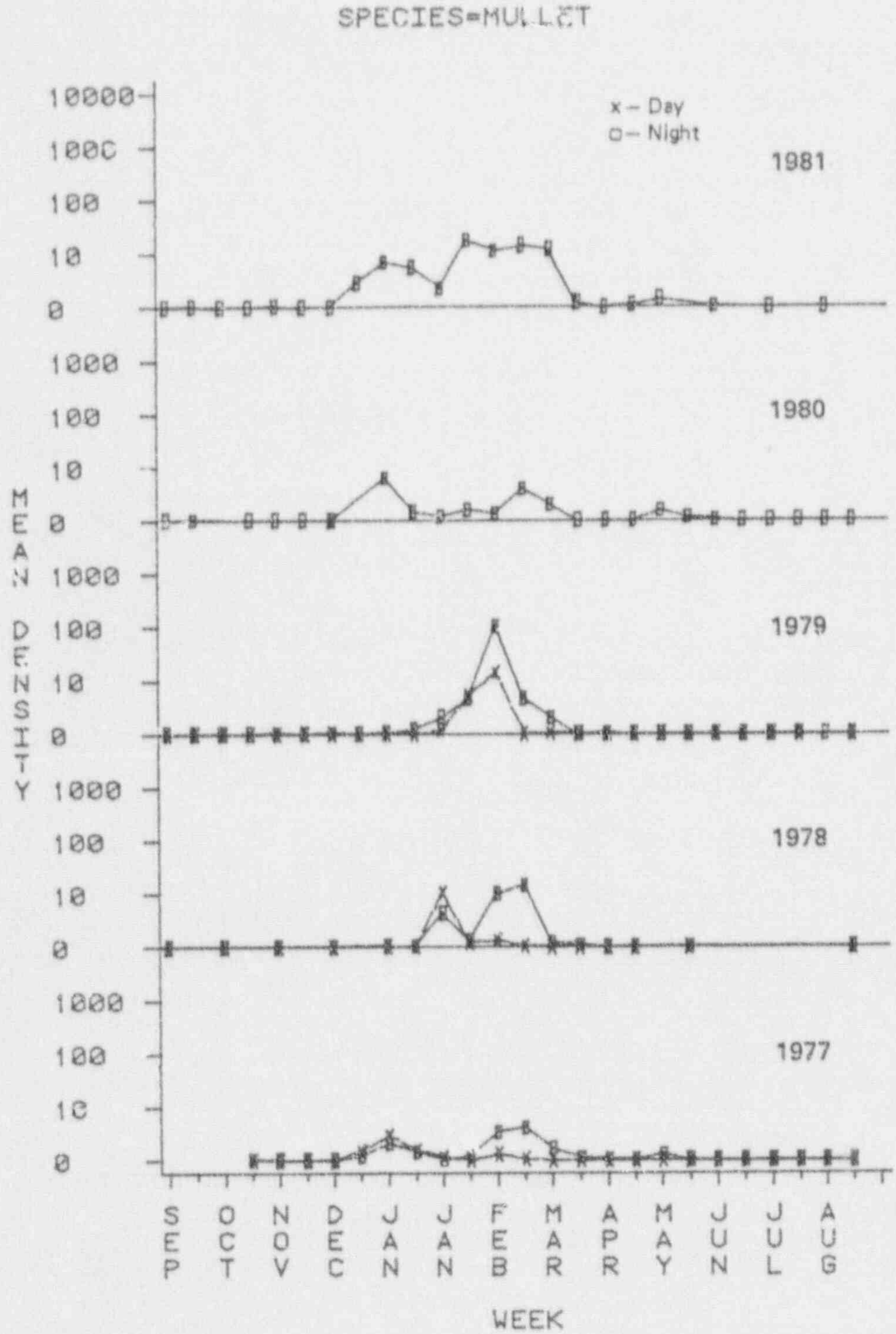


Figure 3.16 Mean density by analysis week for river larval fish program, mullet, September 1976 - August 1981.

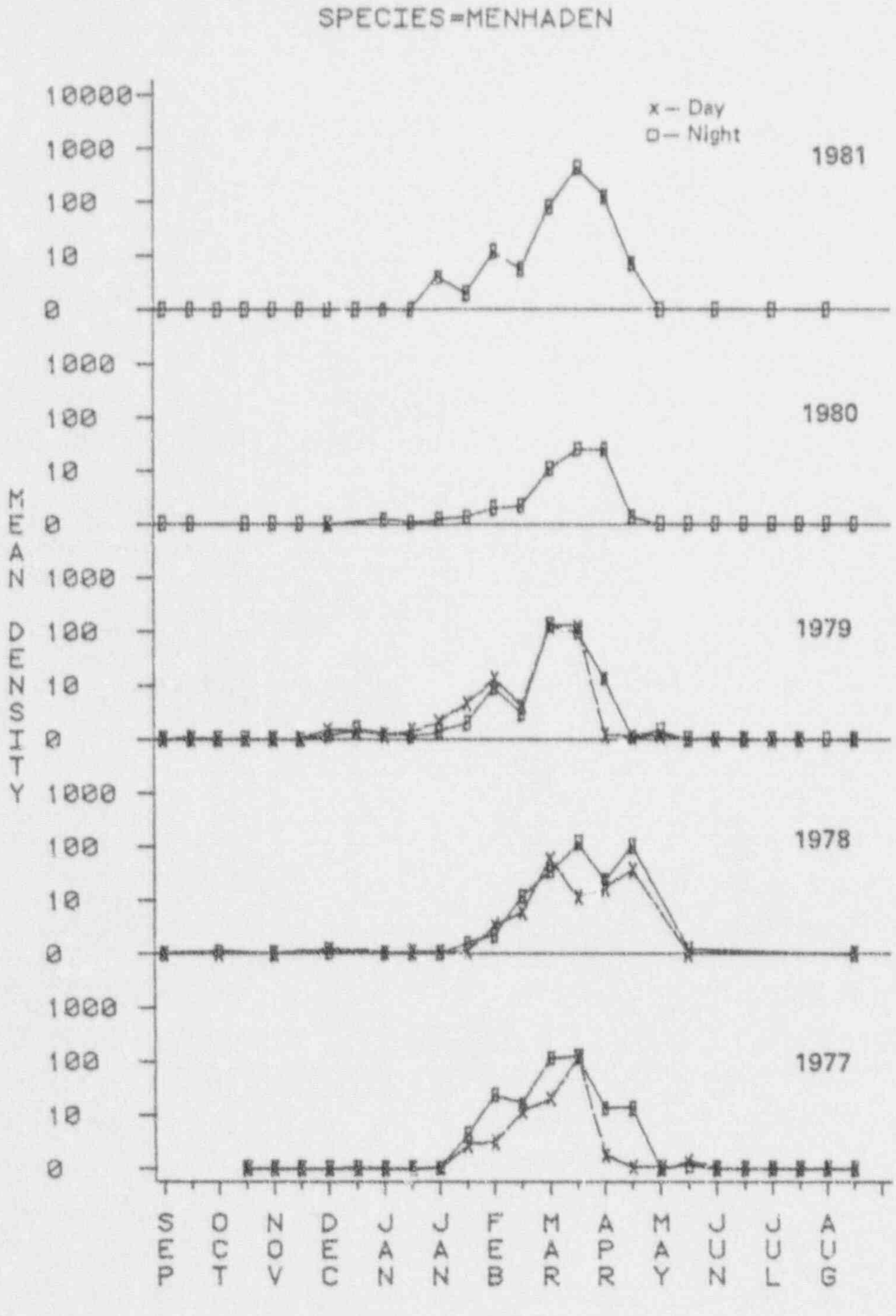


Figure 3.17 Mean density by analysis week for river larval fish program, menhaden, September 1976 - August 1981.

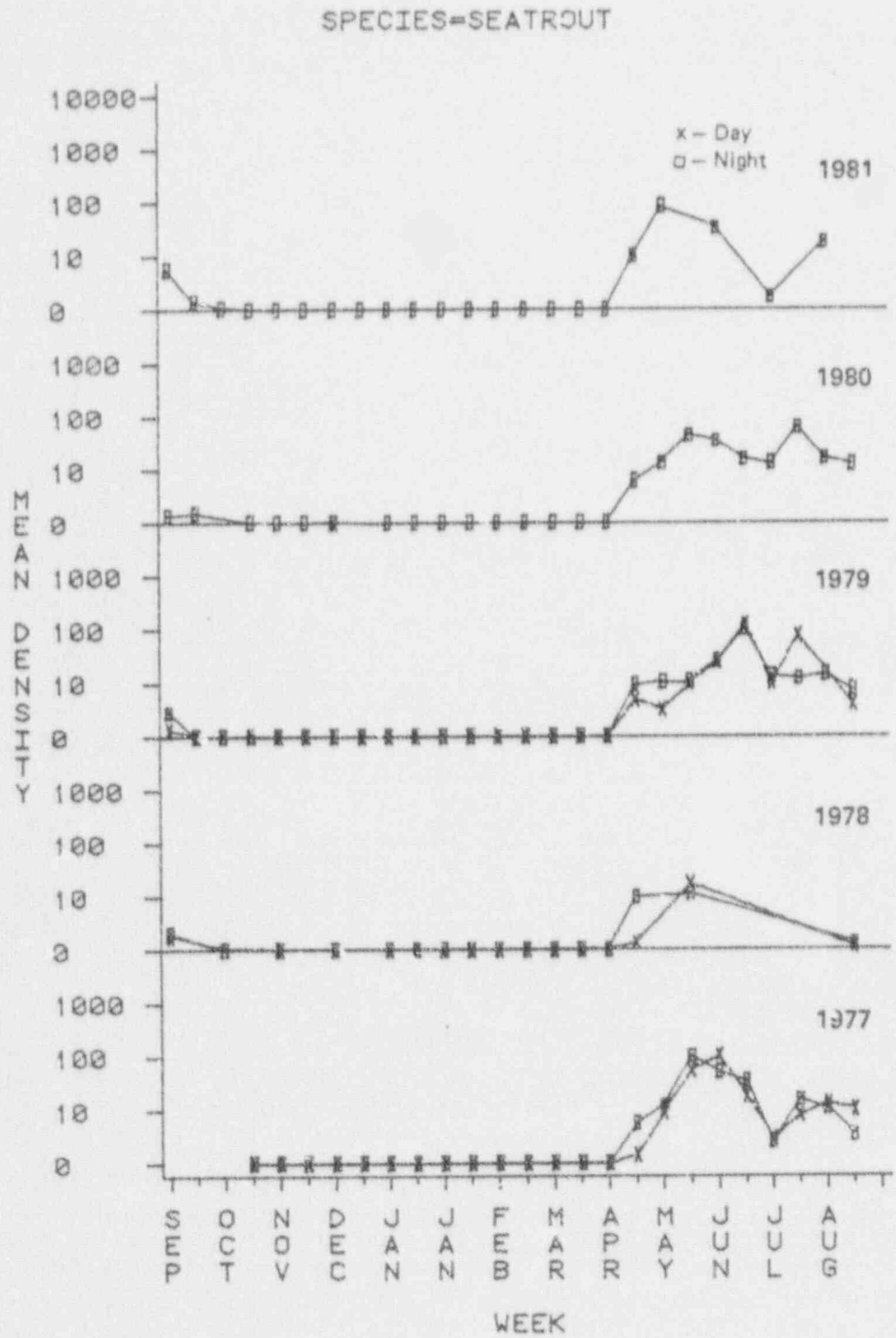


Figure 3.18 Mean density by analysis week for river larval fish program, seatrout, September 1976 - August 1981.

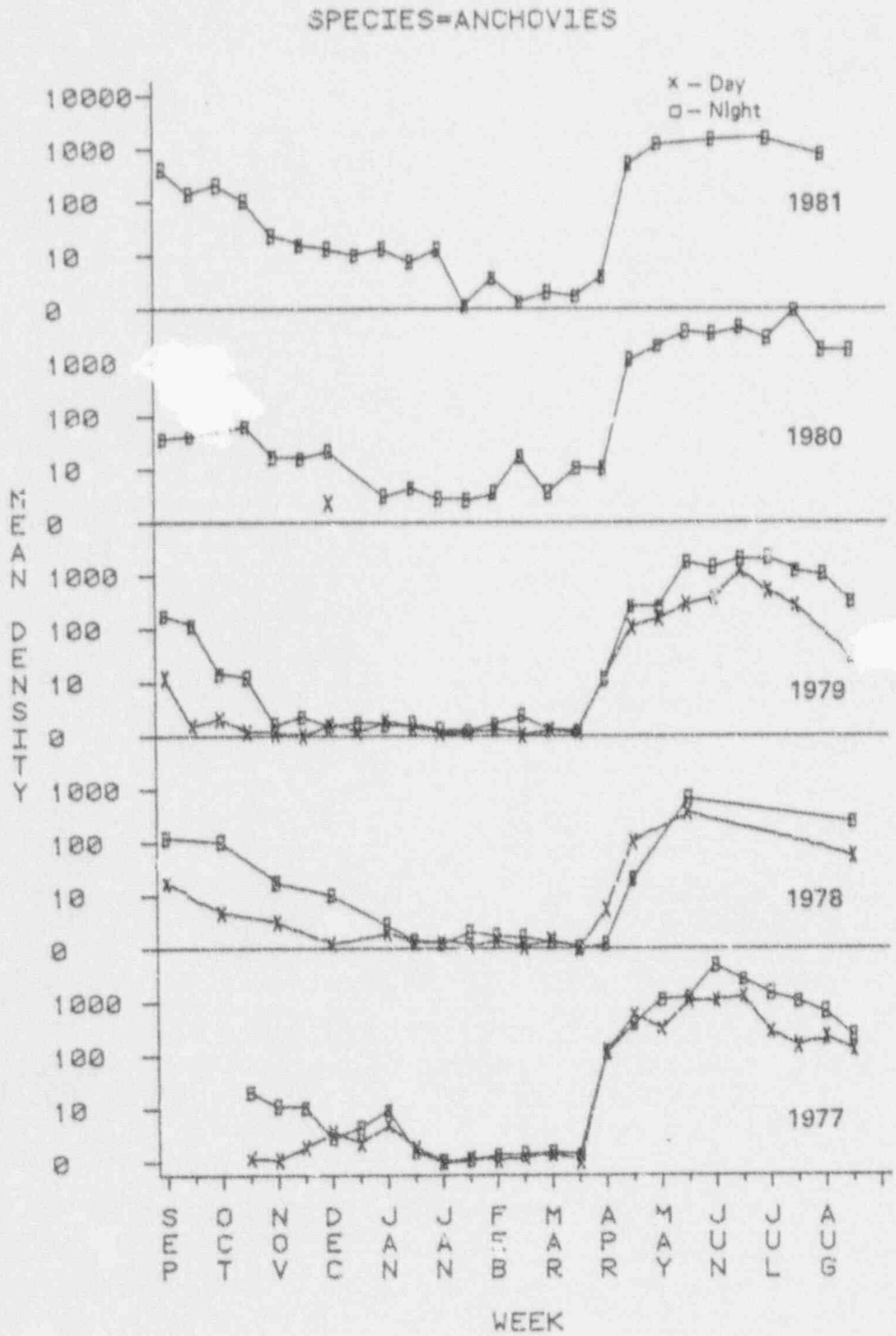


Figure 3.19 Mean density by analysis week for river larval fish program, Anchovy, September 1976 - August 1981.

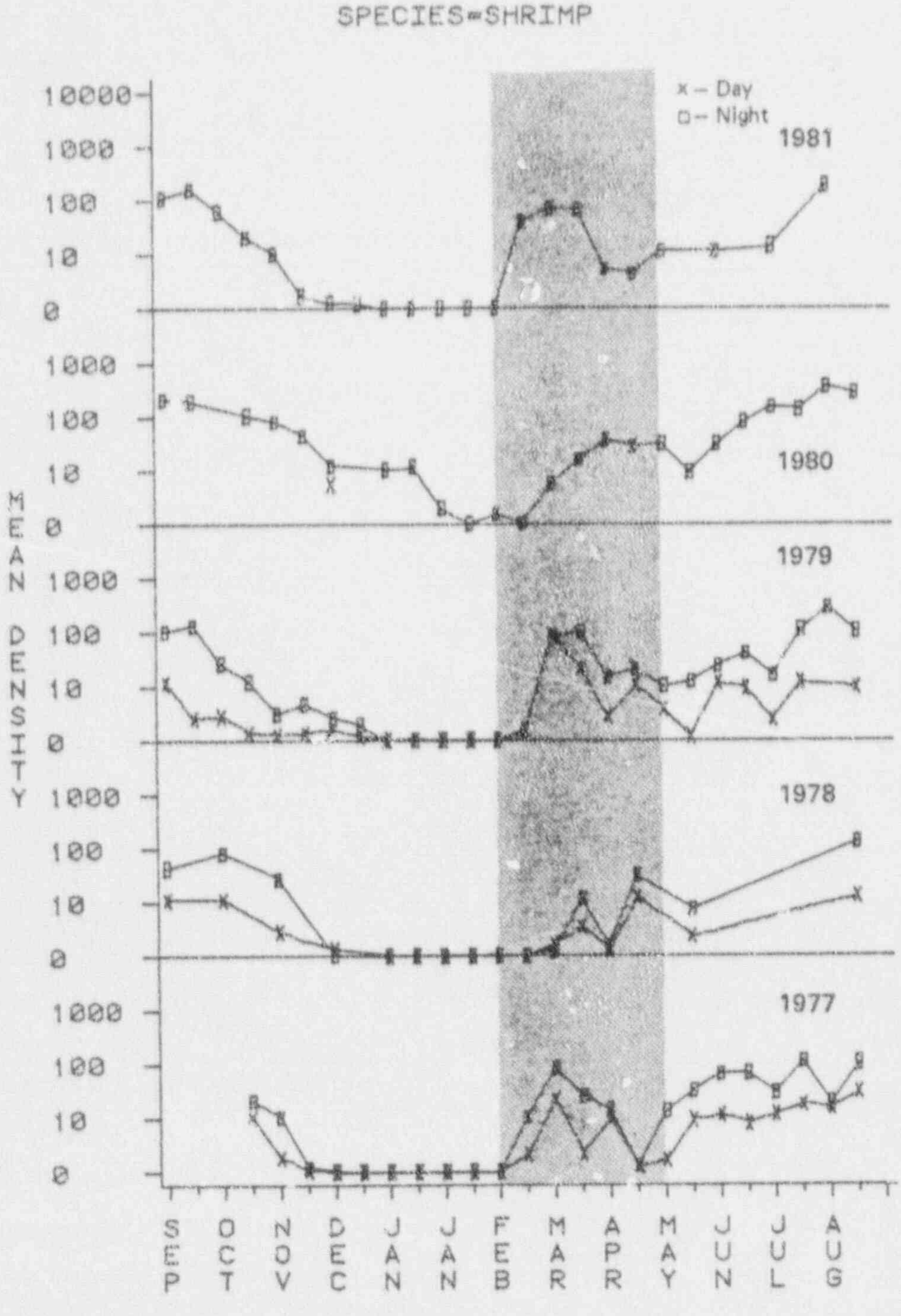


Figure 3.20 Mean density by analysis week for river larval fish program, shrimp, September 1976 - August 1981. (Shaded area = brown shrimp analysis period)

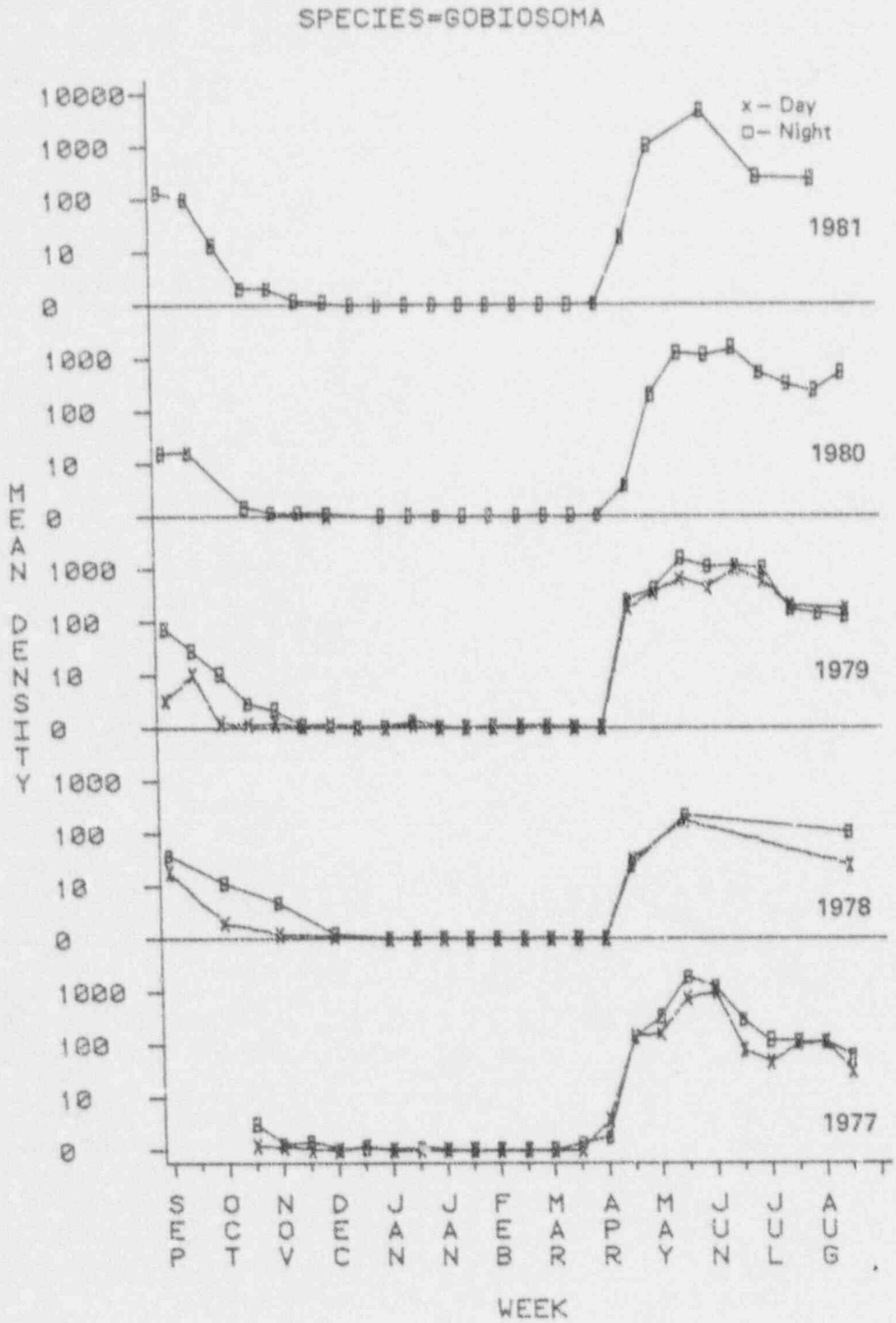


Figure 3.21 Mean density by analysis week for river larval fish program, Gobiosoma spp., September 1976 - August 1981.

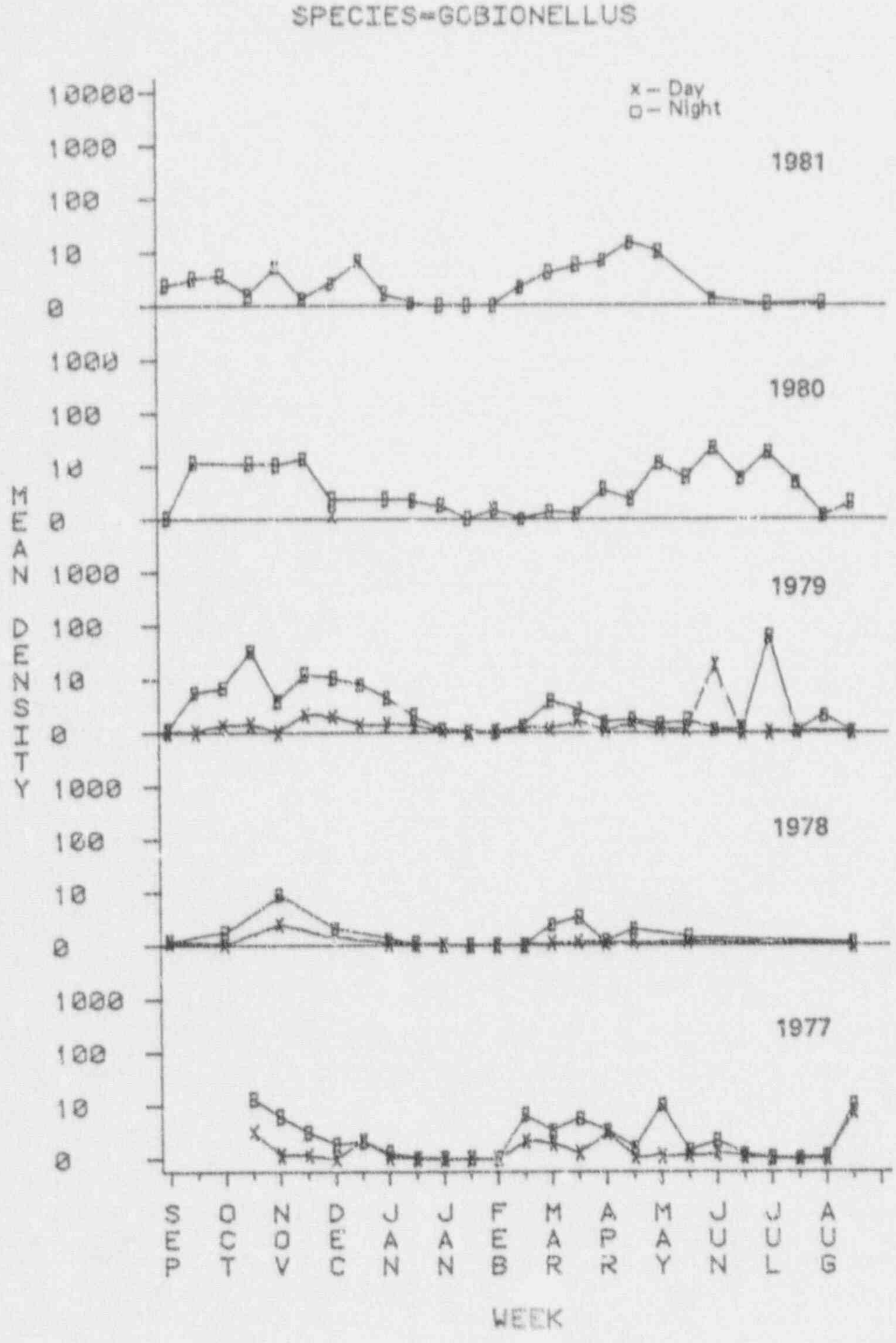


Figure 3.22 Mean density by analysis week for river larval fish program, Gobionellus spp., September 1976 - August 1981.

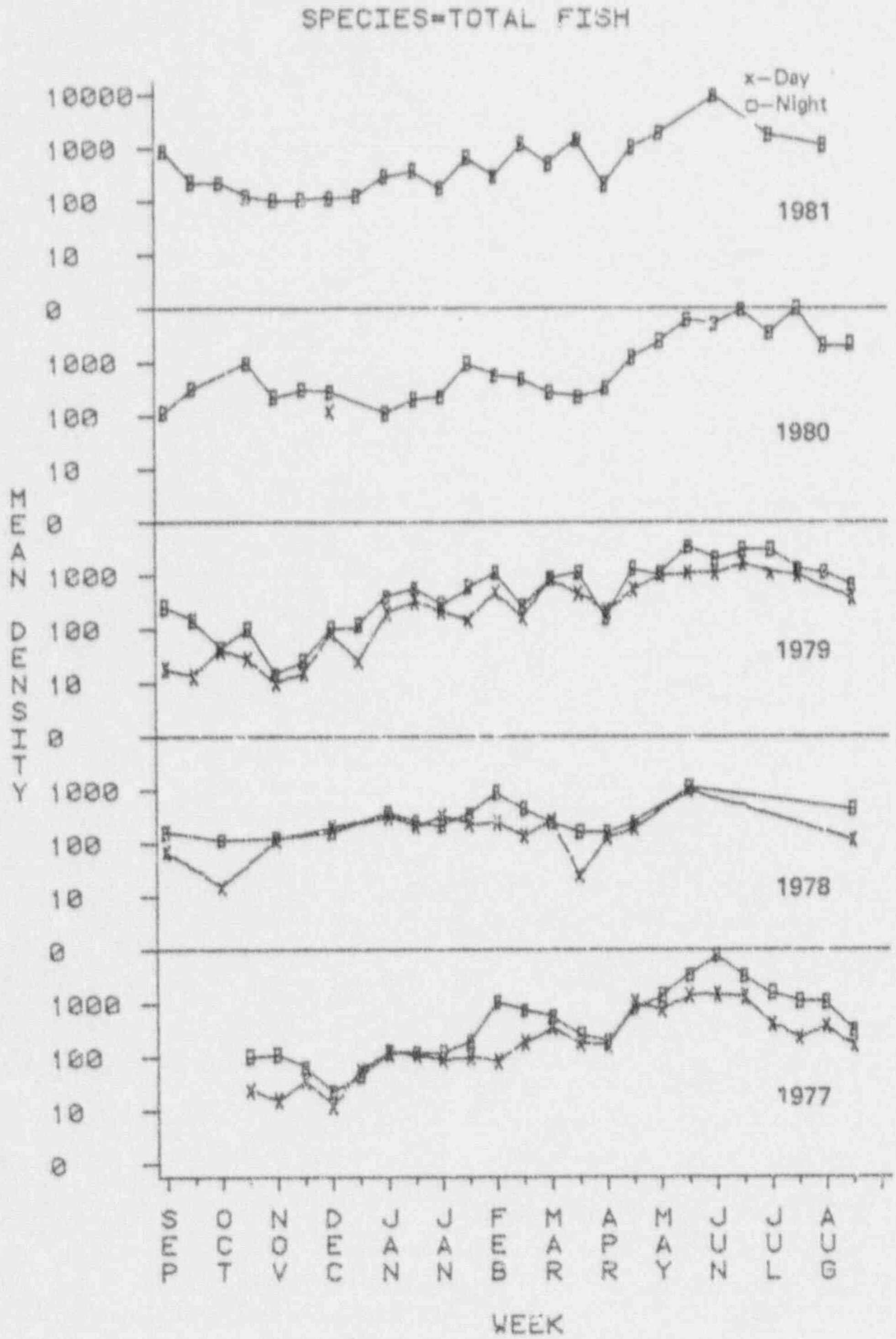


Figure 3.23 Mean density by analysis week for river larval fish program, total fish, September 1976 - August 1981.

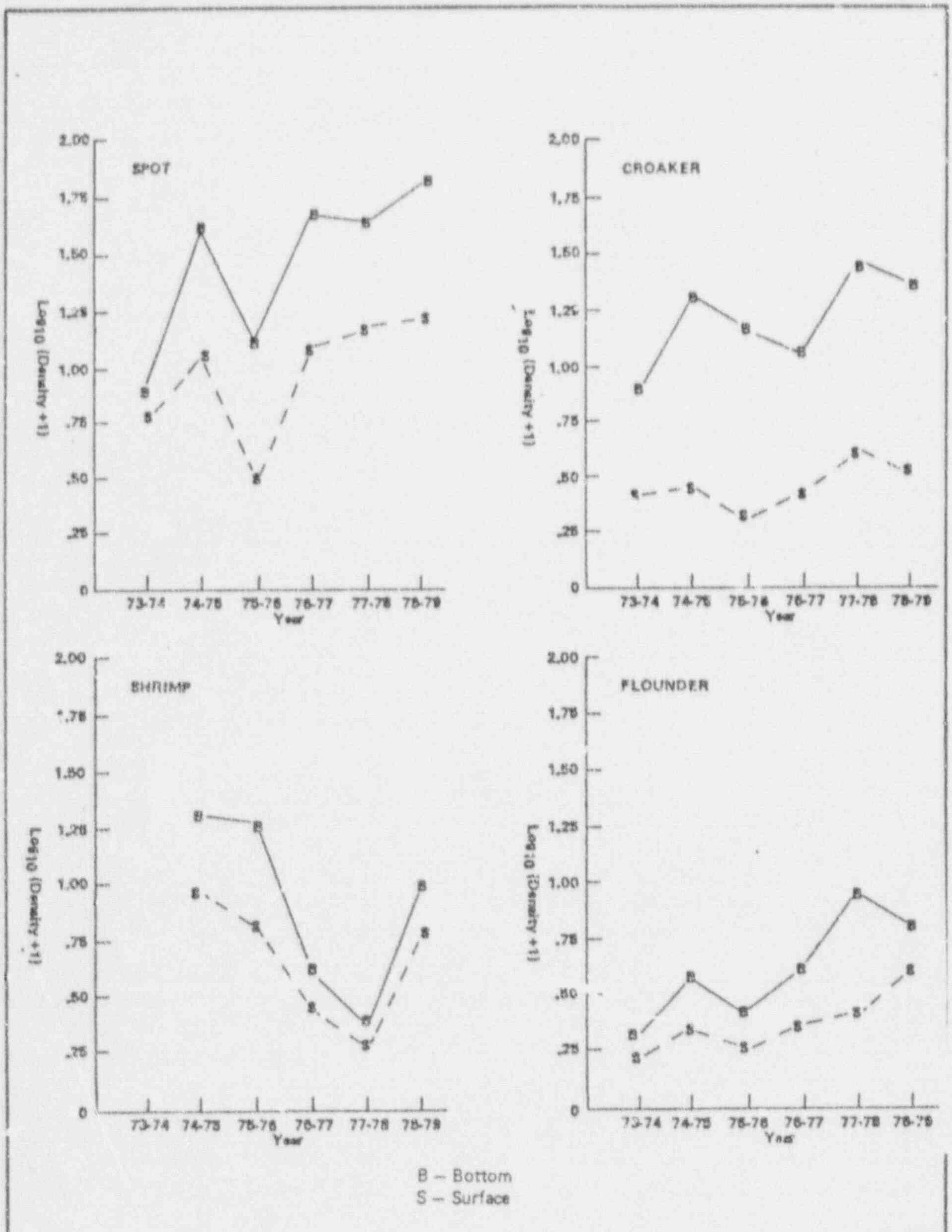


Figure 3.24 Mean density (as $\log_{10}$ [density + 1]) by surface/bottom for selected species, 1973 - 1979. Bottom greater than surface.

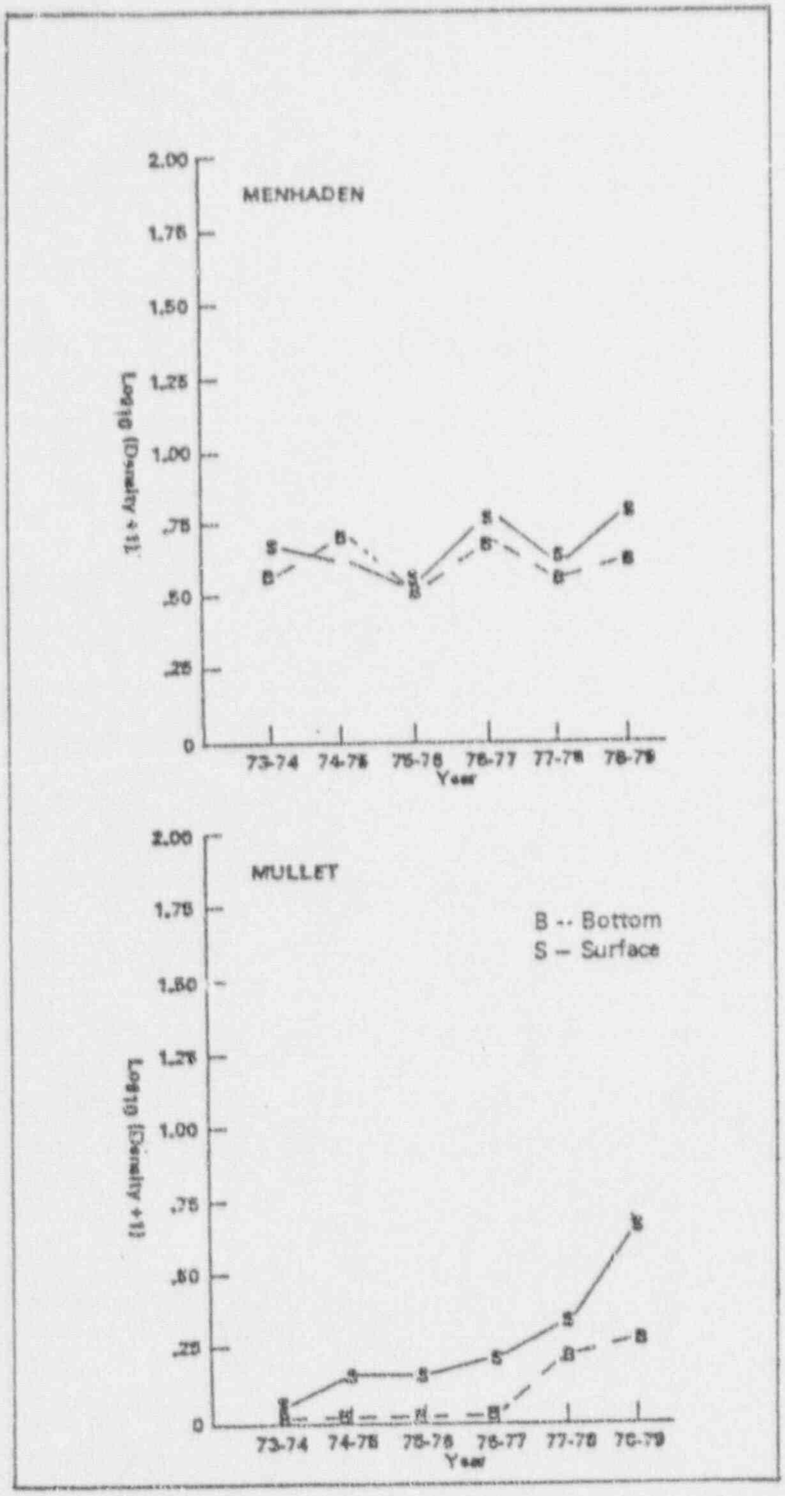


Figure 3.25 Mean density (as $\log_{10}$ [density + 1]) by surface/bottom for selected species, 1973 - 1979. Surface greater than bottom.

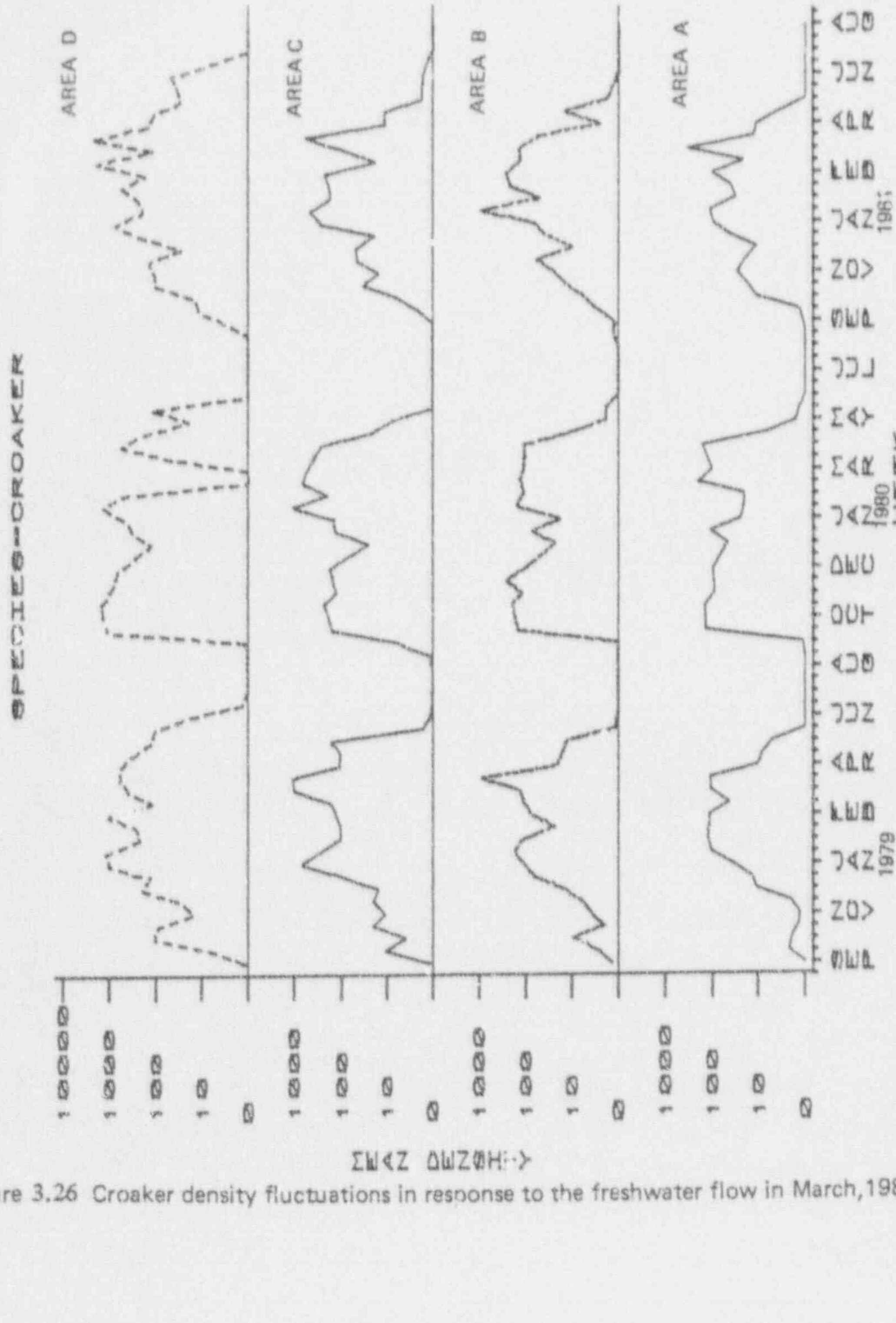


Figure 3.26 Croaker density fluctuations in response to the freshwater flow in March,1980.

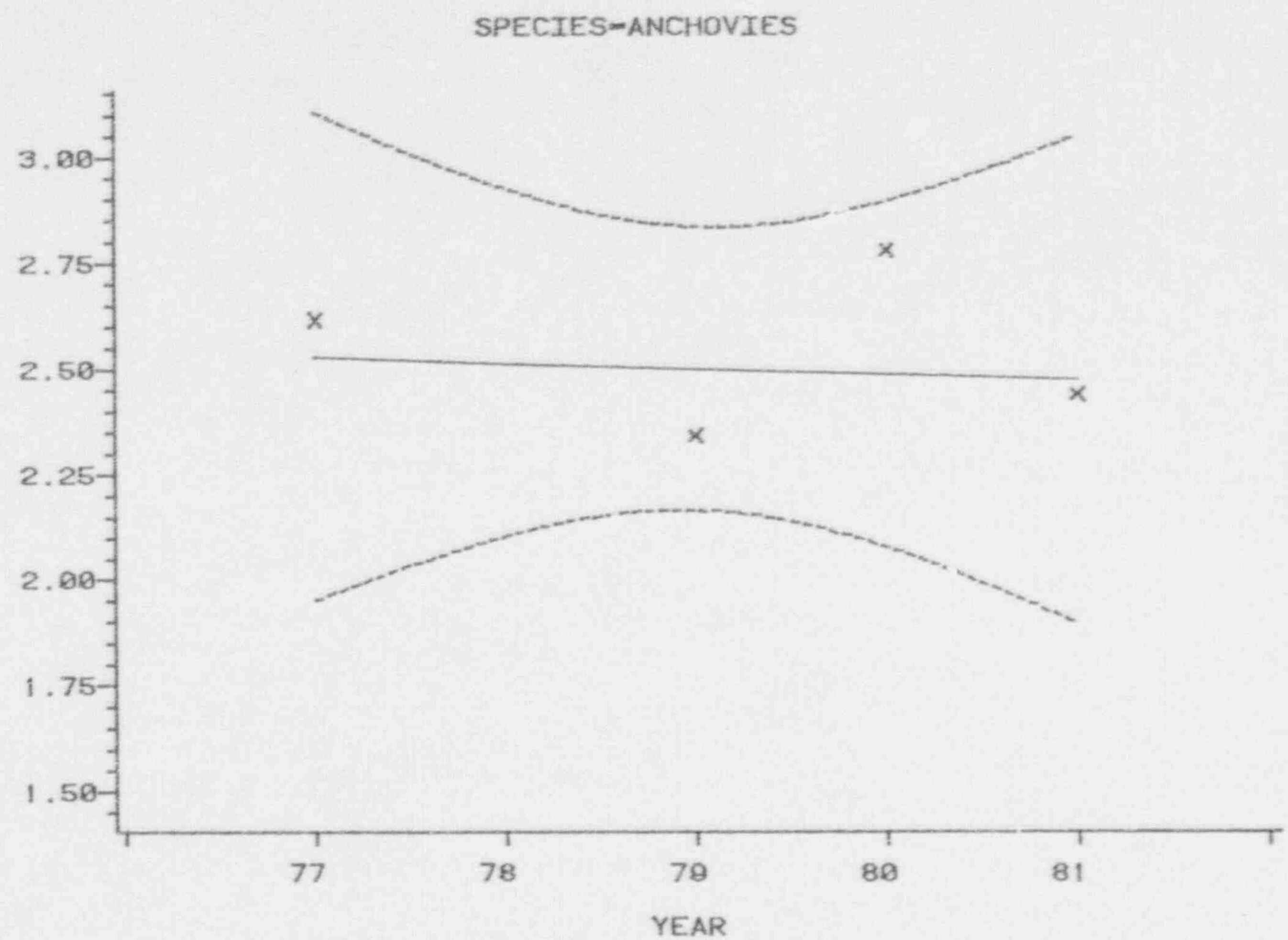


Figure 3.27 Anchovy river trend analysis, September 1976 to August 1981.

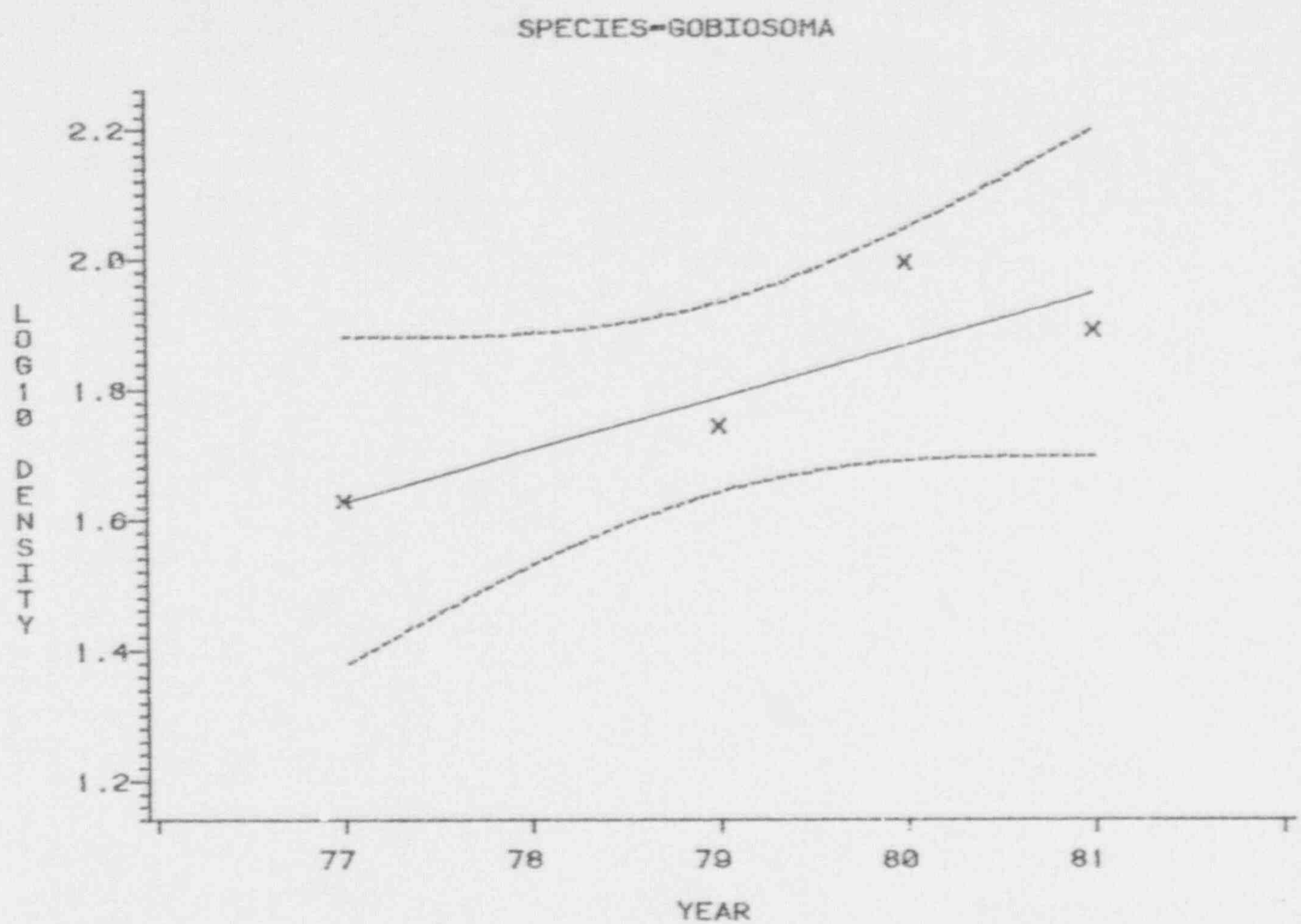


Figure 3.28 Gobiosoma spp. river trend analysis, September 1976 to August 1981.

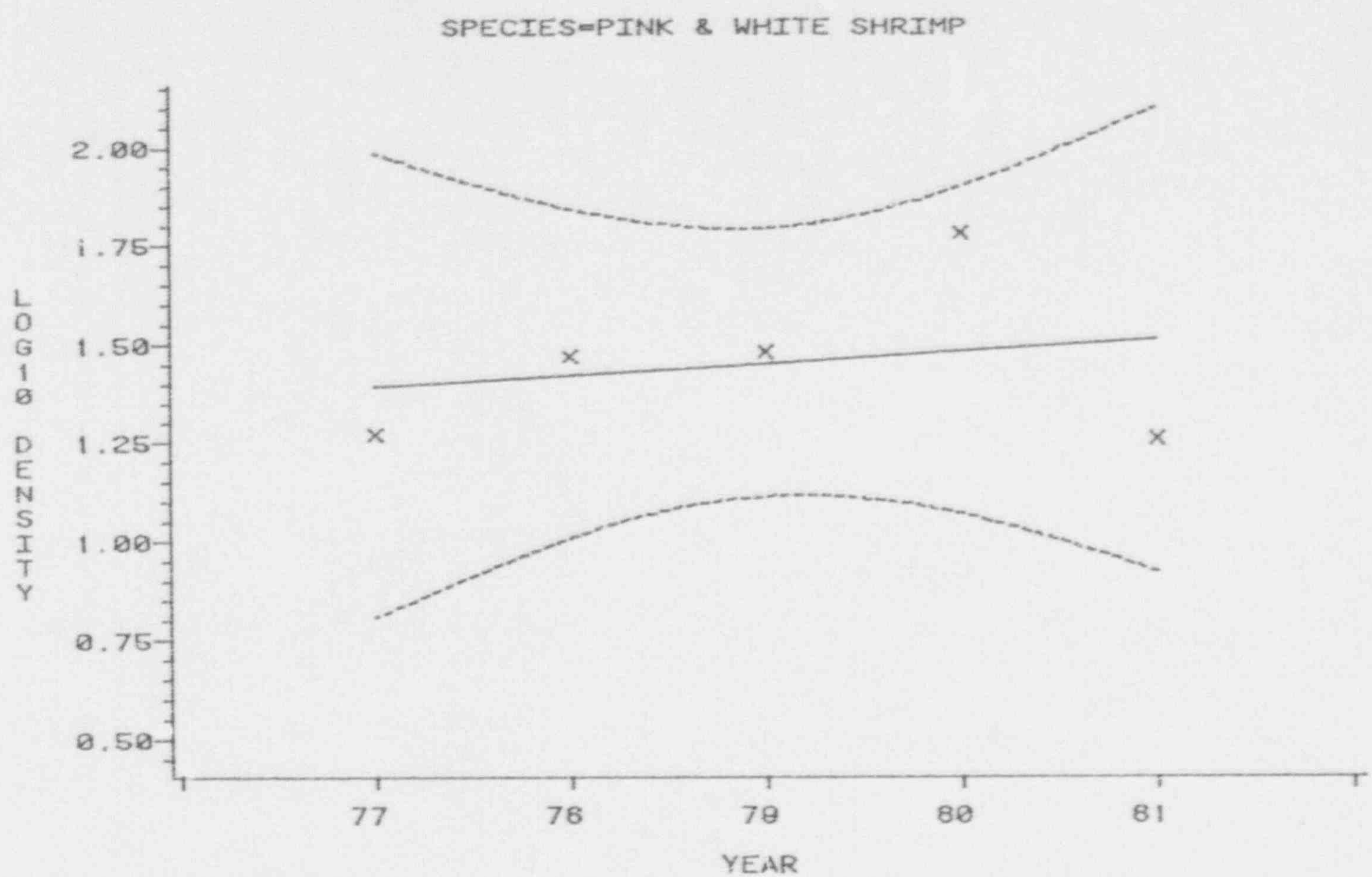


Figure 3.29 Pink/white shrimp trend analysis, September 1976 to August 1981.

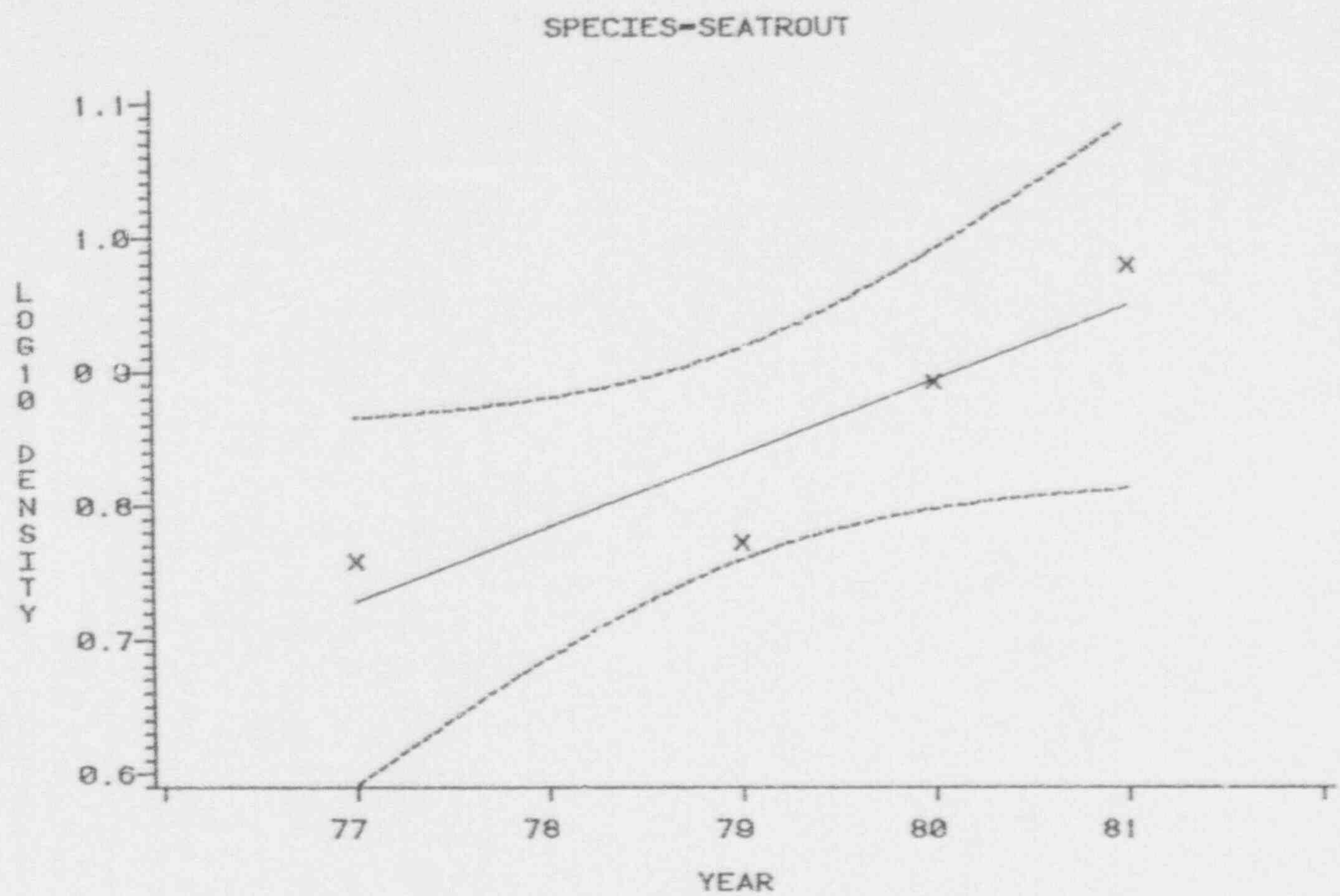


Figure 3.30 Seatrout river trend analysis, September 1976 to August 1981.

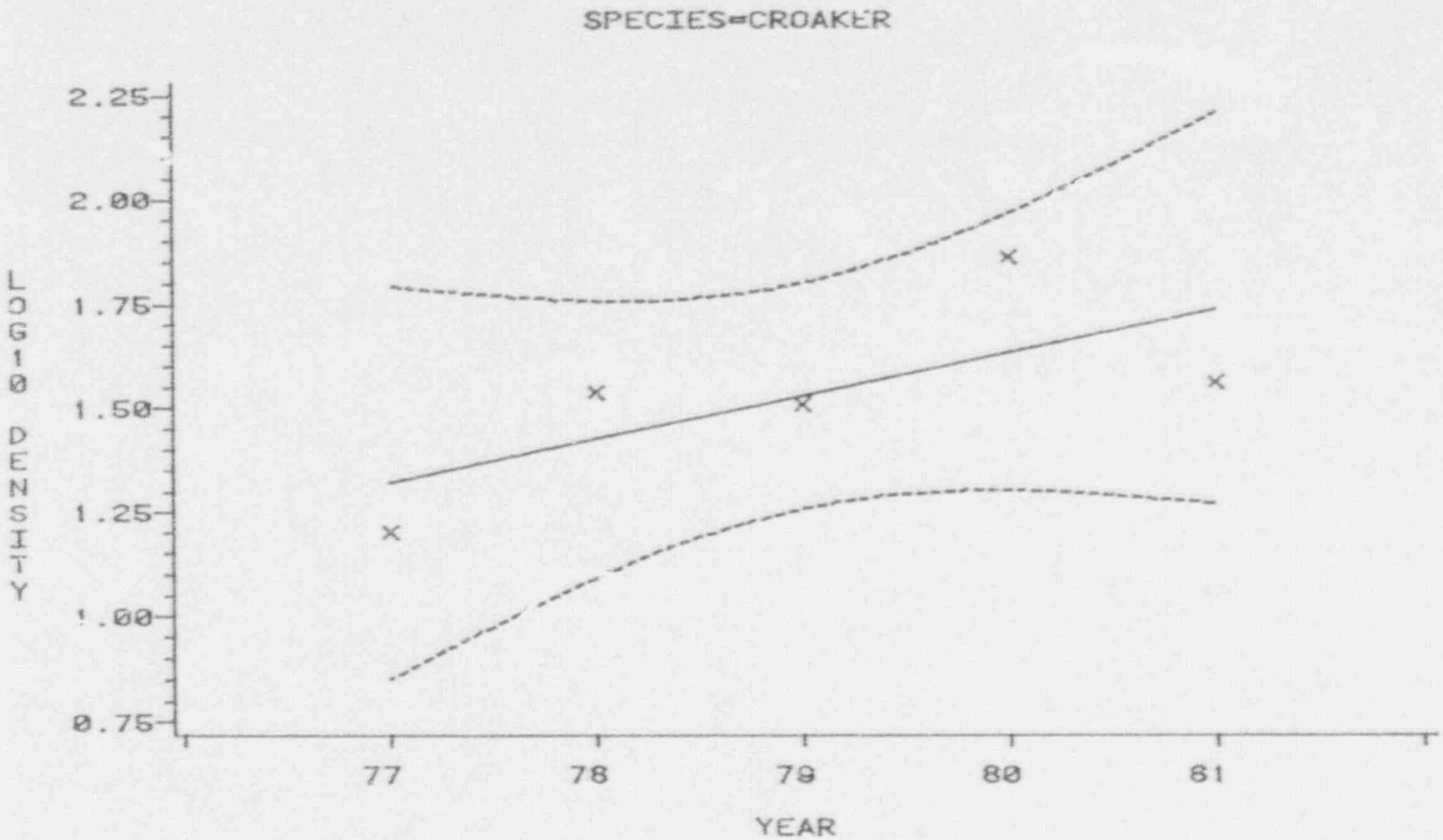


Figure 3.31 Croaker river trend analysis. September 1976 to August, 1981.

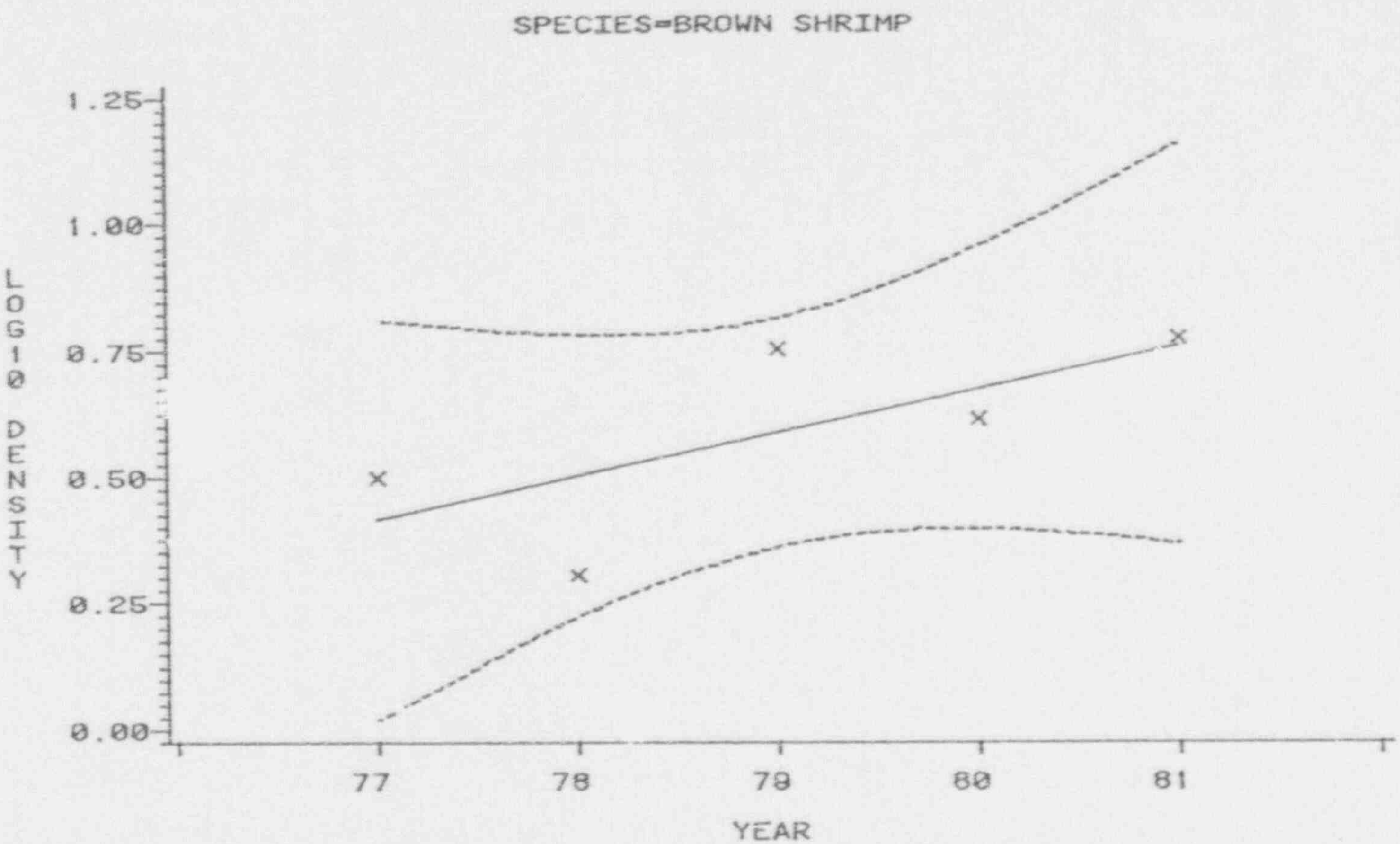


Figure 3.32 Brown shrimp river trend analysis, September 1976 to August 1981.

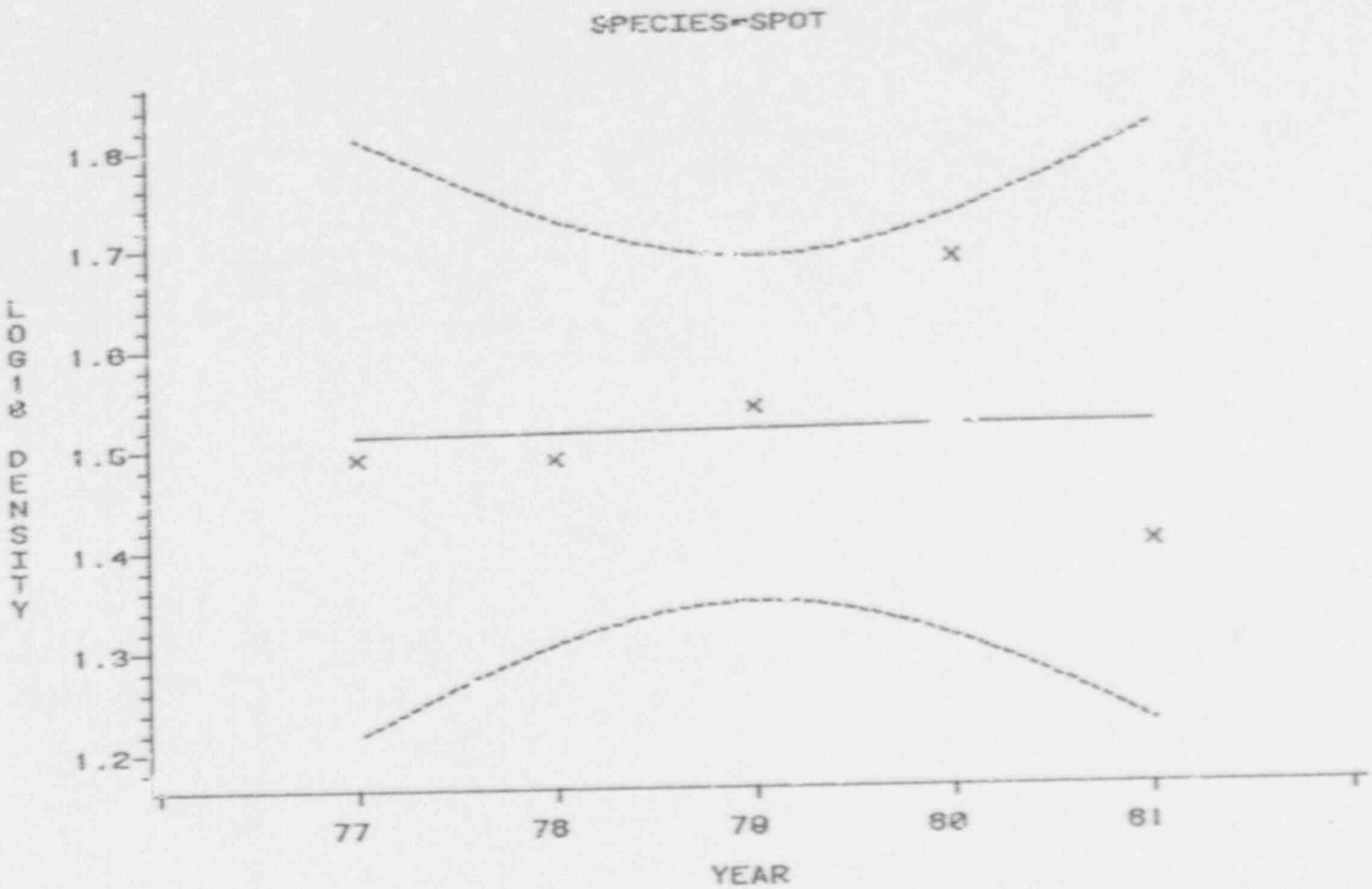


Figure 3.33 Spot river trend analysis, September 1976 to August 1981.

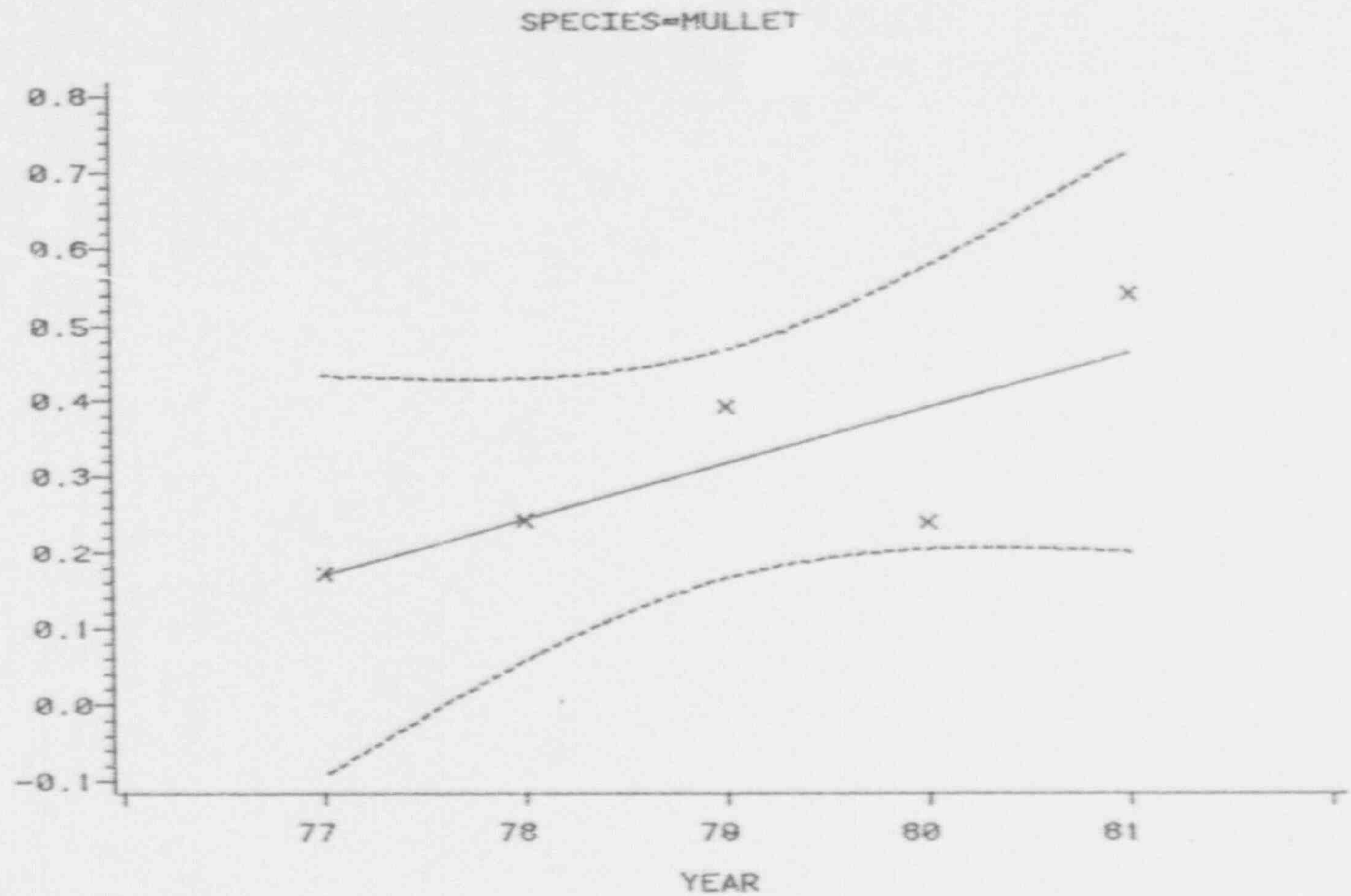


Figure 3.34 Mullet river trend analysis, September 1976 to August 1981.

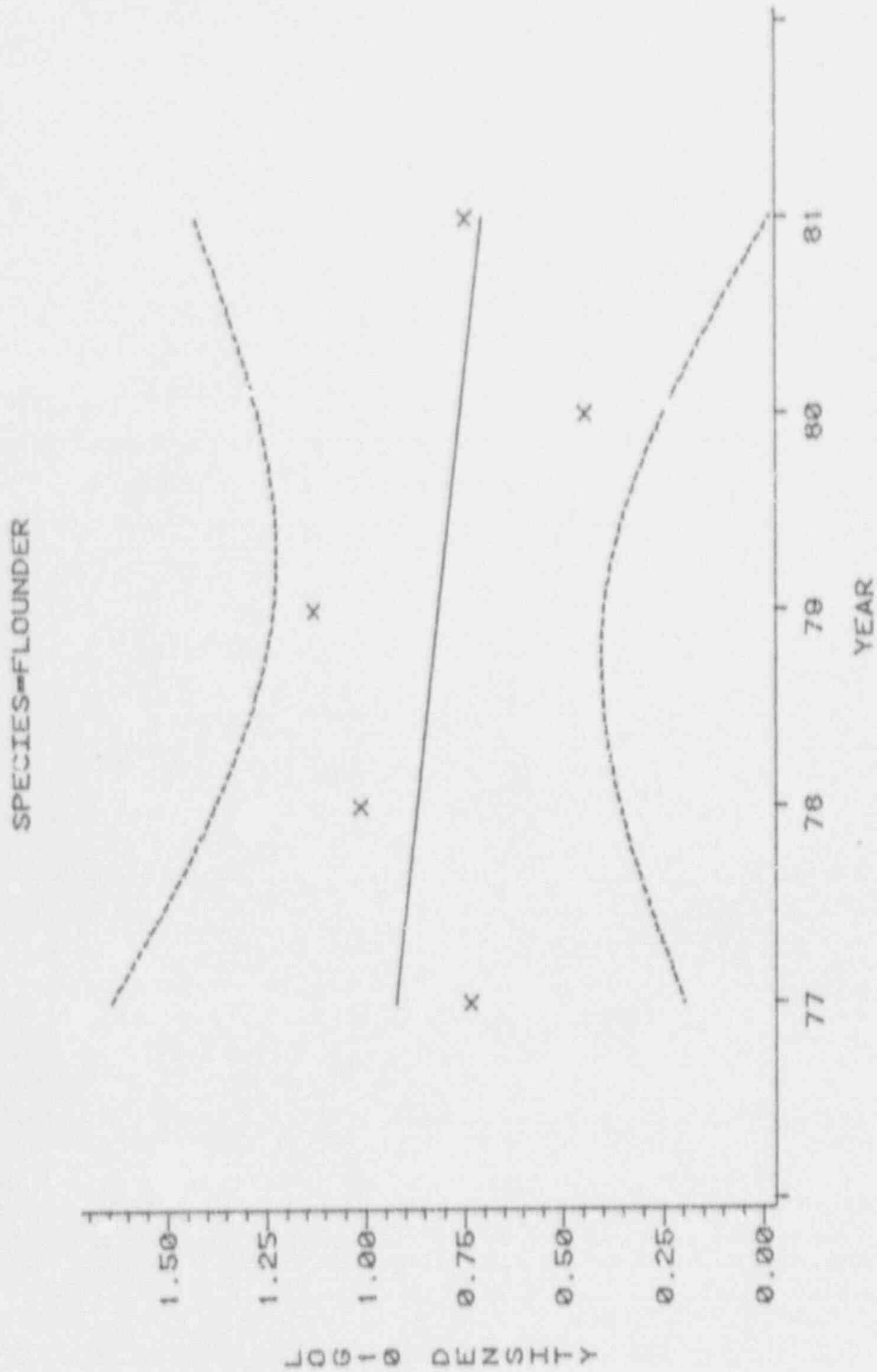


Figure 3.35 Flounder river trend analysis, September 1976 to August 1981.

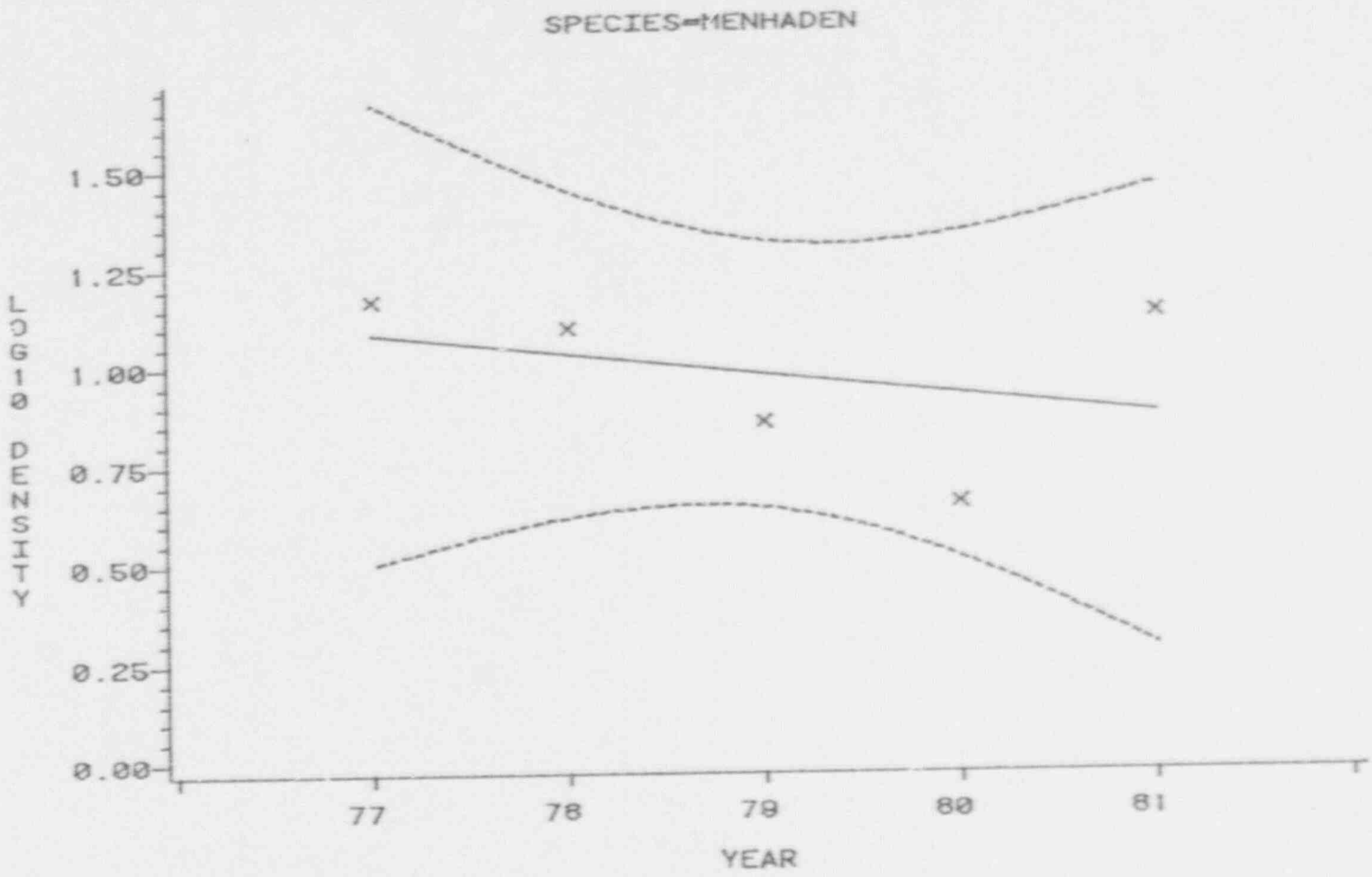


Figure 3.36 Menhaden river trend analysis, September 1976 to August 1981.

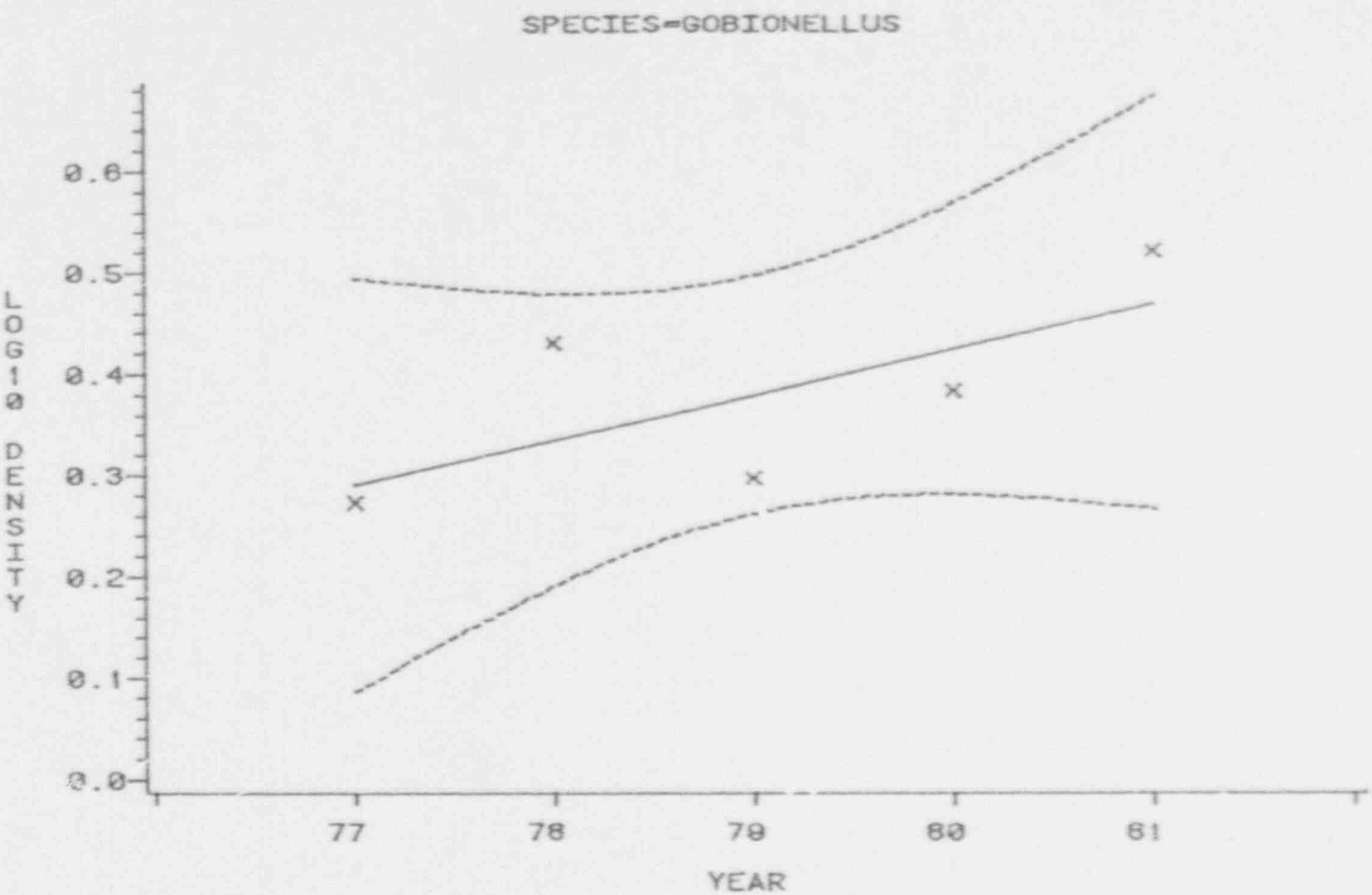


Figure 3.37 Gobionellus spp. river trend analysis, September 1976 to August 1981.

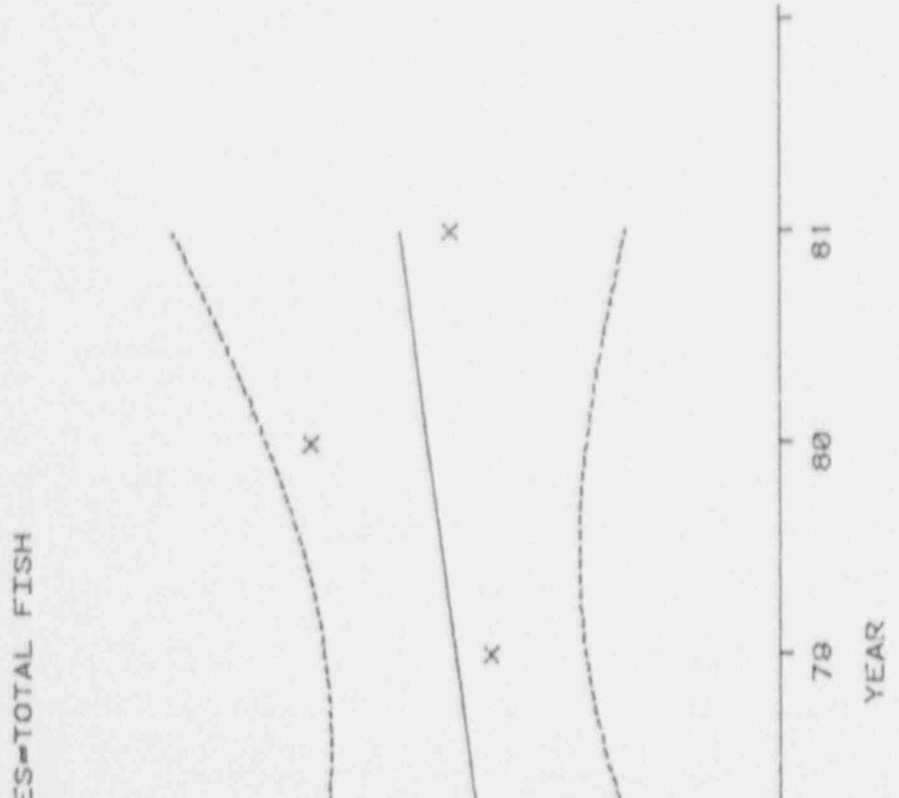


Figure 3.38 Total fish river trend analysis, September 1976 to August 1981.

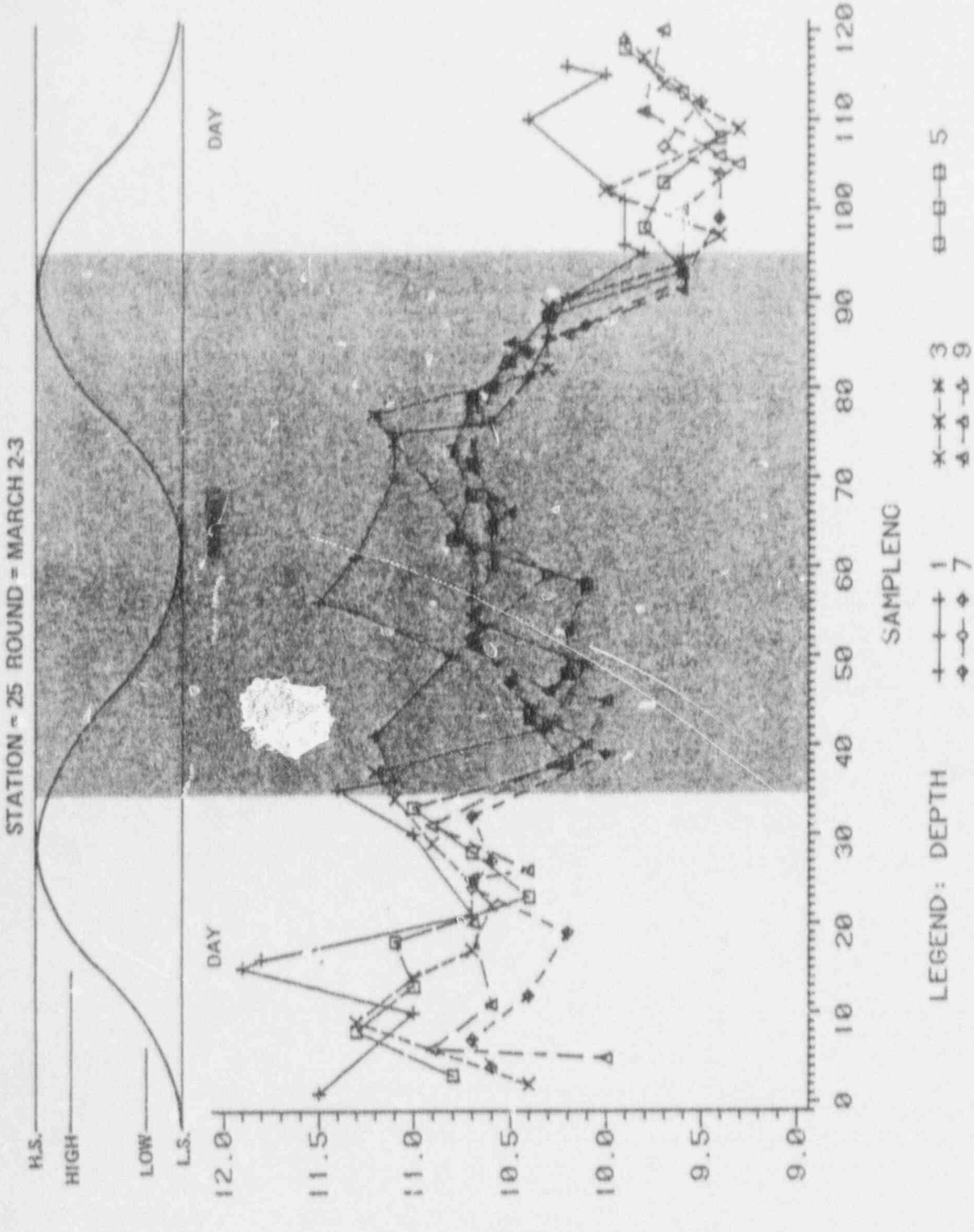


Figure 3.39 Discrete depth sampling temperature profiles -1981 (Sheet 1 of 5).

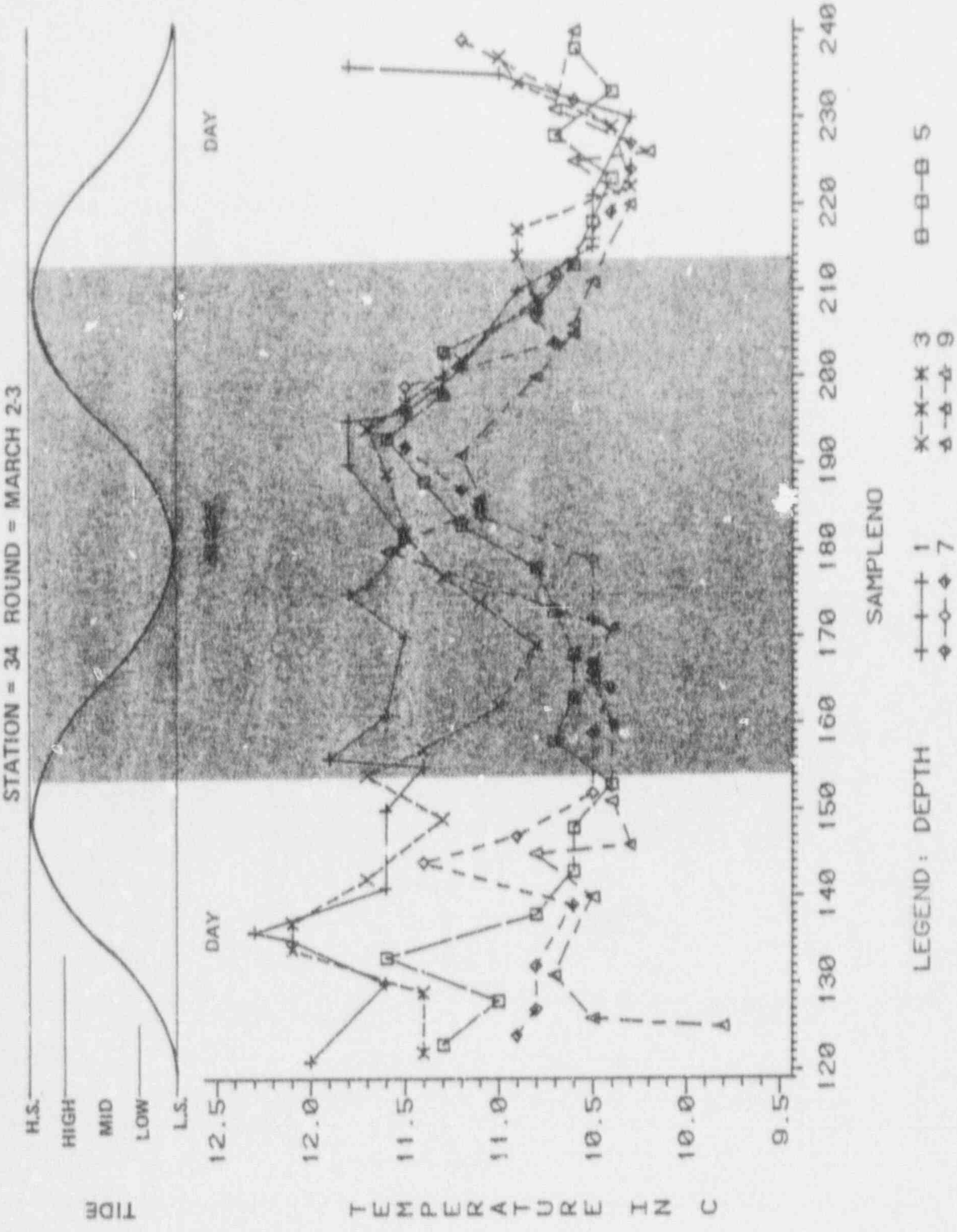


Figure 3.39 Discrete depth samping temperature profiles -1981 (Sheet 2 of 5).

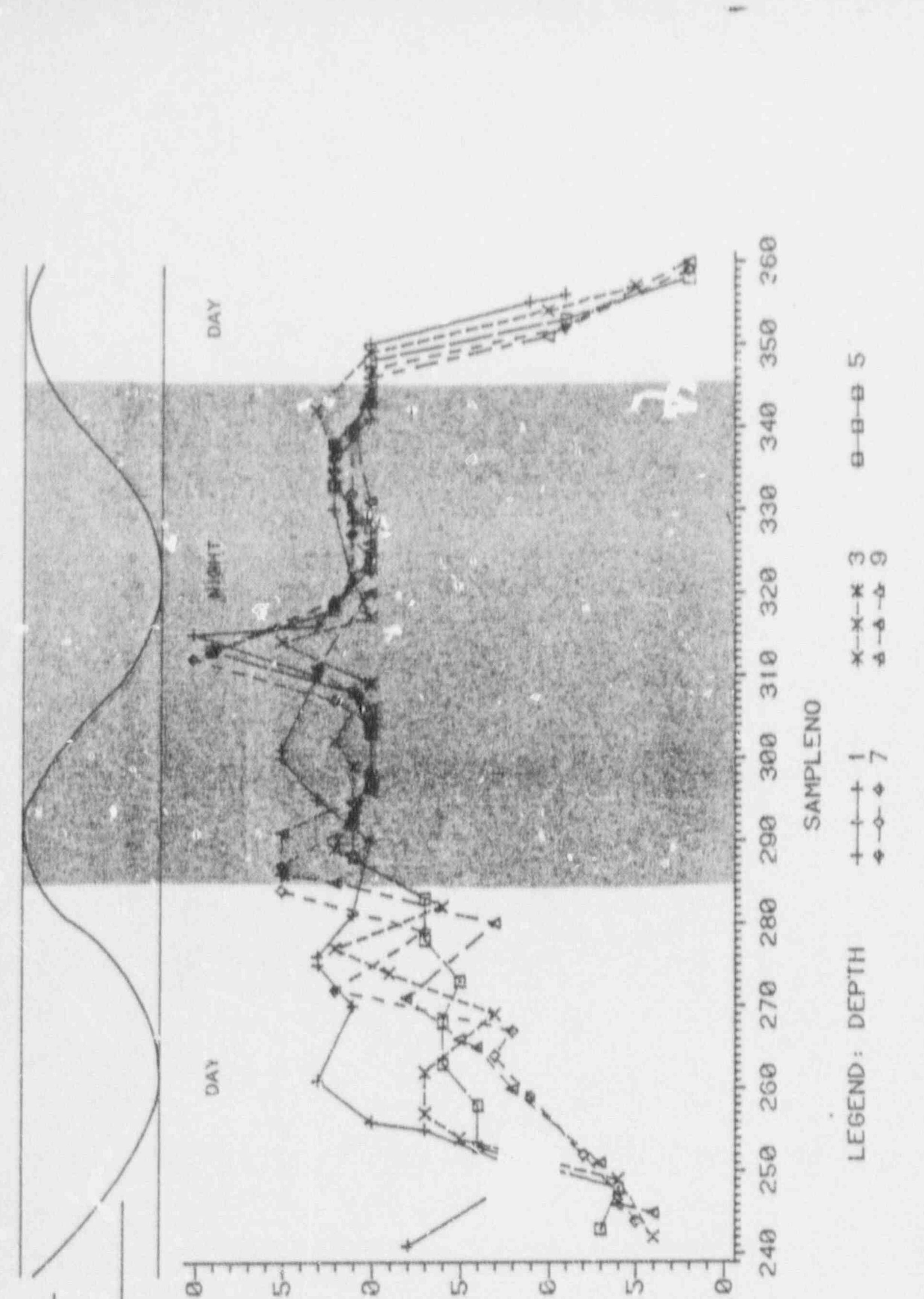


Figure 3.39 Discrete depth sampling temperature profiles -1981 (Sheet 3 of 5).

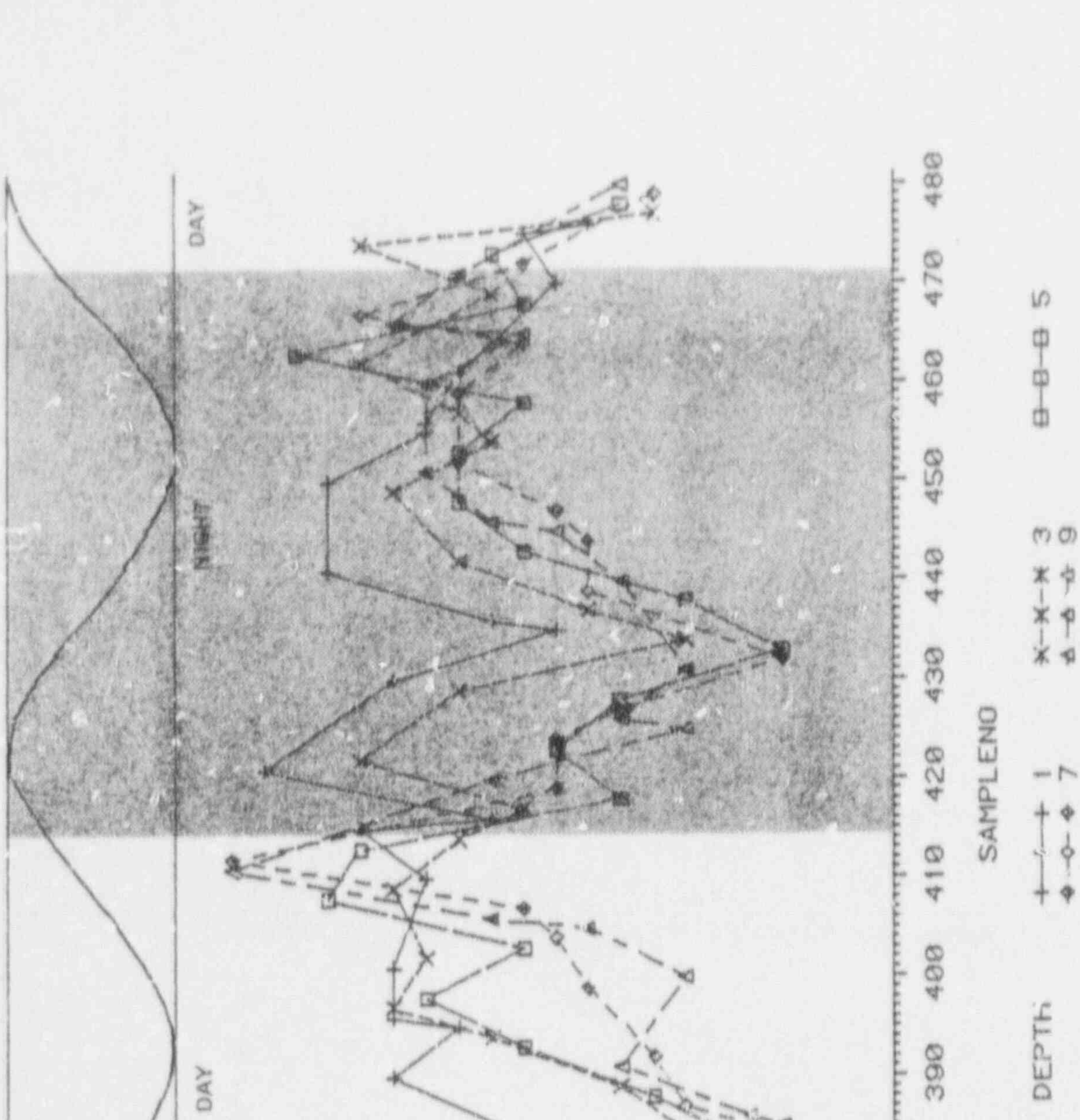
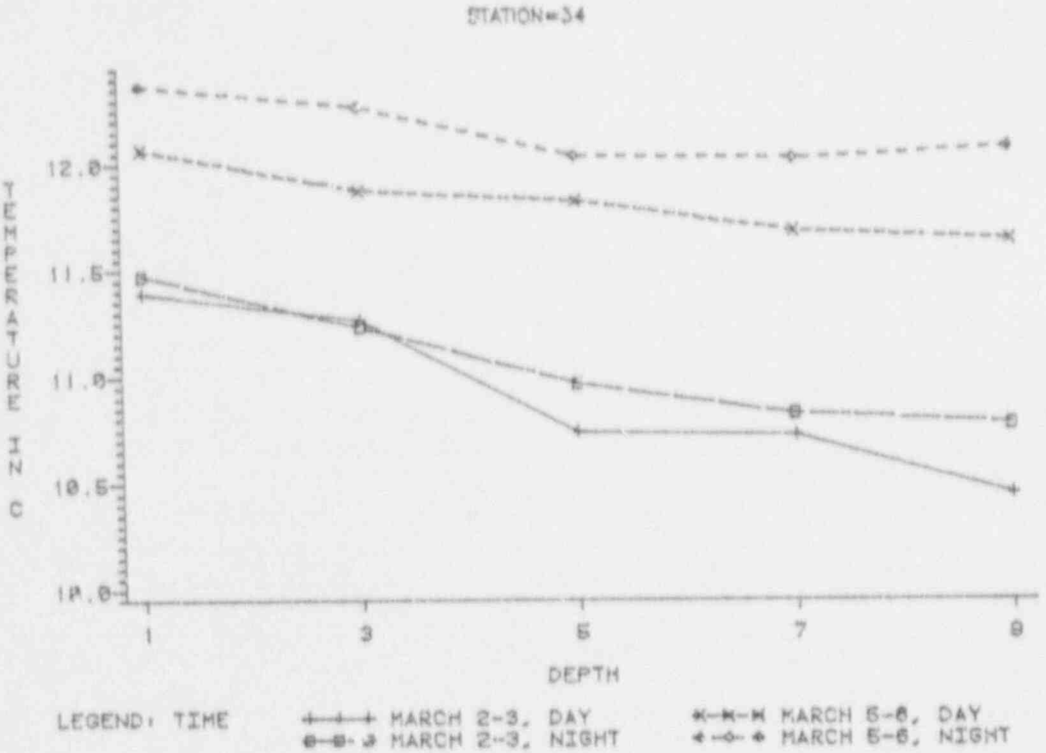


Figure 3.39 Discrete depth sampling temperature profiles -1981 (Sheet 4 of 5).



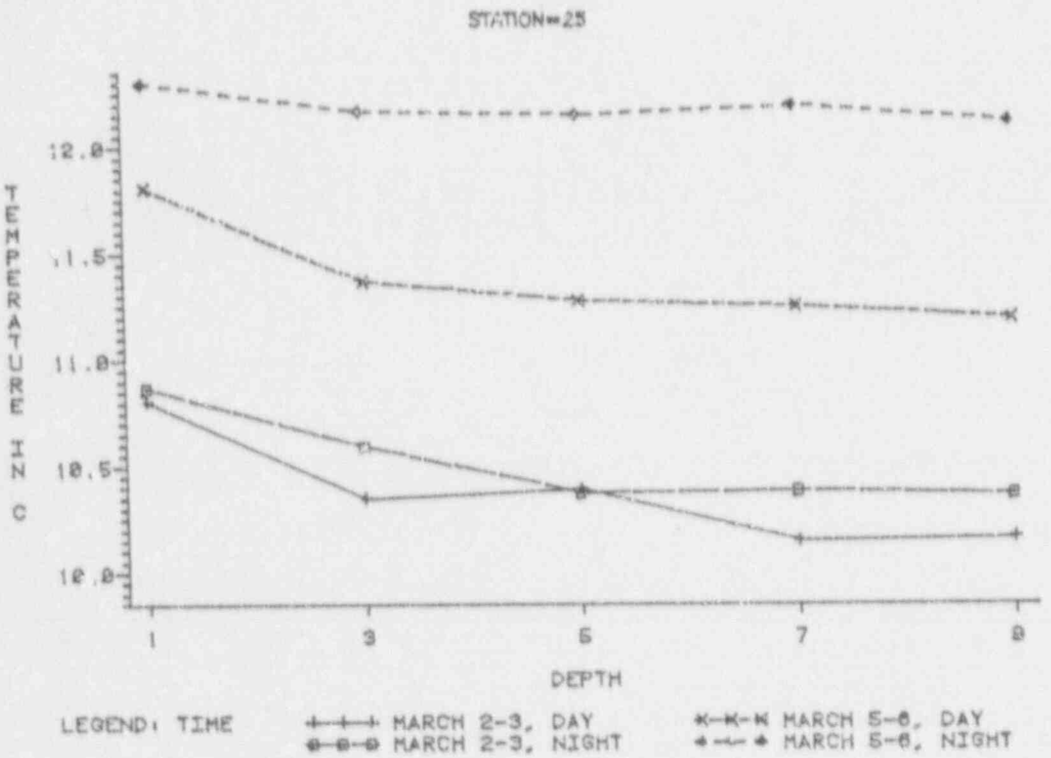


Figure 3.39 Discrete depth sampling temperature profiles -1981 (Sheet 5 of 5).

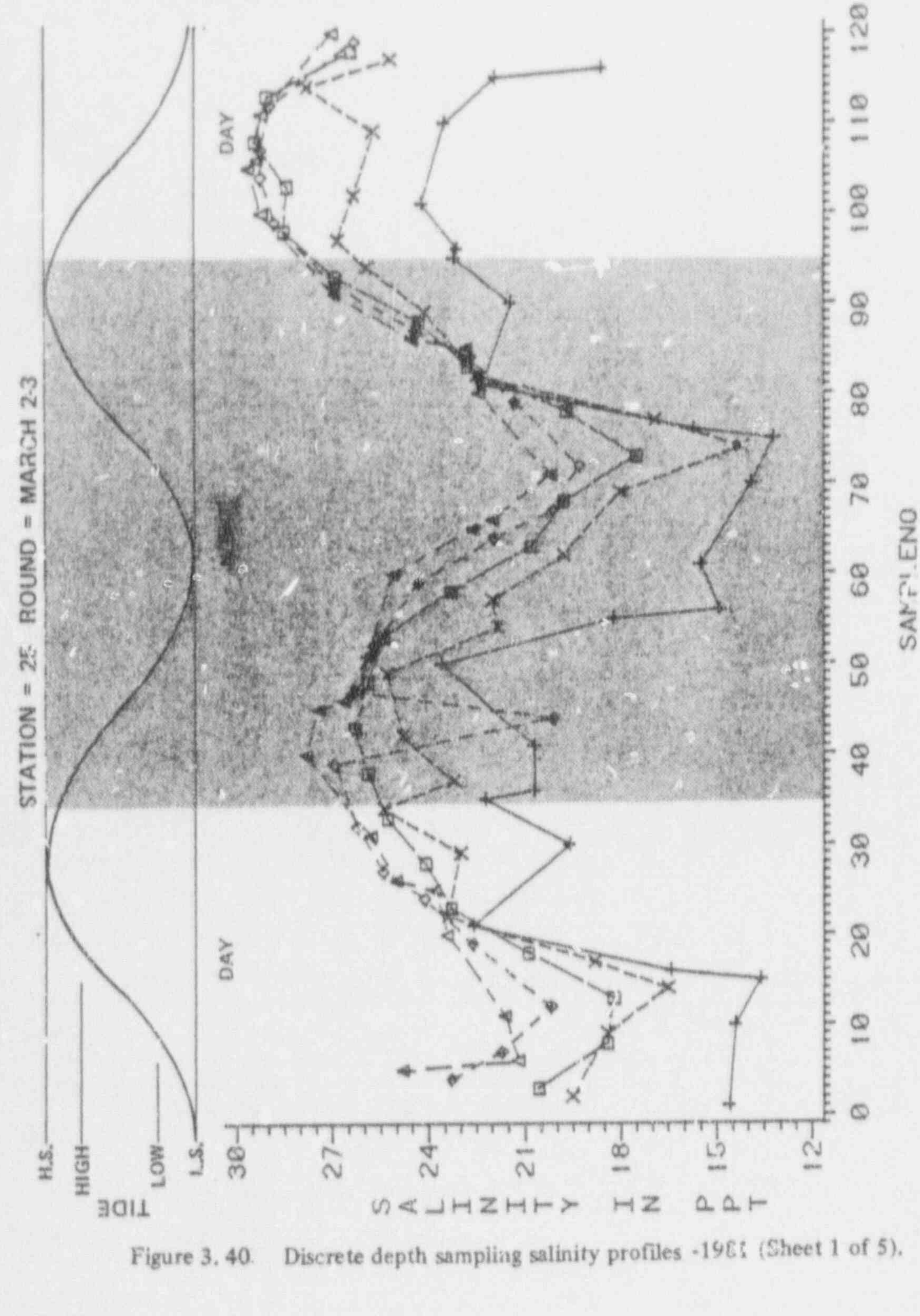


Figure 3.40. Discrete depth sampling salinity profiles -1981 (Sheet 1 of 5).

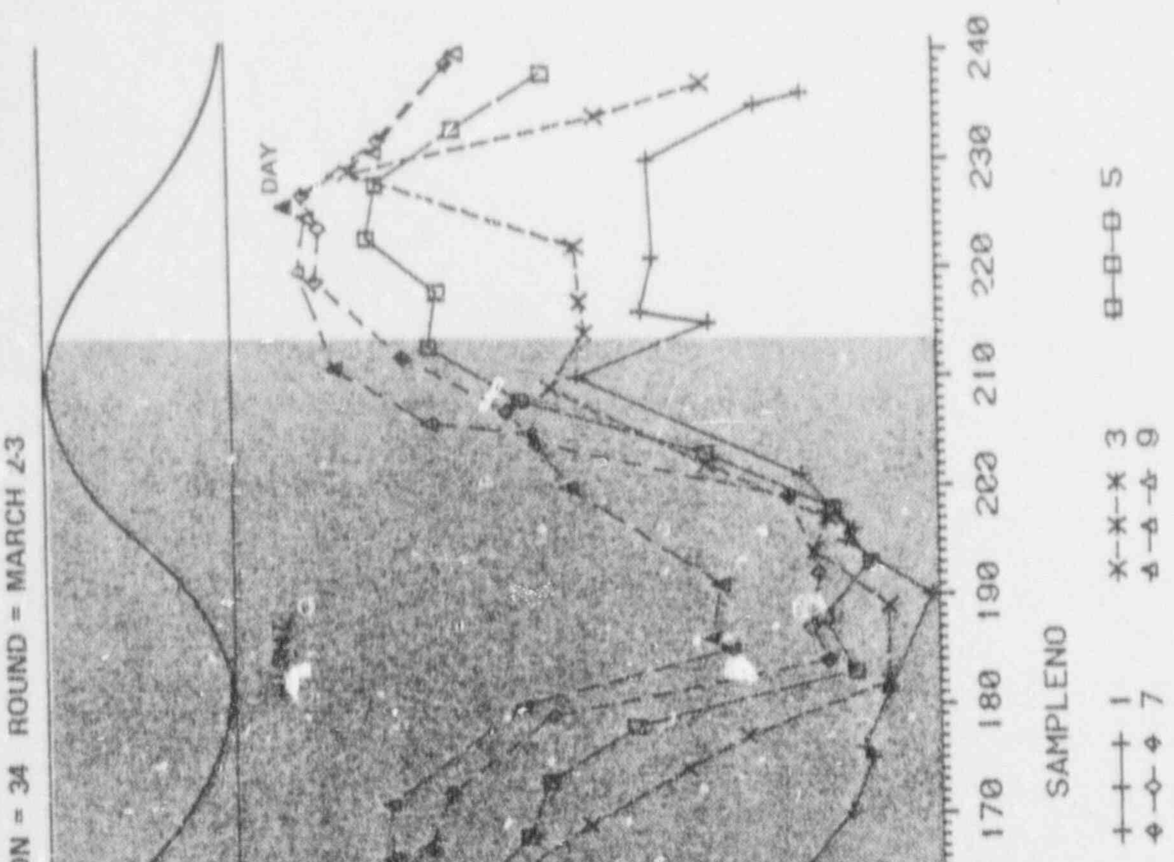


Figure 3.40 Discrete depth sampling salinity profiles -1981 (Sheet 2 of 5).

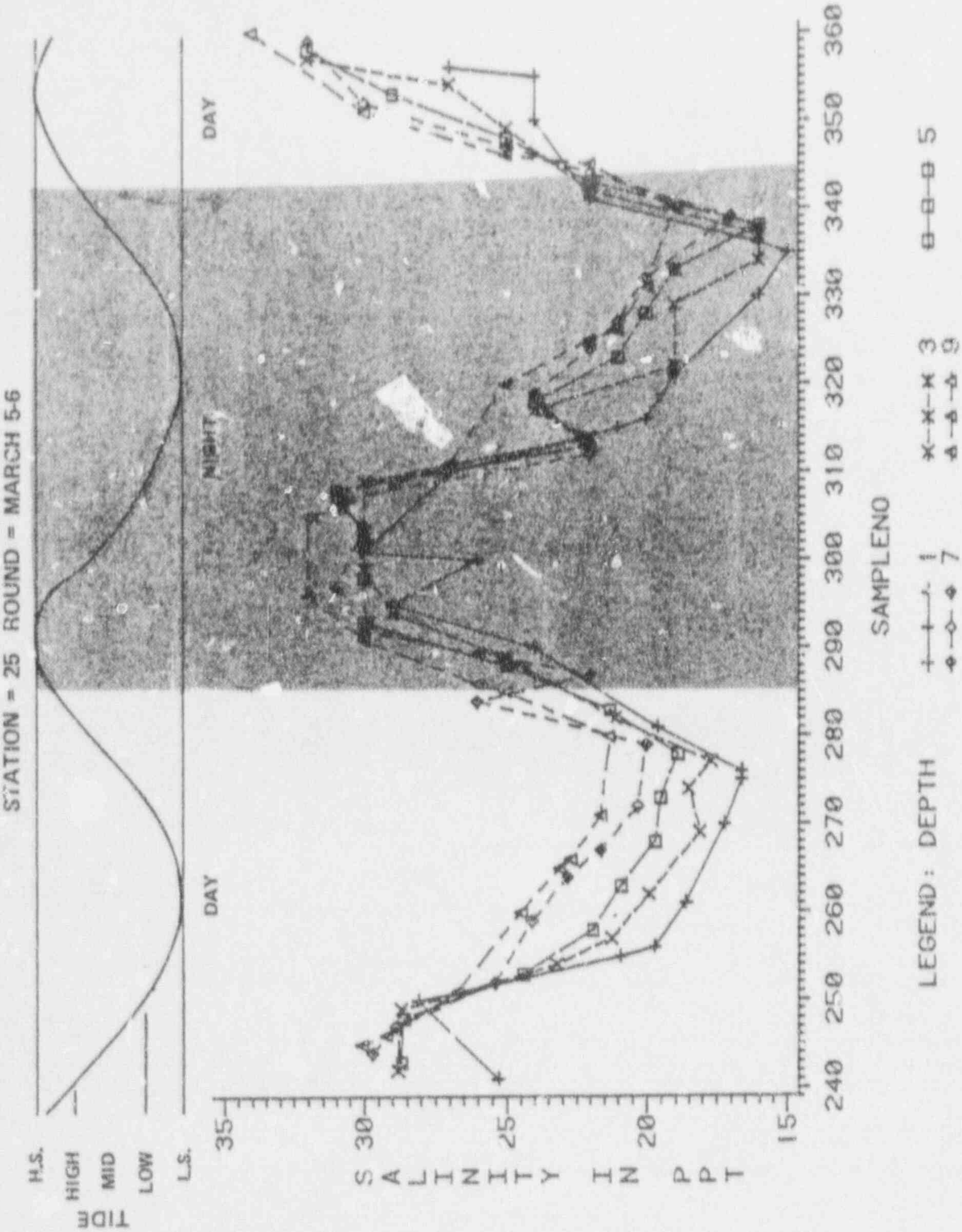


Figure 3.40 Discrete depth sampling salinity profiles -1981 (Sheet 3 of 5).

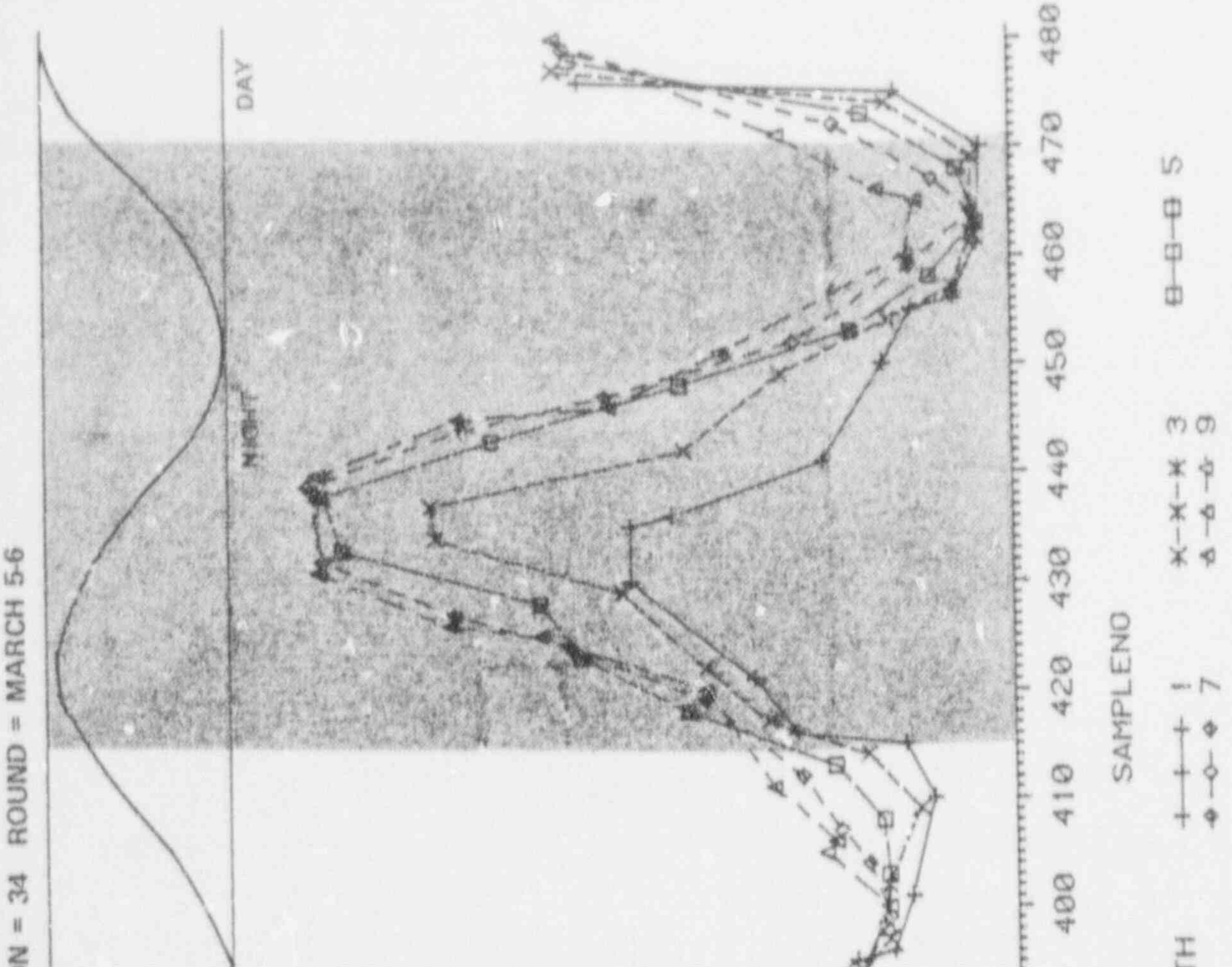
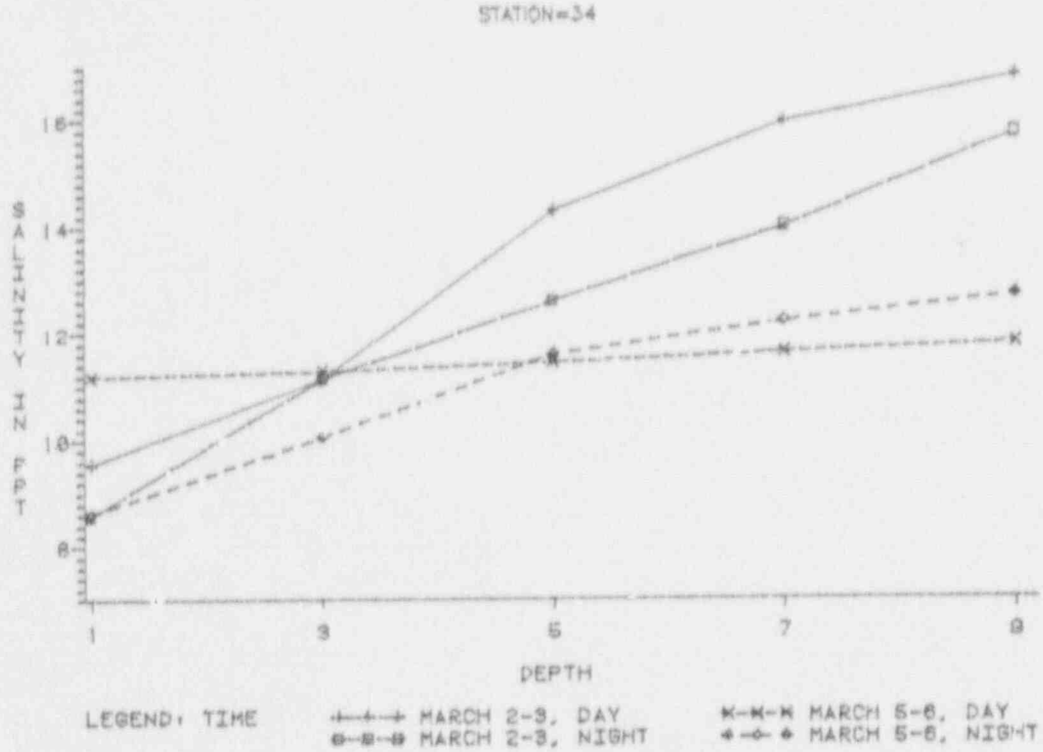


Figure 3.40 Discrete depth sampling salinity profiles -1981 (Sheet 4 of 5).



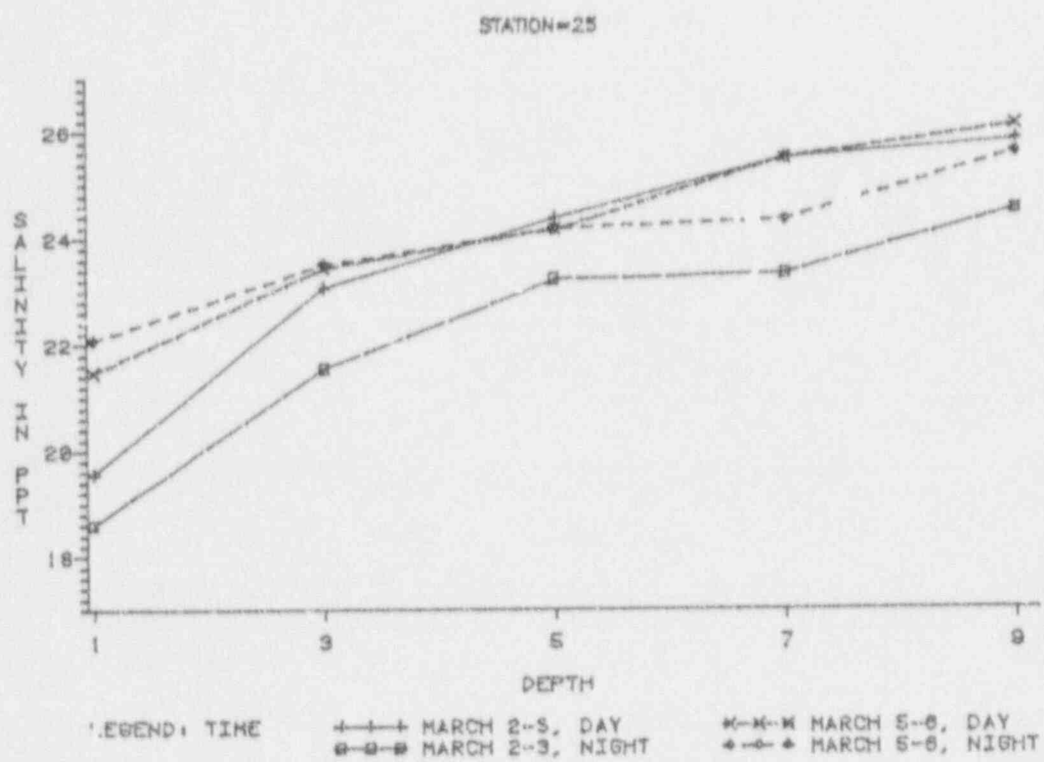


Figure 3.40 Discrete depth sampling salinity profiles -1981 (Sheet 5 of 5).

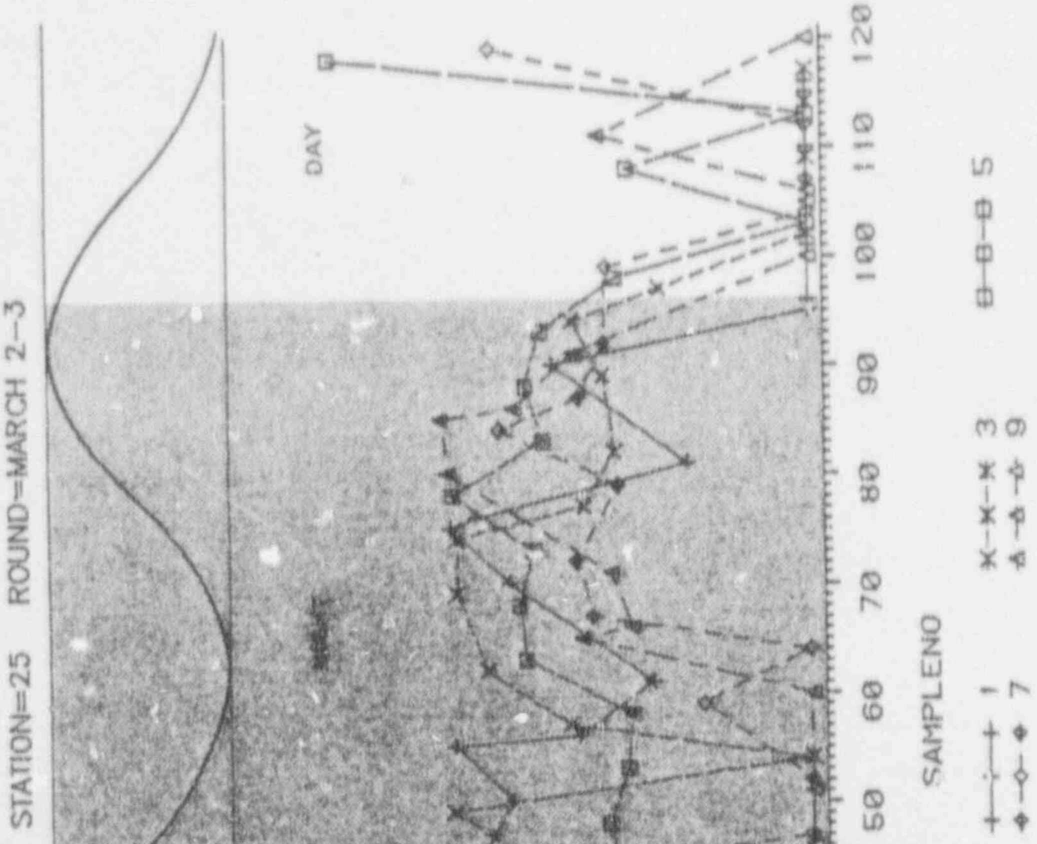


Figure 3.41 Discrete depth sampling density profiles-bay anchovy -1981 (Sheet 1 of 5).

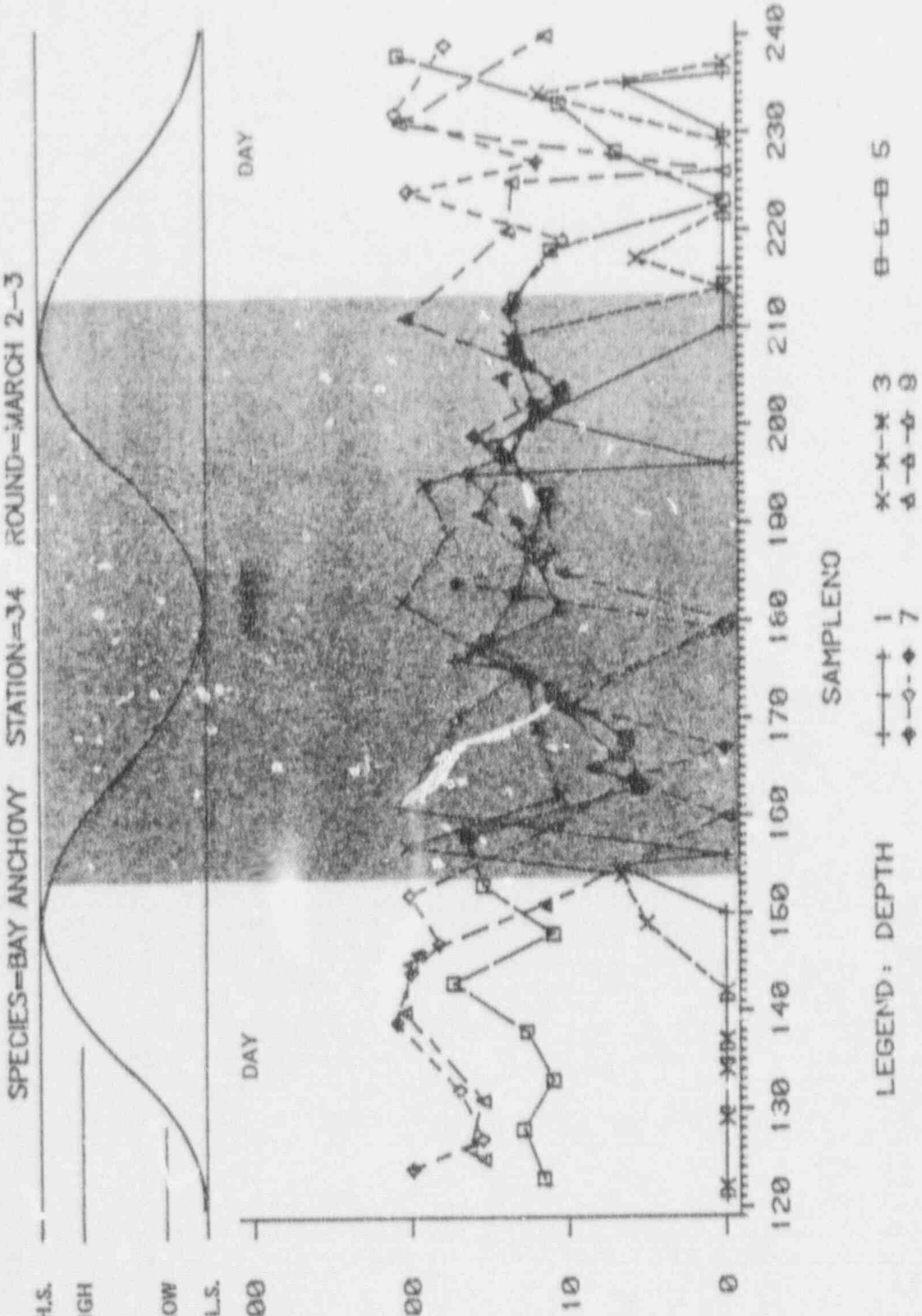


Figure 3.41 Discrete depth sampling density profiles-bay anchovy -1981 (Sheet 2 of 5).

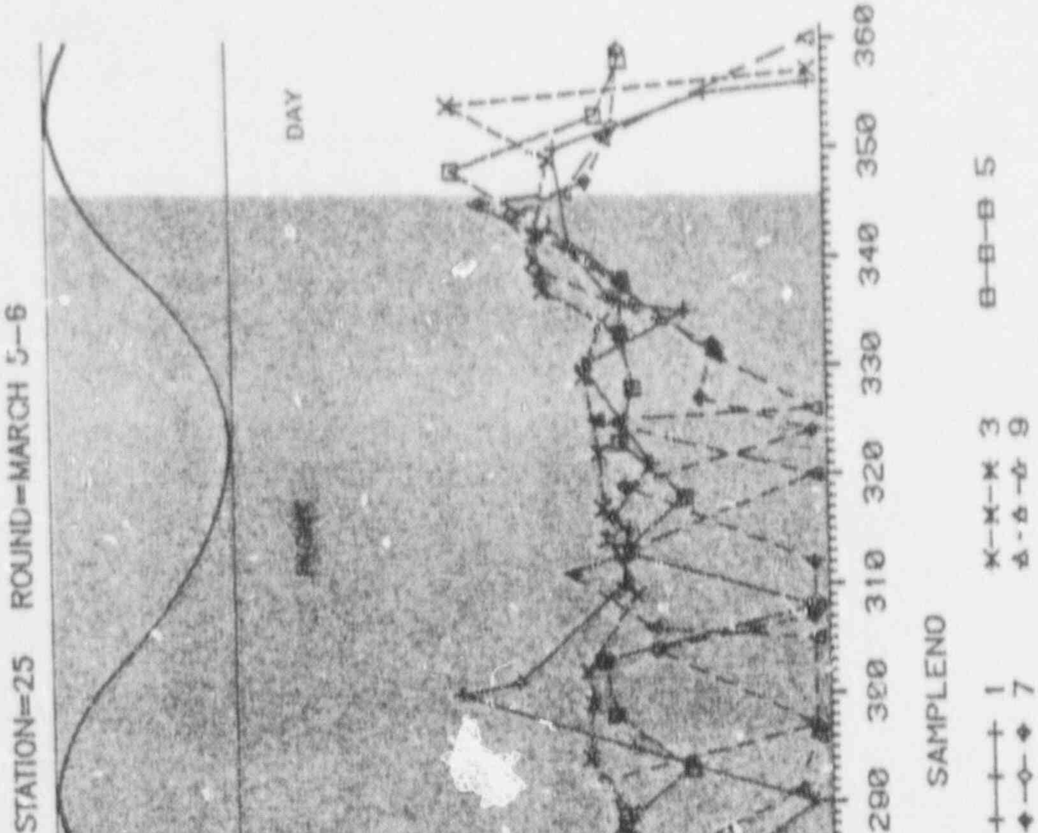


Figure 3. 41 Discrete depth sampling density profiles-bay anchovy -1981 (Sheet 3 of 5).

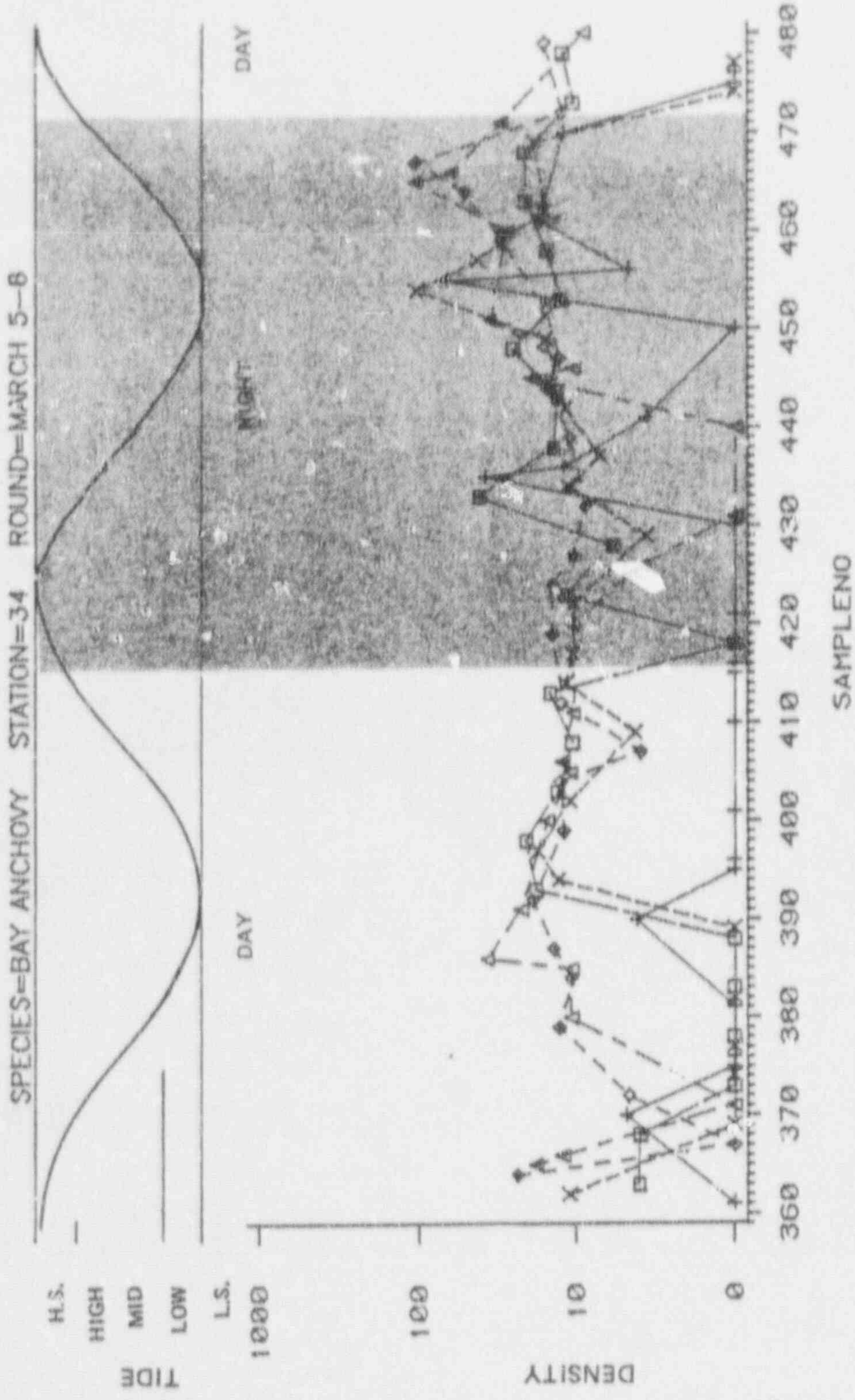
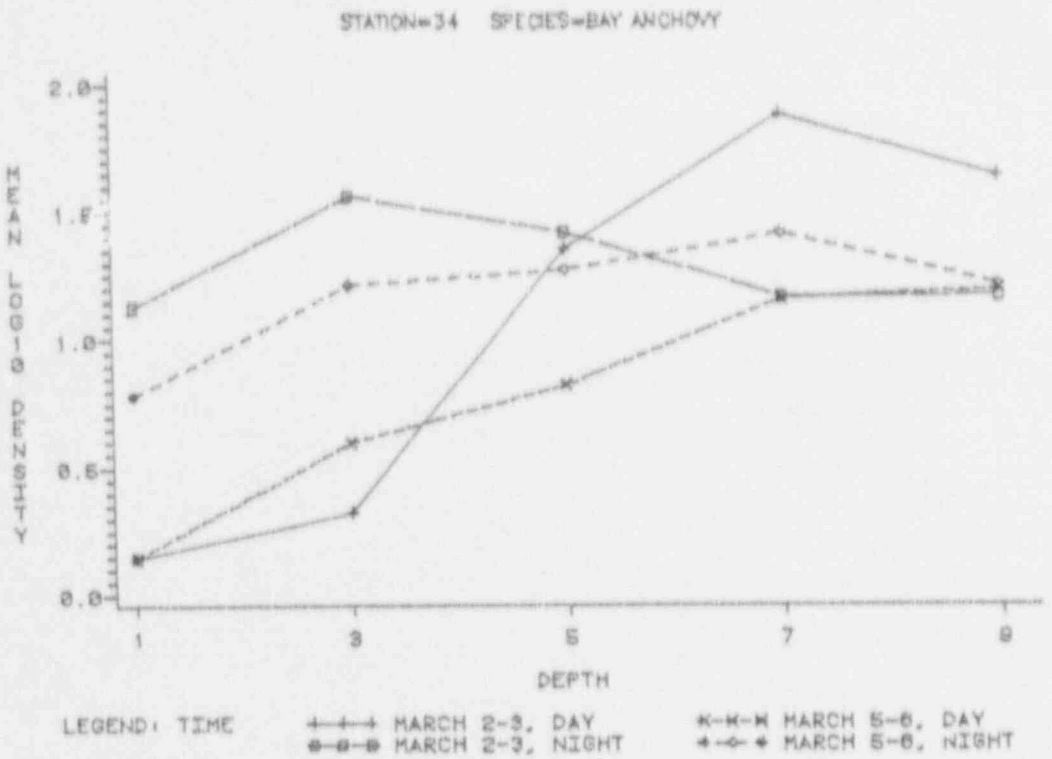


Figure 3.41 Discrete depth sampling density profiles-bay anchovy -1981 (Sheet 4 of 5).



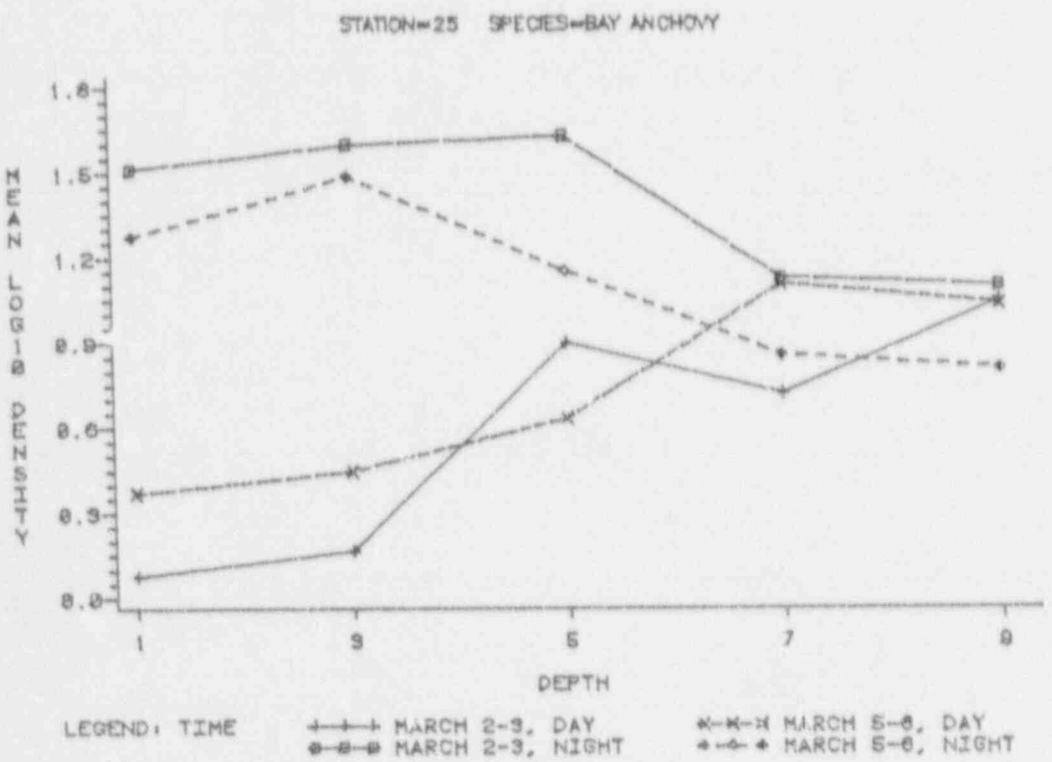


Figure 3.41 Discrete depth sampling density profiles-bay anchovy-1981 (Sheet 5 of 5).

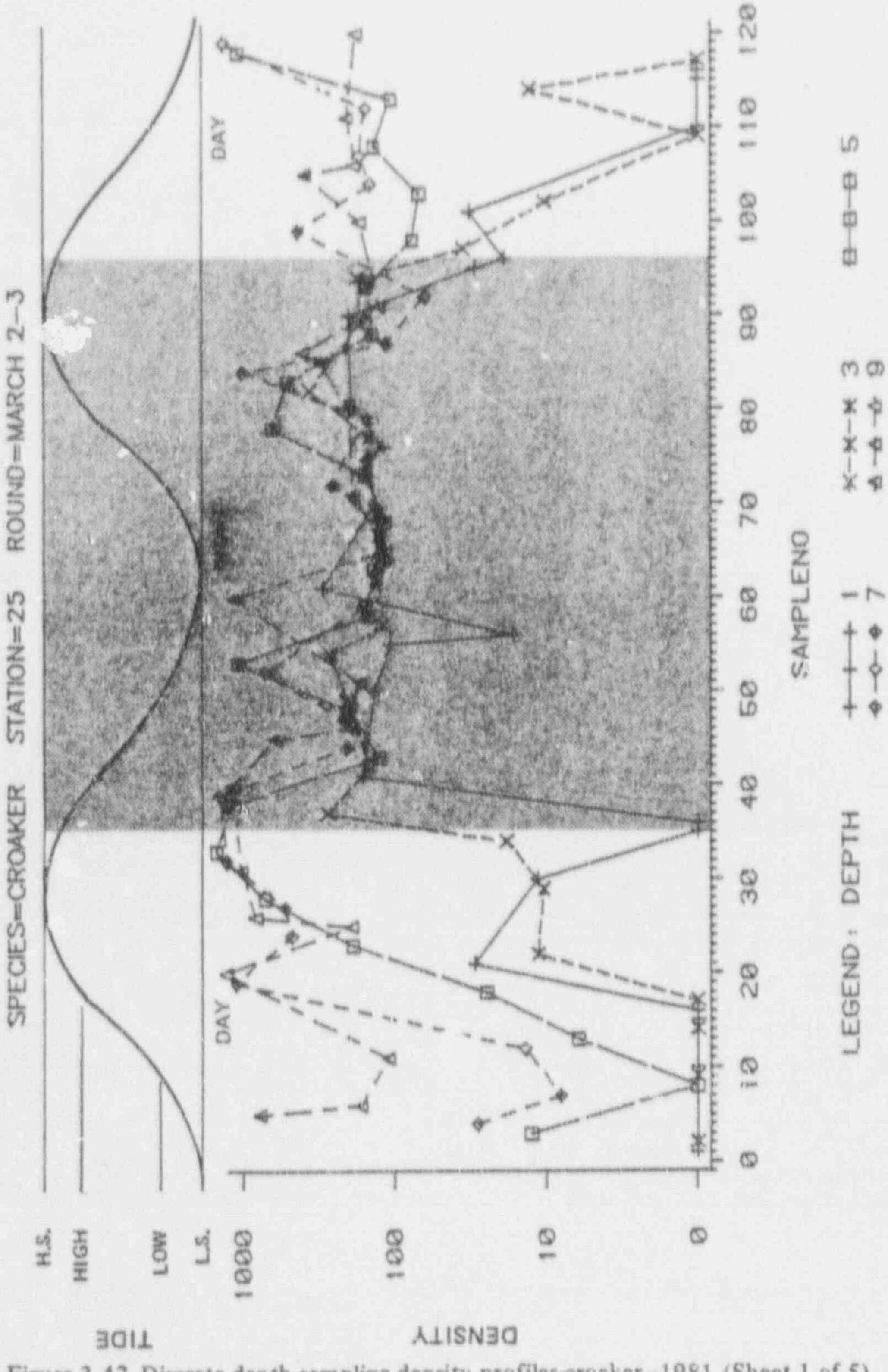


Figure 3.42 Discrete depth sampling density profiles-croaker -1981 (Sheet 1 of 5).

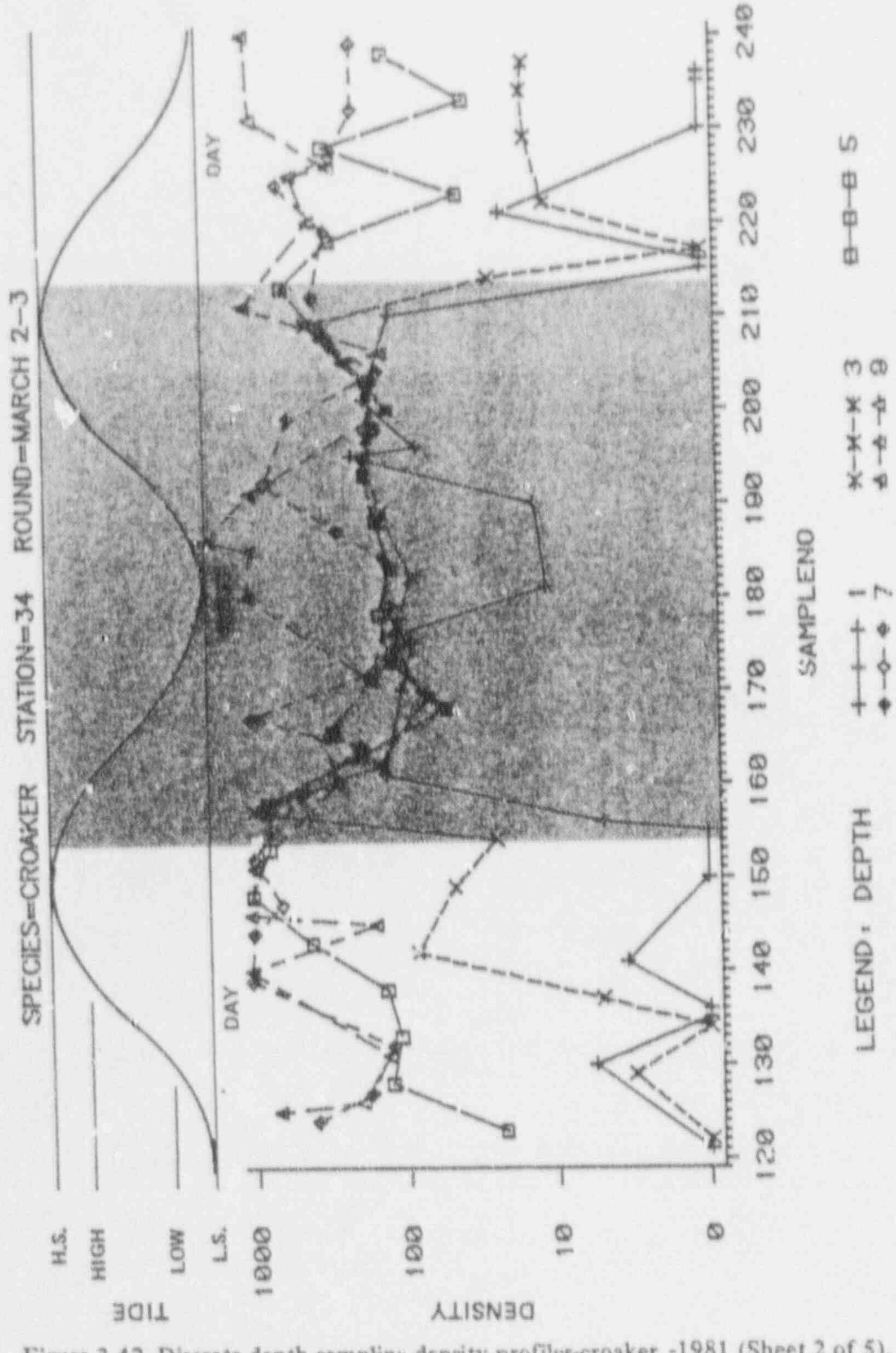


Figure 3.42 Discrete depth sampling density profiles-croaker -1981 (Sheet 2 of 5).

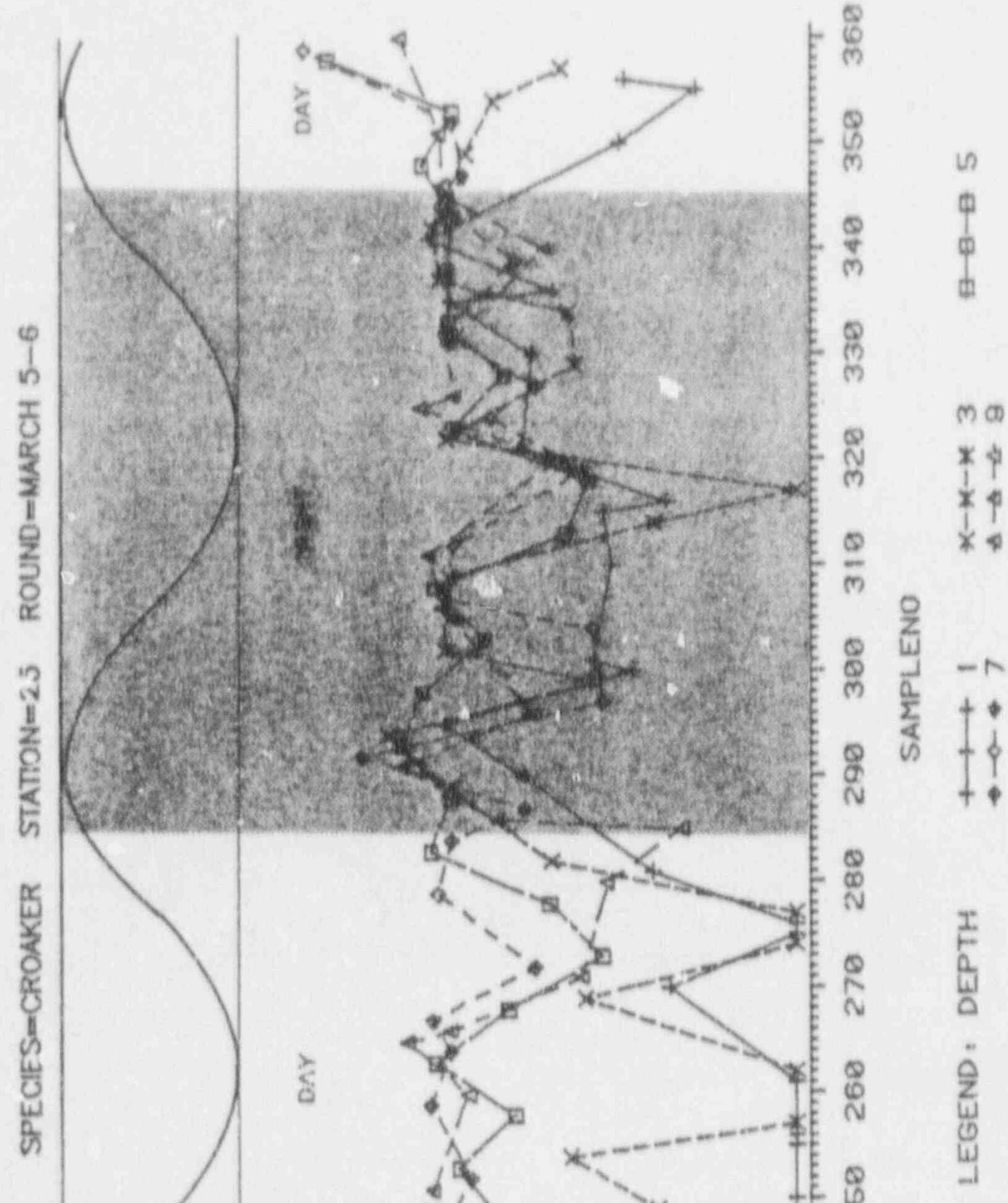


Figure 3.42 Discrete depth sampling density profiles-croaker -1981 (Sheet 3 of 5).

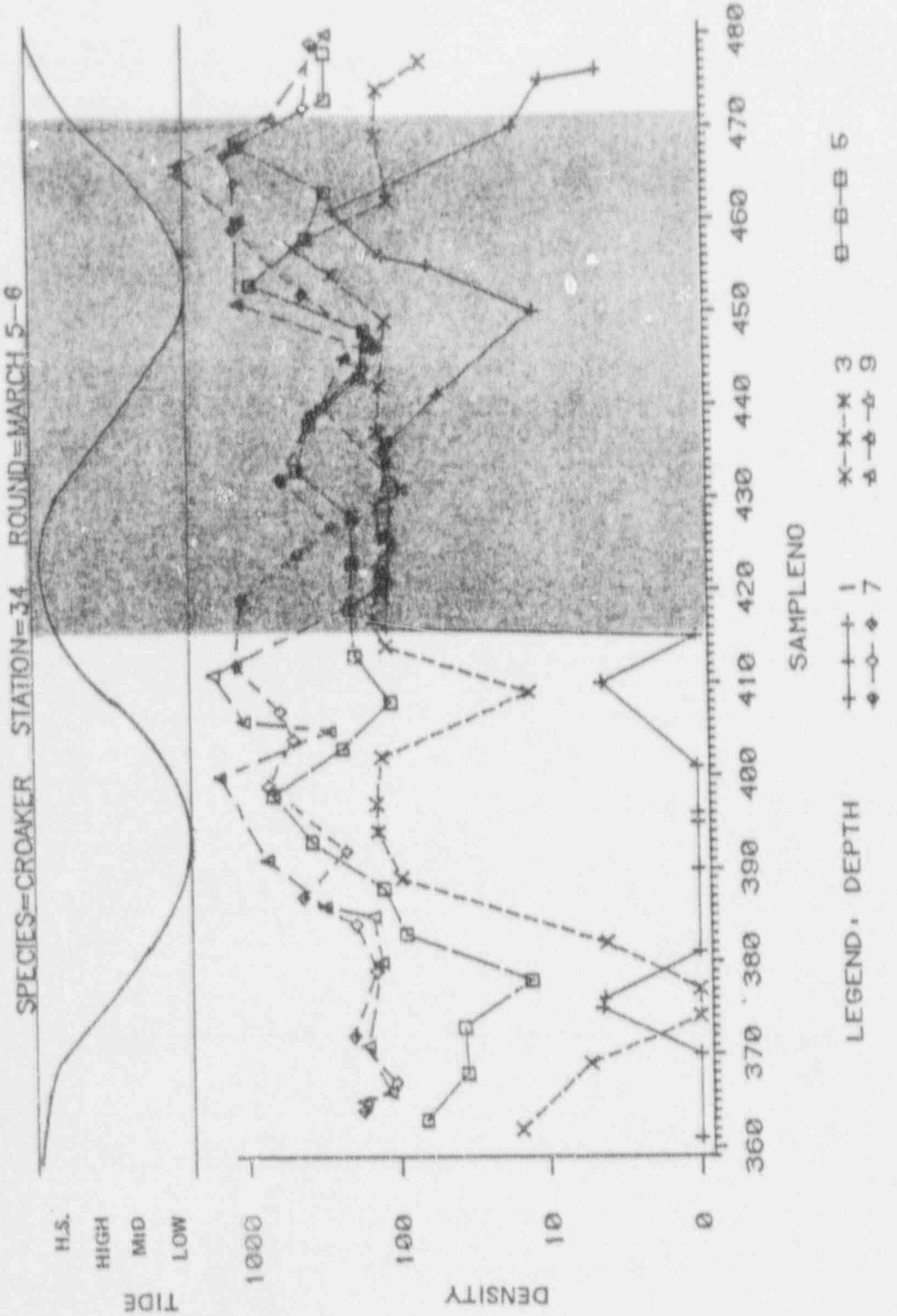
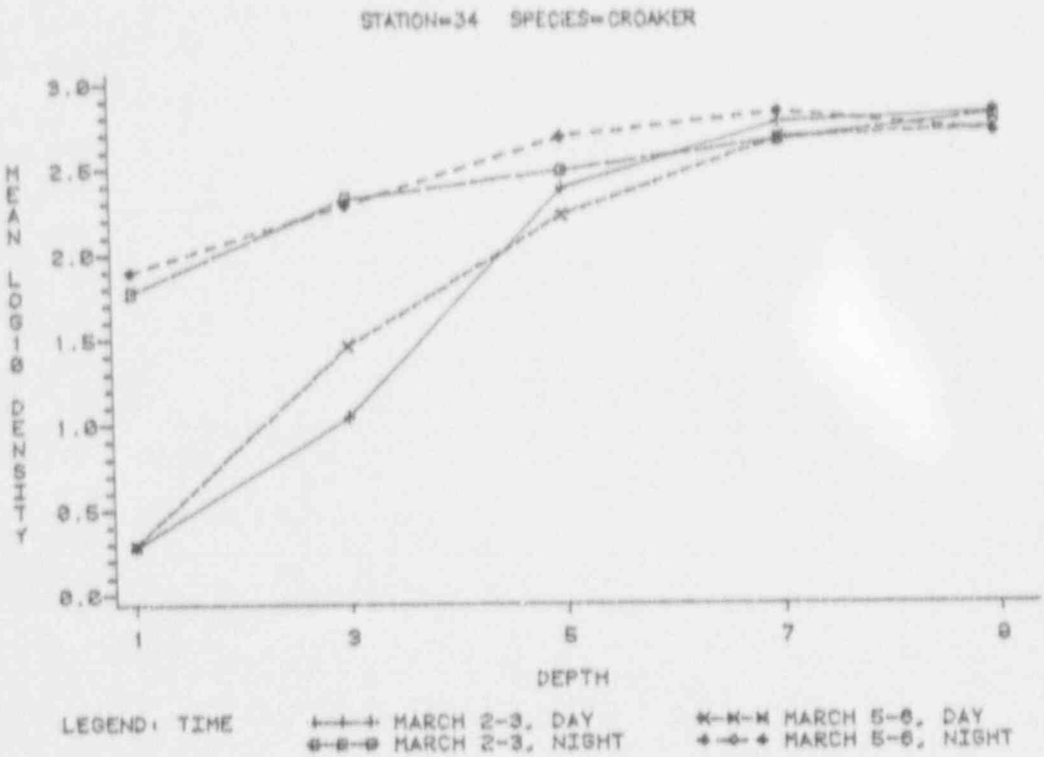


Figure 3.42 Discrete depth sampling density profiles-croaker -1981 (Sheet 4 of 5).



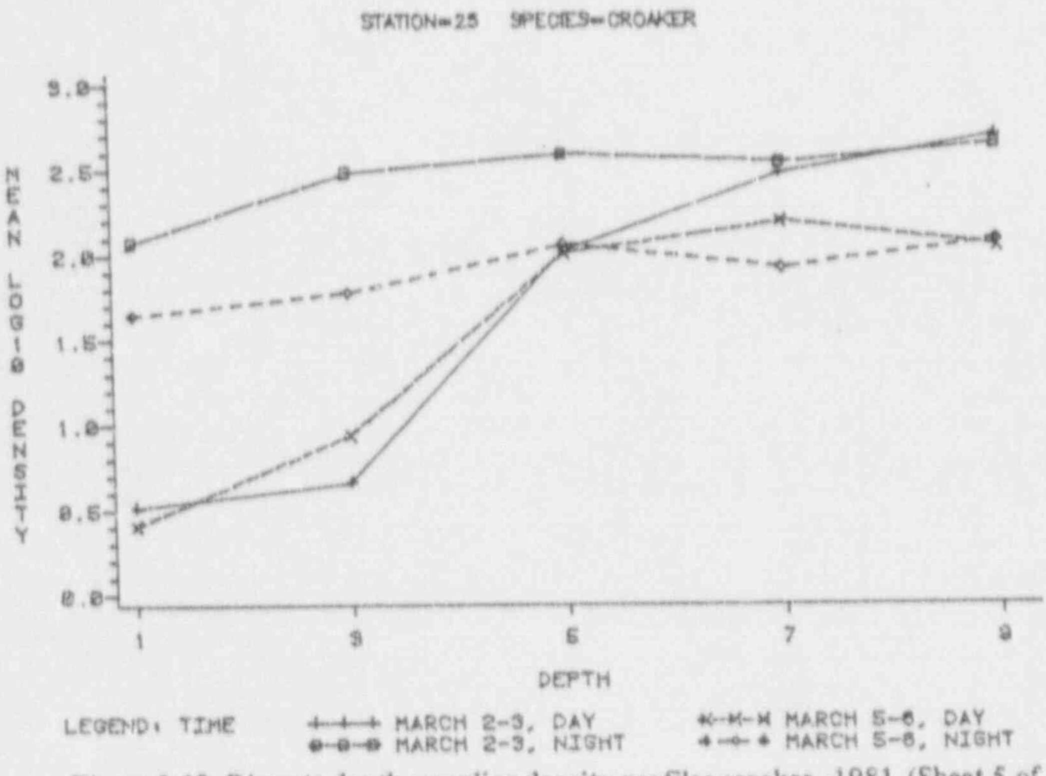


Figure 3.42 Discrete depth sampling density profiles-croaker -1981 (Sheet 5 of 5).

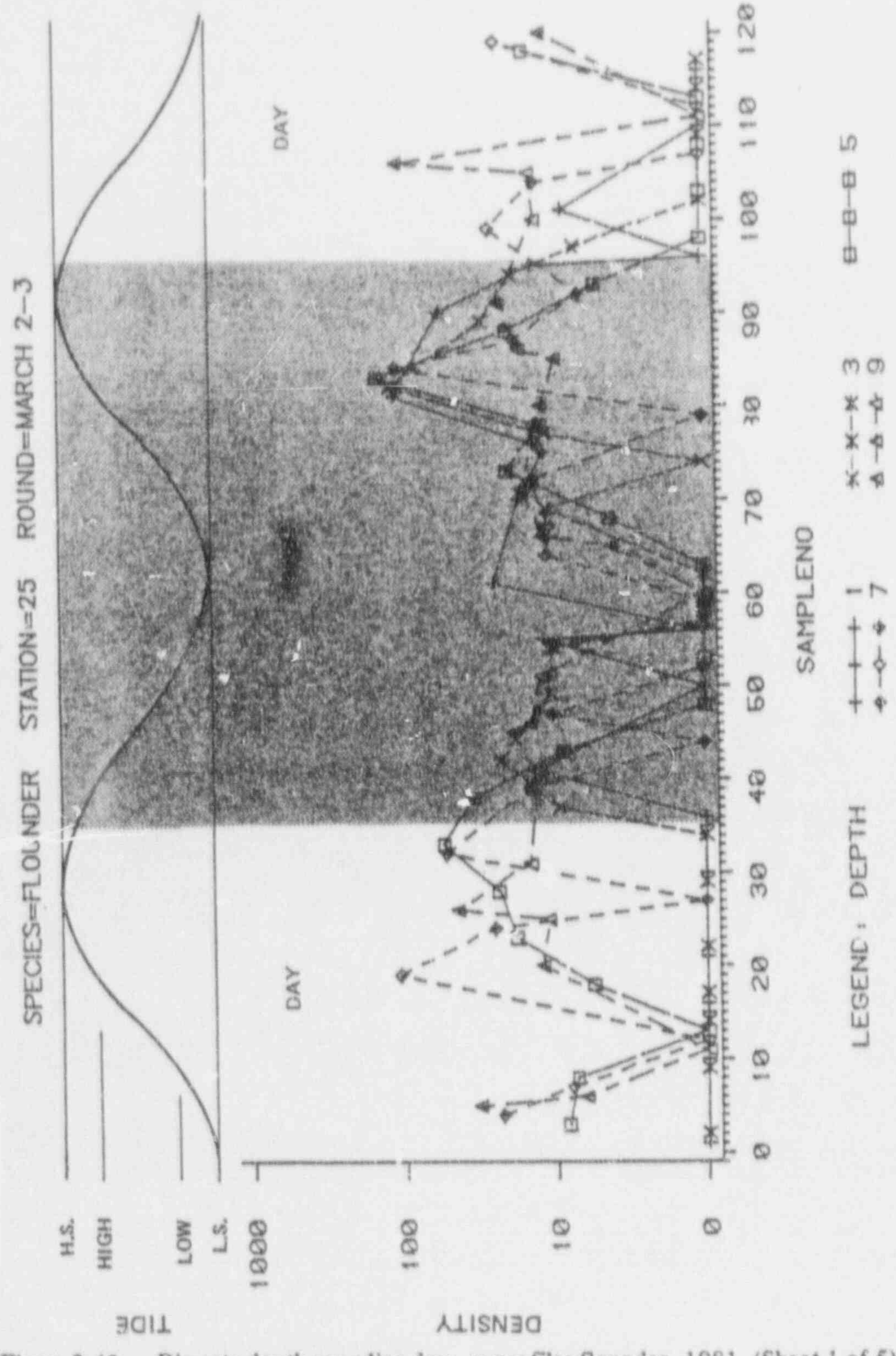


Figure 3.43 Discrete depth sampling density profiles-flounder -1981 (Sheet 1 of 5).

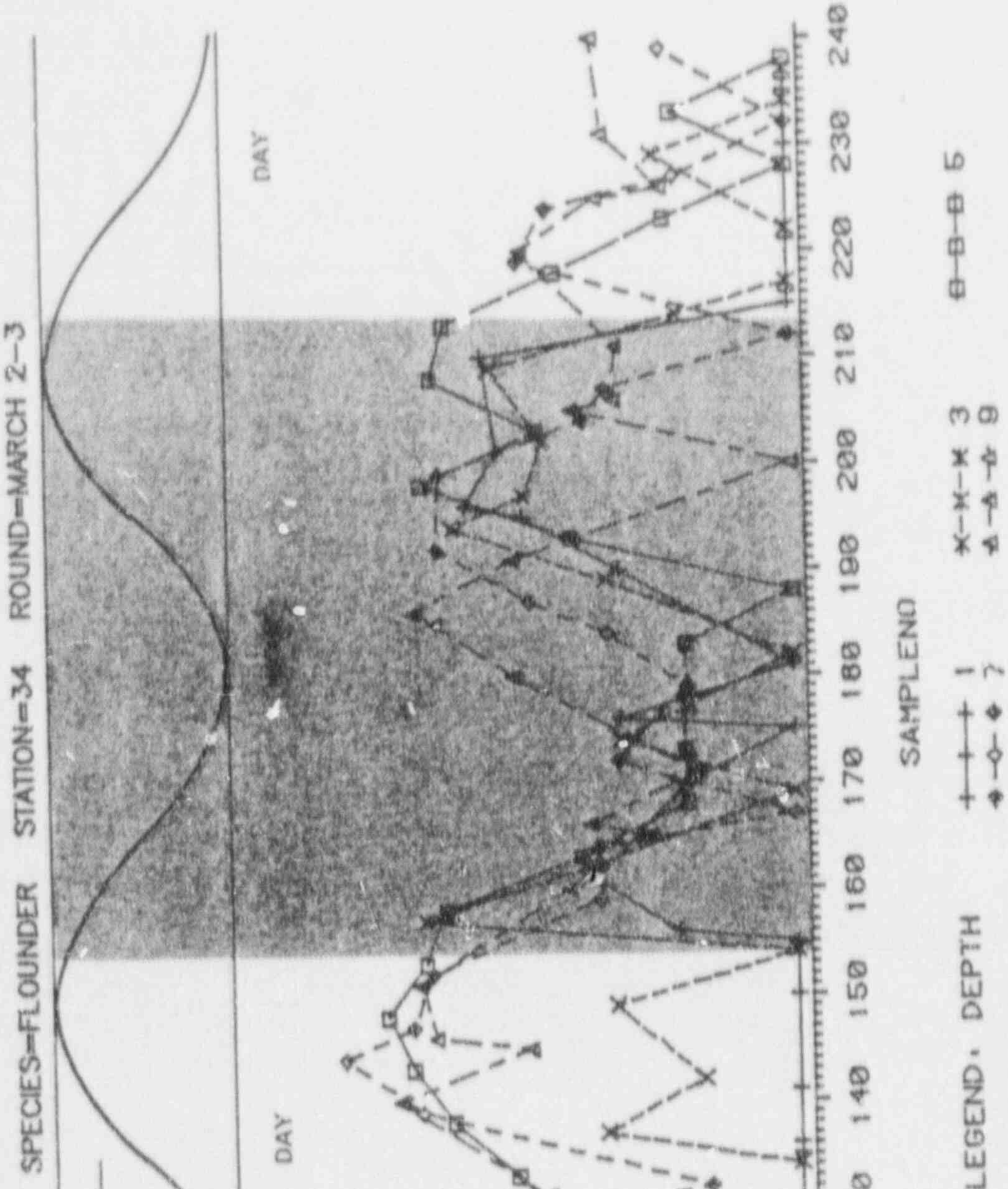


Figure 3.43 Discrete depth sampling density profiles-flounder -1981 (Sheet 2 of 5).

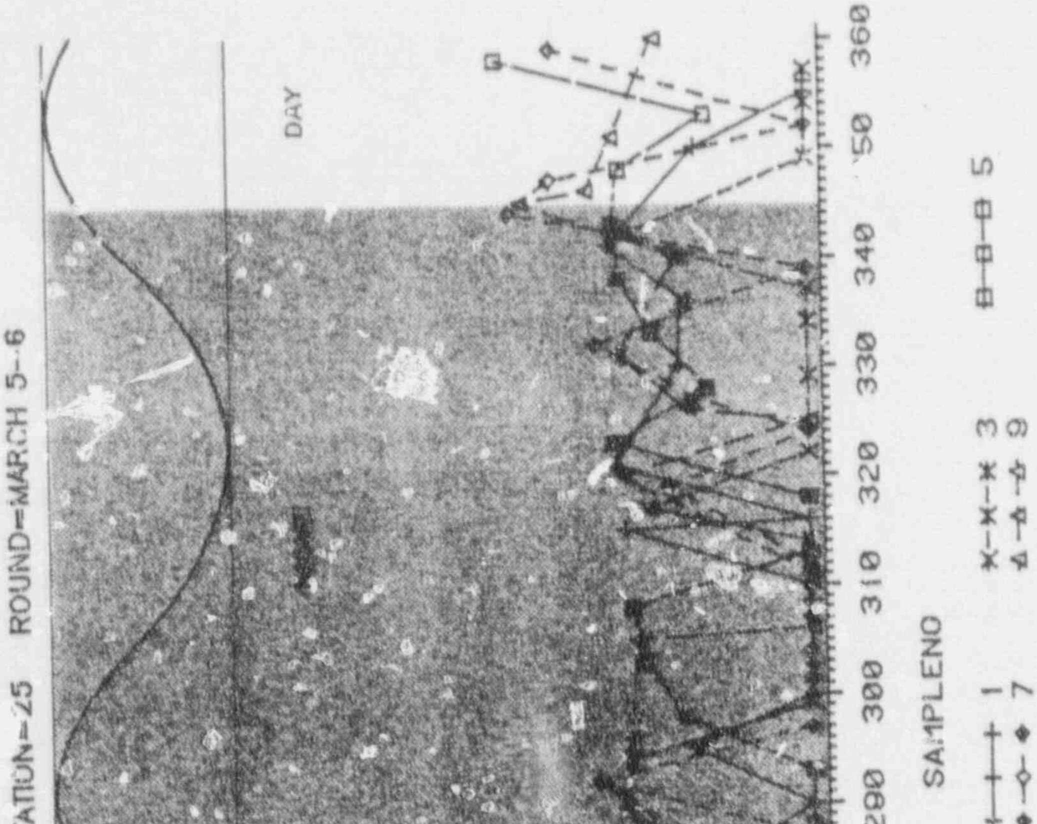


Figure 3.43 Discrete depth sampling density profiles-flounder -1981 (Sheet 3 of 5).

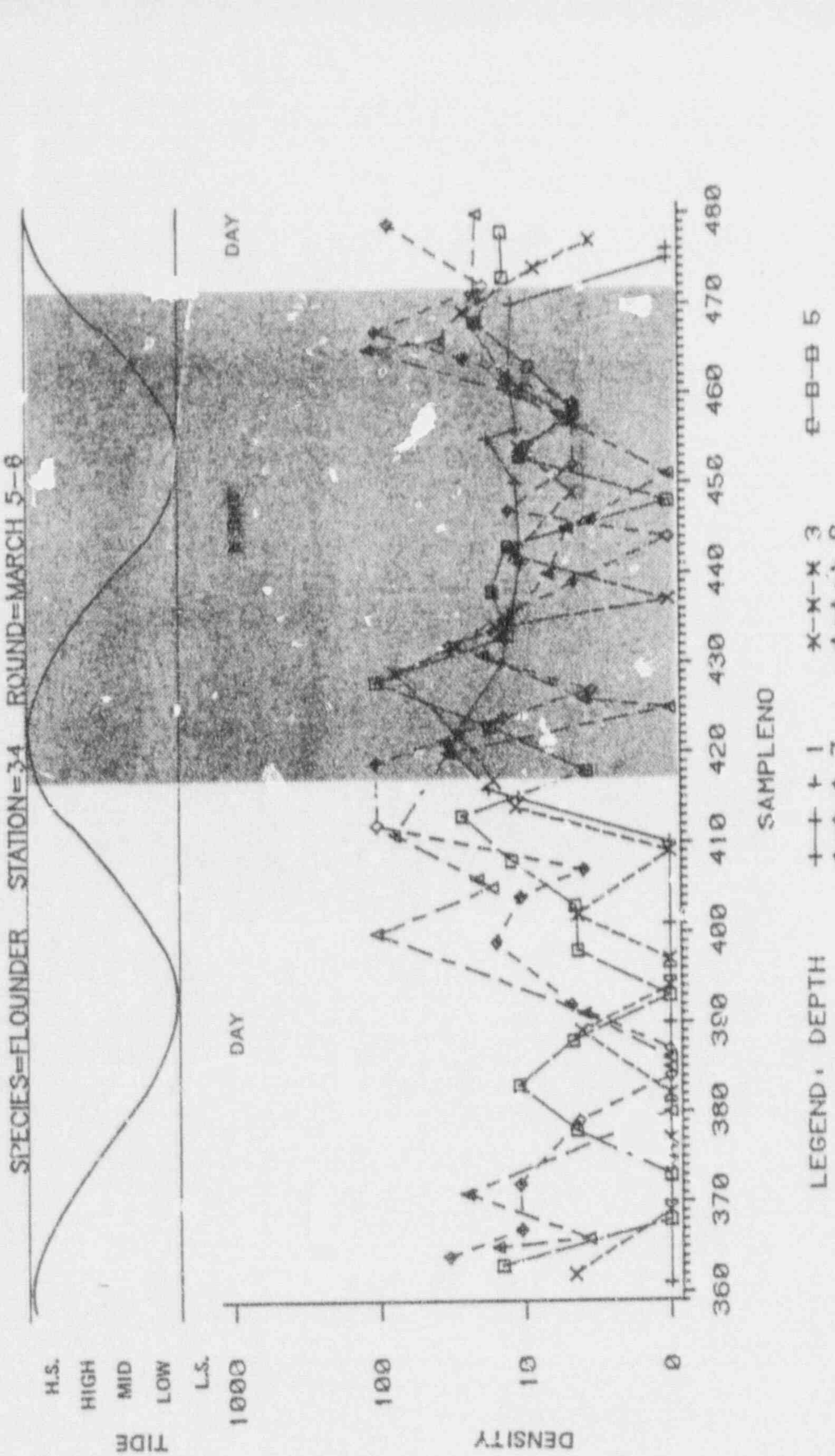


Figure 3.43 Discrete depth sampling density profiles-flounder -1981 (Sheet 4 of 5).

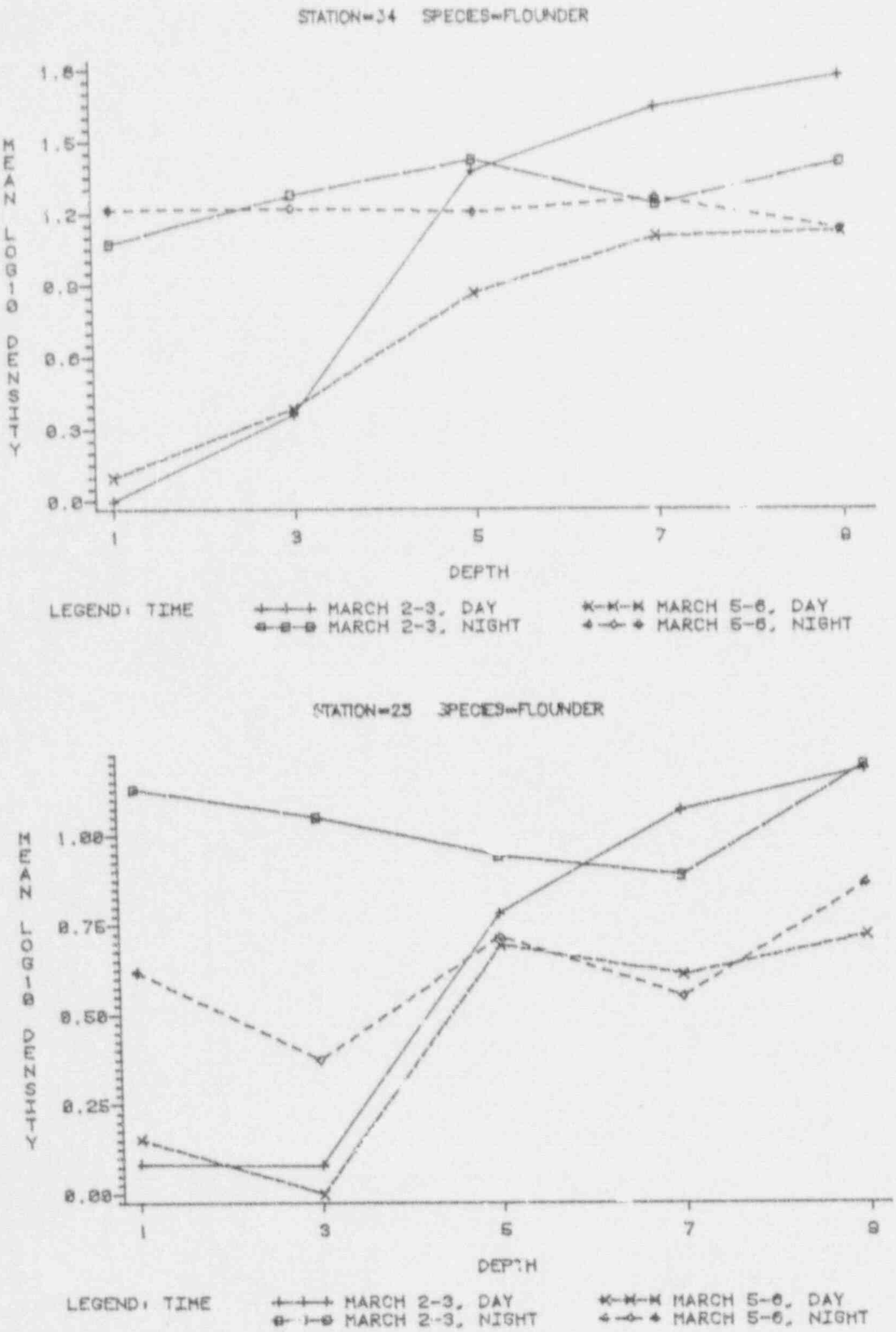


Figure 3.43 Discrete depth sampling density profiles-flounder -1981 (Sheet 5 of 5).

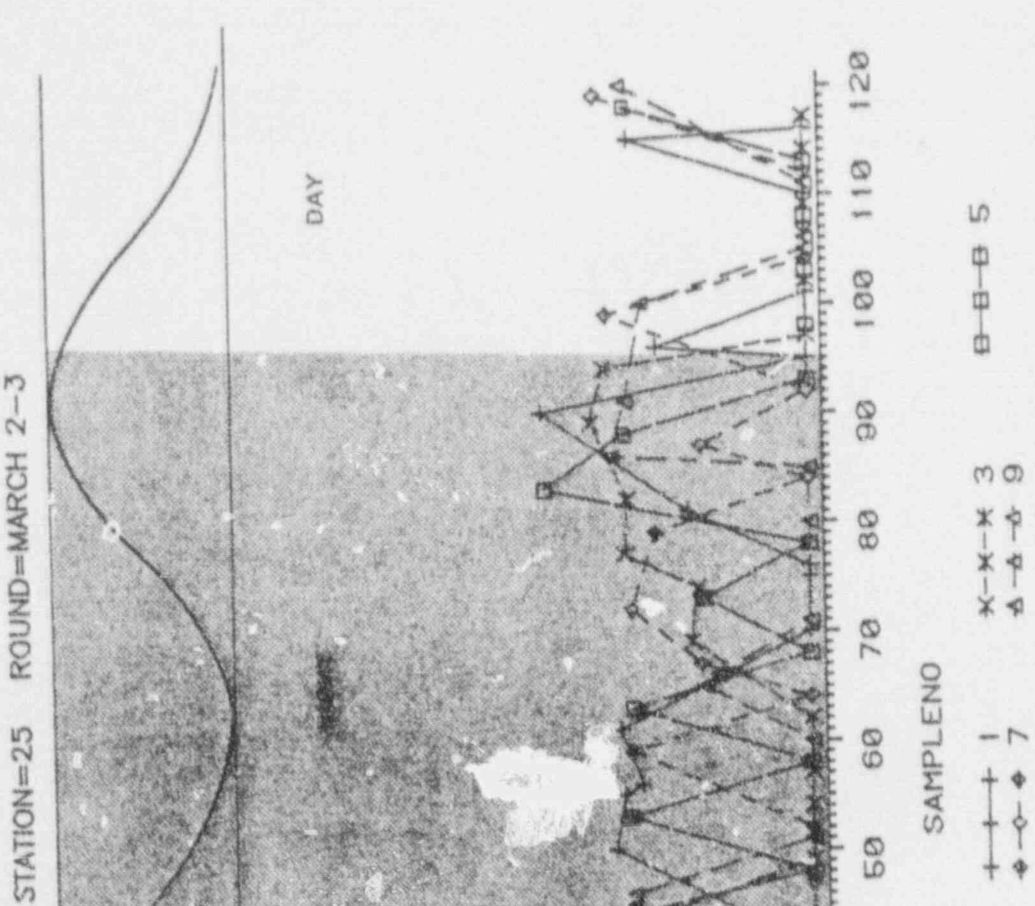


Figure 3.44 Discrete depth sampling density profiles-menhaden -1981 (Sheet 1 of 5).

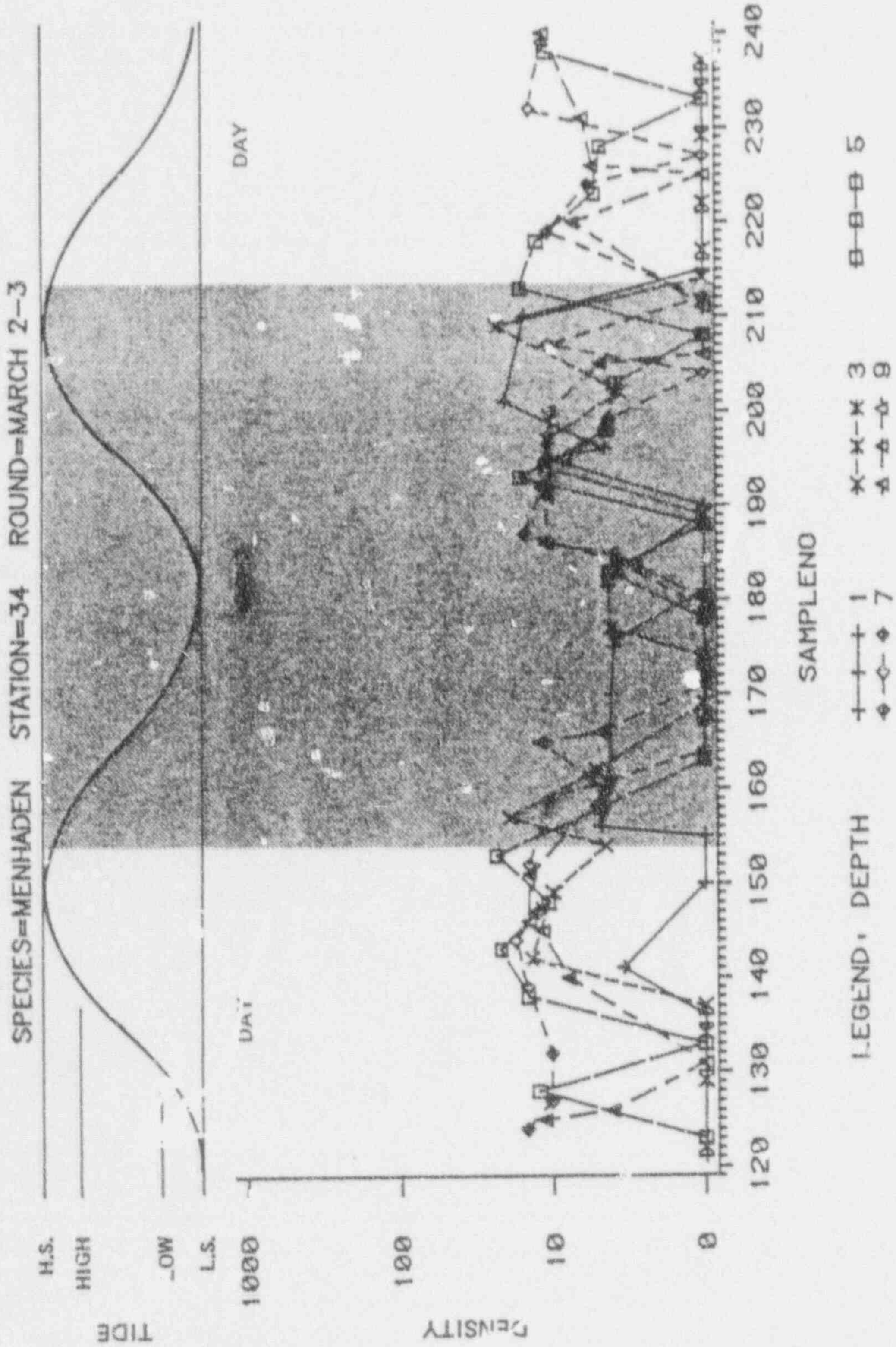


Figure 3.44 Discrete depth sampling density profiles-menhaden -1981 (Sheet 2 of 5).

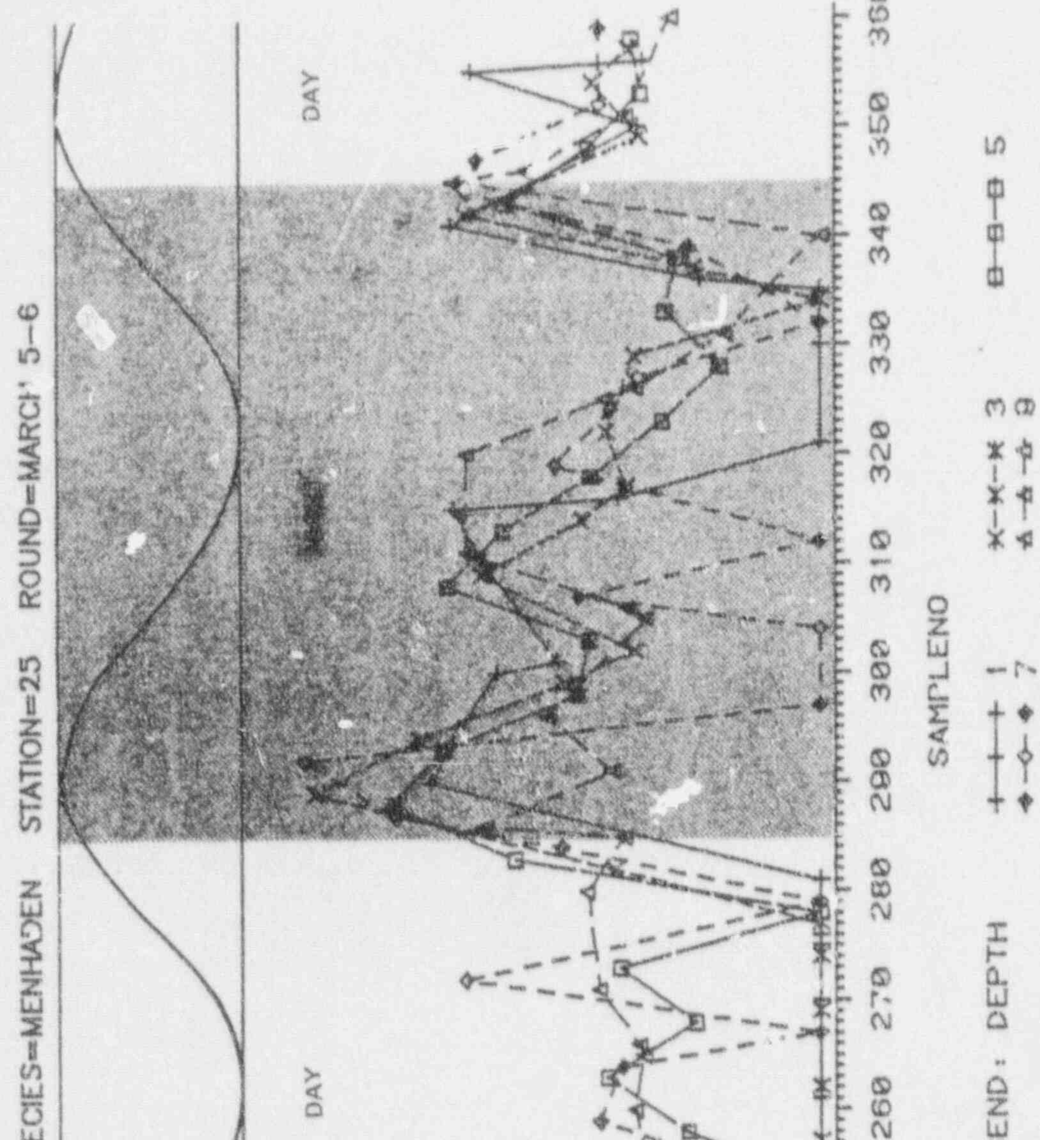


Figure 3.44 Discrete depth sampling density profiles-menhaden -1981 (Sheet 3 of 5).

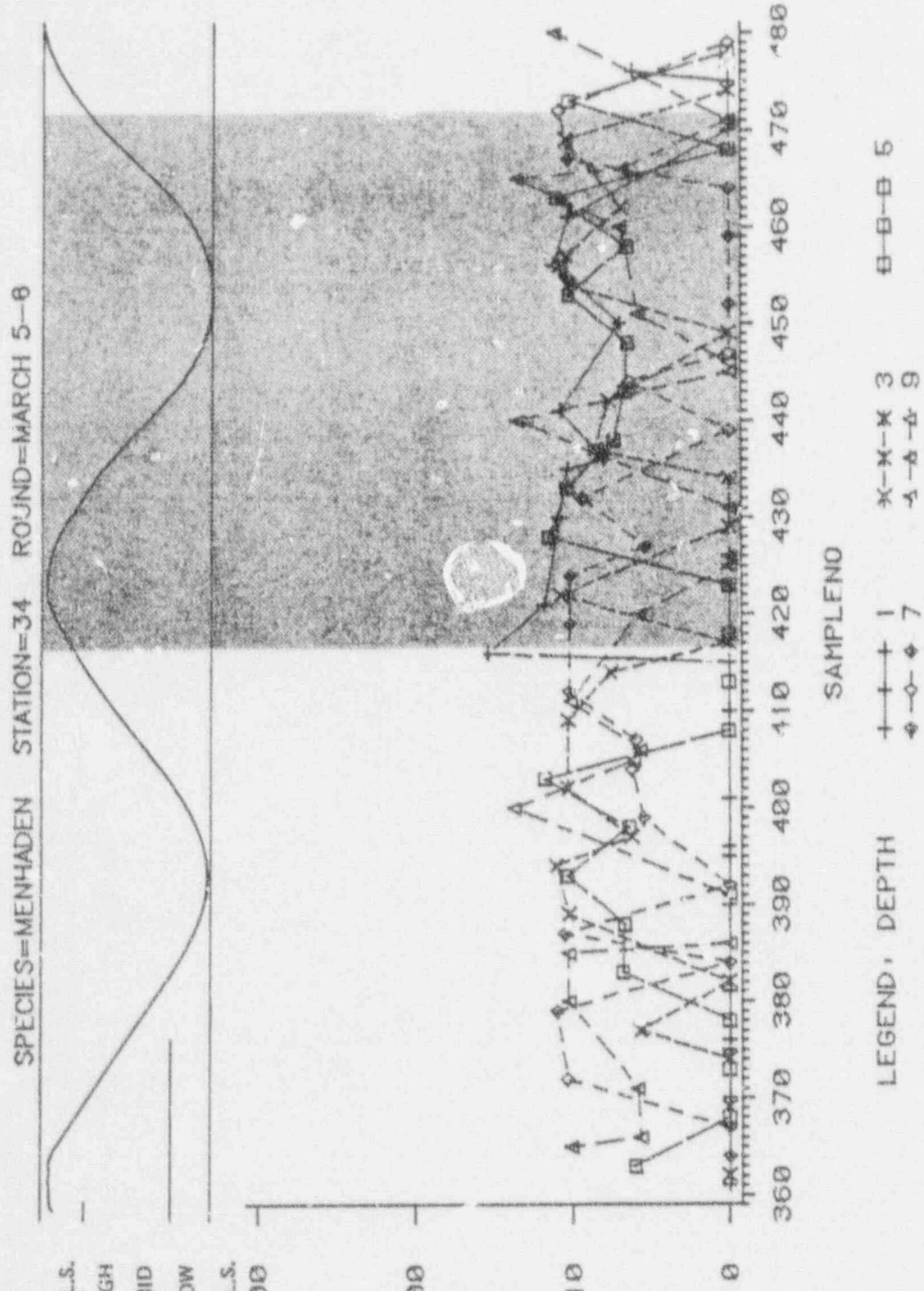
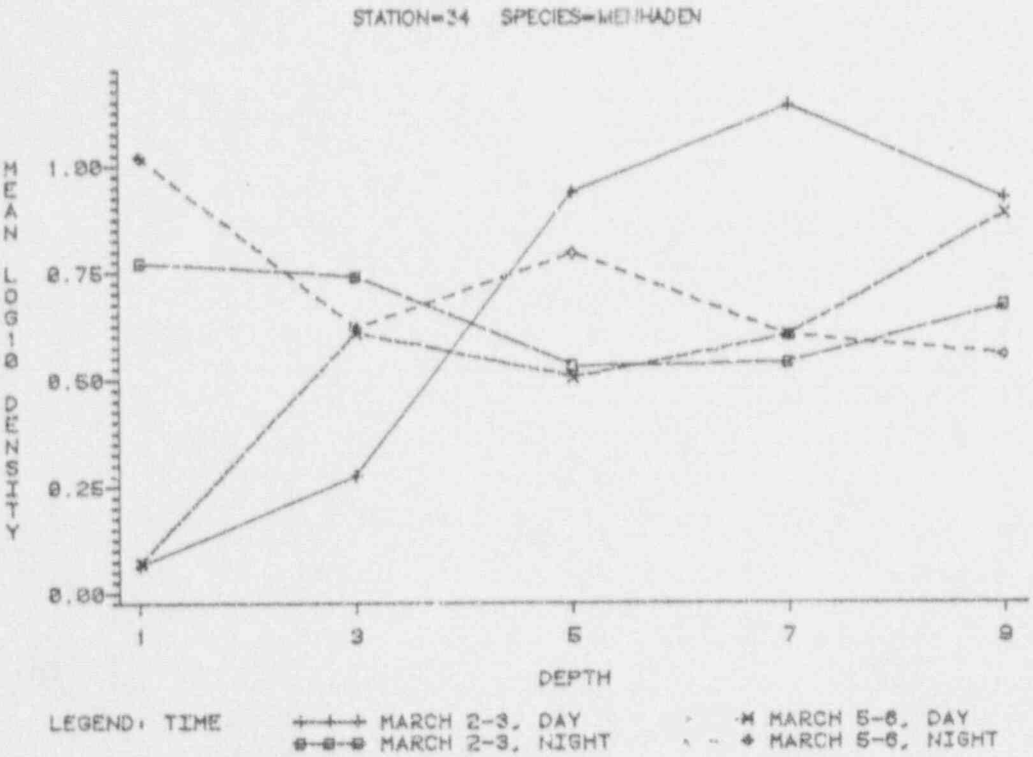


Figure 3.44 Discrete depth sampling density profiles-menhaden -1981 (Sheet 4 of 5).



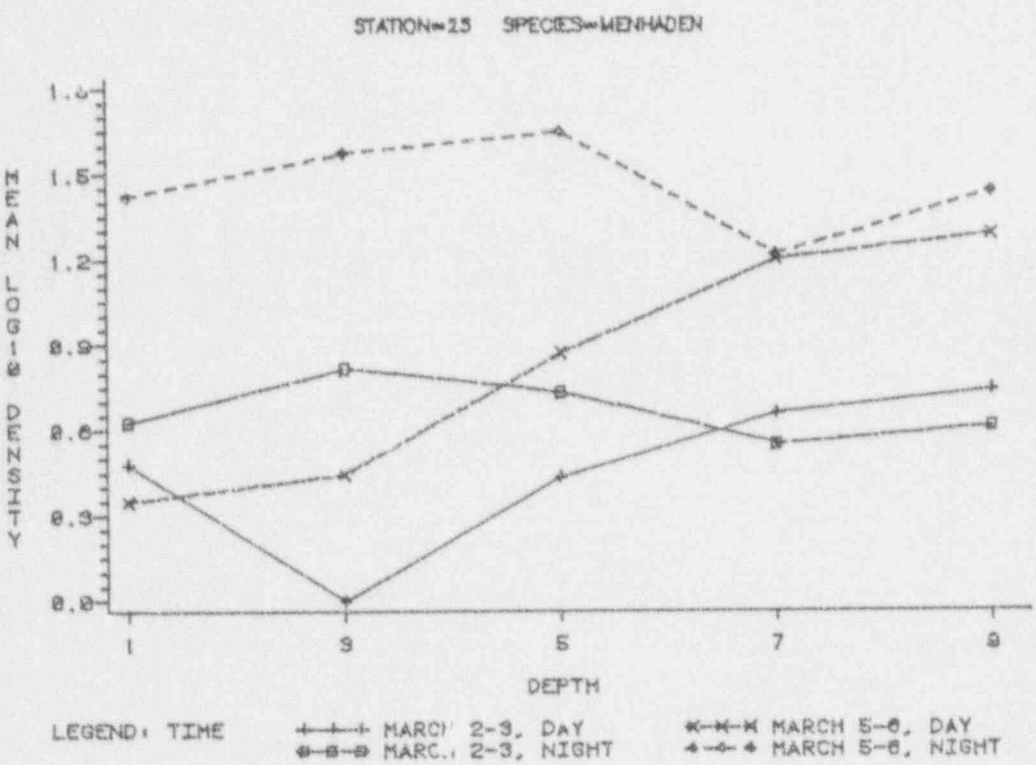


Figure 3.44 Discrete depth sampling density profiles-menhaden -1981 (Sheet 5 of 5).

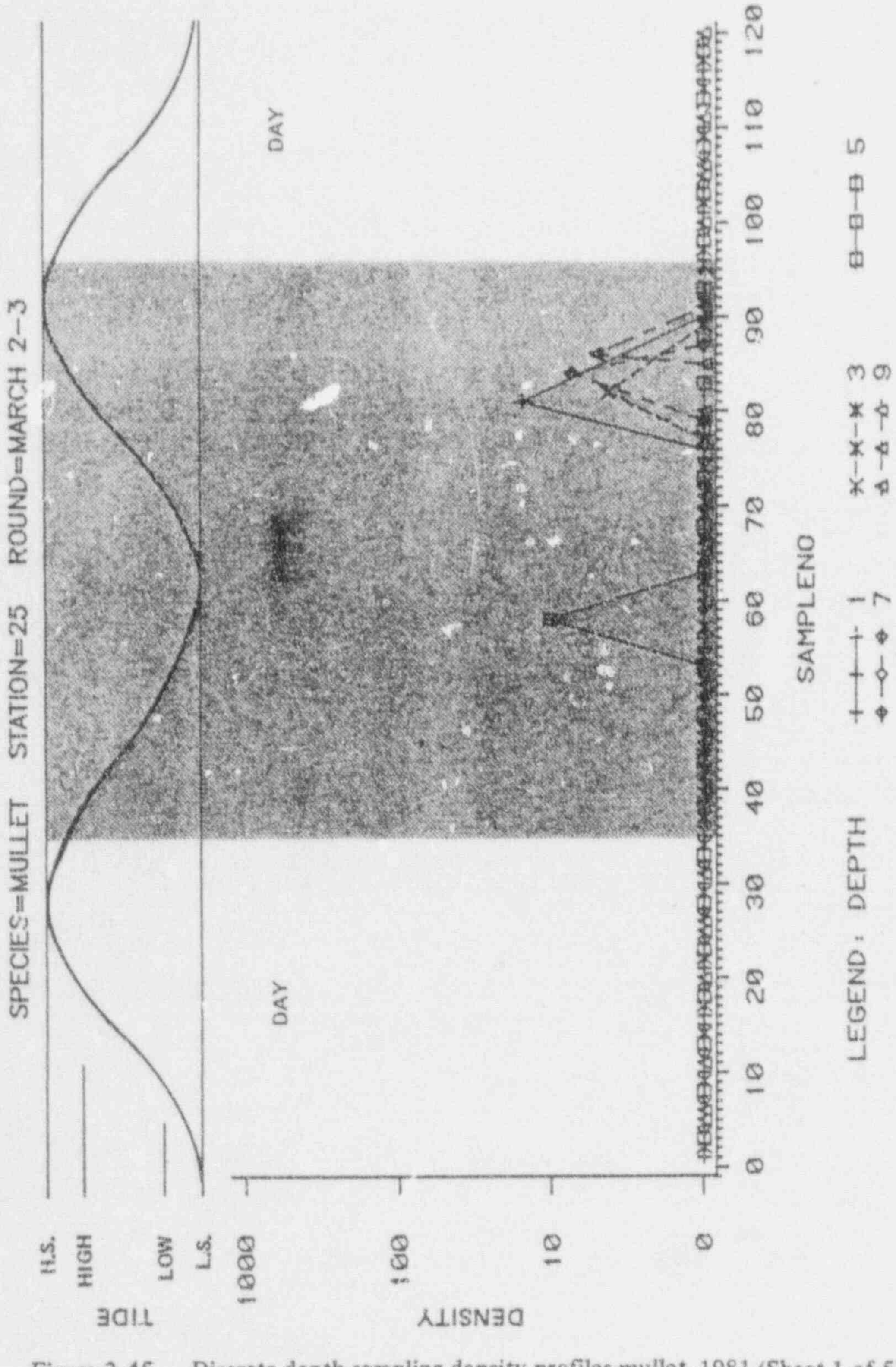


Figure 3.45 Discrete depth sampling density profiles-mullet -1981 (Sheet 1 of 5).

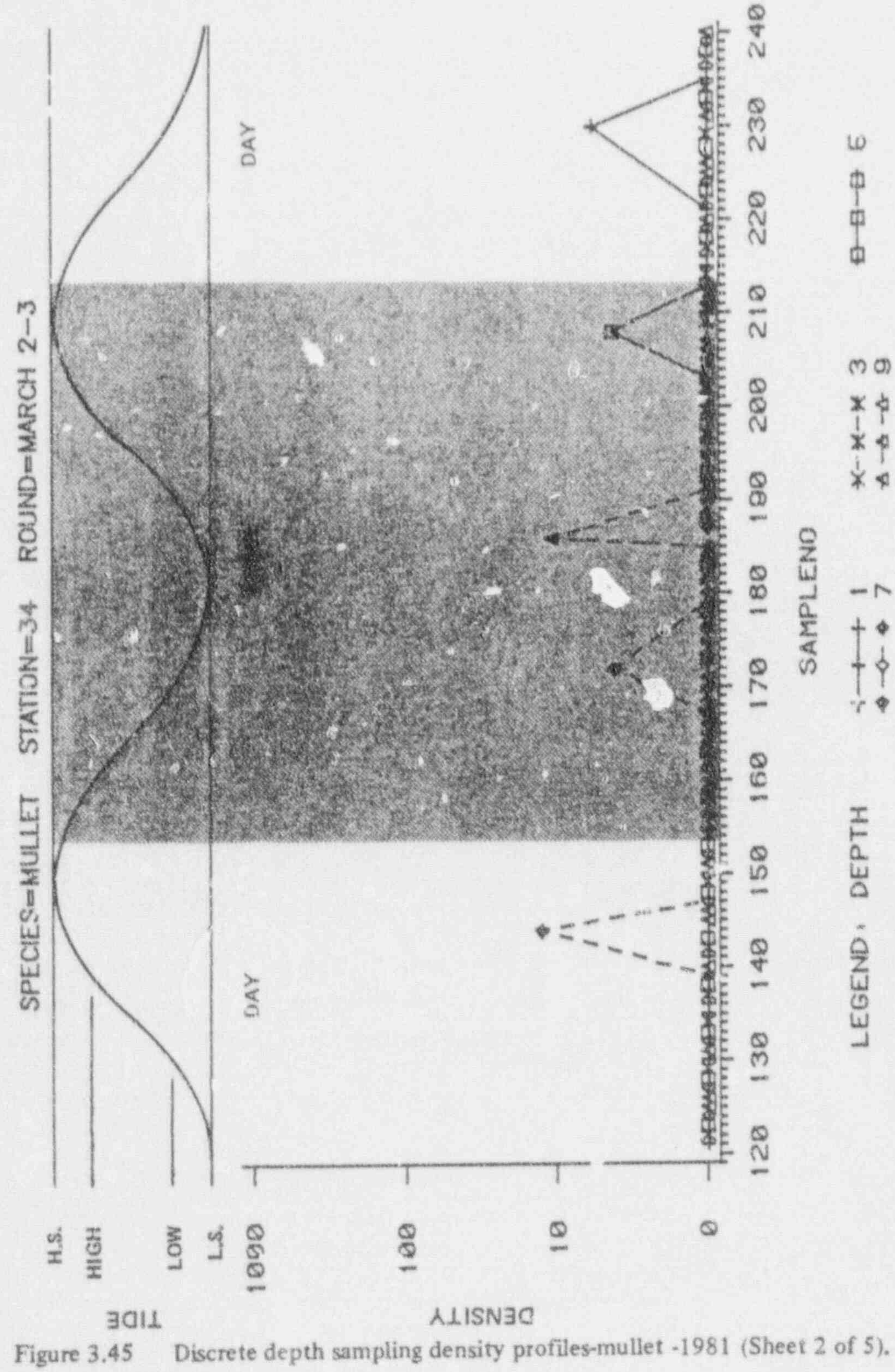


Figure 3.45 Discrete depth sampling density profiles-mullet -1981 (Sheet 2 of 5).

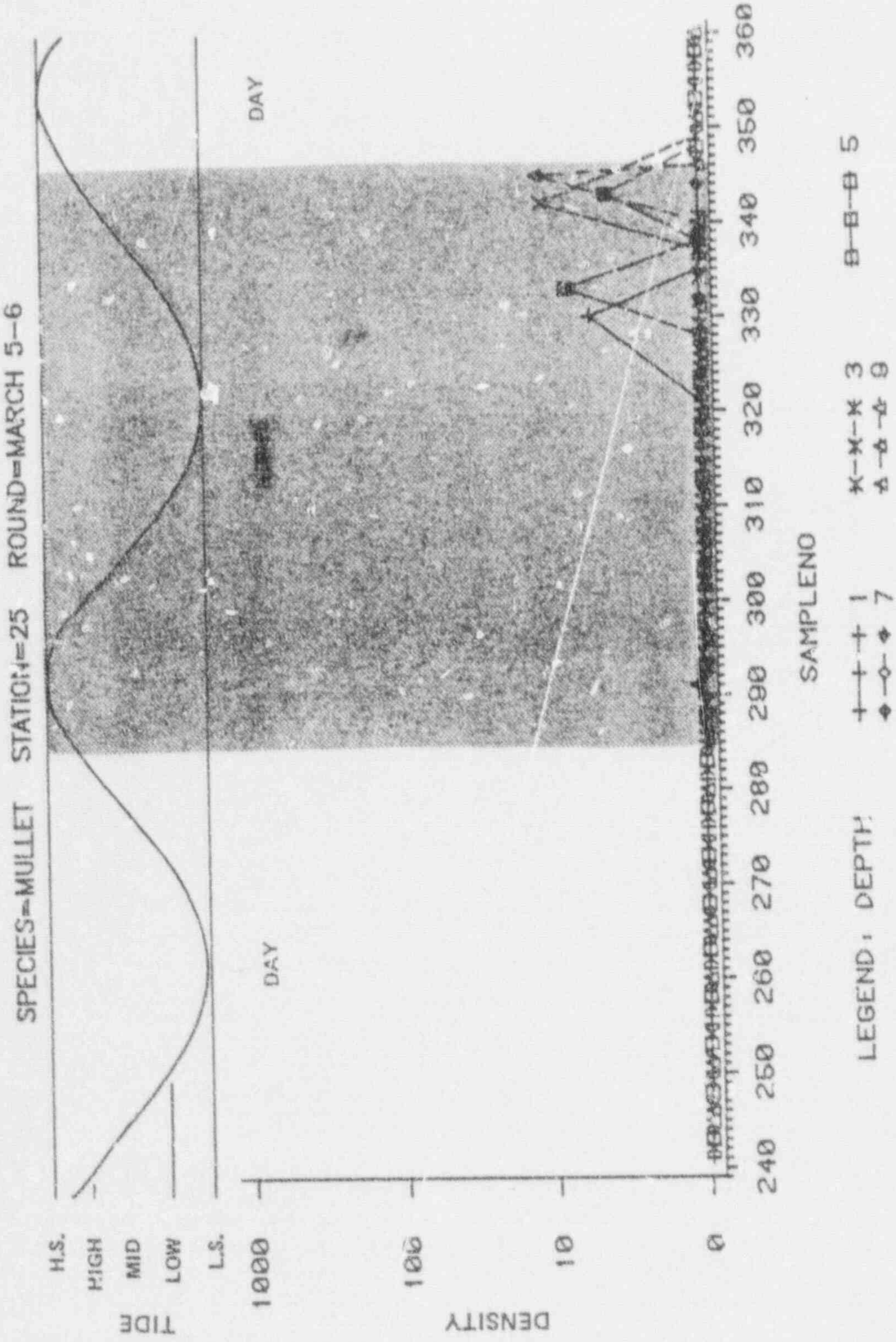


Figure 3.45 Discrete depth sampling density profiles-mullet -1981 (Sheet 3 of 5).

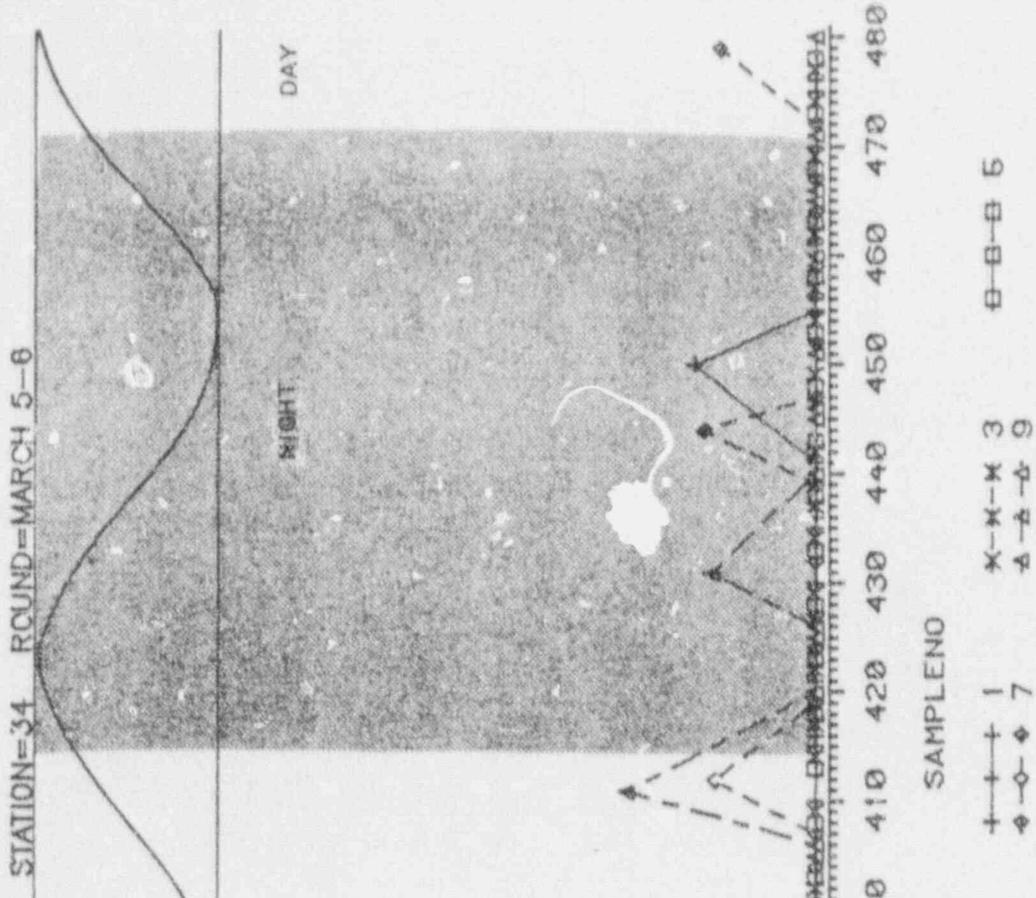
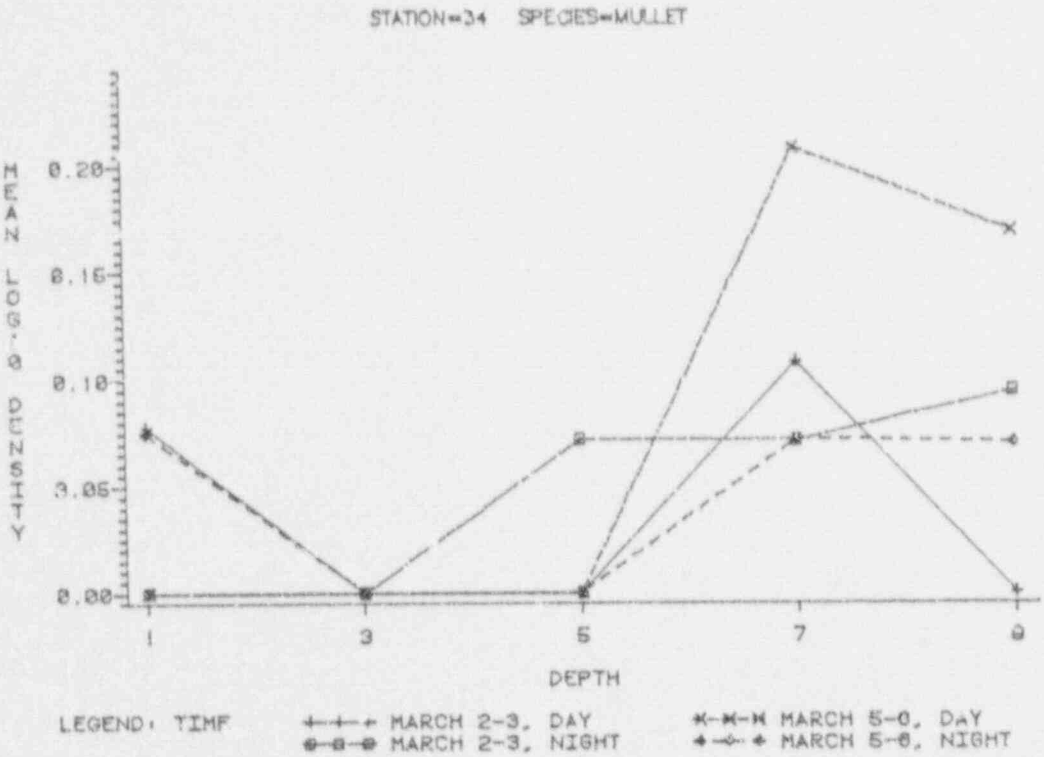


Figure 3.45 Discrete depth sampling density profiles-mullet -1981 (Sheet 4 of 5).



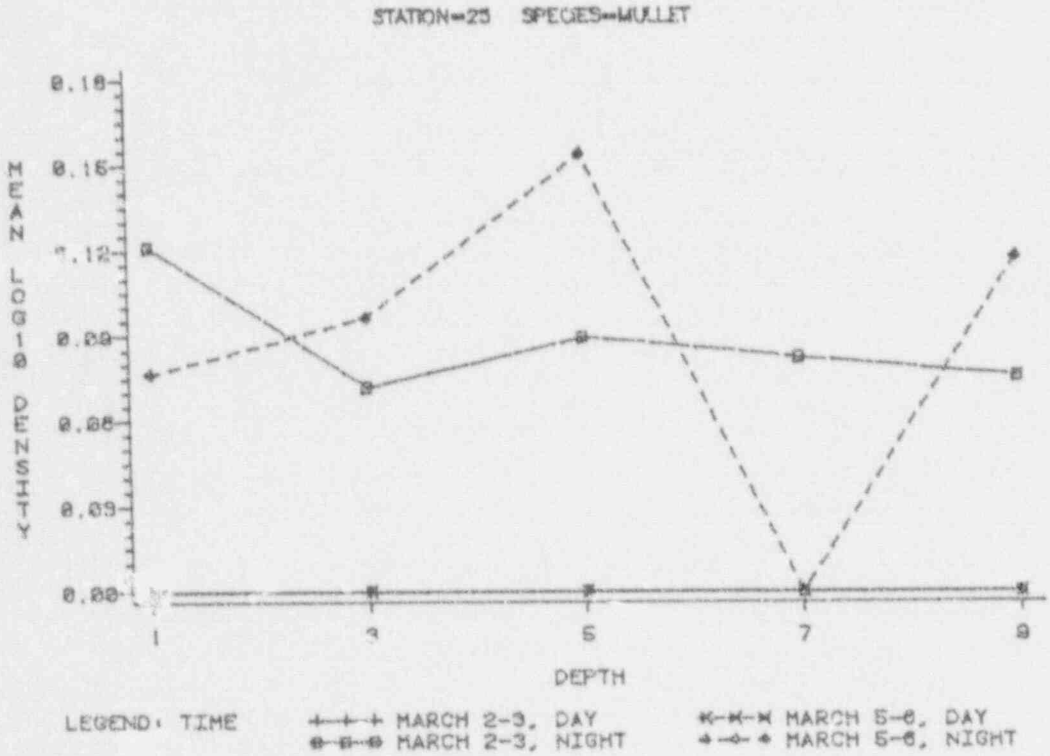


Figure 3.45 Discrete depth sampling density profiles- mullet - 1981 (Sheet 5 of 5)

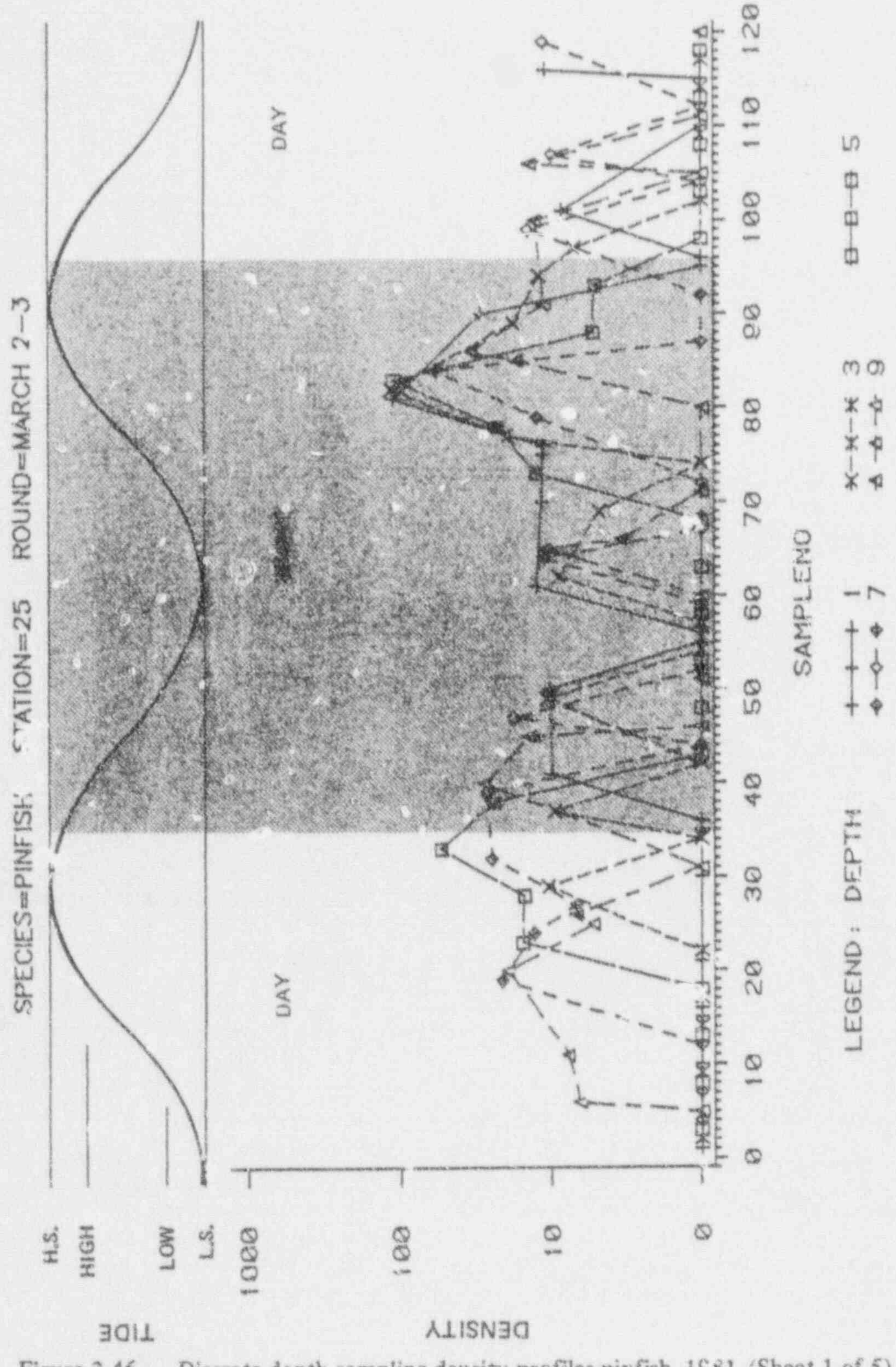


Figure 3.46 Discrete depth sampling density profiles-pinfish -1981 (Sheet 1 of 5).

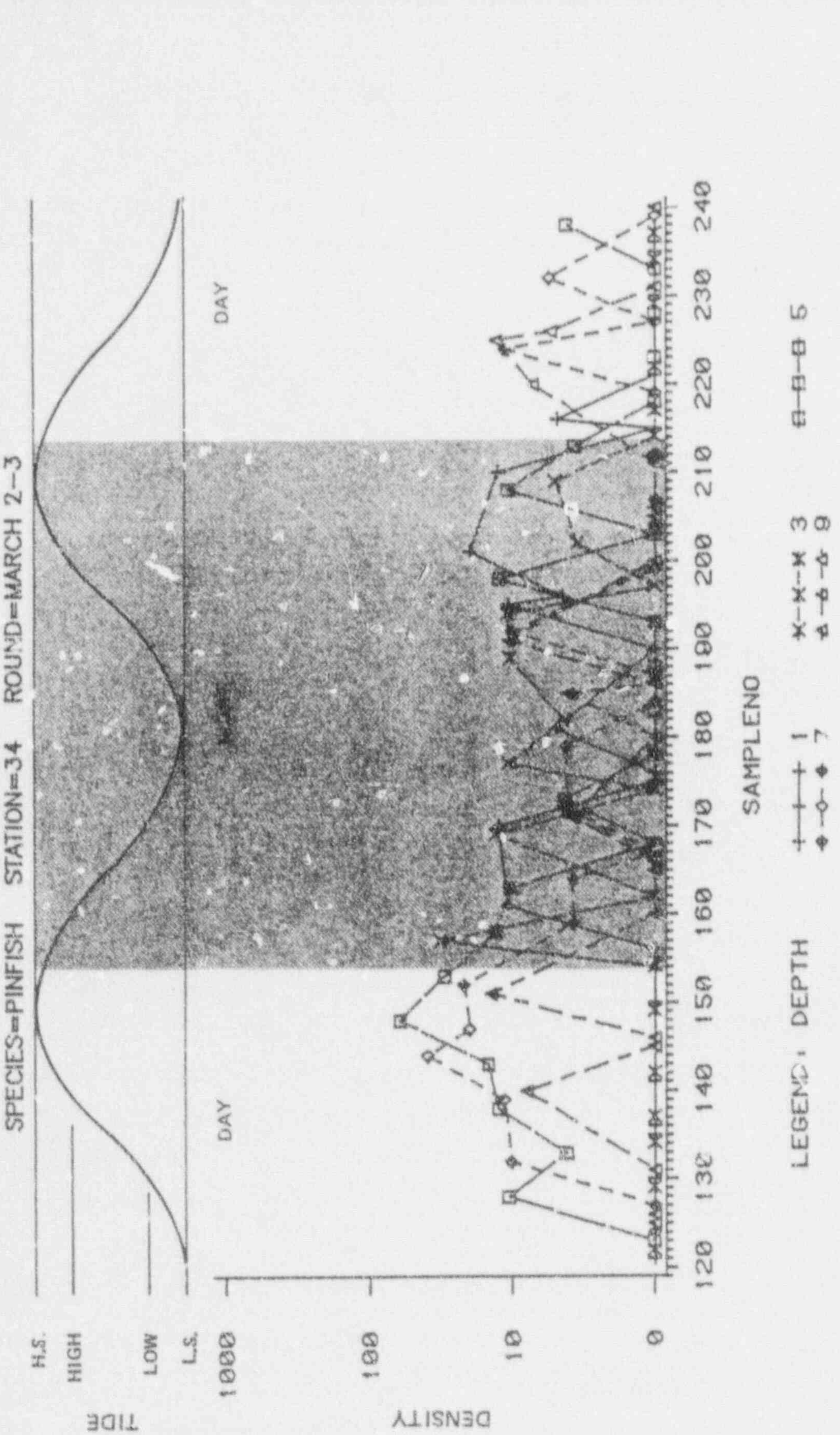


Figure 3.46 Discrete depth sampling density profiles-pinfish -1981 (Sheet 2 of 5).

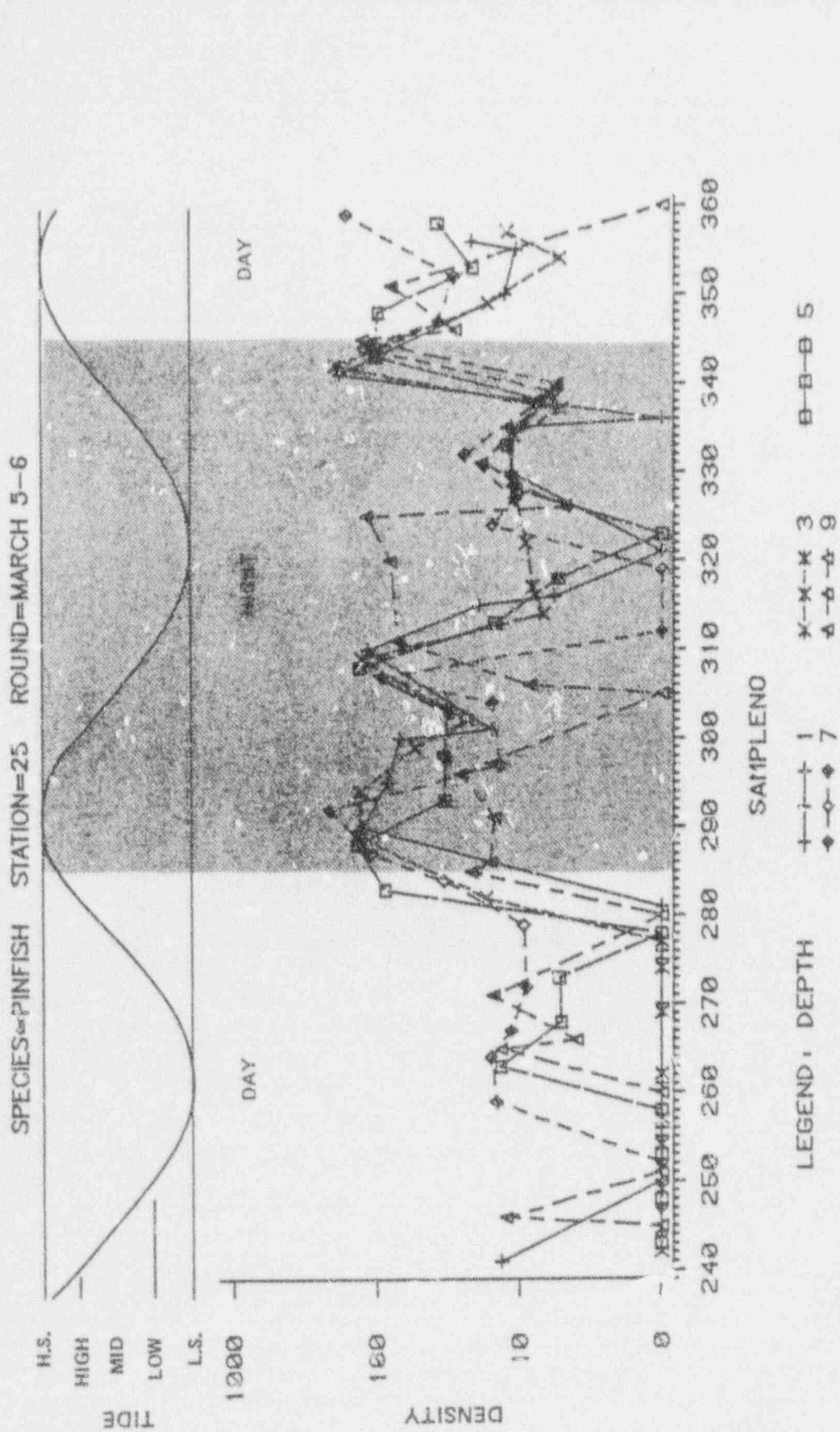


Figure 3.46 Discrete depth sampling density profiles-pinfish -1981 (Sheet 3 of 5).

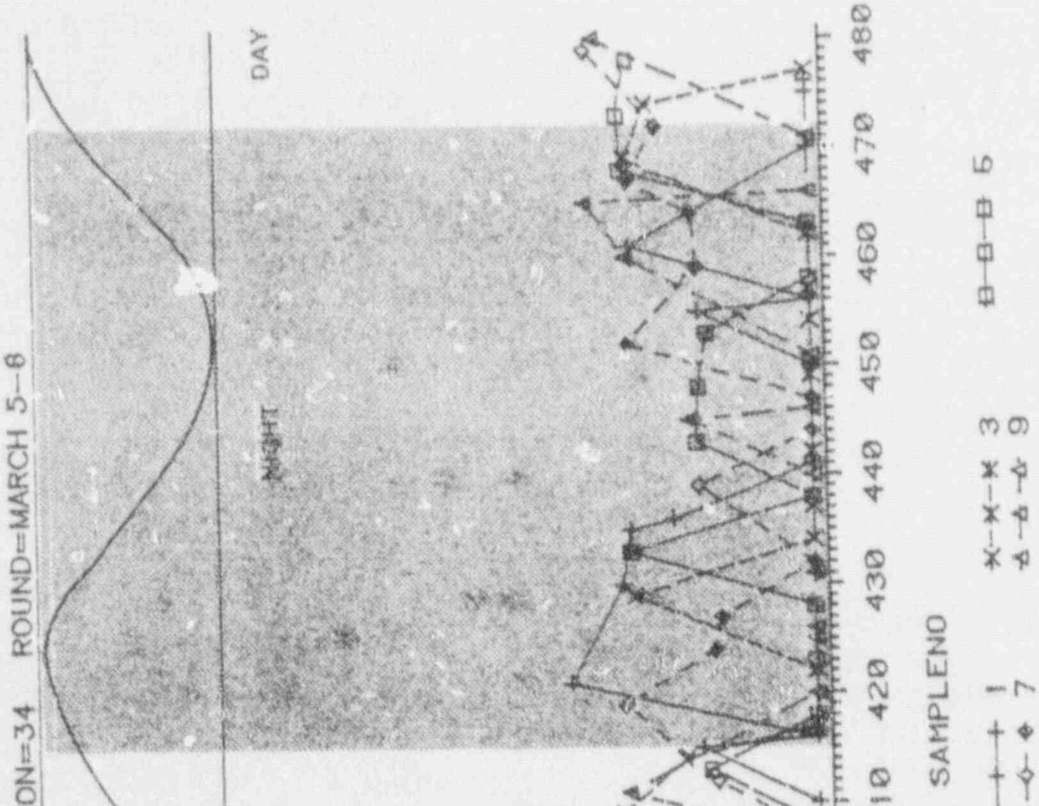
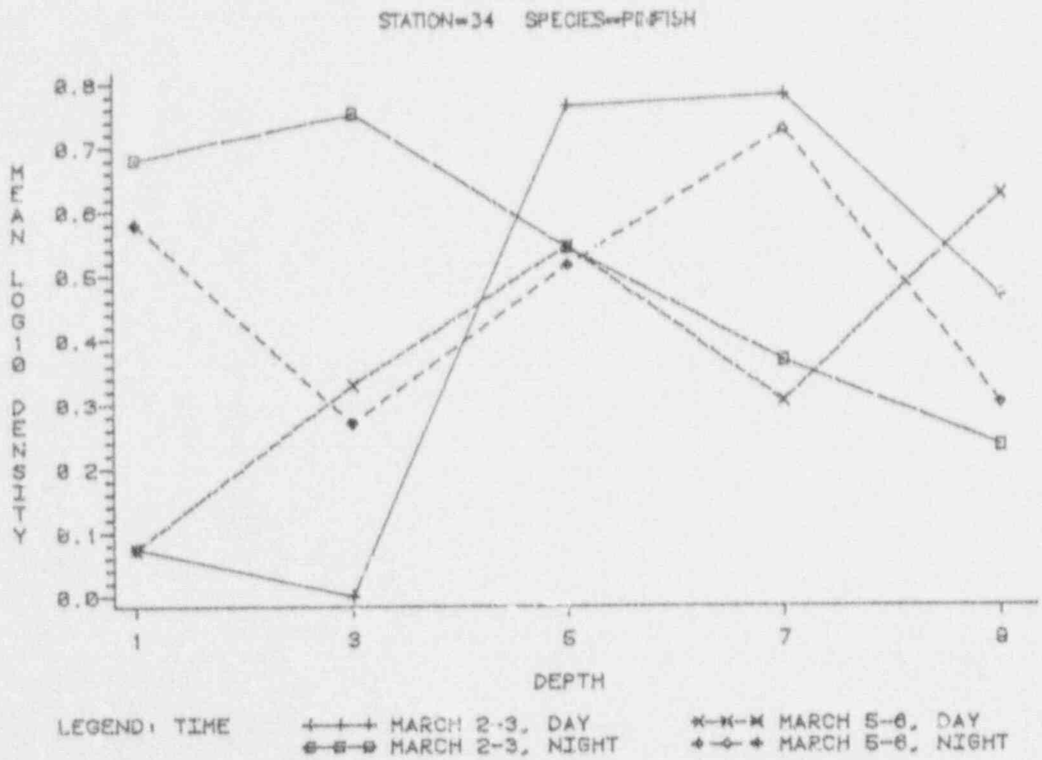


Figure 3.46 Discrete depth sampling density profiles-pinfish -1981 (Sheet 4 of 5).



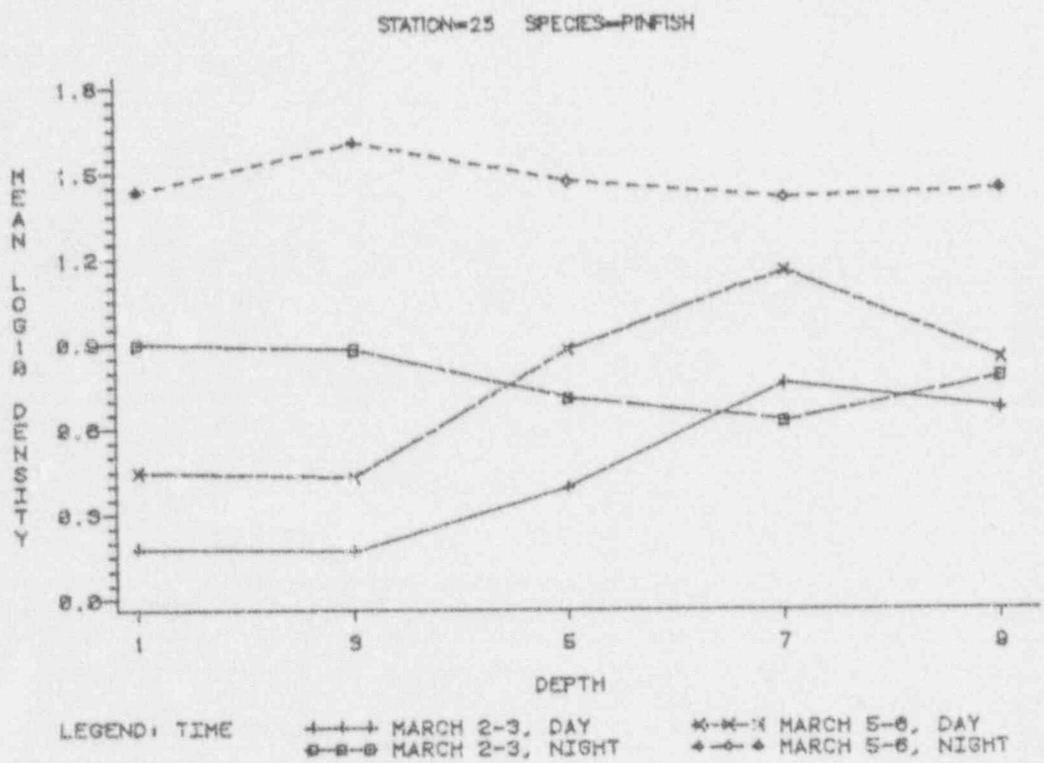


Figure 3.46 Discrete depth sampling density profiles-pinfish -1981 (Sheet 5 of 5).

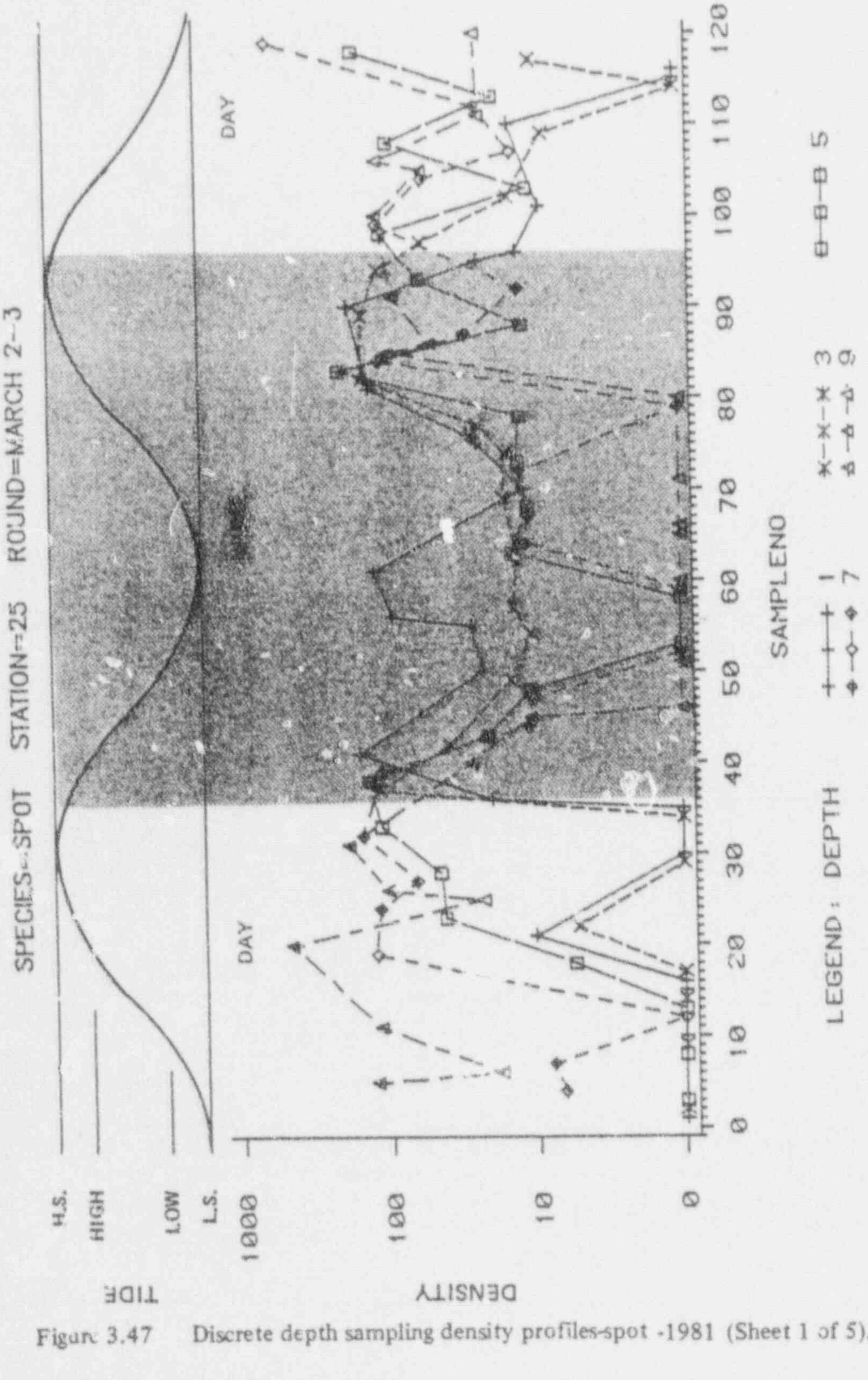


Figure 3.47 Discrete depth sampling density profiles-spot -1981 (Sheet 1 of 5).

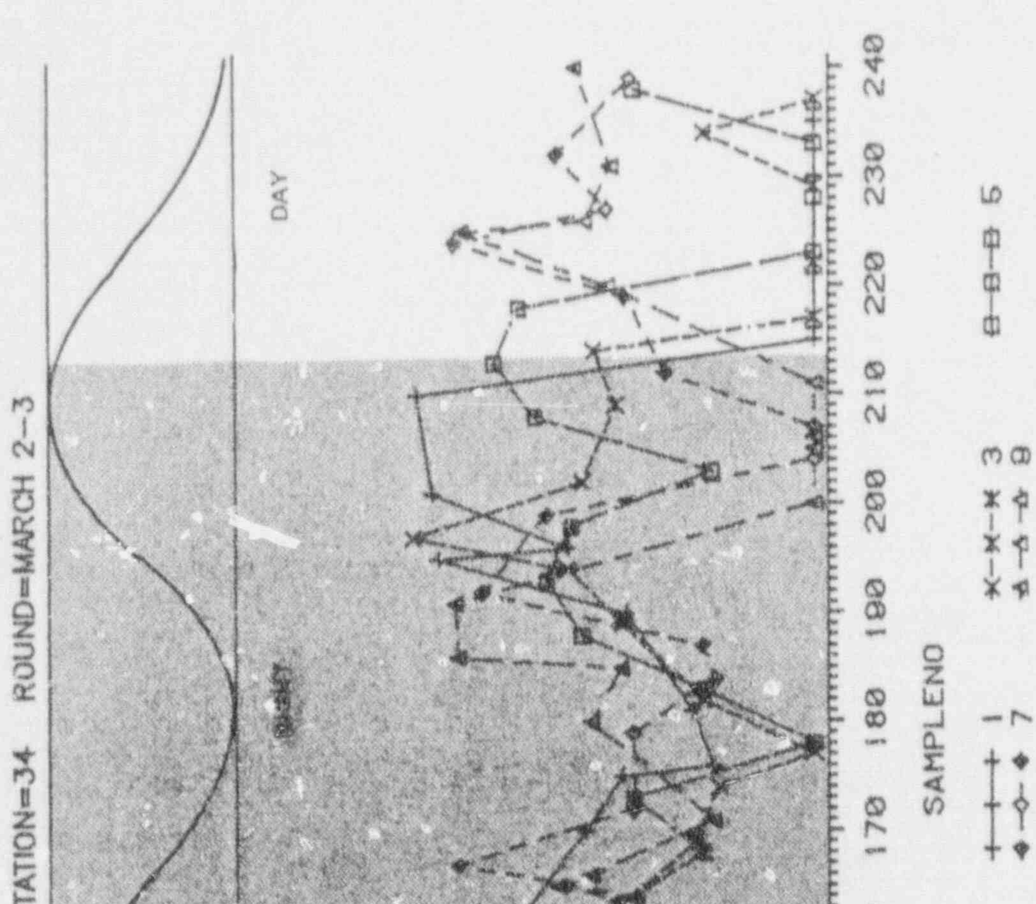


Figure 3.47 Discrete depth sampling density profiles-spot -1981 (Sheet 2 of 5).

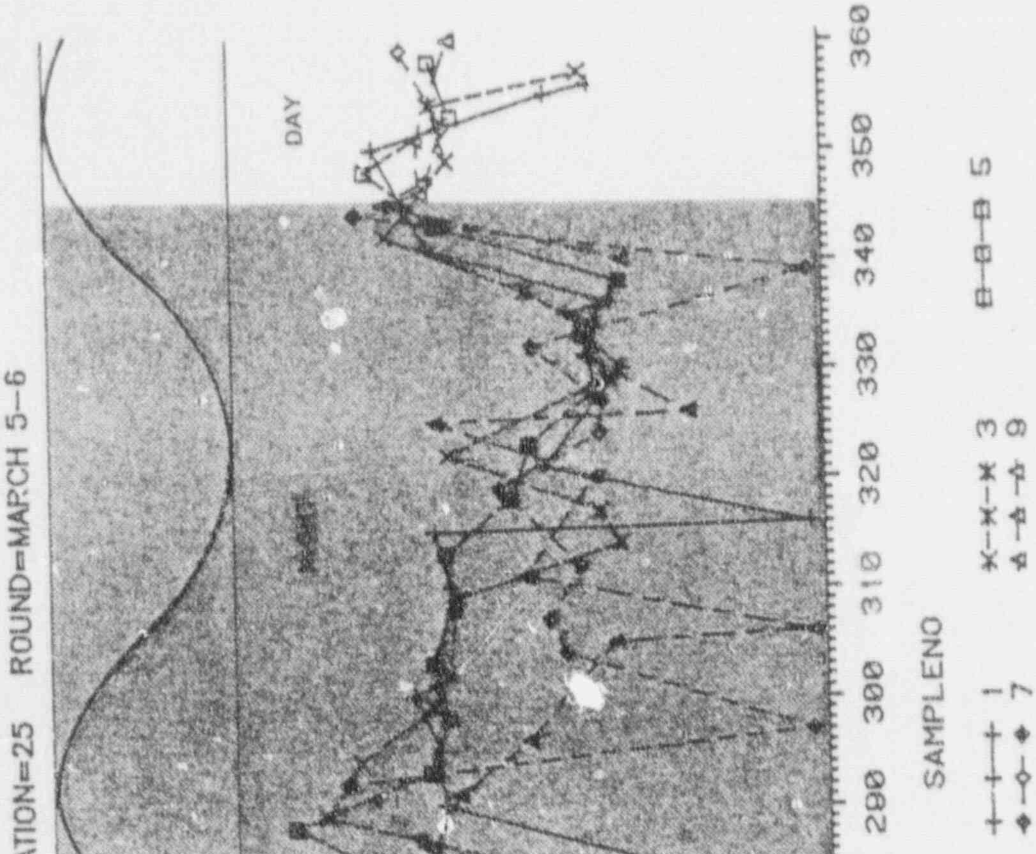


Figure 3.47 Discrete depth sampling density profiles-spot -1981 (Sheet 3 of 5).

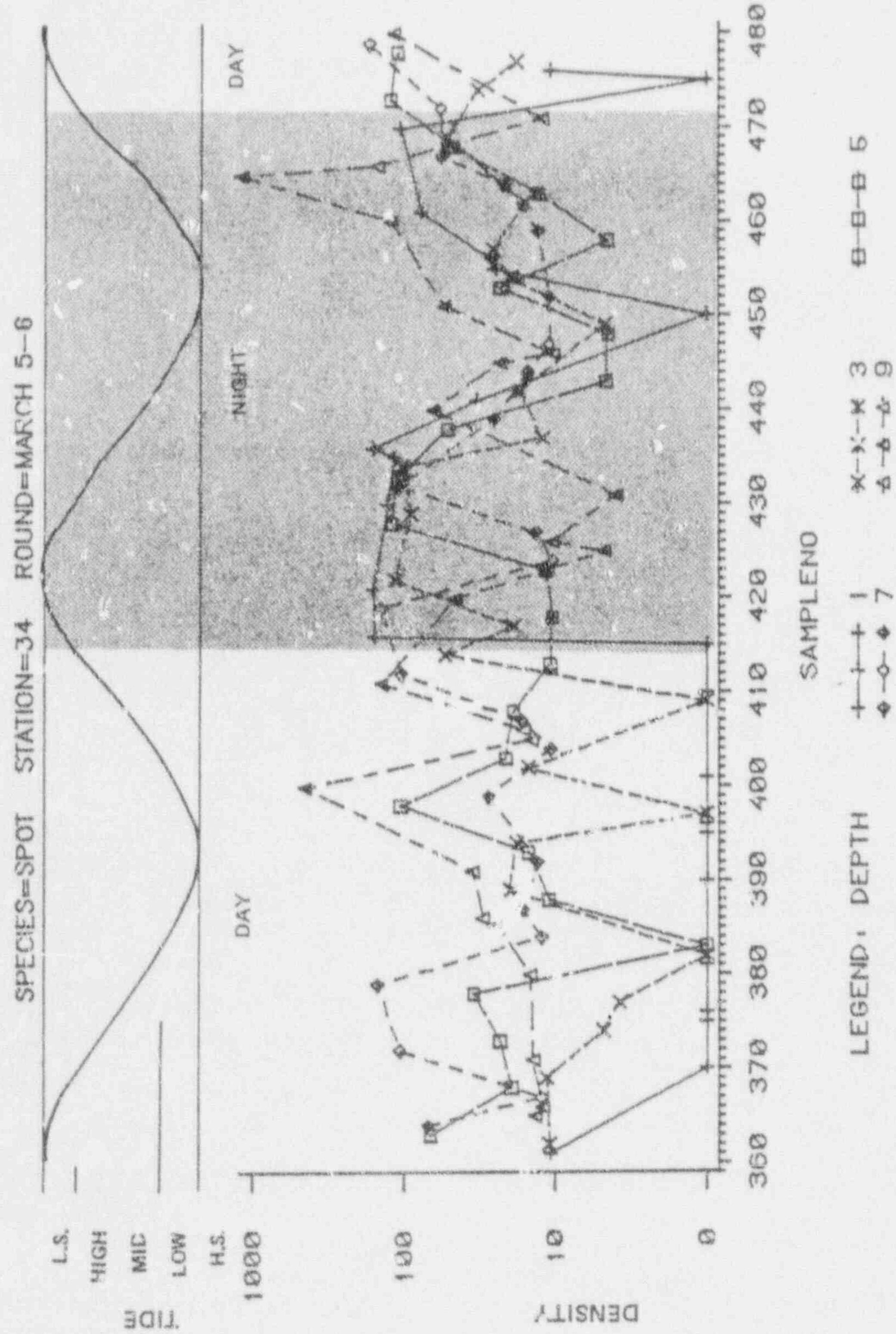
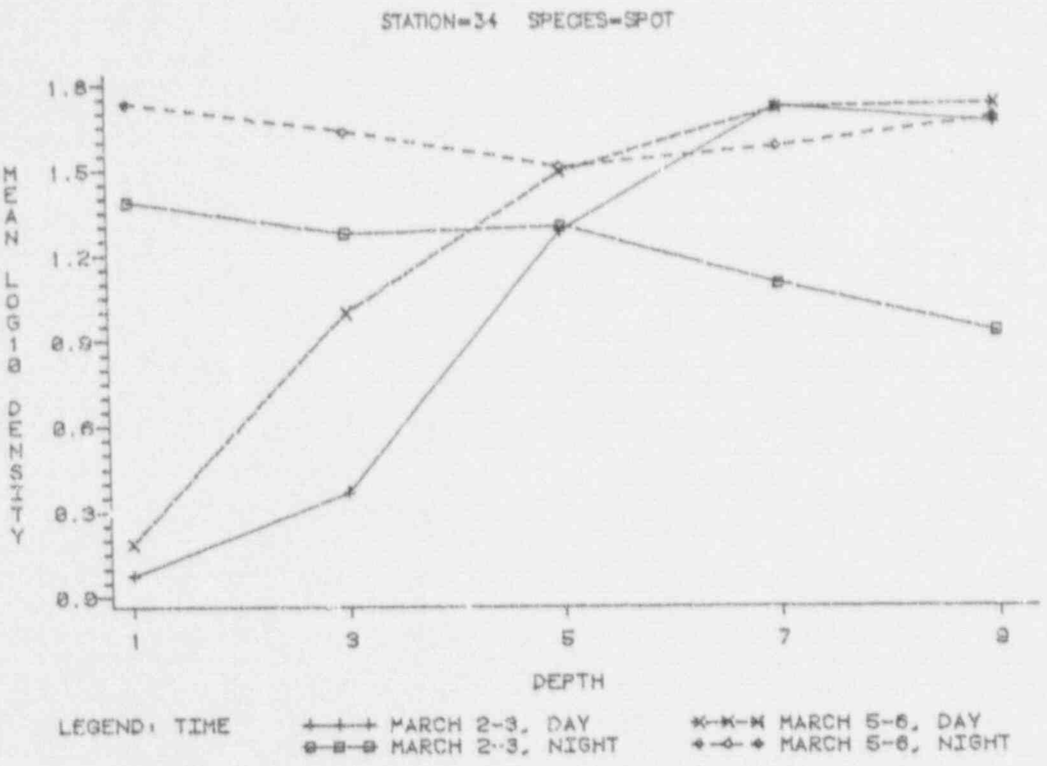


Figure 3.47 Discrete depth sampling density profiles-spot -1981 (Sheet 4 of 5).



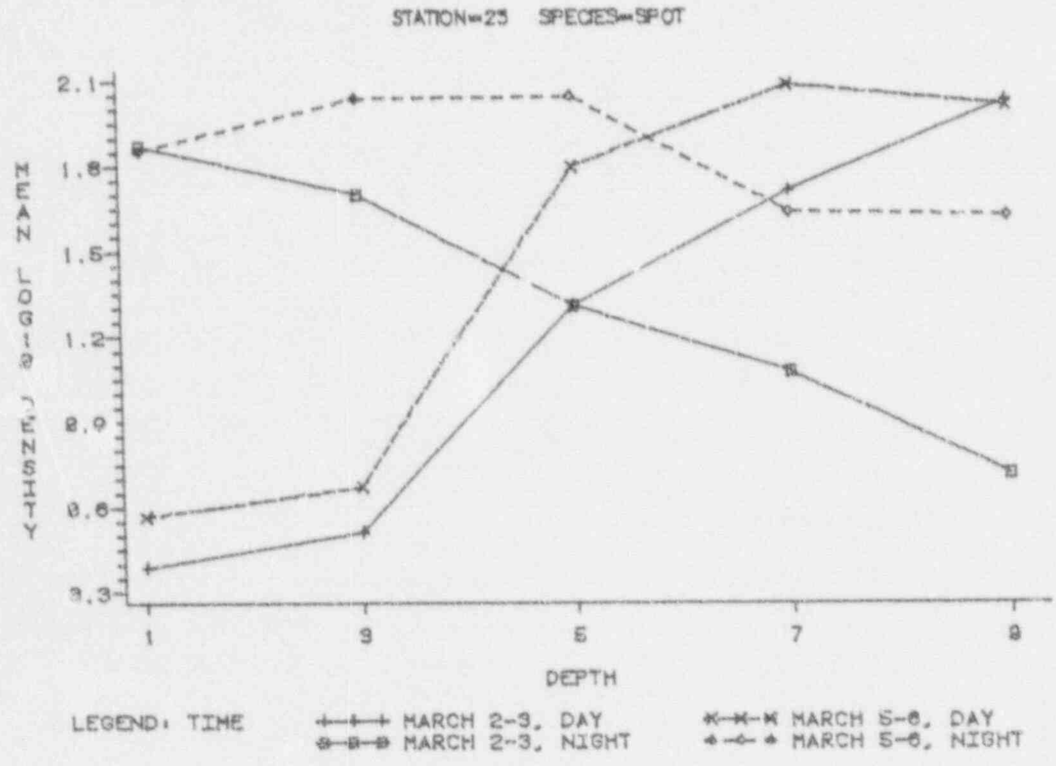


Figure 3.47 Discrete depth sampling density profiles-spot -1981 (Sheet 5 of 5).

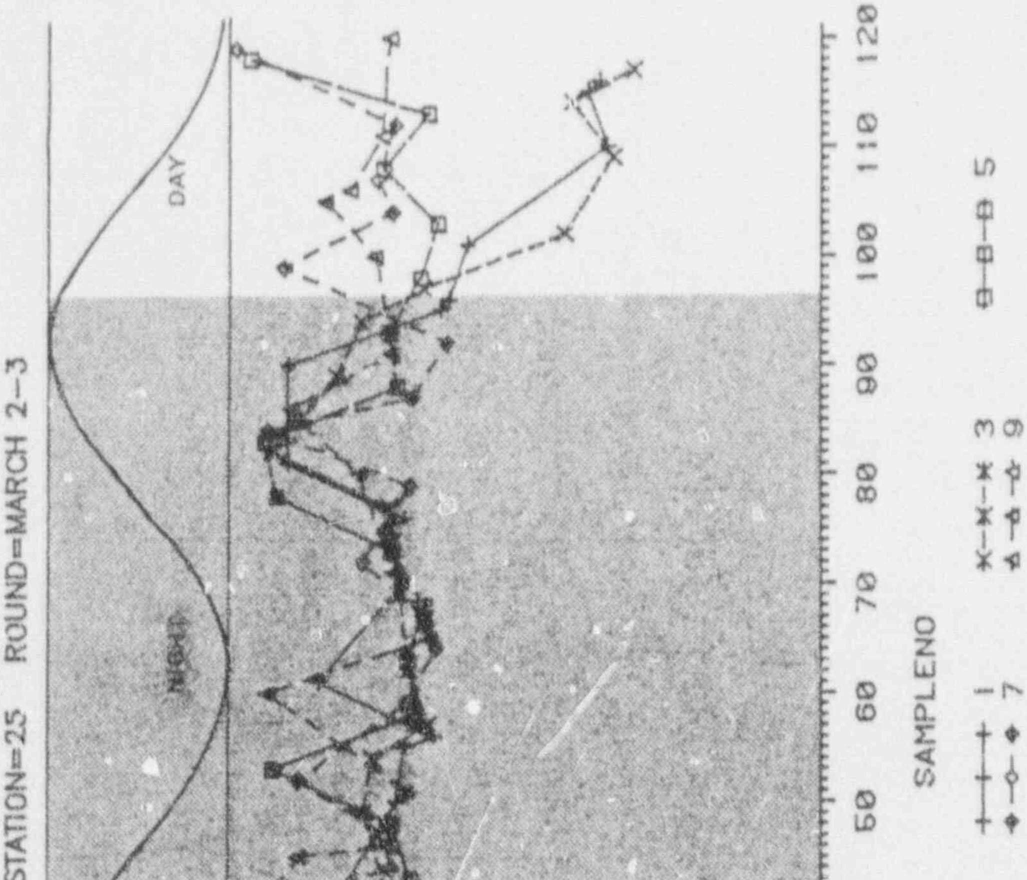


Figure 3.48 Discrete depth sampling density profiles-total species-1981 (Sheet 1 of 5).

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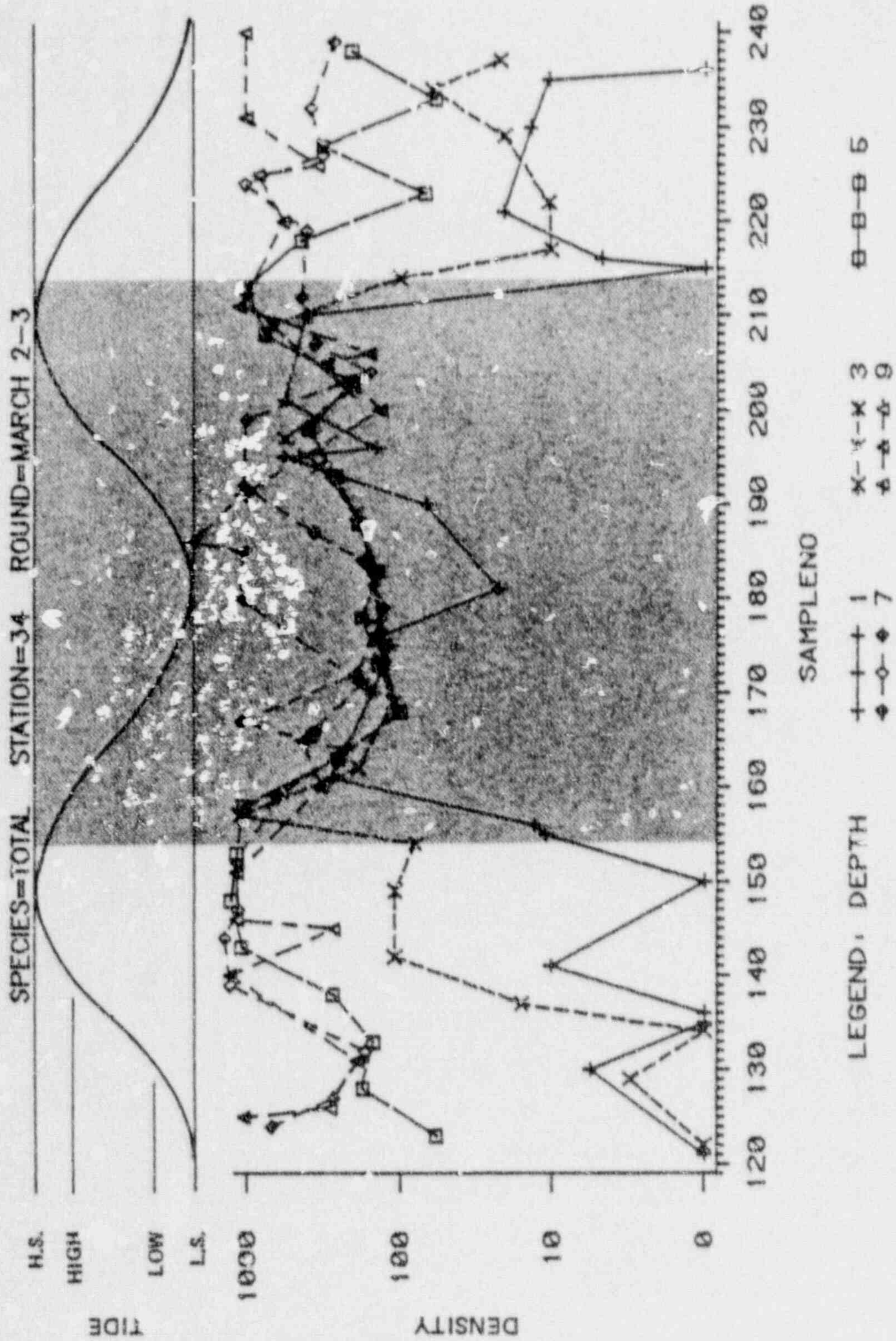


Figure 3.48 Discrete depth sampling density profiles-total species -1981 (Sheet 2 of 5).

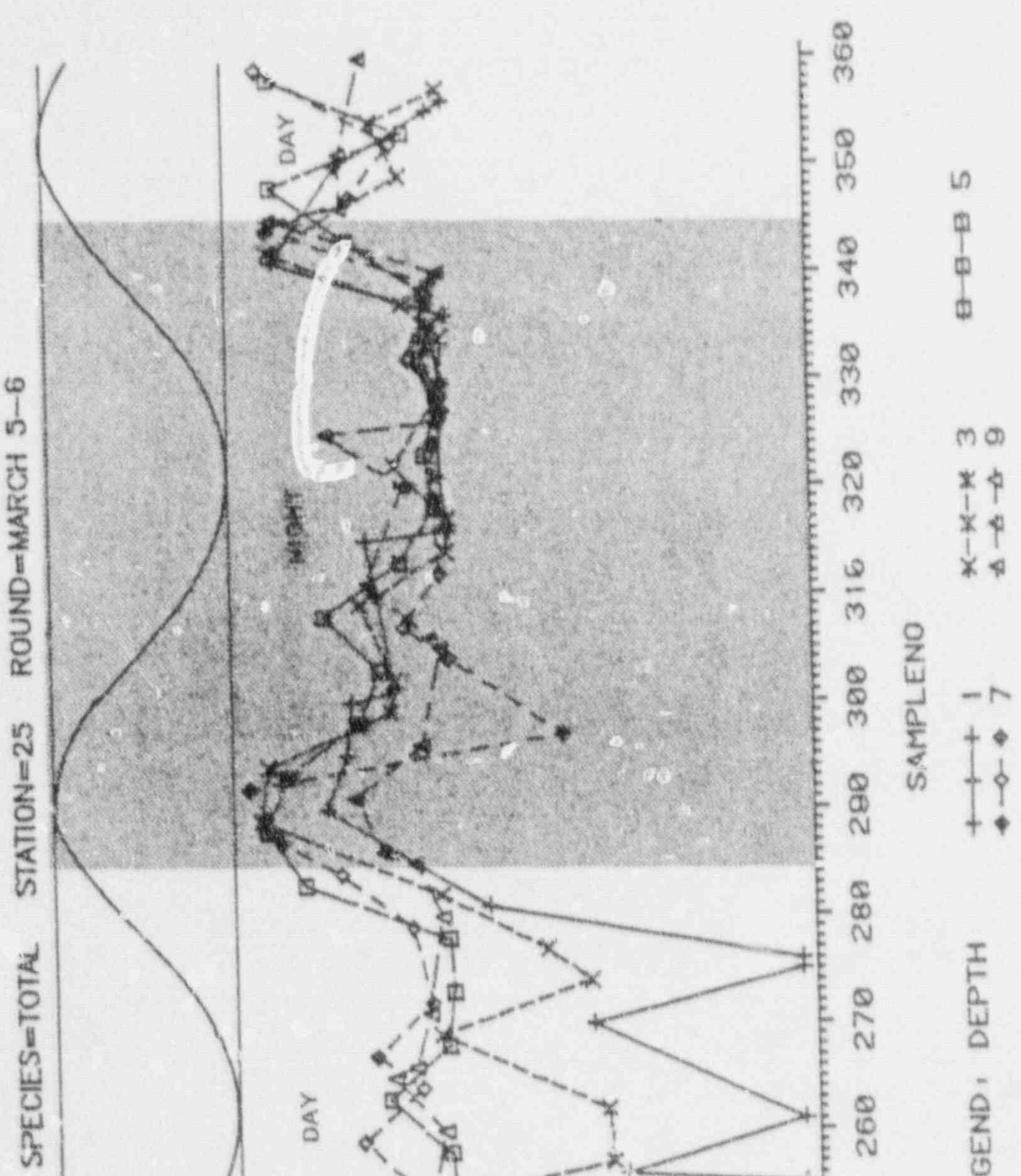


Figure 3.48 Discrete depth sampling density profiles-total species -1981 (Sheet 3 of 5).

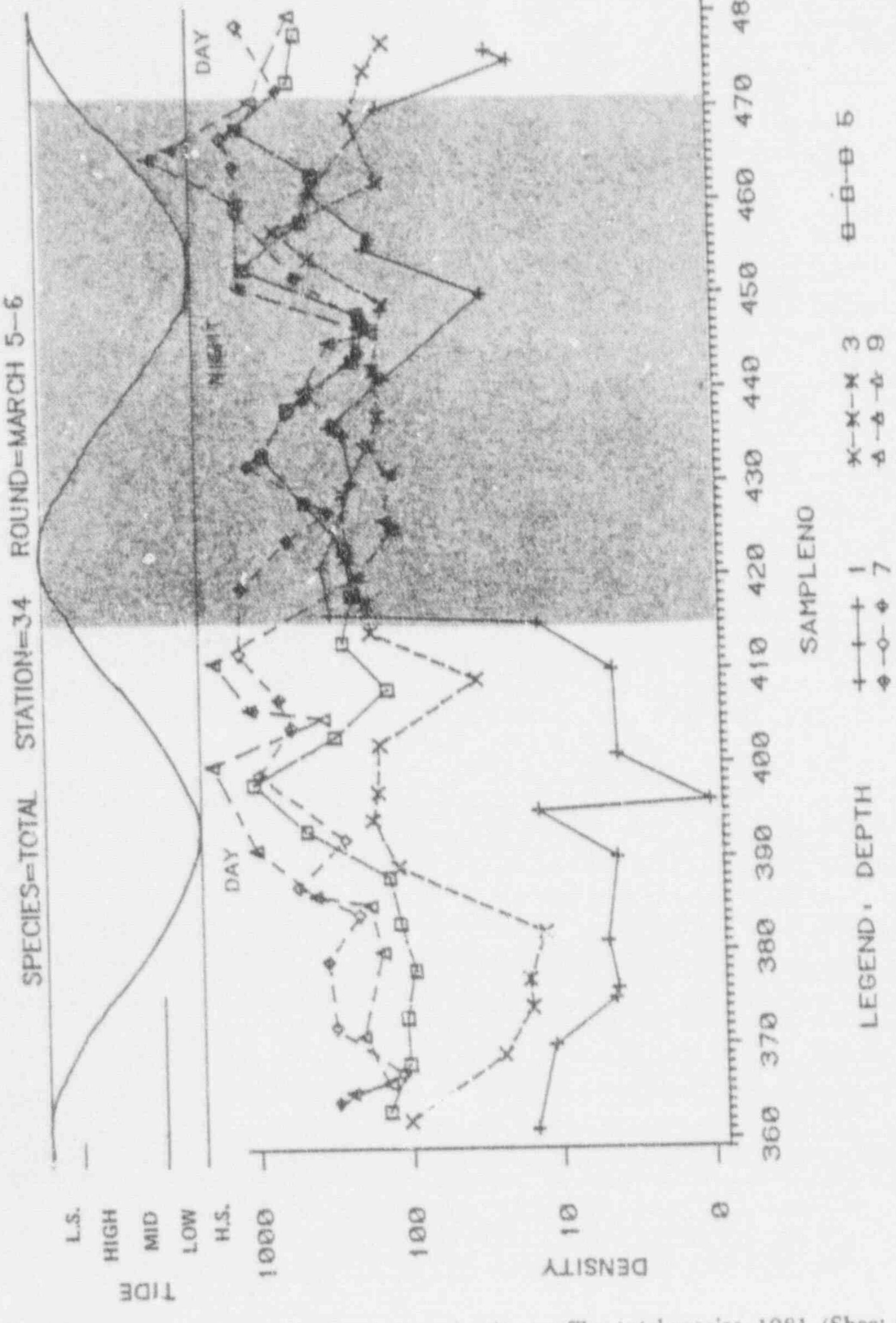
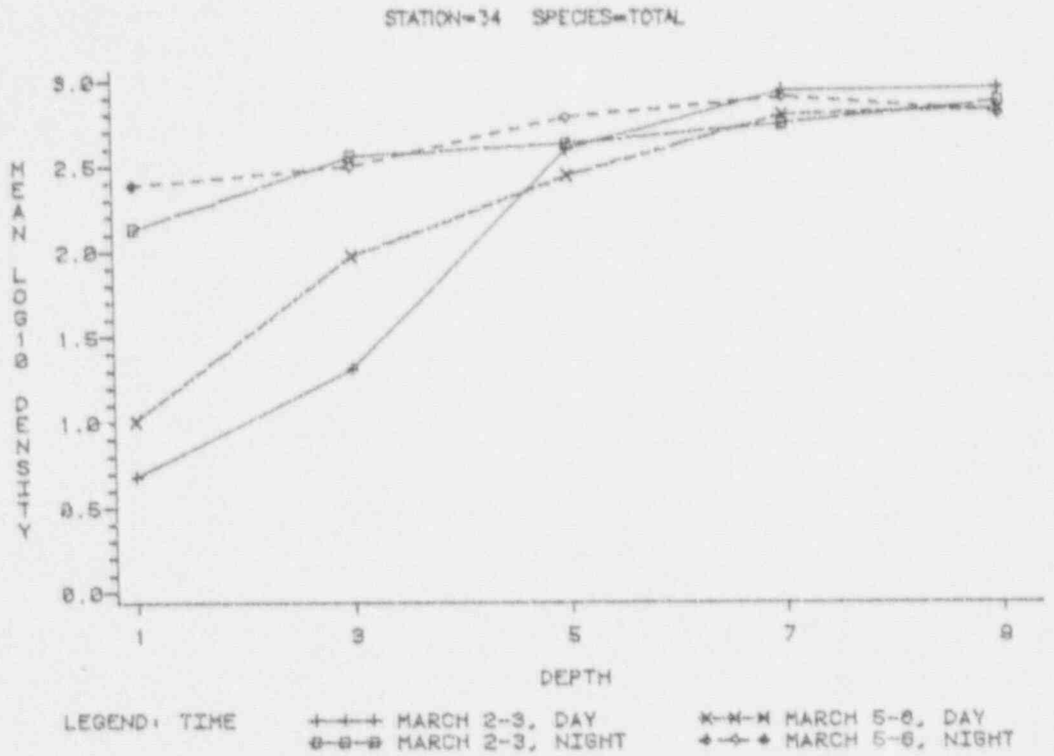


Figure 3.48 Discrete depth sampling density profiles-total species -1981 (Sheet 4 of 5).



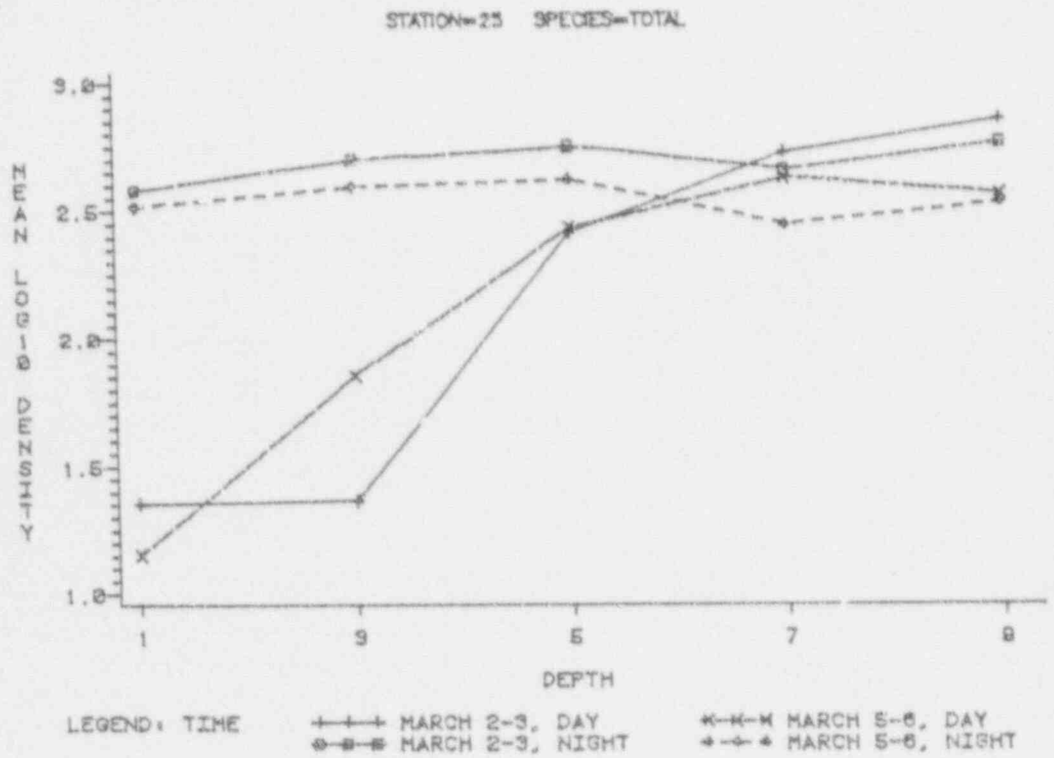


Figure 3.48 Discrete depth sampling density profiles-total species -1981 (Sheet 5 of 5).

4.0 HIGH MARSH STUDY

4.1 Introduction

The marshes of the CFE provide nursery areas for many ocean-spawned fish and shellfish. The populations and their distributions in these areas must be studied to ensure that they are not adversely affected by the large volume of water being removed from the estuary for cooling the BSEP. In June 1980, CP&L began high marsh sampling based on information obtained by various other studies on the marshes of the CFE. The two main studies were Weinstein (1979) and Hodson (1979). The North Carolina Division of Marine Fisheries is also conducting similar studies throughout the state. These studies will allow comparison of the CFE to other estuaries in North Carolina when these data become available.

The main objectives of this program are to determine the following:

1. Relative standing crops of selected fish and shellfish in the high marsh.

2. Seasonal distribution of various fish and shellfish.

3. Influence of salinity, temperature, and bottom type on fish and shellfish in the high marsh.

4. Spatial distribution of various fish and shellfish within the high marsh.

5. Similarity of the CFE to other estuaries within the state (and possibly with South Carolina) emphasizing seasonality, densities and movement.

This report will contain data collected from the initiation of this project through December 1981.

4.2 Methods

4.2.1 Station Descriptions

The study area consists of four tidal creek systems broken down into two major areas--high intensity (Figure 4.1) and low intensity (Figure 4.2). The two creek systems (Baldhead and Walden) which make up the high intensity area are located near the plant site at the lower end of the Cape Fear River. Mott's Creek Bay and Alligator Creek comprise the low intensity area and are located upriver near Wilmington.

Baldhead Creek System

Baldhead Creek is a shallow tidal creek extending approximately 8.5 km (5.3 mi) from its mouth to its headwaters on the Smith Island complex. The mouth of the creek is located approximately 0.9 km (0.6 mi) from the mouth of the Cape Fear River. For sampling purposes, it was divided into seven nearly equal sections with a station in each area (Figure 4.3).

Station 11 is a trawl site (Figure 4.4) located at the lower end of Baldhead Creek approximately 1.3 km (0.8 mi) from the mouth of the creek. The creek is widest at this point (approximately 60 m [197 ft]) with a deep channel cut on the west side and shallow mud flats on the eastern side where the trawl is pulled. Bottom substrate is grayish-tan sand with shell fragments throughout the entire station. Table 4.1 shows organic and sediment characteristics of this site. Depth of the water at mid to low out tide, when samples are taken, varies from 0.6 m (2.0 ft) to 1.1 m (3.6 ft).

Station 12, sampled with both trawl and seine, (Figure 4.4) is located 1.13 km (0.7 mi) upstream (2.4 km [1.5 mi] from the mouth) and is located in a slight bend between an island and the northeast edge of the creek. It is fairly shallow all the way across at this point. Substrate makeup is greenish-tan silty sand at the upper end and

grayish-tan silty sand with shell fragments at the lower end (Table 4.1). Water depth where the trawl sample is taken varies from 0.5 m (1.6 ft) to 1.2 m (4.0 ft) at mid to low out tide. A seine sample is also taken at the downstream end of the trawl station.

Station 12, sampled with rotenone (Figure 4.5), is 251 m (825 ft) upstream from station 12, trawl and seine and 1.4 km (0.9 mi) from the creek's mouth. This sample is collected by blocking the downstream end of a small bay created by the east bank of the creek and an exposed sandbar. The depth in the center of the site is 0.7 m (2.3 ft.) at mid to low out tide with a bottom makeup of gray silty clay with shell fragments (Table 4.1).

Station 13 (Figure 4.6) is located 0.9 km (0.5 mi) upstream (3.5 km [2.2 mi] from the mouth) of the creek. The upstream end of this station is over an oyster bed, thus substrate is tannish-gray silty sand with shells and shell fragments, and the lower end is grayish silty sand with shell fragments (Table 4.1). The trawl station starts just below a curve on the southwest bank in shallow water, with depths varying between 0.5 m (1.5 ft) to 1.0 m (3.0 ft) at sampling time.

Station 14 (Figure 4.6) is 1.29 km (0.8 mi) upstream (4.83 km [3.0 mi] from the creek's mouth). The trawl station is located along the southern bank with the upstream end over an oyster bed. Substrate at the upper end is gray silty sand with shells and shell fragments. The lower end is grayish-tan fine silty sand with shell fragments (Table 4.1). The creek is shallow with depths in the trawl station of 0.5 m (1.6 ft) to 1.0 m (3.3 ft) when sampled.

Station 15 (Figure 4.7) is 0.97 km (0.6 mi) upstream (5.79 km [3.6 mi] from the mouth) on a straight portion of the creek along the southeast side. Substrate on the upper end is grayish-tan silty sand with shell fragments. Bottom at the lower end is medium gray silty sand with shell fragments (Table 4.1). Depth of the water ranges from

0.5 m (1.6 ft) to 1.2 m (4.0 ft) in the trawl station at time of sampling.

Station 16 (Figure 4.7) is 0.8 km (0.5 mi) upstream (6.60 km [4.1 mi] from the mouth) of station 15. It is both a trawl and a seine station; the seine being taken at the upper end of the site. The seine is pulled onto a sandbar in the center of the creek. The substrate makeup is much the same grayish-tan silty sand with shell fragments throughout the entire station. This station has the lowest percentage of organics of all the stations with the upper end registering 0.9 percent and the lower end 0.7 percent (Table 4.1). This station is very shallow with depths of 0.6 m (2.0 ft) when the trawl sample is taken. The site is 0.5 m (1.6 ft) deep and only 15.2 m (50 ft) wide when the seine is taken. The station is located between the eastern edge of the creek and the sandbar.

Station 17, rotenone site (Figure 4.8) is located 1.0 km (0.6 mi) upstream from station 16 and 7.6 km (4.7 mi) from the mouth of the creek. The site is 100 m (328 ft) downstream of the station 17 trawl site and is sampled by blocking off a section of creek along a slight bend. The width of the creek at the time of sampling ranges from 6.7 to 16.5 m (22 to 54 ft) and has a bottom of gray silty sand with shell fragments (Table 4.1).

Station 17, sampled with the trawl (Figure 4.8) is 100 m (328 ft) upstream from Station 17, rotenone (7.7 km [4.8 mi] from the mouth) and about 1.1 km (0.7 mi) from the headwaters. Depth is only 0.3 to 0.6 m (1.0 to 2.0 ft) through the trawl station when the sample is taken. The creek is 9.1 to 10.6 m (30 to 35 ft) wide at this point and drains almost completely at low tide. The substrate at the upper end is gray silty sand and the lower end is the same except some shell fragments are included (Table 4.1). The trawl is pulled down the center of the creek since this station is so narrow.

Walden Creek System

Walden Creek is a deep tidal creek with depths to 7.6 m (25 ft). The distance from the point where it flows into Snow's Marsh to the mouth of the Cape Fear River is approximately 11.6 km (7.2 mi) (Figure 4.9). Walden Creek has three feeder creeks: Governors Creek, Nancys Creek, and Gum Log Branch. This study area consists of nine stations. Three of these stations (21, 22, and 23) are located in Walden Creek; five stations (24 through 27 and 29) are in Nancys Creek; and station 28, which was added on December 10, 1980, is located in Gum Log Branch. For simplicity, all of these stations will be referred to as Walden Creek stations in other sections of this report.

Station 21 (Figure 4.10) is located at the lower end of Walden Creek approximately 1.2 km (0.8 mi) upstream from the point where it flows into Snows Marsh. The site is approximately 300 m (984 ft) downstream from the old SR 1528 bridge just below a large bend in the creek. The creek is approximately 55 m (181 ft) wide at this point with a deep channel (5.8 m [19 ft]) on the southeast side and shallow (0.6 to 1.7 m [2.0 to 5.5 ft] at sampling time) mud flats on the northwest side. Several small tributary creeks empty into the main creek along these mud flats. The trawl is pulled along this shallow mud flat at low out tide. The substrate is very much the same throughout the station, varying only in color from gray silty sand with shell fragments at the lower end to tannish gray at the upper end (Table 4.1).

Station 22 (Figure 4.11) is located approximately 1.1 km (0.7 mi) upstream from station 21 (2.3 km [1.4 m] from the mouth) in a long gradual bend in the creek. The station is located on the north bank over a shallow [0.6 to 1.5 m (2.0 to 4.9 ft) at sampling] mud flat. A small rivulet also empties into the creek at this point. This tributary was utilized by Hodson (1979) in the NCSU study program. The creek is 80 m (264 ft) wide at this point with the deep channel (7.6 m [25 ft]) nearer the middle and inside corner bank. Located just above

the station is a small oyster bed and just below the station, the banks and bottom are covered with brick rubble evidently from an old mill. Substrate is much the same throughout the station varying only in color from light gray silty sand with shell fragments at the lower end to dark gray at the upper end (Table 4.1). A seine station is located about 50 m (164 ft) upstream from the trawl station over the oyster bed. The seine is pulled at the upstream station because the bottom makeup and depth is more suited to this sampling method. The bottom over the oysters is much more firm and shallow (1.2 m [4 ft] maximum at sampling). The downstream ichthyocide (rotenone) station is in the same area as the seine station. The substrate of the seine and rotenone station is composed of gray fine silt with shell fragments (Table 4.1).

Station 23 (Figure 4.10) is located about 60 m (197 ft) upstream from the point where Governors Creek enters Walden Creek. It is in a straight (0.6 to 3.0 m [2.0 to 9.8 ft]) stretch of water approximately 64 m (210 ft) wide. It is approximately 0.8 km (0.5 mi) upstream from station 22 (3.1 km [1.9 mi] from the mouth) and has a small tributary creek emptying into the shallow flats near the upper end. Substrate samples indicate medium gray silty sand at the upper end and greenish-gray silty sand with wood and shell fragments at the lower end (Table 4.1). Depths of the water at time of trawl ir 0.5 to 0.6 m (1.6 to 2 ft) throughout the entire trawl station, which is located on the northeast bank in the mud flats.

Station 29 (Figure 4.12) was introduced as a sampling site on February 20, 1981, and as with station 28, was added to help monitor the impingement discharge flume effects on the Walden Creek system. Station 29 is positioned on a straight portion of Nancys Creek about 0.8 km (0.5 mi) upstream from station 23 and approximately 3.9 km (2.5 mi) from the mouth of Walden Creek. The creek at this point is about 16 m (56 ft) wide and is 1.4 m (4.6 ft) deep when the trawl sample is taken. The site has one large rivulet entering it on the west bank. Substrate analysis shows a bottom makeup of gray silty clay on the downstream end of the site while the upstream end consists of gray silty clay with shell fragments (Table 4.1).

Station 24 (Figure 4.13) is located approximately 1.5 km (0.9 mi) upstream from station 23 (4.6 km [2.9 mi] from the mouth). It is about 1.1 km (0.7 mi) upstream from the confluence of Walden and Nancys Creeks. The creek is about 30 m (98 ft) wide at this point and has several small tributary creeks that feed into it on the northern edge where the trawl is pulled. The area from which the trawl sample is taken is 1.1 m (3.6 ft) deep at sampling time and is located on the northwest bank. The sediment on the lower end of the site is composed of gray silty sand and the upstream end consists of dark gray silty sand with wood and shell fragments (Table 4.1).

Station 25 (Figure 4.13) is located 1.0 km (0.6 mi) upstream from station 24 and 5.6 km (3.5 mi) from the mouth of the creek and is a seine station used by Weinstein. This station is situated on a relatively straight portion of creek between two sharp bends and is approximately 18 m (60 ft) wide. The station has two rivulets entering it, one from the east bank and the other from the west. The substrate ranges from tan sand with wood and shell fragments on the lower end of the site to tannish-gray sand with shell fragments at the upper end (Table 4.2). The east side of the site is the deepest part with a depth of about 0.6 m (2.0 ft) at sampling, while the west side gets shallower with a sandbar exposed at lower tides. The trawl sample is taken down the west side of the site at its deepest point. A seine sample is collected by pulling the seine onto the sandbar on the west shore.

Station 26 (Figure 4.14) is 0.5 km (0.3 mi) upstream from station 25 and is 6.1 km (3.8 mi) from the creek mouth. This station is located on Weinstein's rotenone station along a straight section of creek between two sharp curves. The creek at this point is 12.2 m (40 ft) wide with depths at time of sampling of 0.8 m to 0.9 m (2.5 to 3.0 ft). The downstream end of the site has a bottom makeup of tannish gray silty sand while the upstream end is tan fine silty sand with wood fragments (Table 4.1). The deepest portion of the site is along the east shore and gradually shallows to an almost exposed sandbar on the west shore. The site has five rivulets entering into

it--three on the east side and two on the west. The trawl sample is collected along the eastern bank in the deepest water. The upstream Walden rotenone station is located in this same site.

Station 27 (Figure 4.14) is 0.5 km (0.3 mi) upstream from station 26 and is the most upstream sampling site. The station is located 6.6 km (4.1 mi) from the mouth of Walden Creek and is on a gradual curve. The width of the creek is 7.6 m (25 ft) at the upstream end and 12.2 m (40 ft) at the downstream end of the site. The deepest part of the creek is the east side at the upper end with a depth at time of sampling of about 0.9 m (3.0 ft). The downstream end of the station is shallowed with the deepest area of 0.8 m (2.5 ft) on the west bank. The substrate at the lower end of the station consists of greenish-gray silty sand with wood fragments and the upper end is tan silty sand (Table 4.1).

Station 28 (Figure 4.12) was added as a sampling station on December 12, 1981, to eventually monitor the effects of the discharge from the impingement holding pond. It is located in Gum Log Branch which merges with Nancys Creek between stations 24 and 29. Station 28 is situated along a straight stretch of creek approximately 0.3 km (0.2 mi) upstream from the junction of Gum Log Branch and Nancys Creek and 4.9 km (2.9 mi) from the mouth of Walden Creek. The site ranges in width from 15.2 m (50 ft) at the upper end to 18.3 (60 ft) at the lower end. The depths range from 0.5 m (1.6 ft) on the northwest bank to 0.9 m (3.0 ft) on the southeast bank at time of sampling. The substrate analysis indicates a bottom type of gray silty sand at the lower end and gray silty sand with shell fragments at the upper end (Table 4.1) of the station.

Mott's Creek Bay

Station 31 (Figure 4.15), Mott's Creek Bay, is a shallow area 275 m (902 ft) wide located approximately 30.5 km (18.9 mi) from the mouth of the Cape Fear River. The bay is formed between four small spoil islands and the east shore of the river. Mott's Creek, which is

surrounded by marsh, empties into the bay from the east river bank approximately 275 m (902 ft) from the trawl site. The trawl sample is taken on the east side of the northernmost island of the four spoil islands surrounding the bay. At the time the trawl sample is taken, the water depth in the area is about 0.6 to 0.8 m (2.0 to 2.5 ft) deep with a uniform depth across the bay. The sediment samples revealed that the bottom ranges from tannish-gray silty sand with wood and shell fragments at the northern end to medium gray silty sand with broken shell fragments at the southern end (Table 4.1). The seine sampling is conducted on the second spoil island approximately 0.4 km (0.3 mi) south of the trawl station. The seine station is also located on the east side of the island with a water depth of about 0.6 m (2.0 ft) at sampling time, and a bottom of grayish tan silty sand with shell fragments. The rotenone station is located between the first and second spoil islands with a depth at time of sampling of 0.5 to 1.0 m (1.6 to 3.3 ft). The bottom in this area consists of gray silty sand with shell fragments.

Alligator Creek System

Alligator Creek is a deep creek located approximately 42.3 km (26.3 mi) from the mouth of the Cape Fear River and just west of Wilmington on Eagle Island (Figure 4.16). Eagle Island is formed by the Brunswick River splitting off from the Cape Fear River north of Wilmington and rejoining it again south of Wilmington. Alligator Creek stations are actually positioned with three sites on Alligator Creek and one on Redmond Creek; but for simplicity, the entire system will be referred to as Alligator Creek. The Alligator Creek system forms in a low tidal flat area on the northern end of Eagle Island. The creek flows southward until it joins the Brunswick River on the west side of the island.

Station 41 (Figure 4.17) is positioned along a straight portion of creek about 3.7 km (2.3 mi) from the point where Alligator Creek joins the Brunswick River. The creek at this site is 10.7 to 12.2 m (35 to 40 ft) wide and is 2.1 m (6.7 ft) deep at mid-low out tide.

The station has two rivulets entering it from the west bank and one from the east bank. The bottom ranges from grayish-brown wood with sand at the upstream end to dark brown peat at the lower end (Table 4.1). This site has the highest percentage of organics of any high marsh station with 45.3% at the lower end and 34.7% at the upper end. The narrow width of the creek at this point makes it necessary to pull the trawl down the middle in the deepest part.

Station 42 (Figure 4.17) is located in the main stem of Alligator Creek 1.1 km (0.7 mi) downstream from station 41. The site is on the northeast shore 2.6 km (1.6 mi) from the mouth of the Alligator Creek System. Approximately 50 m (164 ft) upstream from the station is a large feeder creek on the southwest side. The site also has one rivulet entering it from the northeast bank. The creek at this point at the time of sampling is approximately 50 m (164 ft) wide and 3 m (10 ft) deep in the middle, and is 0.7 m (2.3 ft) deep on the northwest bank where the trawl sample is taken. The bottom at the upstream end consists of fine tan clay and silty sand while the downstream end is tannish-beige silty sand (Table 4.1).

Station 43 (Figure 4.18) is 1.0 km (0.6 mi) downstream from station 42 and 1.5 km (0.9 mi) from the mouth of the creek. The width of the creek is 15 to 20 m (50 to 65 ft) wide with a maximum depth of 3.6 m (12 ft). The trawl sample is taken along a mud bar on the west side of the creek at a depth of 1.0 to 2.0 m (3.3 to 6.6 ft). Across the creek on the east shore is a large pond created from a borrow pit which resulted from the construction of Highway 133. The bottom in the trawl site ranges from tan silty sand at the upper end to grayish-tan silty sand at the lower end (Table 4.1).

Station 44 (Figure 4.18) is the most downstream station on Alligator Creek. It is 1.5 km (0.9 mi) downstream from station 43 and 70 m (230 ft) from the mouth of the creek. The sampling site is located on the northwest shore of the creek with a water depth of 1.0 to 1.5 m (3.3 to 4.9 ft) at sampling time. The creek at this point is 68.6 m (225 ft) wide with a maximum depth in the middle of 2.1 m

(6.9 ft). Two rivulets run from the northwest bank of the creek across a narrow mud flat before emptying into the site. The substrate on the upstream end of the site consists of grayish-tan silty sand with wood fragments and the downstream end of greenish-gray silty sand with shells (Table 4.1).

4.2.2 Sampling Methods

High marsh samples were collected approximately every three weeks. Three sampling methods were employed to ensure that all types of habitats were included in the study. Trawls were utilized to sample the fishes that occupy deeper water and benthic habitats. Seines gave a good representation of the species that occupy the shoreline and surface areas. An ichthyocide was used mainly to estimate standing crops of selected species that occupy any type of habitat. Trawls and seines were conducted approximately every three weeks near low tide between one hour after sunrise to one hour before sunset. If adequate time for sampling did not exist during these hours, the trip was rescheduled. This, at times, called for samples to be taken one week earlier or one week later than normal scheduled times. The ichthyocide samples, taken semiannually, were collected between the same sunrise to sunset criterion as trawls and seines. The five ichthyocide sites were sampled during the same week.

The trawl was a 3.2 m (10.5 ft) two-seam otter trawl. The wings and body were constructed of 6.4 mm (0.25 in) bar mesh and the cod end was made of 3.2 mm (0.13 in) knitted mesh. The trawl was towed at mid to low out tide over a predetermined distance of 68.5 m (225 ft) in approximately one minute, which is a calculated speed of 2.2 knots. The sampling procedure was identical to that used in the Coastal Zone Management (CZM) Fisheries Program conducted by the North Carolina Division of Marine Fisheries. The use of the same size boat and motor at all sites eliminated any possibilities of different prop washes causing differences in the catch efficiency of the trawl.

The seine was a 15.2 m (50 ft) long by 1.8 m (6.0 ft) deep bag seine. The wings were made of 6.4 mm (0.25 in) knitted mesh and the bag consisted of 3.2 mm (0.13 in) knitted mesh. The seine was used as a beach seine in which one end was held in place on the bank while the other end was stretched out perpendicular to the shore. That end was then swept with the tide to the bank covering a 90° arc.

The ichthyocide collection was based on methods used by Weinstein (1979). Ichthyocide (rotenone 5 percent emulsifiable Noxfish) was administered to an area of creek which was previously isolated with 1.8 m (6.0 ft) deep blocking seines constructed of 1 mm (0.04 in) mesh. The blocking seines were set in place one to two hours before low slack. This allowed samples to be taken at a low tidal stage plus ensuring that the collection was completed before the flow reversed. A predetermined amount of rotenone was mixed into the water to kill any fish in the blocked off area. Potassium permanganate ($KMnO_4$) was mixed into the water, outside the downstream block net, to neutralize the rotenone as it left the site. Stressed fish were collected with 1 mm (0.04 in) mesh dip nets as they came to the surface. After all the affected fish were collected from the water and banks, the downstream block net was pulled to shore and the organisms impinged on it were removed and added to the dip net collection.

Bottom salinity and temperature measurements were taken each time a station was sampled. The water samples were collected with a two-liter brass Kemmerer. Temperatures were measured in degrees Celsius with a YSI Model 43TD telethermometer, and the salinity was measured in parts per thousand (ppt) with a handheld American Optical refractometer, Model 10419.

The organisms collected in the trawls and seines were sorted by species and counted. Standard lengths of at least 50 specimens of the recreationally and/or commercially important species (Table 4.2) were measured. Noncommercially important species were counted and measured for minimum and maximum lengths only. The organisms collected in the rotenone samples were sorted by species and counted. At least 50

specimens of each species were measured. This allowed length frequencies to be made on the total standing crop of noncommercial species along with the commercially important species. Small samples were, at times, worked up in the field, but usually samples were returned on ice to the lab for analysis.

Two sediment samples were collected from each station with a 2458.5 cm^3 (150 cubic inch) petite ponar grab. One sample was taken inside the site about 15.2 m (50 ft) from the downstream end (Sample A). The other grab was made inside the site about 15.2 m (50 ft) from the upstream end (Sample B). Grain sizes were obtained by drying approximately 300.0 grams (10.6 oz) of sediment at 60°C (140°F) for 48 hours. The dry samples were broken up and sieved through the following United States Standard sieves:

No. 4 - 4750 microns (shell fragments)
No. 8 - 2360 microns (coarse sand)
No. 16 - 1180 microns (medium sand)
No. 30 - 600 microns (medium sand)
No. 50 - 300 microns (fine sand)
No. 100 - 150 microns (fine sand)
No. 200 - 75 microns (fine sand)
Less than 75 microns (silt and clay)

Percent organics were determined by drying 5 g (0.2 oz) of sediment for one hour in a 550°C (1022°F) muffle furnace. The samples were removed from the furnace and placed in a desiccator to cool for an additional hour. The cooled samples were weighed to determine the percent weight loss.

4.3 Results and Discussion

4.3.1 Hydrography

The mean water temperature reached a high of 29.5°C (August 5) in the CFE marshes during the 1980 sampling period. From August to

December, the mean temperature decreased gradually to a low of 5.5°C. Mean water temperature began to rise in January and increased steadily to a high of 31.0°C in June . The mean water temperature began to fall again in July and continued to drop until the end of the sampling period in December 1981 when a low of 7.5°C was reached (Table 4.3).

The salinity of the Cape Fear River marshes had a minimum value of 0.0 ppt which occurred mainly in the upriver areas. The highest salinity measured in the marshes was found in Baldhead Creek with a value of 34.0 ppt. The monthly mean salinity in 1980 varied slightly with values of 17.5 ppt to 19.1 ppt, except for late August which had a mean of 24.5 ppt. February had a mean salinity of 9.1 ppt which was the low for 1981. A high mean salinity of 25.1 ppt occurred in October of 1981 (Table 4.3).

4.3.2 General Trends

Data presented in this report are from trip 1 (July 23, 1980) through trip 29 (December 23, 1981) (Table 4.4). Collections on three previous trips (June 3 to July 1, 1980) were made during various tidal cycles in an effort to determine the most suitable sampling periods. All samples after July 1, 1980, were collected on mid out to low out tides.

This report is presented by years. The results for 1980 will represent July to December, while the results for 1981 will represent January to December. Any comparisons made between years will use only months that data were collected in both 1980 and 1981.

1980 Gear Type

A total of 17,450 fish and 5075 invertebrates comprised of 62 and 10 species, respectively, was collected from July 23, 1980 to December 24, 1980, using all collection methods. Grass shrimp were not included in the 1980 counts. Rotenone does not affect invertebrates so they were not counted even though some were inadvertently collected.

The otter trawl produced the largest number of fish and invertebrates as well as the greatest species diversity in 1980. The total catch for the sample period was 7392 fish and 3895 invertebrates from 173 efforts. These organisms comprised 52 and 9 different species of fish and invertebrates, respectively. The most abundant fish species collected in the trawls were bay anchovy, which comprised 51.70% of the total trawl catch followed by spot (20.81%) and croaker (5.37%). White shrimp (33.12%) was the most abundant invertebrate, followed by blue crab (26.03%), brown shrimp (21.5%), and pink shrimp (14.51%).

The bag seine yielded 4310 fish comprised of 32 species and 1180 invertebrates comprised of 6 species from 45 samples. The most abundant fish species in the seine collections was Atlantic silverside *Menidia menidia* (34.76%) followed by bay anchovy (22.53%), white mullet (15.13%), spotfin mojarro *Eucinostomus argenteus* (8.86%), mummichog *Fundulus heteroclitus* (6.22%), and spot (5.52%). White shrimp was the most abundant invertebrate (58.81%) followed by pink shrimp (15.93%), brown shrimp (13.64%), and blue crabs (9.83%).

The rotenone sample collections produced 5748 fish comprised 28 species. In the five collections, Atlantic silverside (25.75%) was the most abundant species, followed by mummichog (24.69%), darter goby *Gobionellus boleosoma* (14.60%), naked goby *Gobiosoma bosci* (10.77%), bay anchovy (8.92%), spot (3.48%), and striped mullet (3.18%).

A list of the number, species, and the percentage of total organisms collected by each gear type in 1980 is presented in Table 4.5.

<u>1981 Gear Type</u>

A total of 124,424 fish comprised of 91 species and 28,980 invertebrates of 11 species were collected from January to December 1981 using all collection methods. Rotenone does not affect invertebrates so they were not counted, even though some were collected.

The trawl yielded the largest number of fish and invertebrates and the greatest species diversity. The total catch from 356 trawl samples was 79,242 fish and 23,296 invertebrates comprised of 80 and 10 species, respectively. The most abundant fish species collected was spot, comprising 74.51% of the total trawl catch. Spot were followed by bay anchovy (8.35%), Atlantic menhaden (5.15%), striped mullet (2.56%), and Atlantic croaker (2.01%). The invertebrates were led in abundance by grass shrimp *Palaemonetes* sp. (66.45%) followed by blue crabs (13.06%), brown shrimp (12.55%), and pink shrimp (4.67%).

In 83 seine efforts, 17,885 fish (46 species) and 5684 invertebrates (9 species) were caught. Spot comprised 35.91% of the total seine catch followed by white mullet (35.76%), Atlantic menhaden (7.40%), mummichog (5.28%), and striped mullet (5.13%). The most abundant invertebrates were grass shrimp (84.75%), blue crabs (7.49%), brown shrimp (4.03%), and pink shrimp (1.94%).

In 10 rotenone samples, 27,297 fish (53 species) were collected. Spot was the most abundant fish and comprised 41.98% of the catch. Spot was followed by mummichog (21.53%), striped mullet (10.29%), white mullet (7.58%), and Atlantic menhaden (6.77%).

A list of the number, species, and the percentage of total organisms collected by gear type in 1981 is presented in Table 4.6.

4.3.3 Seasonal and Spatial Distribution

Two different gear types were used to more adequately sample the different habitat types in the study area. The spatial and seasonal distributions for various species were determined by analyzing data collected with the gear type considered the most effective for each species.

Total Organisms

The CPUE of total organisms with the trawl was greatest at Mott's followed by Walden, Alligator, and Baldhead (Table 4.7). The peak abundance of total organisms in the second half of 1980 occurred in July. Trawls produced the highest CPUE for 1981 in March (Figure 4.19).

The CPUE for seines was not significantly different among the three creeks sampled (Table 4.7). Like the trawl catches, the peak abundance for the six-month period of 1980 was greatest in July. The peak for 1981 was found to be in June (Figure 4.20).

The CPUE of total organisms for rotenone was greatest in Baldhead, followed by Mott's and Walden (Table 4.7). Only one rotenone sample was taken in 1980. The 1981 rotenone samples showed a greater abundance for total organisms in the spring than in the fall.

Spot

Spot were the most abundant fish collected over the 18-month sample period. They were the third most abundant fish caught in the six-month collection period of 1980, representing 11.32% of the finfish catch using all collection methods. The 1981 collections using all gear showed spot by far the most abundant fish, representing 61.83% of the catch.

Because spot was the most abundant species collected, the CPUE followed the same ranking as seen in the total organisms grouping. In fact, the large numbers of spot controlled the total organism ranking. Spot collected with the trawl were most abundant in Mott's and Walden (Table 4.7). The peak abundance for the six-month collection period of 1980 was in July while March had the peak abundance for the 1981 collection period (Figure 4.21).

The rotenone collections showed no significant difference between creeks (Table 4.7). The CPUE was much greater in the spring with a value of 2262 than in the fall with a CPUE of only 30.

Spot were most abundant in the upstream areas of all the creek systems except Alligator, which had the highest abundance at the mid-creek station. The duration of peak abundance was generally longer in the upper reaches of the creeks. Again, Alligator Creek was dissimilar and the longest abundance duration was in the lower creek stations (Figures 4.22 through 4.24).

The highest percentage (about 50%) of spot collected during the entire sampling period occurred at a salinity of approximately 2 ppt, while the range of salinity where spot were caught was from 0 ppt to approximately 30 ppt. Over 35% of the spot were collected from water with a temperature of about 14°C, while the overall range when spot were caught was 12 to 32 degrees. The highest percentage of spot were taken from areas where the substrate contained slightly over 30% organics.

Bay Anchovy

Bay anchovy was the second most abundant fish collected in the 1980 and 1981 samples. They were the most abundant fish collected in 1980 representing 30.41% of the fish catch. The 1981 collections showed bay anchovy as the third most abundant fish representing 6.35% of the total finfish catch.

Trawl samples from Mott's Creek showed a significantly higher CPUE for bay anchovy than the other three creeks. Alligator Creek was second in CPUE, followed by Walden and Baldhead (Table 4.7). The peak CPUE for 1980 trawl samples was highest in August. For the full years' collection period of 1980, the peak occurred in November (Figure 4.25).

Rotenone samples showed no significant difference between the three creeks sampled (Table 4.7). The 1981 samples showed that bay anchovy were more abundant in the fall than in the spring.

Bay anchovy, unlike spot, exhibited no clear decrease in abundance from upstream to downstream. Instead, the peak abundance occurred in the mid-creek areas. The duration of abundance peaks were generally longer in the mid-creek area of Walden and Alligator while Baldhead showed the longest abundance duration upstream (Figures 4.26 through 4.28).

Bay anchovy were collected from a wide range of salinities, being most abundant at locations which had a salinity of about 30 ppt. The range of salinity from which they were caught was from 0 to 34 ppt. About equal numbers (slightly above 18%) of bay anchovies were collected in temperatures of 12 and 28°C. The temperature range when they were caught was 8 to 32°C. The greatest percentage (24%) of bay anchovy were collected at sites with a bottom organic content of about 18%. They were also abundant (21%) in areas with <1 and 3% organic substrates.

White Mullet

White mullet was the third most abundant species of fish collected in the 18-month sample period. They were the sixth most abundant fish collected in 1980 using all methods. White mullet represented 4.61% of the total finfish catch for that year. The 1981 collections showed white mullet as the second most abundant fish (7.72 percent) collected with all methods.

The CPUE using seines showed no significant difference between any of the creeks sampled during the study period (Table 4.7). White mullet collected with the seine were at their peak abundance in July for the 1980 samples. June showed the highest CPUE for the 1981 seine collections (Figure 4.29).

No significant difference was observed between abundance of white mullet in the three creek systems sampled with rotenone (Table 4.7). White mullet were caught in very substantial numbers in the 1981 fall collection while none were caught in the spring.

The most abundant catches of white mullet occurred in the upstream stations. The longest duration of the peak abundance also occurred in the upstream areas in all creeks sampled (Figures 4.30 through 4.32).

Almost all the white mullet were collected in largest numbers from areas with salinities of 10 to 16 ppt and from 24 to 32 ppt. The temperature at which virtually all of the white mullet were caught ranged from 24 to 32°C. The greatest percentage of white mullet were collected from stations with organics of approximately 2% and 8%.

Atlantic Menhaden

Atlantic menhaden were the fifth most abundant fish collected over the 1980 and 1981 collection period. They were 14th in order of abundance in 1980 and 5th in 1981 representing 0.9% and 5.83%, respectively. Although the seine was slightly more effective than the trawl, catches from both methods were analyzed with similar results.

The CPUE for Atlantic menhaden in the 18-month study period using trawls showed that their abundance was greater in Walden Creek, followed by Mott's, Alligator, and Baldhead (Table 4.7). The CPUE of trawls showed that Atlantic menhaden reached a peak abundance for the 1980 samples in July. The 1981 CPUE peaked in April (Figure 4.33).

Using seines, Atlantic menhaden were significantly more abundant in Walden than in Mott's, with Baldhead intermediate in catch (Table 4.7). The peak CPUE for the 1980 collection appeared in August while the 1981 peak was in April (Figure 4.34).

No significant difference was observed between the CPUE for Baldhead, Walden, or Mott's using rotenone (Table 4.7). The spring rotenone collection had a much more abundant catch than the fall collection.

Atlantic menhaden were much higher in abundance at the upper reaches of the creeks with catches over three and 12 times greater in the headwaters than in downstream areas at Baldhead and Walden Creeks respectively. The duration of the peak abundance of Atlantic menhaden was generally greater in the headwaters of Walden and Baldhead Creeks (Figures 4.35 through 4.37).

Over 24% of the Atlantic menhaden catch was from areas with salinities of about 26 ppt and were relatively abundant along the entire range of salinity from 6 to 30 ppt. At least 30% of the Atlantic menhaden caught were obtained from 18°C water while they ranged in temperatures of 12-30°C. The vast majority of Atlantic menhaden were found in areas with a substrate of 2% to 4% organics but were found in much smaller numbers at areas with higher organics.

Striped Mullet

Striped mullet were the sixth most abundant fish collected during the 1980 to 1981 sample period. They were the tenth most abundant fish collected in 1980 comprising 1.80% of the total fish catch for the year. Striped mullet were sixth in abundance in 1981 representing 4.63% of the total fish catch.

Seines were much more effective for catching striped mullet than were the trawls. The abundance of striped mullet were not significantly different at any of the three creeks sampled with seines (Table 4.7). The highest CPUE for the six-month sample period in 1980 appeared in September while the 1981 peak was in March (Figure 4.38).

The abundance of striped mullet in the Baldhead rotenone samples was significantly greater than the abundance at Mott's and Walden. However, there was no significant difference between Mott's and Walden (Table 4.7). The rotenone samples showed the 1981 greater abundance of striped mullet to be in the fall samples.

Striped mullet catches indicated, like white mullet, that the upstream areas afforded them more suitable habitats than did the lower reaches. Therefore, the abundance upstream was much greater than downstream, and the peak abundance extended over a longer period upstream than downstream in all creeks (Figures 4.39 through 4.41).

The most numerous catches of striped mullet were from salinities between 6 and 12 ppt while smaller numbers collected from areas with 12 to 34 ppt. The greatest percentage of striped mullet were caught in areas that had a water temperature of about 12°C, however, they were found in much higher temperatures (up to 32°C). Over 70% of the entire striped mullet catch appeared at sites with an organic makeup of about 6% while the range of percent organics where they were collected was from 2% to 22%.

Atlantic Croaker

Atlantic croaker was the eighth most abundant species collected during the study period. They represented 1.63% of the entire fish catch for both years. Croaker was ninth in abundance (2.40%) of the total fish catch in 1980. They moved up in abundance in 1981 to seventh comprising 1.52% of the total fish catch for that year.

Atlantic croaker were significantly greater in abundance in Mott's Creek than in any other creek using the trawl. Alligator, Walden, and Baldhead were all significantly different from each other (Table 4.7). The peak abundance of croaker appeared in December for 1980 and November for 1981 (Figure 4.42).

Rotenone showed a significantly greater abundance in Mott's Creek than in Baldhead and Walden (Table 4.7). The 1981 rotenone samples showed the greater croaker abundance in April.

Atlantic croaker were more abundant in the upcreek stations in Walden and Baldhead Creeks. However, the lower creek stations in Baldhead Creek showed a higher abundance than the mid-creek areas. Alligator Creek showed a greater abundance in the mid-creek stations than in the upper or lower stations. The duration of abundance in Alligator was longest in the mid to low creek areas (Figures 4.43 through 4.45).

Atlantic croaker were most abundant in the lower salinity areas. Approximately 50% of the entire Atlantic croaker catch came from salinities of 0 to 2 ppt while the salinity range that Atlantic croaker were caught was from 0 to 26 ppt. The highest percentage of Atlantic croaker were collected at about 16°C with a range when they were, found of 6 to 34 ppt. Over 35% and 25% of the Atlantic croaker catch was from areas with organics of 20% and 8%.

Flounder

Southern, summer, and gulf flounder were lumped together for analysis and will be referred to as flounder. Flounder was the 15th most abundant species of fish collected in the 18-month collection period. Flounder was 21st in abundance (0.13%) in 1980 and 23rd in abundance (0.41%) in 1981.

Flounder were significantly more abundant in the Alligator Creek trawl samples than in the other creeks. Mott's, Baldhead, and Walden showed no significant difference among them (Table 4.7). July and August had the highest abundance for the 1980 samples while February was the peak for 1981 (Figure 4.46).

Rotenone samples showed no significant differences in abundance between Baldhead, Walden, and Mott's (Table 4.7). The abundance was greater in the spring rotenone sample than in the fall.

Flounder were most abundant downstream in Ba] ":ad and Walden, while Alligator Creek exhibited higher catches in : id-creek stations. The duration of abundance was longest upstream in Baldhead, but Walden showed little difference between the two. Alligator Creek showed the duration to be longest in the mid creek areas (Figures 4.47 through 4.49).

Flounder were most abundant in areas with a salinity of approximately 2 ppt but were found in areas with values of 0 to 30 ppt. Temperatures at which the highest percentages of flounder were caught were about 12 to 14°C while the range was from 4 to 32°C. Approximately 35% of the total flounder catch was from areas with substrates containing about 4% organics while the range of organics was 4% to 36%.

Weakfish

Weakfish were the 12th most abundant fish collected in the 1980 and 1981 study period. Weakfish were 17th in order of abundance in 1980 and represented 0.49% of the fish catch for that year. The 1981 catch of weakfish ranked 19th in order of abundance representing only .05% of the fish catch for the year.

The abundance of weakfish collected with trawls showed no significant difference between Walden and Alligator Creeks. Walden was significantly higher in abundance than Baldhead and Mott's (Table 4.7). The peak abundance of weakfish occurred in July 1980 and June 1981 (Figure 4.50).

No weakfish were collected in the rotenone samples.

The weakfish catch for the study period was low in all creeks. The most abundant areas in Baldhead and Walden were upstream while Alligator Creek showed the most abundant areas to be downstream. Very little difference was noticed between upstream and downstream abundance periods (Figures 4.51 through 4.53).

Weakfish were most abundant in areas with salinities around 14 ppt, while the range of salinity associated with their catches was 6 to 18 ppt. The temperature which showed the highest catch percentage (approximately 55%) of weakfish was about 28°C while the range of temperatures when they were caught was 24 to 32°C. Weakfish were most abundant (over 50%) in areas that had a substrate containing about 5% organics but were found in areas with percent organics of approximately 2% to 20% also.

Spotted Seatrout

Due to low numbers collected, spotted seatrout will not be discussed.

Blue Crab

Blue crabs were the second most abundant invertebrate collected in the high marsh program falling behind grass shrimp. Over the total sample period, they represented 13.51% of the total invertebrate catch. Blue crabs represent 22.27% of the total 1980 invertebrate catch ranking second in abundance. They also ranked second in abundance in 1981 representing 11.97% of the total invertebrate catch.

Trawl CPUE was highest at Mott's followed by Walden, Alligator, and Baldhead (Table 4.7). Blue crabs were slightly higher in abundance in July for the 1980 samples followed closely by the remaining five months. The peak abundance for blue crabs taken by trawl appeared in February for the 1981 collections (Figure 4.54).

Blue crabs exhibited their greatest numbers upstream in all creeks except Alligator which showed the peak abundance in the mid creek station. The duration of peak abundance was greatest upstream in Baldhead and Walden and in midcreek in Alligator (Figures 4.55 through 4.57).

Approximately 22% of the blue crab catch was taken from areas with a salinity of about 2 ppt. Blue crabs were relatively abundant in salinities of 0 to 26 ppt but decreased in numbers above 28 ppt. The greatest catch (over 30%) of blue crabs occurred when temperatures were about 14°C while smaller numbers were taken from water ranging in temperature from 8 to 32°C. Blue crabs were much more abundant (about 28% and 25%) in areas with substrates having <1% and 4% organics, but they were also collected in areas with substrate organics up to 40%.

Brown Shrimp

Brown shrimp were the third most abundant invertebrates collected in the 18-month study period. They were also third in abundance in 1980 and 1981 representing 19.33% and 10.88%, respectively.

Brown shrimp abundance, using trawls, was greater at Walden and Mott's than at Baldhead or Alligator (Table 4.7). Brown shrimp peak abundance occurred in July of 1980 and June for 1981 (Figure 4.58).

Brown shrimp occurred in greatest abundance in the headwaters of Baldhead and Walden Creeks while Alligator had a peak abundance downstream. The length of abundance time was generally slightly greater in the upstream stations (Figures 4.59 through 4.61).

Approximately 27% of the brown shrimp collected were from areas with a salinity of 10 ppt while areas with values of 12 to 14 ppt had slightly less. Brown shrimp also collected in areas with a salinity range of 2 to 34 ppt. Over 60% of the total brown shrimp catch came from waters with temperatures of 28 to 30°C, while smaller numbers were collected from waters with temperatures ranging from 22 to 32°C. Brown shrimp catches were most abundant (about 36%) in areas with a substrate of <1% organics but were also found in areas with substrates containing up to 24% organics.

White Shrimp

White shrimp were fourth in abundance of the total invertebrate catch. White shrimp were the most abundant invertebrate in 1980 representing 39.09% of the catch. The 1981 catch showed white shrimp as the seventh most abundant invertebrate collected by both gears, representing only 0.41% of the catch. White shrimp were collected equally well with trawls and seines; therefore, the analysis results for both gears are presented. The results obtained by the two gears were slightly different, but both showed that the upper river areas contained a greater abundance.

Trawls showed catches to generally be highest at Mott's and Walden followed by Alligator and Baldhead (Table 4.7). The peak abundance for trawls occurred in September 1980 and July, August, and September in 1981 (Figure 4.62).

Seines also showed catches at Mott's and Walden to be highest in abundance (Table 4.7). The peak abundance of white shrimp in seine samples occurred in August 1980 and September and October 1981 (Figure 4.63).

White shrimp were collected in low numbers in Baldhead Creek as a whole. They were most abundant in the upper creek stations of Baldhead and Walden. White shrimp were most abundant in the downstream areas of Alligator. The duration of abundance was slightly longer at the upstream stations (Figures 4.64 through 4.66).

The most abundant catches of white shrimp were from areas with salinities from 6 to 14 ppt. The range of salinity where white shrimp were caught was from 2 to 32 ppt. Over 50% of the white shrimp collected were from waters with temperatures of about 28°C while smaller numbers were found in temperatures of 16 to 30°C. Over 40% of the white shrimp catch was from areas with a bottom makeup of <1% organics but smaller catches were made in areas with bottom organics up to 24%.

Pink Shrimp

Pink shrimp were the fifth most abundant invertebrate collected over the entire study period. Pink shrimp ranked fourth in abundance in 1980 representing 14.84%. They were also fourth in abundance in 1981 representing 4.14%.

Trawl data showed that all creeks were significantly different from each other. The abundance of pink shrimp in decreasing order was found at Mott's, Walden, Baldhead, and then Alligator (Table 4.7). The peak abundance for 1980 appeared in September while the peak abundance for the 1981 samples appeared in August (Figure 4.67).

Pink shrimp were most abundant in the upcreek stations of Baldhead while the most abundant station in Walden Creek was downstream. Pink shrimp like the other species of shrimp were most abundant downstream in Alligator. Very little difference was observed between the duration of abundance in the upper and lower stations of Baldhead. The length of time that the pink shrimp were high in abundance was greatest upstream in Walden and downstream in Alligator (Figures 4.68 through 4.70).

The catches of pink shrimp were relatively high in areas with a salinity range from 4 to 26 ppt while smaller numbers were taken from areas with salinities down to 2 ppt and up to 34 ppt. Approximately 26% of the pink shrimp catch came from water with a temperature of about 26°C while the range of temperatures when they were found was from 10 to 30°C. Approximately 22% of the pink shrimp catch came from areas with a bottom makeup of about 2% organics. Their abundance was also relatively high in areas with a bottom makeup of about 8% to 10% organics while the total range where they were found was from 2% to 22%.

4.3.4 Standing Crop Estimates

Standing crop estimates were determined in the spring for each creek system that was suitable for rotenone sampling. These creeks were Baldhead and Walden, with two rotenone stations each and Mott's with one station. Alligator Creek's substrate contained extremely soft organic ooze which made walking practically impossible so no sample could be taken. Since the densities of most species of fish decrease from upstream to downstream, rotenone samples were collected near the headwaters and near the mouth. By combining the high density area with the low density area, an average standing crop per acre was obtained for the creek as a whole.

Mott's Creek showed the highest standing crop of spot, Atlantic menhaden, and Atlantic croaker. Baldhead Creek had the greatest abundance of bay anchovy and striped mullet while Walden Creek had the highest standing crop of flounder (Table 4.8).

4.3.5 Special Studies

High marsh special studies are occasionally conducted in the Cape Fear River and estuary. A small special study to compare the upriver extent of various species to the movement of the salt wedge was performed September 16, 1980. Trawl samples were collected in the Cape Fear River north of Wilmington using the same trawl and mesh sizes as in the normal high marsh study. Trawl samples were collected by towing the net along mud bars, where available, or in deeper water for a duration of one minute. Sampling was conducted on an incoming tide at two-mile intervals beginning one mile north of Point Peter (junction of Northeast Cape Fear and Cape Fear Rivers). The most upstream sample was taken approximately 28.2 km (17.5 mi) from Point Peter (Figure 4.71). The results of this study showed that the leading edge of the salt wedge at high slack was 18.1 km (11.25 mi) upriver from Point Peter. The salinity of the salt wedge at this point was 0.5 ppt. No croaker were collected past this point, but blue crabs and white shrimp were collected 25.0 km (15.5 mi) past Point Peter and approximately 7.2 km (4.5 mi) past the salt wedge.

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Table 4.1 Sampling localities and sediment analysis for collections of high marsh fishes and invertebrates, Cape Fear River Estuary, North Carolina. D^1 = approximate distance from river mouth to creek entrance; D^2 = approximate distance from creek entrance to center of station.

Station No.	Locality	Method	D^1(km)	D^2(km)	% Shell Fragment	Sand (%) Coarse	Sand (%) Medium	Sand (%) Fine	Silt & Clay	% Organics
11a	Baldhead Creek	Trawl	0.9	1.3	0	0	[illegible]	98.7	0.5	0.9
11b		Trawl			0	0.4	[illegible]	98.6	0.3	0.8
12a	Baldhead Creek	Trawl/ Seine	0.9	2.4	1.4	0.1	0.8	97.1	0.6	1.1
12b		Trawl			0	0	0.8	98.1	1.1	1.5
12c		Rotenone			2.6	0	20.4	67.3	9.7	11.9
13a	Baldhead Creek	Trawl	0.9	3.5	0	0	7.7	87.2	5.1	4.2

Table 4.1 (continued)

Station No.	Locality	Method	D^1(km)	D^2(km)	% Shell Fragment	Sand (%) Coarse	Sand (%) Medium	Sand (%) Fine	Silt & Clay	% Organics
23a	Nancy's Creek	Trawl	11.6	3.1	0.2	0.0	21.1	64.4	14.3	13.0
23b		Trawl			4.8	0.4	19.7	60.5	14.6	14.9
29a	Nancy's Creek	Trawl	11.6	3.9	0	0	31.6	48.9	19.5	19.3
29b		Trawl			0	0	17.6	68.7	13.7	13.7
24a	Nancy's Creek	Trawl	11.5	4.6	0	0.3	49.0	41.0	9.7	21.0
24b		Trawl			0.5	4.8	45.0	40.0	9.7	22.4
25a	Nancy's Creek	Trawl	11.6	5.6	0	0.5	2.9	94.4	2.2	1.5
25b		Trawl/ Seine			0.2	1.4	28.0	69.1	1.3	1.7
26a	Nancy's Creek	Trawl	11.6	6.1	0	0	0.4	96.6	3.0	1.0
26b		Trawl/ Rotenone			0	0	1.0	76.1	22.9	1.5
27a	Nancy's Creek	Trawl	11.6	6.6	0	0.3	13.7	72.6	13.4	8.4
27b					0	0	2.0	86.4	11.6	2.8
28a	Gum Log Branch	Trawl	11.6	4.7	0	0	47.4	41.9	10.7	22.2
28b		Trawl			0	0	30.7	45.0	24.3	21.6
28c		Rep			0	0	28.1	46.1	25.8	21.2
28d		Rep			0	0.4	52.1	37.8	9.7	20.9
31a	Spoil Island/	Trawl	30.5	0	0.3	0.2	14.3	78.3	6.9	4.9
31b	Motts Creek Bay	Trawl			0	0.3	25.4	62.3	12.0	11.6
31c		Seine			0	1.5	19.5	65.8	13.2	7.8
31d		Rotenone			10.8	5.3	45.3	38.2	0.4	2.8
41a	Alligator Creek	Trawl	42.3	3.7	Wood-57.4	9.3	18.2	12.8	2.3	45.3
41b		Trawl			Peat-4.7	1.1	20.3	65.1	8.8	34.7
42a	Alligator Creek	Trawl	42.3	2.6	0	0	25.5	39.8	34.7	17.3
42b		Trawl			0	0	49.7	34.6	15.7	15.9

Table 4.1 (continued)

Station No.	Locality	Method	D[1] (km)	D[2] (km)	% Shell Fragment	Sand (%) Coarse	Medium	Fine	Silt & Clay	% Organics
43a	Alligator Creek	Trawl	42.3	1.5	0	0	28.4	54.4	17.2	20.1
43b		Trawl			0	0	31.5	47.6	20.9	18.6
44a	Alligator Creek	Trawl	42.3	0.7	0	1.6	21.8	53.9	22.7	14.9
44b		Trawl			0.5	0.1	4.1	83.6	11.7	5.9

Table 4.2 Dominant and/or commercially important species for High Marsh Study

Species	Common Name
Brevoortia tyrannus	Atlantic Menhaden
Anchoa mitchilli	Bay Anchovy
Cynosion nebulosus	Spotted Trout
C. regalis	Weakfish
Leiostomus xanthurus	Spot
Micropogonius undulatus	Atlant.c Croaker
Mugil cephalus	Striped Mullet
M. curema	White Mullet
Paralichthys spp.	Flounder
Penaeus aztecus	Brown Shrimp
P. duorarum	Pink Shrimp
P. setiferus	White Shrimp
Callinectes spp.	Blue Crab

Table 4.3 DAILY STATISTICS ON TEMPERATURE AND SALINITY FOR MARSH STUDY, JULY 1980-DECEMBER 1981.

	WATER TEMPER[illegible]RE				SALINITY			
DATE	MIN	MEAN	MAX	N	MIN	MEAN	MAX	N
23JUL80	20.0	27.8	31.3	25	2.0	17.5	30.0	25
05AUG80	27.5	29.5	31.0	25	2.0	17.9	32.0	25
25AUG80	23.2	26.8	31.3	24	7.0	24.5	34.0	24
22SEP80	26.5	27.9	29.2	24	4.0	18.9	23.0	24
07OCT80	18.5	21.1	23.0	24	2.0	18.8	33.0	24
02NOV80	12.2	15.5	16.9	24	2.5	17.5	31.0	24
05NOV80	14.5	16.5	19.0	5	12.0	18.6	25.0	5
20NOV80	11.0	12.0	12.9	24	0.0	17.0	29.0	24
09DEC80	12.0	13.7	15.7	25	1.0	17.1	30.0	25
21DEC80	2.5	5.5	7.4	25	0.0	19.1	34.0	25
2[illegible]JAN81	4.0	5.8	7.5	16	0.0	12.4	25.0	25
17FEB81	3.0	12.5	15.0	26	0.0	9.1	22.0	26
03MAR81	10.3	13.2	17.5	26	2.0	13.1	28.0	26
24MAR81	11.0	14.0	19.0	26	1.0	14.2	29.0	26
01APR81	15.9	18.0	19.5	5	6.0	15.3	32.0	5
14APR81	17.3	19.3	20.5	26	1.0	17.0	30.0	25
05MAY81	18.0	22.1	24.8	25	6.0	21.9	33.0	26
27MAY81	22.	23.6	25.3	26	1.0	16.4	30.0	25
16JUN81	29.2	31.0	32.8	26	2.0	15.7	29.0	26
06JUL81	27.2	29.3	32.8	26	2.0	20.0	34.0	26
28JUL81	26.0	29.0	31.0	26	2.0	19.5	28.0	26
17AUG81	23.8	25.1	26.3	26	0.0	11.8	25.0	26
08SEP81	24.0	25.4	26.5	26	2.0	12.0	25.0	26
28SEP81	21.2	23.7	26.5	26	2.0	17.9	31.0	26
07OCT81	16.1	19.0	21.0	5	10.0	21.8	34.0	5
13OCT81	17.0	18.5	19.5	26	7.0	25.1	34.0	26
1[illegible]NOV81	11.8	13.9	16.2	24	0.0	19.6	32.0	24
07DEC81	6.8	8.9	10.5	26	0.0	18.3	31.0	26
21DEC81	3.0	7.5	10.9	26	0.0	16.0	27.0	26

Table 4.4 TRIP NUMBER, DATE AND EFFORTS FOR HIGH MARSH STUDY, 1980 TO 1981.

TRIP	STARTING DATE	TRAWL EFFORTS	SEINE EFFORTS	ROTENONE EFFORTS
1	23JUL80	19	5	0
2	08AUG80	19	5	0
3	26AUG80	19	5	0
4	22SEP80	19	5	0
5	07OCT80	19	5	0
6	02NOV80	19	5	0
7	06NOV80	0	0	5
8	20NOV80	19	5	0
9	09DEC80	20	5	0
10	21DEC80	20	5	0
11	24JAN81	20	5	0
12	17FEB81	21	5	0
13	03MAR81	21	5	0
14	24MAR81	21	5	0
15	01APR81	0	0	5
16	14APR81	21	5	0
17	05MAY81	21	5	0
18	27MAY81	21	5	0
19	16JUN81	21	5	0
20	06JUL81	21	5	0
21	28JUL81	21	5	0
22	17AUG81	21	5	0
23	08SEP81	21	5	0
24	28SEP81	21	5	0
25	07OCT81	0	0	5
26	13OCT81	21	5	0
27	1 NOV81	21	3	0
28	07DEC81	21	5	0
29	21DEC81	21	5	0
	TOTAL	529	128	15

TABLE 4.5 TOTAL CATCH AND PERCENT TOTAL OF ORGANISMS COLLECTED IN HIGH MARSH STUDY, 1980

YEAR = 1980

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	TRAWLS CATCH	TRAWLS %	SEINES CATCH	SEINES %	ROTENONE CATCH	ROTENONE %
ELOPIDAE	TARPONS	.	.	.	.	.	.
ELOPS SAURUS(LEPTOCEPHALUS)	LADYFISH(LEPTOCEPHALUS)	0	0.00	0	0.00	1	0.02
ANGUILLIDAE	FRESHWATER EELS	.	.	.	.	.	.
ANGUILLA ROSTRATA	AMERICAN EEL	17	0.23	0	0.00	0	0.00
OPHICHTHIDAE	SNAKE EELS	.	.	.	.	.	.
MYROPHIS PUNCTATUS	SPECKLED WORM EEL	2	0.03	0	0.00	2	0.03
MYROPHIS PUNCTATUS(LEPTOCEPHAL	SPECKLED WORM EEL(LEPTO.)	1	0.01	0	0.00	0	0.00
CLUPEIDAE	HERRINGS	.	.	.	.	.	.
BREVOORTIA TYRANNUS	ATLANTIC MENHADEN	122	1.65	36	0.84	0	0.00
ENGRAULIDAE	ANCHOVIES	.	.	.	.	.	.
ANCHOA HEPSETUS	STRIPED ANCHOVY	5	0.07	14	0.32	0	0.00
ANCHOA MITCHILLI	BAY ANCHOVY	3,822	51.70	971	22.53	513	8.92
SYNODONTIDAE	LIZARDFISHES	.	.	.	.	.	.
SYNODUS FOETENS	INSHORE LIZARDFISH	18	0.24	4	0.09	0	0.00
BATRACHOIDIDAE	TOADFISHES	.	.	.	.	.	.
OPSANUS TAU	OYSTER TOADFISH	3	0.04	0	0.00	0	0.00
BELONIDAE	NEEDLEFISHES	.	.	.	.	.	.
STRONGYLURA MARINA	ATLANTIC NEEDLEFISH	0	0.00	2	0.05	0	0.00
CYPRINODONTIDAE	KILLIFISHES	.	.	.	.	.	.
CYPRINODON VARIEGATUS	SHEEPSHEAD MINNOW	0	0.00	0	0.00	1	0.02
FUNDULUS HETEROCLITUS	MUMMICHOG	19	0.26	268	6.22	1,419	24.69
FUNDULUS MAJALIS	STRIPED KILLIFISH	1	0.01	59	1.37	124	2.16
ATHERINIDAE	SILVERSIDES	.	.	.	.	.	.
MEMBRAS MARTINICA	ROUGH SILVERSIDE	1	0.01	2	0.05	0	0.00
MENIDIA BERYLLINA	INLAND SILVERSIDE	83	1.12	4	0.09	1	0.02
MENIDIA MENIDIA	ATLANTIC SILVERSIDE	72	0.97	1,498	34.76	1,480	25.75
SYNGNATHIDAE	PIPEFISHES	.	.	.	.	.	.
SYNGNATHUS FUSCUS	NORTHERN PIPEFISH	0	0.00	0	0.00	5	0.09
SYNGNATHUS LOUISIANAE	CHAIN PIPEFISH	9	0.12	1	0.02	6	0.10
CENTROPOMIDAE	SNOOKS	.	.	.	.	.	.
CENTROPOMUS UNDECIMALIS	SNOOK	1	0.01	0	0.00	17	0.30
PERCICHTHYIDAE	TEMPERATE BASSES	.	.	.	.	.	.
MORONE SAXATILIS	STRIPED BASS	1	0.01	0	0.00	0	0.00
CENTRARCHIDAE	SUNFISHES	1	0.01	0	0.00	0	0.00
LEPOMIS GIBBOSUS	PUMPKINSEED	12	0.16	0	0.00	0	0.00
LEPOMIS GULOSUS	WARMOUTH	2	0.03	0	0.00	0	0.00
LEPOMIS MACROCHIRUS	BLUEGILL	5	0.07	0	0.00	0	0.00
MICROPTERUS SALMOIDES	LARGEMOUTH BASS	1	0.01	0	0.00	0	0.00
PERCIDAE	PERCHES	.	.	.	.	.	.
PERCA FLAVESCENS	YELLOW PERCH	3	0.04	0	0.00	0	0.00
CARANGIDAE	JACKS	.	.	.	.	.	.
CARANX HIPPOS	CREVALLE JACK	0	0.00	1	0.02	0	0.00

Table 4.5 (continued)

YEAR = 1980

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	TRAWLS CATCH	TRAWLS %	SEINES CATCH	SEINES %	ROTENONE CATCH	ROTENONE %
TRACHINOTUS FALCATUS	PERMIT	0	0.00	1	0.02	0	0.00
LUTJANIDAE	SNAPPERS	.	.	.	.	.	.
LUTJANUS ANALIS	MUTTON SNAPPER	1	0.01	0	0.00	0	0.00
LUTJANUS GRISEUS	GRAY SNAPPER	9	0.12	4	0.09	8	0.14
GERREIDAE	MOJARRAS	.	.	.	.	.	.
DIAPTERUS AURATUS	IRISH POMPANO	5	0.07	3	0.07	0	0.00
EUCINOSTOMUS SP.	MOJARRA UNID.(EUCINOSTOMUS)	3	0.04	1	0.02	0	0.00
EUCINOSTOMUS ARGENTEUS	SPOTFIN MOJARRA	220	2.98	362	8.86	135	2.35
EUCINOSTOMUS GULA	SILVER JENNY	1	0.01	0	0.00	0	0.00
HAEMULIDAE	GRUNTS	.	.	.	.	.	.
ORTHOPRISTIS CHRYSOPTERA	PIGFISH	8	0.11	0	0.00	0	0.00
SPARIDAE	PORGIES	.	.	.	.	.	.
ARCHOSARGUS PROBATOCEPHALUS	SHEEPSHEAD	34	0.46	0	0.00	2	0.03
LAGODON RHOMBOIDES	PINFISH	66	0.89	6	0.14	0	0.00
SCIAENIDAE	DRUMS	.	.	.	.	.	.
BAIRDIELLA CHRYSOURA	SILVER PERCH	182	2.46	9	0.21	0	0.00
CYNOSCION NEBULOSUS	SPOTTED SEATROUT	4	0.05	1	0.02	0	0.00
CYNOSCION REGALIS	WEAKFISH	85	1.15	1	0.02	0	0.00
LEIOSTOMUS XANTHURUS	SPOT	1,538	20.81	238	5.52	200	3.48
MENTICIRRHUS SP.	KINGFISH UNID.(MENTICIRRHUS)	1	0.01	0	0.00	0	0.00
MICROPOGONIAS UNDULATUS	ATLANTIC CROAKER	397	5.37	11	0.26	11	0.19
SCIAENOPS OCELLATUS	RED DRUM	3	0.04	4	0.09	6	0.10
STELLIFER LANCEOLATUS	STAR DRUM	1	0.01	0	0.00	0	0.00
EPHIPPIDAE	SPADEFISHES	.	.	.	.	.	.
CHAETODIPTERUS FABER	ATLANTIC SPADEFISH	4	0.05	0	0.00	0	0.00
MUGILIDAE	MULLETS	.	.	.	.	.	.
MUGIL CEPHALUS	STRIPED MULLET	23	0.31	108	2.51	183	3.18
MUGIL CUREMA	WHITE MULLET	58	0.78	652	15.13	94	1.64
SPHYRAENIDAE	BARRACUDAS	.	.	.	.	.	.
SPHYRAENA GUACHANCHO	GUAGUANCHE	0	0.00	2	0.05	0	0.00
BLENNIIDAE	COMBTOOTH BLENNIES	.	.	.	.	.	.
CHASMODES BOSQUIANUS	STRIPED BLENNY	0	0.00	0	0.00	5	0.09
HYPSOBLENNIUS HENTZI	FEATHER BLENNY	0	0.00	0	0.00	1	0.02
GOBIIDAE	GOBIES	.	.	.	.	.	.
GOBIONELLUS SP.	GOBY UNID.(GOBIONELLUS)	0	0.00	1	0.02	0	0.00
GOBIONELLUS BOLEOSOMA	DARTER GOBY	38	0.51	7	0.16	839	14.60
GOBIONELLUS HASTATUS	SHARPTAIL GOBY	4	0.05	0	0.00	9	0.16
GOBIONELLUS SHUFELDTI	FRESHWATER GOBY	104	1.41	11	0.26	20	0.35
GOBIOSOMA SP.	GOBY UNID.(GOBIOSOMA)	1	0.01	0	0.00	0	0.00
GOBIOSOMA BOSCI	NAKED GOBY	12	0.16	0	0.00	619	10.77
GOBIOSOMA GINSBURGI	SEABOARD GOBY	0	0.00	0	0.00	8	0.14
MICROGOBIUS THALASSINUS	GREEN GOBY	25	0.34	0	0.00	1	0.02

Table 4.5 (continued)

YEAR = 1980

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	TRAWLS CATCH	TRAWLS %	SEINES CATCH	SEINES %	ROTENONE CATCH	ROTENONE %
TRIGLIDAE	SEAROBINS	*	*	*	*	*	*
PRIONOTUS SP.	SEAROBIN UNID.(PRIONOTUS)	1	0.01	0	0.00	0	0.00
PRIONOTUS TRIBULUS	BIGHEAD SEAROBIN	9	0.12	0	0.00	0	0.00
BOTHIDAE	LEFTEYE FLOUNDERS	*	*	*	*	*	*
CITHARICHTHYS SPILOPTERUS	BAY WHIFF	70	0.95	0	0.00	4	0.07
ETROPUS CROSSOTUS	FRINGED FLOUNDER	16	0.22	1	0.02	0	0.00
PARALICHTHYS SP.	FLOUNDER UNID.(PARALICHTHYS)	0	0.00	1	0.02	0	0.00
PARALICHTHYS DENTATUS	SUMMER FLOUNDER	2	0.03	1	0.02	0	0.00
PARALICHTHYS LETHOSTIGMA	SOUTHERN FLOUNDER	15	0.20	1	0.02	2	0.03
SOLEIDAE	SOLES	*	*	*	*	*	*
TRINECTES MACULATUS	HOGCHOKER	161	2.18	0	0.00	0	0.00
CYNOGLOSSIDAE	TONGUEFISHES	*	*	*	*	*	*
SYMPHURUS PLAGIUSA	BLACKCHEEK TONGUEFISH	87	1.18	4	0.09	32	0.56
BALISTIDAE	LEATHERJACKETS	*	*	*	*	*	*
MONACANTHUS HISPIDUS	PLANEHEAD FILEFISH	3	0.04	0	0.00	0	0.00
	TOTAL FISH	7,392	99.9	4,310	100.0	5,748	100.0
SQUILLA EMPUSA	MANTIS SHRIMP	2	0.05	0	0.00	0	0.00
PENAEUS SP.(POSTLARVAE)	PENAEUS (POSTLARVAE)	3	0.08	0	0.00	0	0.00
PENAEUS AZTECUS	BROWN SHRIMP	820	21.05	161	13.64	1	1.67
PENAEUS DUORARUM	PINK SHRIMP	565	14.51	188	15.93	22	36.67
PENAEUS SETIFERUS	WHITE SHRIMP	1,290	33.12	694	58.81	1	1.67
TRACHYPENEUS CONSTRICTUS	T-CON OR HARDBACK SHRIMP	178	4.57	19	1.61	20	33.33
ALPHEUS SP.	SNAPPING SHRIMP	2	0.05	0	0.00	0	0.00
UPOGEBIA SP. AND CALLIANASSA S	MUD SHRIMPS	1	0.03	0	0.00	0	0.00
PORTUNIDAE	SWIMMING CRABS	14	0.36	0	0.00	0	0.00
PORTUNUS SP.	SWIMMING CRABS	0	0.00	2	0.17	0	0.00
CALLINECTES SP.	BLUE CRABS	1,014	26.03	116	9.83	16	26.67
LOLLIGUNCULA BREVIS	BRIEF SQUID	6	0.15	0	0.00	0	0.00
	TOTAL INVERTEBRATES	3,895	100.0	1,180	100.0	60	100.0
	TOTAL ORGANISMS	11,287		5,490		5,808	
	TOTAL EFFORTS	173		45		5	

TABLE 4.6 TOTAL CATCH AND PERCENT TOTAL OF ORGANISMS COLLECTED IN HIGH MARSH STUDY. 1981.

YEAR = 1981

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	TRAWLS CATCH	TRAWLS %	SEINES CATCH	SEINES %	ROTENONE CATCH	ROTENONE %
LEPISOSTEIDAE	GARS	.	.	.	.	.	.
LEPISOSTEUS OSSEUS	LONGNOSE GAR	1	0.00	0	0.00	0	0.00
ELOPIDAE	TARPONS	1	0.00	0	0.00	0	0.00
ELOPS SAURUS	LADYFISH	12	0.02	1	0.01	11	0.04
ELOPS SAURUS(LEPTOCEPHALUS)	LADYFISH(LEPTOCEPHALUS)	22	0.03	4	0.02	6	0.02
ANGUILLIDAE	FRESHWATER EELS	.	.	.	.	.	.
ANGUILLA ROSTRATA	AMERICAN EEL	26	0.03	0	0.00	13	0.05
OPHICHTHIDAE	SNAKE EELS	.	.	.	.	.	.
MYROPHIS PUNCTATUS	SPECKLED WORM EEL	5	0.01	0	0.00	1	0.00
MYROPHIS PUNCTATUS(LEPTOCEPHAL	SPECKLED WORM EEL(LEPTO.)	8	0.01	0	0.00	18	0.07
CLUPEIDAE	HERRINGS	.	.	.	.	.	.
ALOSA AESTIVALIS	BLUEBACK HERRING	6	0.01	3	0.02	0	0.00
ALOSA PSEUDOHARENGUS	ALEWIFE	1	0.00	0	0.00	0	0.00
BREVOORTIA TYRANNUS	ATLANTIC MENHADEN	4,083	5.15	1,324	7.40	1,849	6.77
DOROSOMA CEPEDIANUM	GIZZARD SHAD	9	0.01	6	0.03	1	0.00
ENGRAULIDAE	ANCHOVIES	.	.	.	.	.	.
ANCHOA SP.	ANCHOVY UNID.(ANCHOA)	4	0.01	0	0.00	0	0.00
ANCHOA HEPSETUS	STRIPED ANCHOVY	6	0.01	1	0.01	1	0.00
ANCHOA MITCHILLI	BAY ANCHOVY	6,616	8.35	431	2.41	855	3.13
SYNODONTIDAE	LIZARDFISHES	.	.	.	.	.	.
SYNODUS FOETENS	INSHORE LIZARDFISH	84	0.11	13	0.07	1	0.00
CYPRINIDAE	CARPS AND MINNOWS	.	.	.	.	.	.
NOTEMIGONUS CRYSOLEUCAS	GOLDEN SHINER	2	0.00	0	0.00	0	0.00
ICTALURIDAE	BULLHEAD CATFISHES	.	.	.	.	.	.
ICTALURUS CATUS	WHITE CATFISH	11	0.01	0	0.00	0	0.00
ICTALURUS PUNCTATUS	CHANNEL CATFISH	6	0.01	0	0.00	0	0.00
BATRACHOIDIDAE	TOADFISHES	.	.	.	.	.	.
OPSANUS TAU	OYSTER TOADFISH	0	0.00	0	0.00	2	0.01
GOBIESOCIDAE	CLINGFISHES	.	.	.	.	.	.
GOBIESOX STRUMOSUS	SKILLETFISH	0	0.00	0	0.00	1	0.00
GADIDAE	CODFISHES	.	.	.	.	.	.
UROPHYCIS FLORIDANA	SOUTHERN HAKE	10	0.01	1	0.01	1	0.00
UROPHYCIS REGIA	SPOTTED HAKE	1	0.00	0	0.00	0	0.00
OPHIDIIDAE	CUSK-EELS	.	.	.	.	.	.
C[illegible] DION WELSHI	CRESTED CUSK-EEL	0	0.00	0	0.00	13	0.05
CY[illegible]ODONTIDAE	KILLIFISHES	.	.	.	.	.	.
C[illegible]INODON VARIEGATUS	SHEEPSHEAD MINNOW	0	0.00	0	0.00	3	0.01
FUN[illegible]US HETEROCLITUS	MUMMICHOG	1,037	1.31	944	5.28	5,877	21.53
FUND[illegible]LUS LUCIAE	SPOTFIN KILLIFISH	0	0.00	0	0.00	63	0.23
FUNDULUS MAJALIS	STRIPED KILLIFISH	23	0.03	144	0.81	181	0.66
POECILIIDAE	LIVEBEARERS	.	.	.	.	.	.
GAMBUSIA AFFINIS	MOSQUITOFISH	0	0.00	2	0.01	1	0.00

Table 4.6 (continued)

YEAR = 198[illegible]

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	TRAWLS CATCH	TRAWLS %	SEINES CATCH	SEINES %	ROTENONE CATCH	ROTENONE %
ATHERINIDAE	SILVERSIDES	2	0.00	53	0.30	0	0.00
MEMBRAS MARTINICA	ROUGH SILVERSIDE	1	0.00	30	0.17	0	0.00
MENIDIA BERYLLINA	INLAND SILVERSIDE	57	0.07	14	0.08	35	0.13
MENIDIA MENIDIA	ATLANTIC SILVERSIDE	676	0.85	685	3.83	125	0.46
SYNGNATHIDAE	PIPEFISHES	*	*	*	*	*	*
SYNGNATHUS FUSCUS	NORTHERN PIPEFISH	2	0.00	4	0.02	6	0.02
SYNGNATHUS LOUISIANAE	CHAIN PIPEFISH	6	0.01	4	0.02	3	0.01
CENTROPOMIDAE	SNOOKS	*	*	*	*	*	*
CENTROPOMUS UNDECIMALIS	SNOOK	0	0.00	0	0.00	1	0.00
PERCICHTHYIDAE	TEMPERATE BASSES	*	*	*	*	*	*
MORONE SAXATILIS	STRIPED BASS	2	0.00	0	0.00	0	0.00
SERRANIDAE	SEA BASSES	*	*	*	*	*	*
CENTROPRISTIS STRIATA	BLACK SEA BASS	2	0.00	0	0.00	0	0.00
MYCTEROPERCA BONACI	BLACK GROUPER	2	0.00	0	0.00	0	0.00
MYCTEROPERCA MICROLEPIS	GAG	7	0.01	0	0.00	3	0.01
CENTRARCHIDAE	SUNFISHES	*	*	*	*	*	*
LEPOMIS GIBBOSUS	PUMPKINSEED	16	0.02	0	0.00	0	0.00
LEPOMIS GULOSUS	WARMOUTH	2	0.00	0	0.00	0	0.00
LEPOMIS MACROCHIRUS	BLUEGILL	8	0.01	0	0.00	0	0.00
LEPOMIS MICROLOPHUS	REDEAR SUNFISH	2	0.00	0	0.00	0	0.00
MICROPTERUS SALMOIDES	LARGEMOUTH BASS	1	0.00	0	0.00	0	0.00
PERCIDAE	PERCHES	*	*	*	*	*	*
PERCA FLAVESCENS	YELLOW PERCH	1	0.00	0	0.00	0	0.00
POMATOMIDAE	BLUEFISHES	*	*	*	*	*	*
POMATOMUS SALTATRIX	BLUEFISH	2	0.00	2	0.01	0	0.00
CARANGIDAE	JACKS	*	*	*	*	*	*
CARANX HIPPOS	CREVALLE JACK	14	0.02	24	0.13	2	0.01
CHLOROSCOMBRUS CHRYSURUS	ATLANTIC BUMPER	1	0.00	0	0.00	0	0.00
LUTJANIDAE	SNAPPERS	*	*	*	*	*	*
LUTJANUS SP.	SNAPPER UNID. (LUTJANUS)	6	0.00	0	0.00	2	0.91
LUTJANUS ANALIS	MUTTON SNAPPER	3	0.00	0	0.00	0	0.00
LUTJANUS GRISEUS	GRAY SNAPPER	10	0.01	13	0.07	58	0.21
LUTJANUS SYNAGRIS	LANE SNAPPER	4	0.01	0	0.00	3	0.01
GERREIDAE	MOJARRAS	13	0.02	8	0.04	493	1.81
DIAPTERUS AURATUS	IRISH POMPANO	9	0.01	4	0.02	0	0.00
EUCINOSTOMUS SP.	MOJARRA UNID. (EUCINOSTOMUS)	8	0.01	2	0.01	24	0.09
EUCINOSTOMUS ARGENTEUS	SPOTFIN MOJARRA	300	0.38	182	1.02	91	0.33
EUCINOSTOMUS GULA	SILVER JENNY	1	0.00	1	0.01	13	0.05
HAEMULIDAE	GRUNTS	*	*	*	*	*	*
ORTHOPRISTIS CHRYSOPTERA	PIGFISH	7	[illegible]	1	0.01	0	0.00
SPARIDAE	PORGIES	*	*	*	*	*	*
ARCHOSARGUS PROBATOCEPHALUS	SHEEPSHEAD	1	0.00	0	0.00	0	0.00

Table 4.6 (continued)

YEAR = 1981

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	TRAWLS CATCH	TRAWLS %	SEINES CATCH	SEINES %	ROTENONE CATCH	ROTENONE %
LAGODON RHOMBOIDES	PINFISH	661	0.83	83	0.46	171	0.63
SCIAENIDAE	DRUMS	*	*	*	*	*	*
BAIRDIELLA CHRYSOURA	SILVER PERCH	130	0.16	27	0.15	0	0.00
CYNOSCION NEBULOSUS	SPOTTED SEATROUT	1	0.00	1	0.01	2	0.01
CYNOSCION REGALIS	WEAKFISH	64	0.08	2	0.01	0	0.00
LEIOSTOMUS XANTHURUS	SPOT	59,045	74.51	6,422	35.91	11,459	41.98
MENTICIRRHUS AMERICANUS	SOUTHERN KINGFISH	2	0.00	0	0.00	0	0.06
MICROPOGONIAS UNDULATUS	ATLANTIC CROAKER	1,589	2.01	60	0.34	238	0.87
POGONIAS CROMIS	BLACK DRUM	2	0.00	0	0.00	0	0.00
SCIAENOPS OCELLATUS	RED DRUM	3	0.00	1	0.01	27	0.10
STELLIFER LANCEOLATUS	STAR DRUM	1	0.00	0	0.00	0	0.00
EPHIPPIDAE	SPADEFISHES	*	*	*	*	*	*
CHAETODIPTERUS FABER	ATLANTIC SPADEFISH	3	0.00	1	0.01	0	0.00
MUGILIDAE	MULLETS	*	*	*	*	*	*
MUGIL CEPHALUS	STRIPED MULLET	2,031	2.56	918	5.13	2,810	10.29
MUGIL CUREMA	WHITE MULLET	1,144	1.44	6,395	35.76	2,069	7.58
SPHYRAENIDAE	BARRACUDAS	*	*	*	*	*	*
SPHYRAENA BARRACUDA	GREAT BARRACUDA	0	0.00	0	0.00	2	0.01
URANOSCOPIDAE	STARGAZERS	0	0.00	0	0.00	1	0.00
ASTROSCOPUS Y-GRAECUM	SOUTHERN STARGAZER	2	0.00	0	0.00	0	0.00
BLENNIIDAE	COMBTOOTH BLENNIES	0	0.00	0	0.00	4	0.01
CHASMODES BOSQUIANUS	STRIPED BLENNY	0	0.00	0	0.00	5	0.02
HYPSOBLENNIUS IONTHAS	FRECKLED BLENNY	0	0.00	1	0.01	2	0.01
GOBIIDAE	GOBIES	*	*	*	*	*	*
EVORTHODUS LYRICUS	LYRE GOBY	1	0.00	1	0.01	0	0.00
GOBIONELLUS SP.	GOBY UNID.(GOBIONELLUS)	2	0.00	2	0.01	17	0.06
GOBIONELLUS BOLEOSOMA	DARTER GOBY	57	0.07	9	0.05	160	0.59
GOBIONELLUS HASTATUS	SHARPTAIL GOBY	40	0.05	0	0.00	3	0.01
GOBIONELLUS SHUFELDTI	FRESHWATER GOBY	110	0.14	25	0.14	0	0.00
GOBIOSOMA SP.	GOBY UNID.(GOBIOSOMA)	6	0.00	0	0.00	2	0.01
GOBIOSOMA BOSCI	NAKED GOBY	47	0.06	3	0.02	415	1.52
GOBIOSOMA GINSBURGI	SEABOARD GOBY	1	0.00	0	0.00	5	0.02
MICROGOBIUS THALASSINUS	GREEN GOBY	0	0.00	0	0.00	4	0.01
TRIGLIDAE	SEAROBINS	*	*	*	*	*	*
PRIONOTUS SP.	SEAROBIN UNID.(PRIONOTUS)	1	0.00	0	0.00	0	0.00
PRIONOTUS CAROLINUS	NORTHERN SEAROBIN	1	0.00	0	0.00	0	0.00
PRIONOTUS SCITULUS	LEOPARD SEAROBIN	6	0.01	0	0.00	1	0.00
PRIONOTUS TRIBULUS	BIGHEAD SEAROBIN	10	0.01	2	0.01	4	0.01
BOTHIDAE	LEFTEYE FLOUNDERS	*	*	*	*	*	*
ANCYLOPSETTA QUADROCELLATA	OCELLATED FLOUNDER	2	0.00	0	0.00	1	0.00
CITHARICHTHYS SP.	WHIFF UNID.(CITHARICHTHYS)	1	0.00	0	0.00	0	0.00
CITHARICHTHYS SPILOPTERUS	BAY WHIFF	19	0.02	1	0.01	0	0.00

Table 4.6 (continued)

YEAR = 1981

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	TRAWLS CATCH	TRAWLS %	SEINES CATCH	SEINES %	ROTENONE CATCH	ROTENONE %
ETROPUS CROSSOTUS	FRINGED FLOUNDER	35	0.04	3	0.02	2	0.01
PARALICHTHYS SP.	FLOUNDER UNID.(PARALICHTHYS)	386	0.49	9	0.05	44	0.16
PARALICHTHYS ALBIGUTTA	GULF FLOUNDER	4	0.01	0	0.00	0	0.00
PARALICHTHYS DENTATUS	SUMMER FLOUNDER	13	0.02	1	0.01	2	0.01
PARALICHTHYS LETHOSTIGMA	SOUTHERN FLOUNDER	43	0.05	0	0.00	10	0.04
SCOPHTHALMUS AQUOSUS	WINDOWPANE	2	0.00	0	0.00	3	0.01
SOLEIDAE	SOLES	*	*	*	*	*	*
TRINECTES MACULATUS	HOGCHOKER	478	0.60	0	0.00	0	0.00
CYNOGLOSSIDAE	TONGUEFISHES	*	*	*	*	*	*
SYMPHURUS PLAGIUSA	BLACKCHEEK TONGUEFISH	158	0.20	11	0.06	76	0.28
BALISTIDAE	LEATHERJACKETS	*	*	*	*	*	*
MONACANTHUS HISPIDUS	PLANEHEAD FILEFISH	10	0.01	3	0.02	0	0.00
TETRAODONTIDAE	PUFFERS	*	*	*	*	*	*
SPHOEROIDES MACULATUS	NORTHERN PUFFER	1	0.00	3	0.02	0	0.00
	TOTAL FISH	79,242	99.9	17,885	100.0	27,297	100.0
SQUILLA EMPUSA	MANTIS SHRIMP	0	0.00	1	0.02	0	0.00
PENAEIDAE	PENAEID SHRIMP	9	0.04	0	0.00	0	0.00
PENAEUS SP.(ADULT)	PENAEUS (ADULT)	3	0.01	0	0.00	0	0.00
PENAEUS SP.(POSTLARVAE)	PENAEUS (POSTLARVAE)	69	0.30	18	0.32	3	3.57
PENAEUS AZTECUS	BROWN SHRIMP	2,923	12.55	229	4.03	1	1.19
PENAEUS DUORARUM	PINK SHRIMP	1,089	4.67	110	1.94	7	8.33
PENAEUS SETIFERUS	WHITE SHRIMP	96	0.41	22	0.39	0	0.00
TRACHYPENEUS CONSTRICTUS	T-CON OR HARDBACK SHRIMP	230	0.99	11	0.19	1	1.19
PALAEMONETES SP.	GRASS SHRIMP	15,480	66.45	4,817	84.75	0	0.00
ALPHEUS SP.	SNAPPING SHRIMP	13	0.06	0	0.00	3	3.57
PORTUNIDAE	SWIMMING CRABS	285	1.22	22	0.39	1	1.19
OVALIPES SP.	CALICO CRABS	2	0.01	0	0.00	0	0.00
PORTUNUS SP.	SWIMMING CRABS	3	0.01	20	0.35	1	1.19
CALLINECTES SP.	BLUE CRABS	3,043	13.06	426	7.49	67	79.75
LOLLIGUNCULA BREVIS	BRIEF SQUID	51	0.22	8	0.14	0	0.00
	TOTAL INVERTEBRATES	23,296	100.0	5,684	100.0	84	100.0
	TOTAL ORGANISMS	102,538		23,569		27,381	
	TOTAL EFFORTS	356		83		10	

Table 4.7 Analysis of variance of CPUE for high marsh - July 1980 to December 1981.

SPECIES	GEAR	SOURCE: TRIP	SOURCE: CREEK	$\overline{LOG}$	S^2	(R^2)	TRIPS ANALYZED
Total organisms	Trawl	***	*** MW A B	1.616	0.290	0.5[illegible]	1-29[1]
	Seine	***	ns	1.817	0.302	0.647	1-29[1]
	Rotenone	*	** BM W	3.01[illegible]	0.100	0.840	7, 15, 25
Spot	Trawl	***	*** MW A B	0.818	0.270	0.700	1-29[1]
	Seine	***	ns	0.675	0.249	0.730	1-29[1]
	Rotenone	***	ns	1.688	0.234	0.918	7, 15, 25
Bay anchovy	Trawl	***	*** MA WB	0.435	[illegible].336	0.293	1-29[1]
	Seine	**	ns	0.264	0.246	0.387	1-29[1]
	Rotenone	*	ns	0.943	0.495	0.747	7, 15, 25

[1] Trips 5, 15, and 25 not included in trawls

ns	Not significant - $p > .05$	B = Baldhead Creek
*	$.01 < p \leq .05$	W = Walden Creek
**	$.001 < p \leq .01$	M = Motts Creek
***	$p \leq .001$	A = Alligator Creek

Table 4.7 (continued)

SPECIES	GEAR	TRIP	CREEK	$\overline{LOG}$	S^2	(R^2)	TRIPS ANALYZED
White mullet	Trawl	***	*** W BMA	0.057	0.063	0.268	1-29[1]
	Seine	***	ns	0.531	0.196	0.786	1-29[1]
	Rotenone	ns	ns	0.473	0.460	0.710	7, 15, 25
Menhaden	Trawl	***	*** WM AB	0.220	0.156	0.451	1-29[1]
	Seine	***	* WB M	0.245	0.197	0.545	1-29[1]
	Rotenone	**	ns	0.678	0.530	0.736	7, 15, 25
Striped mullet	Trawl	***	*** W BAM	0.116	0.090	0.406	1-29[1]
	Seine	**	ns	0.411	0.222	0.457	1-29[1]
	Rotenone	*	*** B MW	1.125	0.103	0.944	7, 15, 25

[1] Trips 5, 15, and 25 not included in trawls

ns	Not significant - $p > .05$	B = Baldhead Creek
*	$.01 < p \leq .05$	W = Walden Creek
**	$.001 < p \leq .01$	M = Motts Creek
***	$p \leq .001$	A = Alligator Creek

Table 4.7 (continued)

SPECIES	GEAR	TRIP	CREEK	$\overline{LOG}$	S^2	(R^2)	TRIPS ANALYZED
Atlantic croaker	Trawl	***	*** M A W B	0.191	0.109	0.425	1-29[1]
	Seine	ns	ns	0.045	0.041	0.243	1-29[1]
	Rotenone	ns	*** M BW	0.355	0.120	0.856	7, 15, 25
Flounders	Trawl	ns	*** A MBW	0.035	0.011	0.233	1-29[1]
	Seine	ns	ns	0.007	0.002	0.225	1-29[1]
	Rotenone	ns	ns	0.224	0.040	0.554	7, 15, 25
Weak fish	Trawl	***	* WA BM	0.023	0.019	0.146	1-29[1]
	Seine	ns	ns	0.007	0.002	0.223	1-29[1]
	Rotenone[2]	-	-	-	-	-	7, 15, 25

[1]Trips 5, 15, and 25 not included in trawls

[2]Not caught in rotenone

ns	Not significant - $p > .05$	B = Baldhead Creek
*	$.01 < p < .05$	W = Walden Creek
**	$.001 < p \leq .01$	M = Motts Creek
***	$p \leq .001$	A = Alligator Creek

Table 4.7 (continued)

SPECIES	GEAR	TRIP	CREEK	$\overline{LOG}$	S^2	(R^2)	TRIPS ANALYZED
Blue crab	Trawl	***	*** M W A B	0.577	0.133	0.527	1-29[1]
	Seine	***	*** M BW	0.409	0.132	0.492	1-29[1]
Brown shrimp	Trawl	***	*** WM BA	0.257	0.148	0.540	1-29[1]
	Seine	ns	ns	0.213	0.100	0.608	1-29[1]
White shrimp	Trawl	ns	*** MW A B	0.139	0.088	0.474	1-29[1]
	Seine	***	** MW B	0.164	0.117	0.521	1-29[1]
Pink shrimp	Trawl	***	*** M W B A	0.252	0.115	0.438	i-29[1]
	Seine	***	ns	0.210	0.092	0.530	1-29[1]

[1] Trips 5, 15, and 25 not included in trawls

ns	Not significant - $p > .05$	B = Baldhead Creek
*	$.01 < p \leq .05$	W = Walden Creek
**	$.001 < p \leq .01$	M = Motts Creek
***	$p \leq .001$	A = Alligator Creek

Table 4.8 Standing crop estimates for high marsh study July 1980 to December 1981

Species	Walden Creek No./m^2	Walden Creek No./Acre	Baldhead Creek No./m^2	Baldhead Creek No./Acre	Mott's Creek No./m^2	Mott's Creek No./Acre
Spot	2.46	9978.57	4.59	19016.67	6.14	23857.14
Bay anchovy	0.0009	3.57	0.0013	5.55	0	0
White mullet	0	0	0	0	0	0
Atlantic menhaden	0.12	492.85	0.10	427.77	5.68	22085.71
Striped mullet	0.0317	128.57	0.49	2022.22	0.0919	357.14
Croaker	0	0	0	0	0.79	3057.14
Flounder	0.0009	3.57	0.0007	2.77	0	0
Weakfish	0	0	0	0	0	0
Total organisms	2.78	11292.86	7.37	30494.44	12.94	50300.0

	Walden Creek	Baldhead Creek	Mott's Creek
Salinity			
Upstream	9.5	16.0	6.0
Downstream	13.0	32.0	
Temperature			
Upstream	17.9	19.5	15.9
Downstream	18.0	18.8	
Percent Organics			
Upstream	1.5	0.9	2.8
Downstream	2.8	11.9	

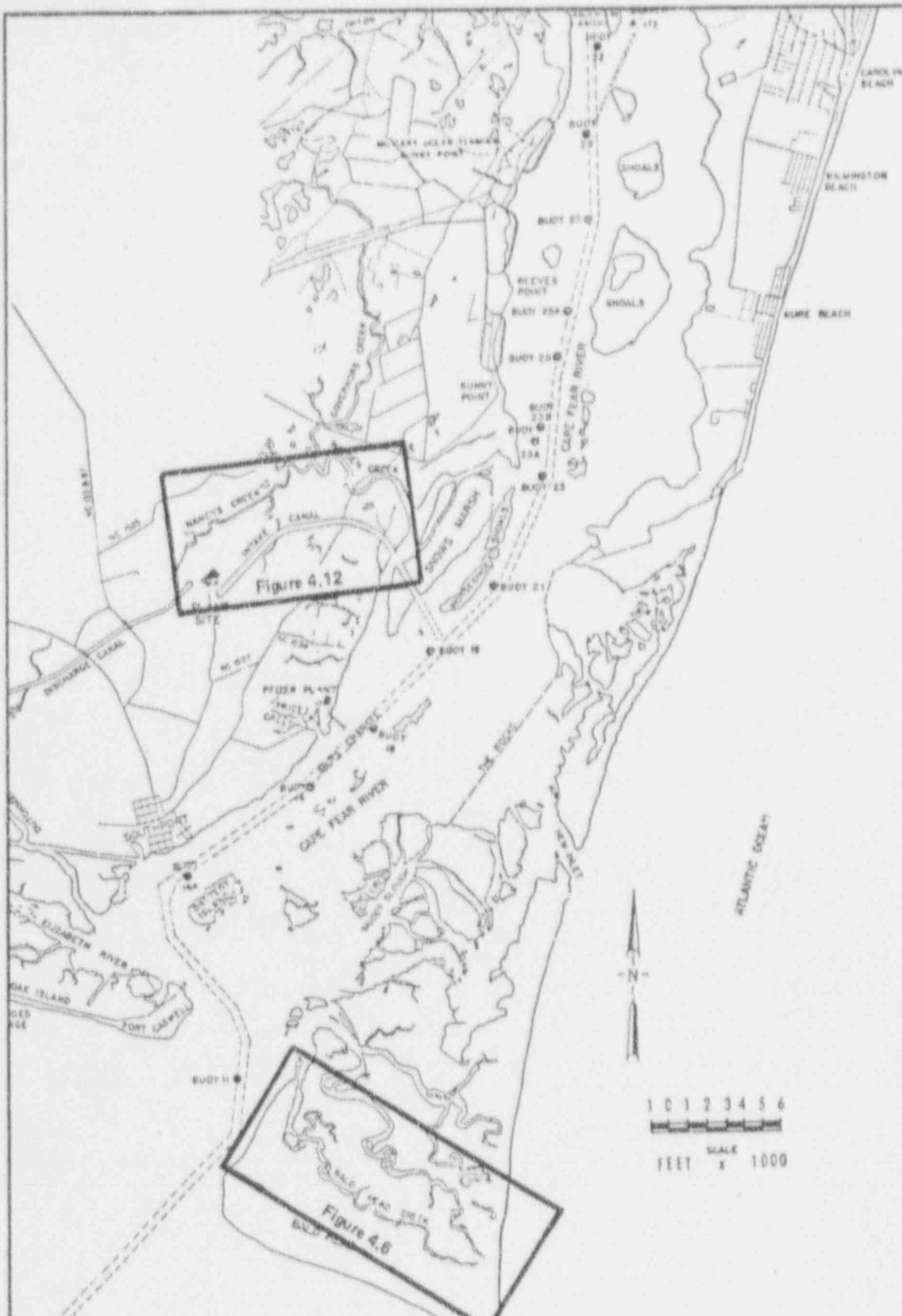


Figure 4.1 High marsh study area (high intensity)

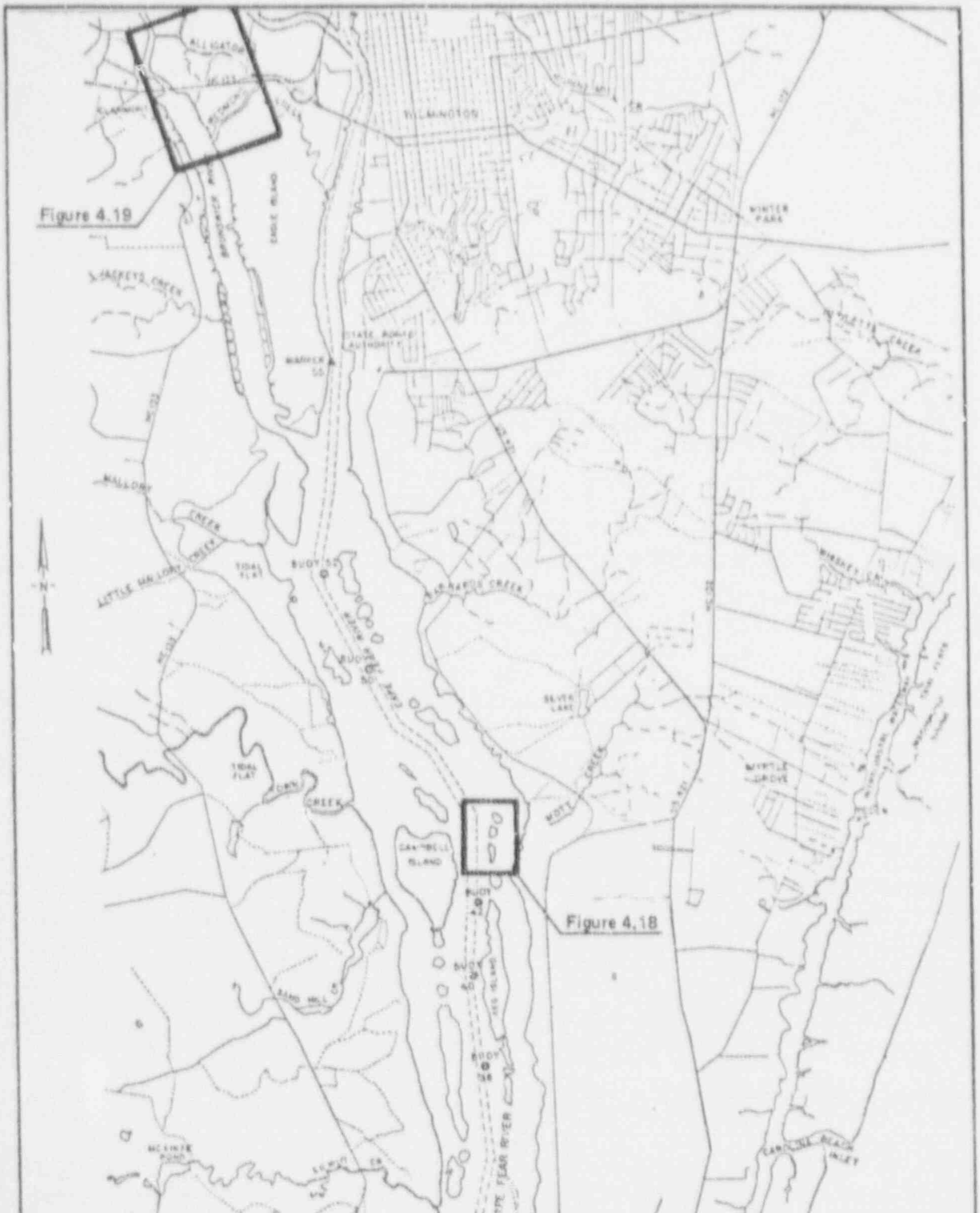


Figure 4.2 High marsh study area (low intensity)

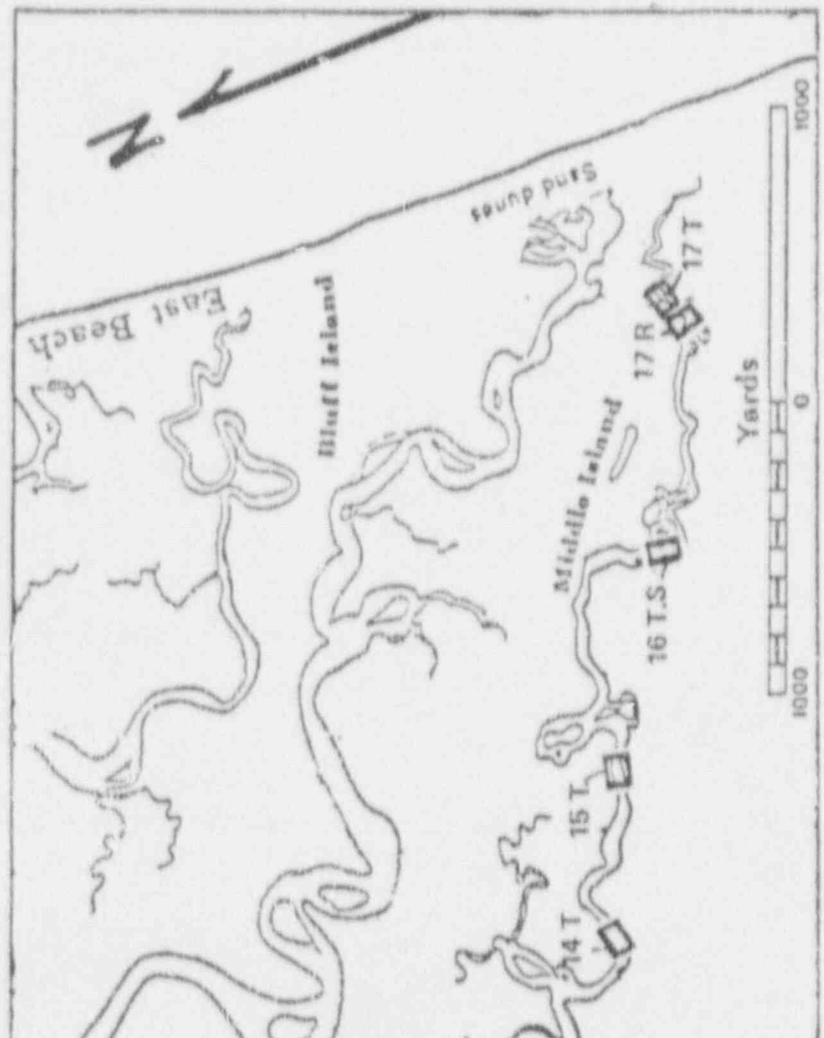


Figure 4.3 Baldhead Creek sampling stations

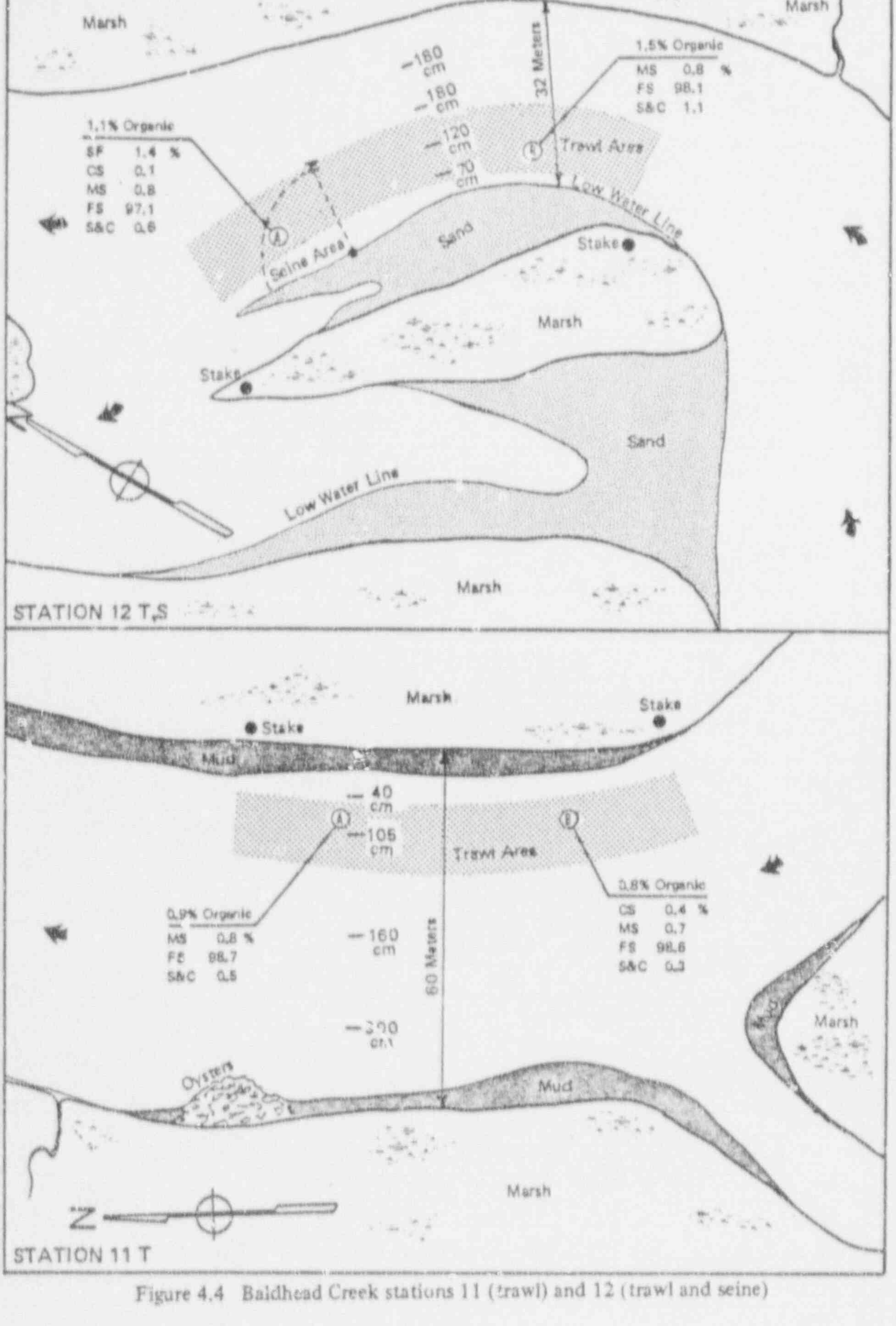


Figure 4.4 Baldhead Creek stations 11 (trawl) and 12 (trawl and seine)

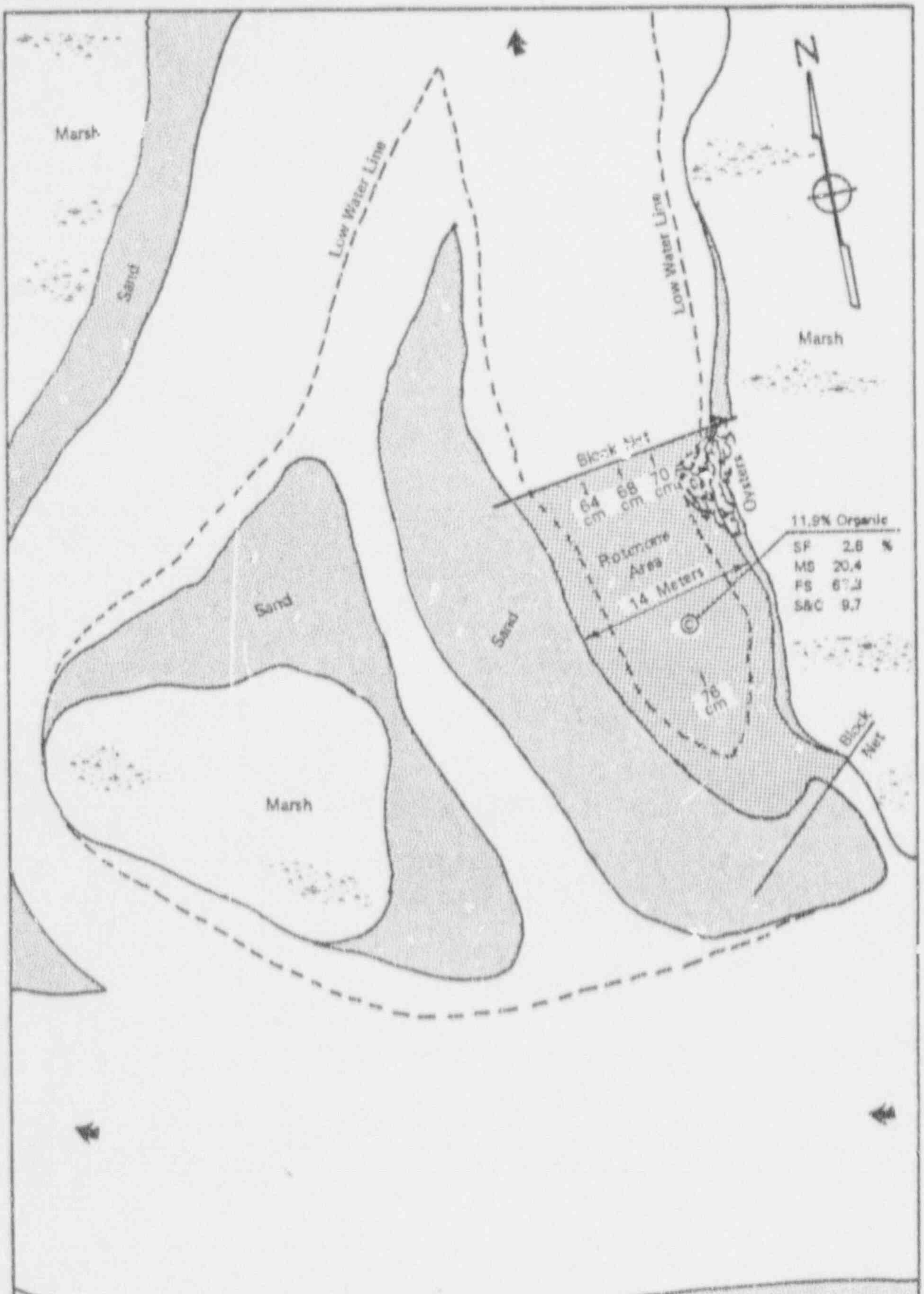


Figure 4.5 Baldhead Creek station 12 (rotenone)

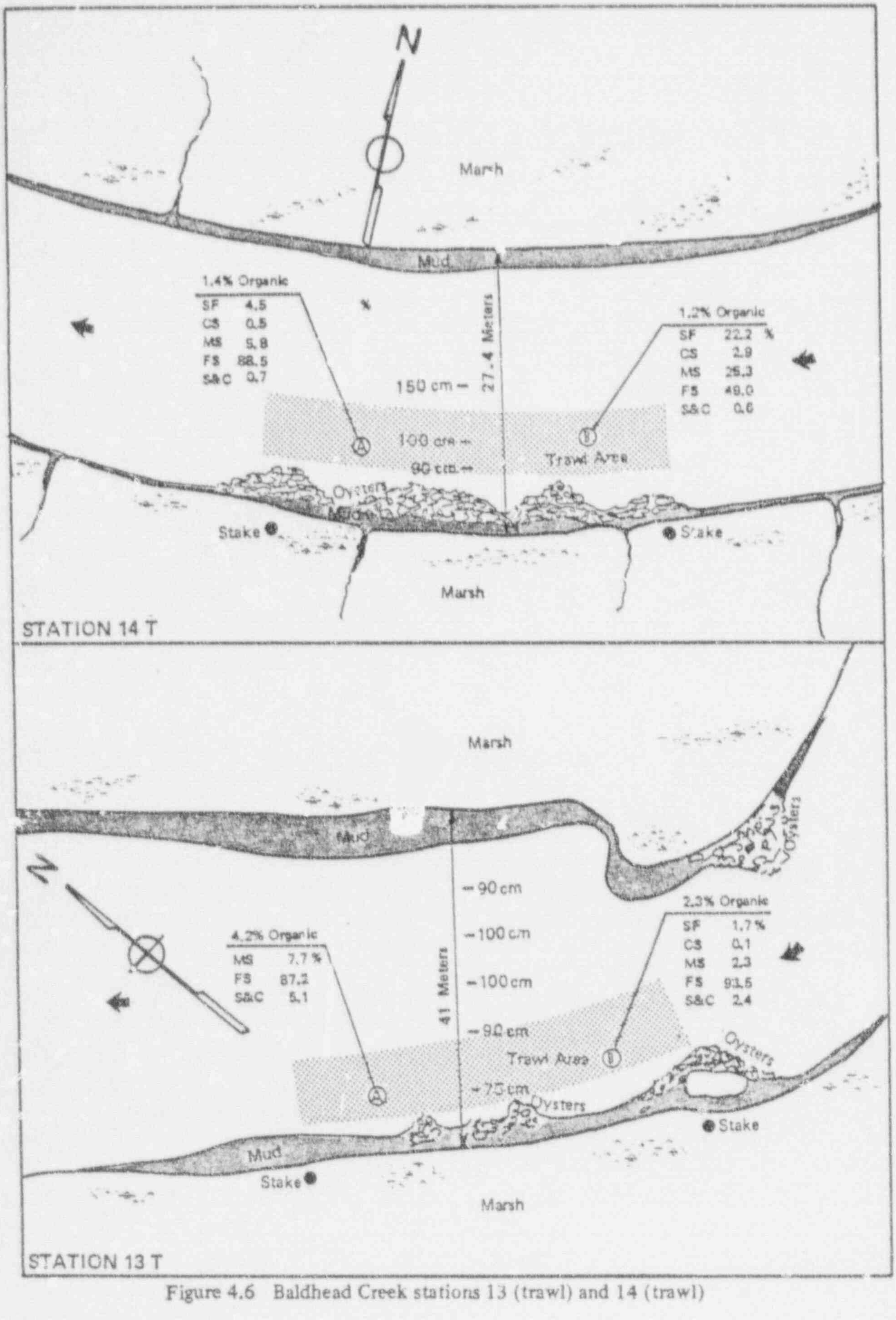


Figure 4.6 Baldhead Creek stations 13 (trawl) and 14 (trawl)

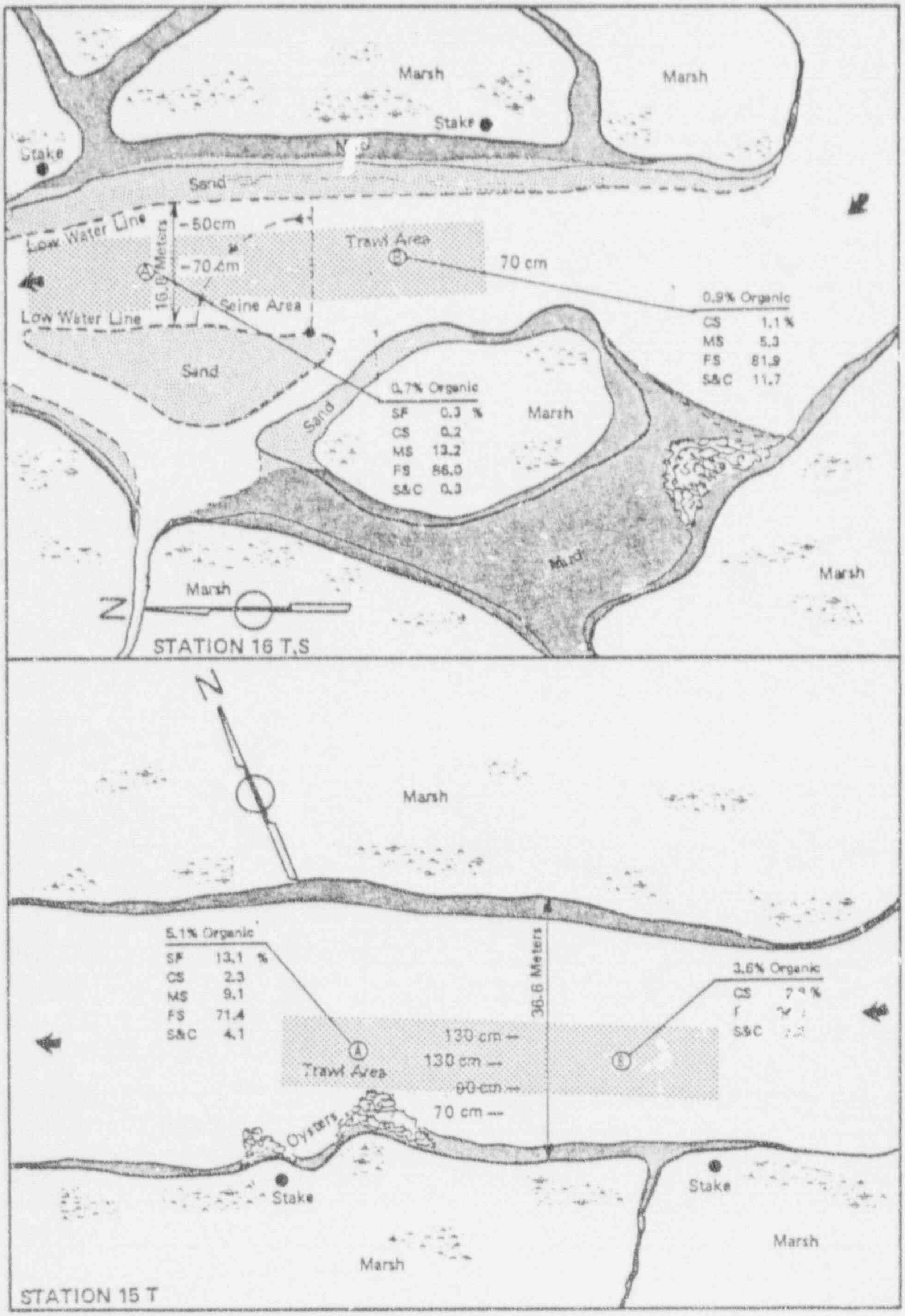


Figure 4.7 Baldhead Creek stations 15 (trawl) and 16 (trawl and seine)

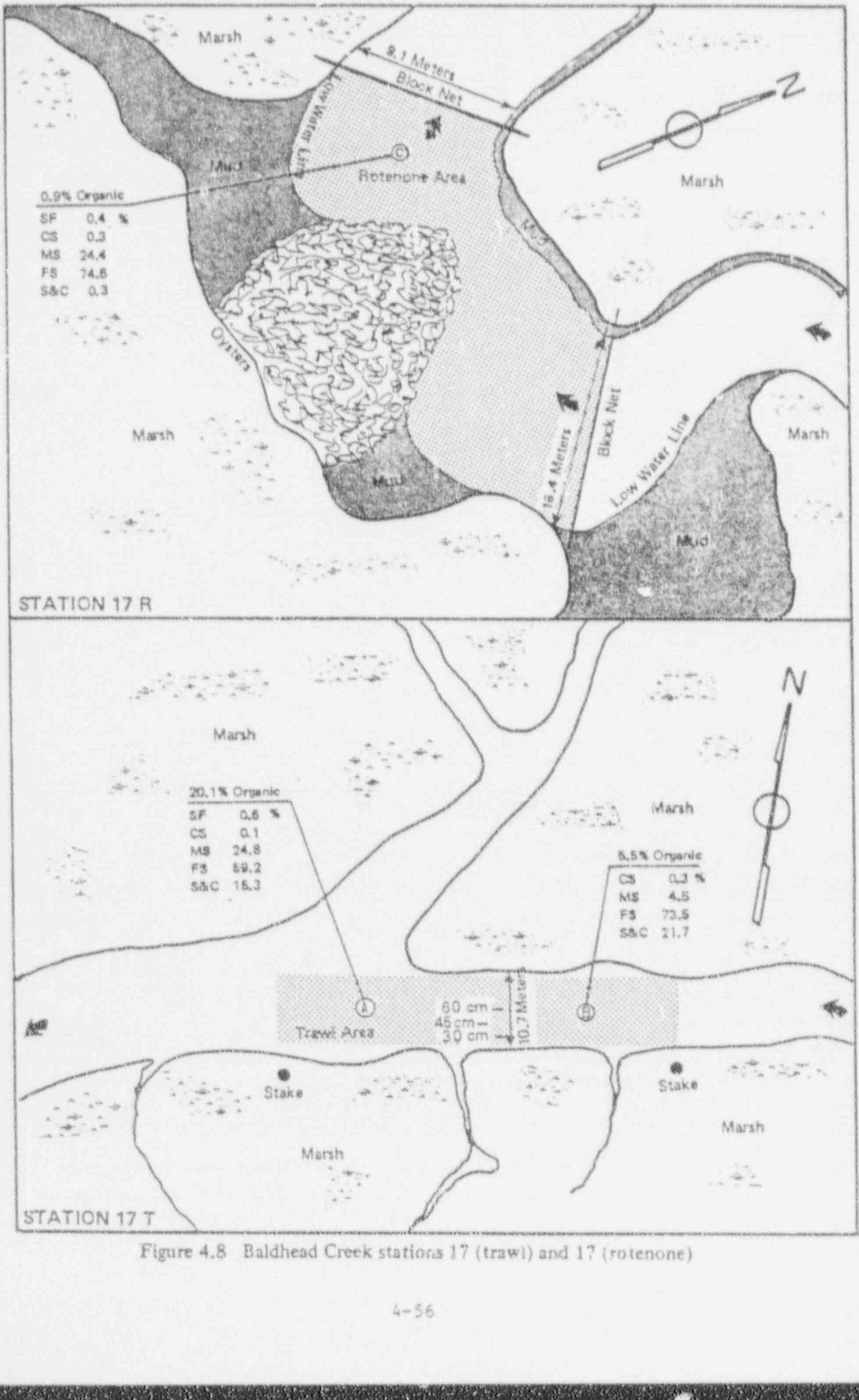


Figure 4.8 Baldhead Creek stations 17 (trawl) and 17 (rotenone)

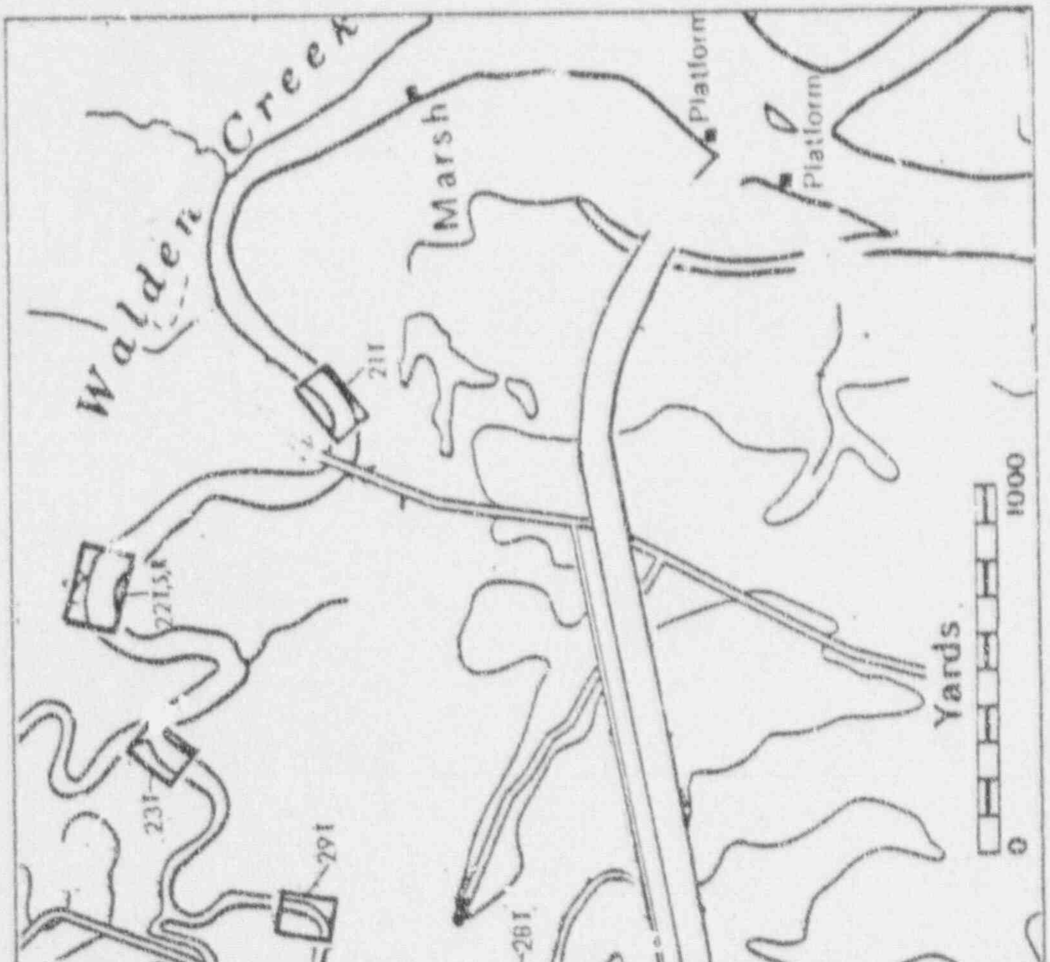


Figure 4.9 Walden Creek sampling stations

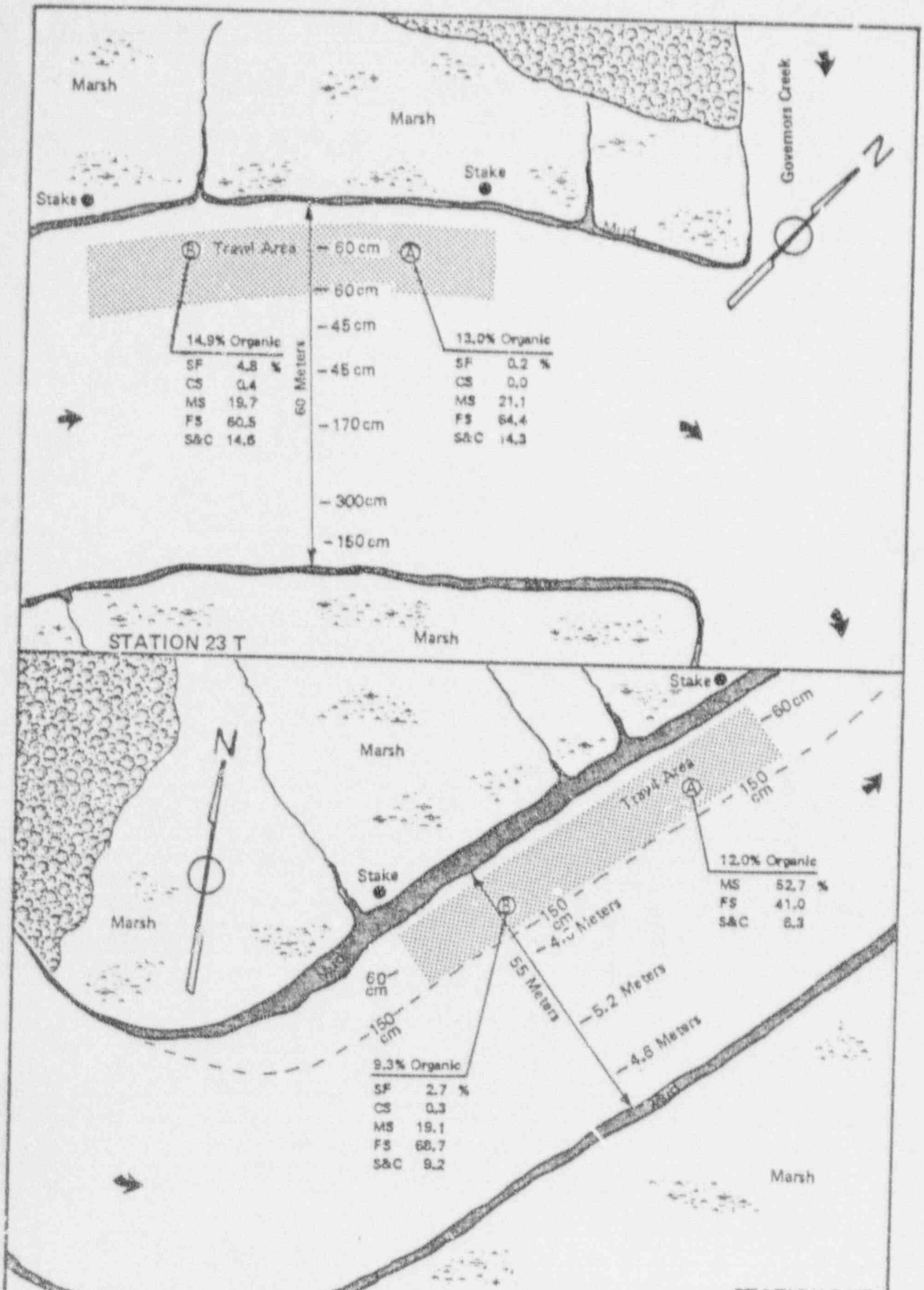


Figure 4.10 Walden Creek stations 21 (trawl) and 23 (trawl)

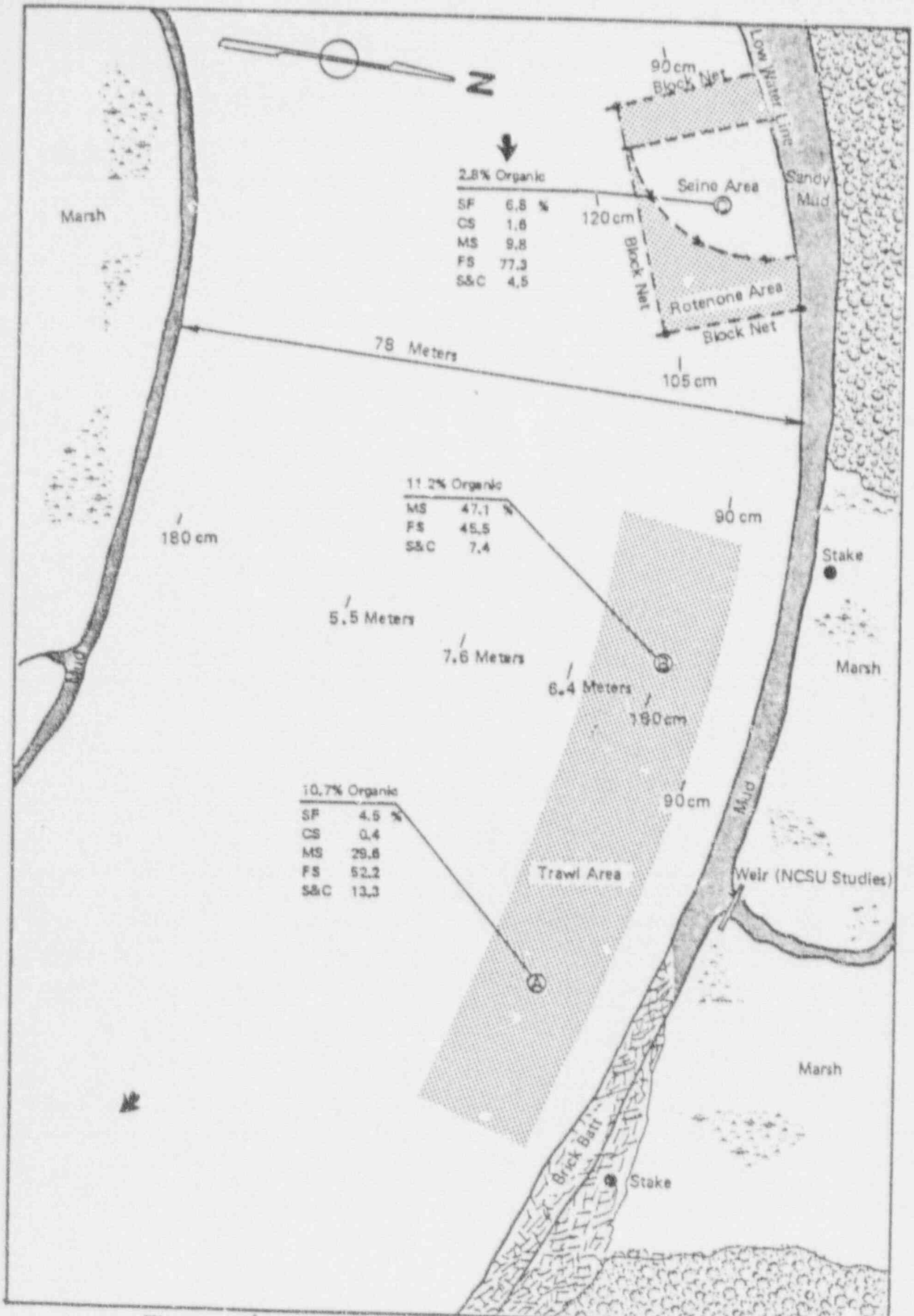


Figure 4.11 Walden Creek station 22 (trawl, seine, and rotenone)

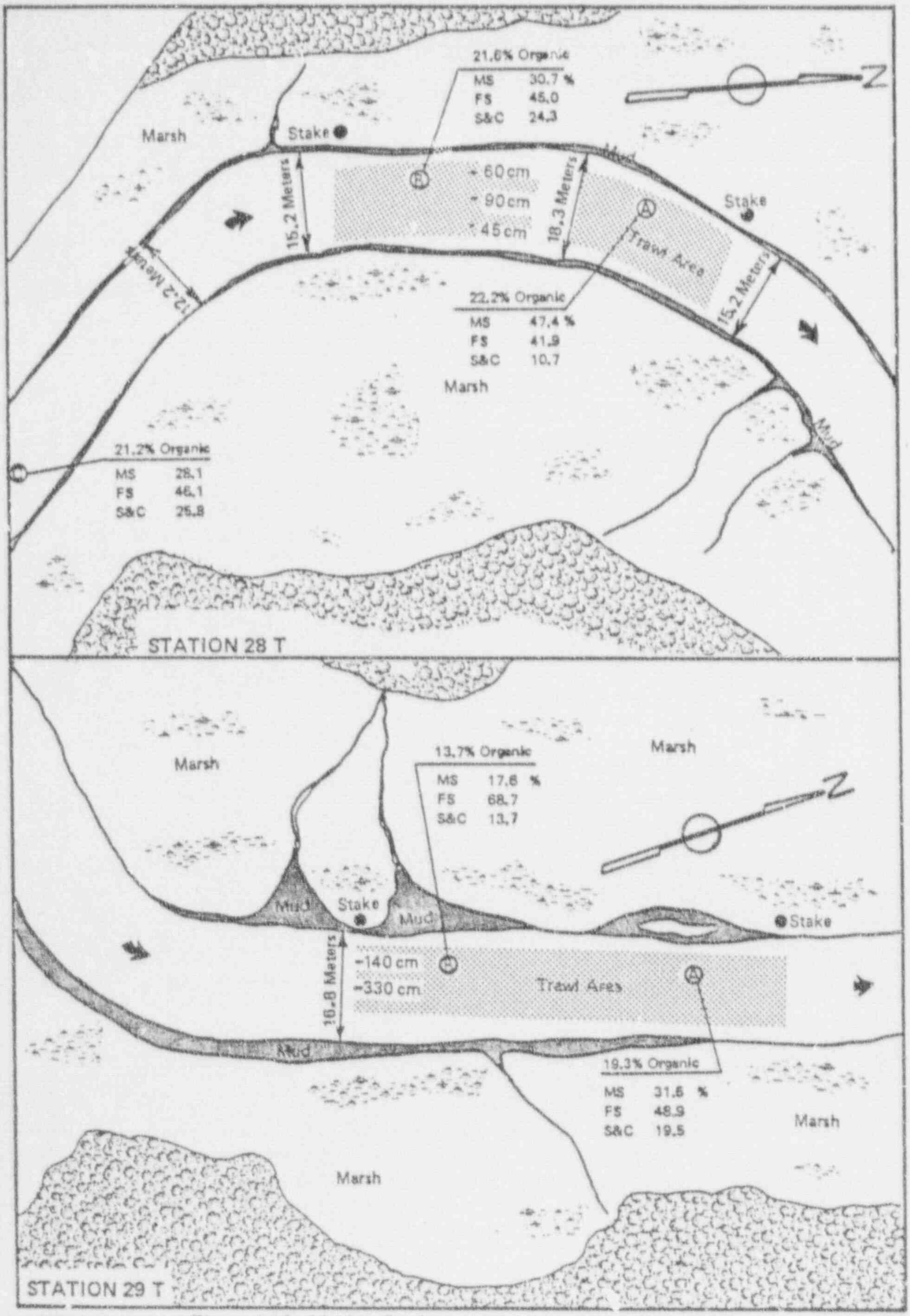


Figure 4.12 Walden Creek stations 28 (trawl) and 29 (trawl)

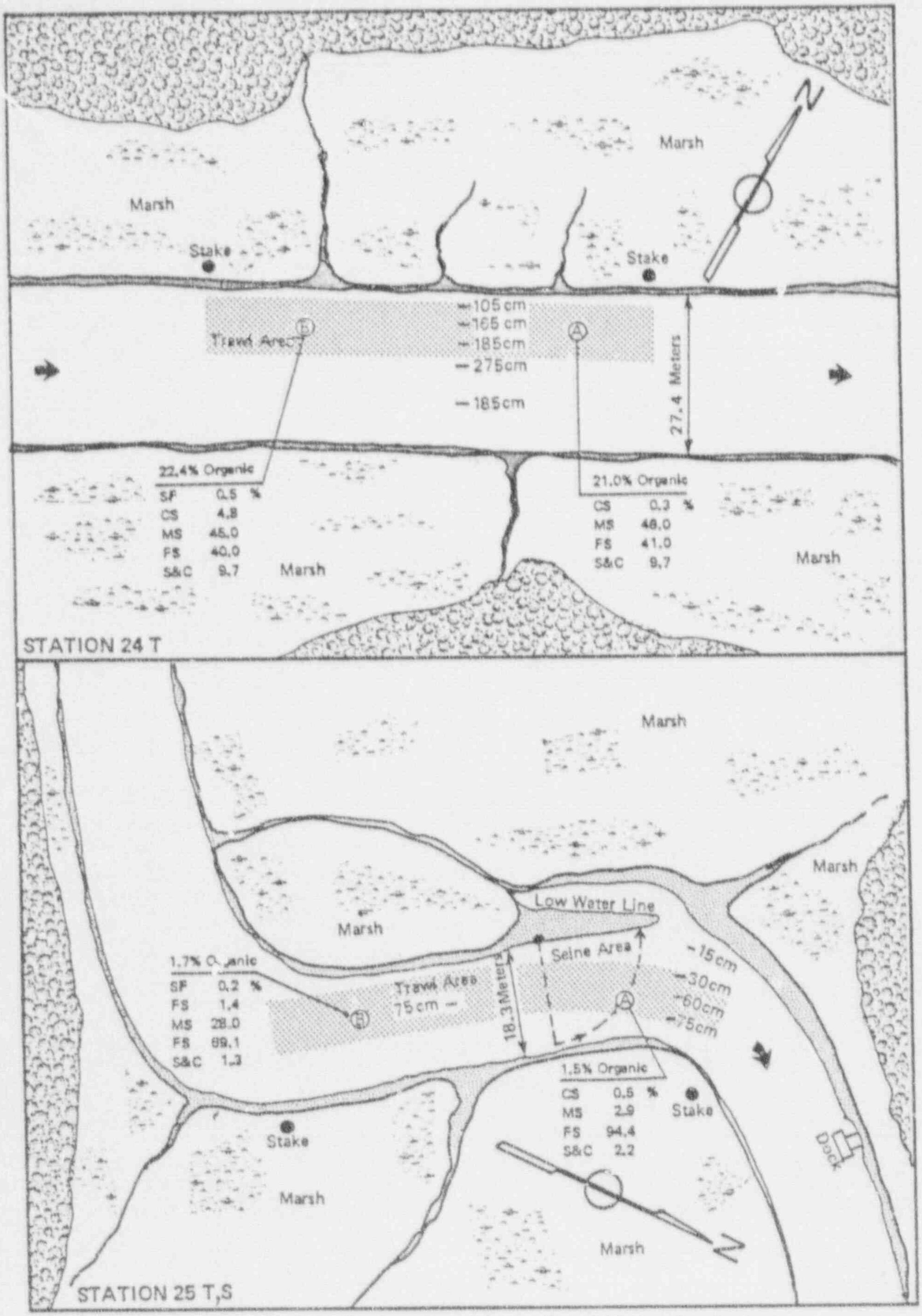


Figure 4.13 Walden Creek stations 24 (trawl) and 25 (trawl and seine)

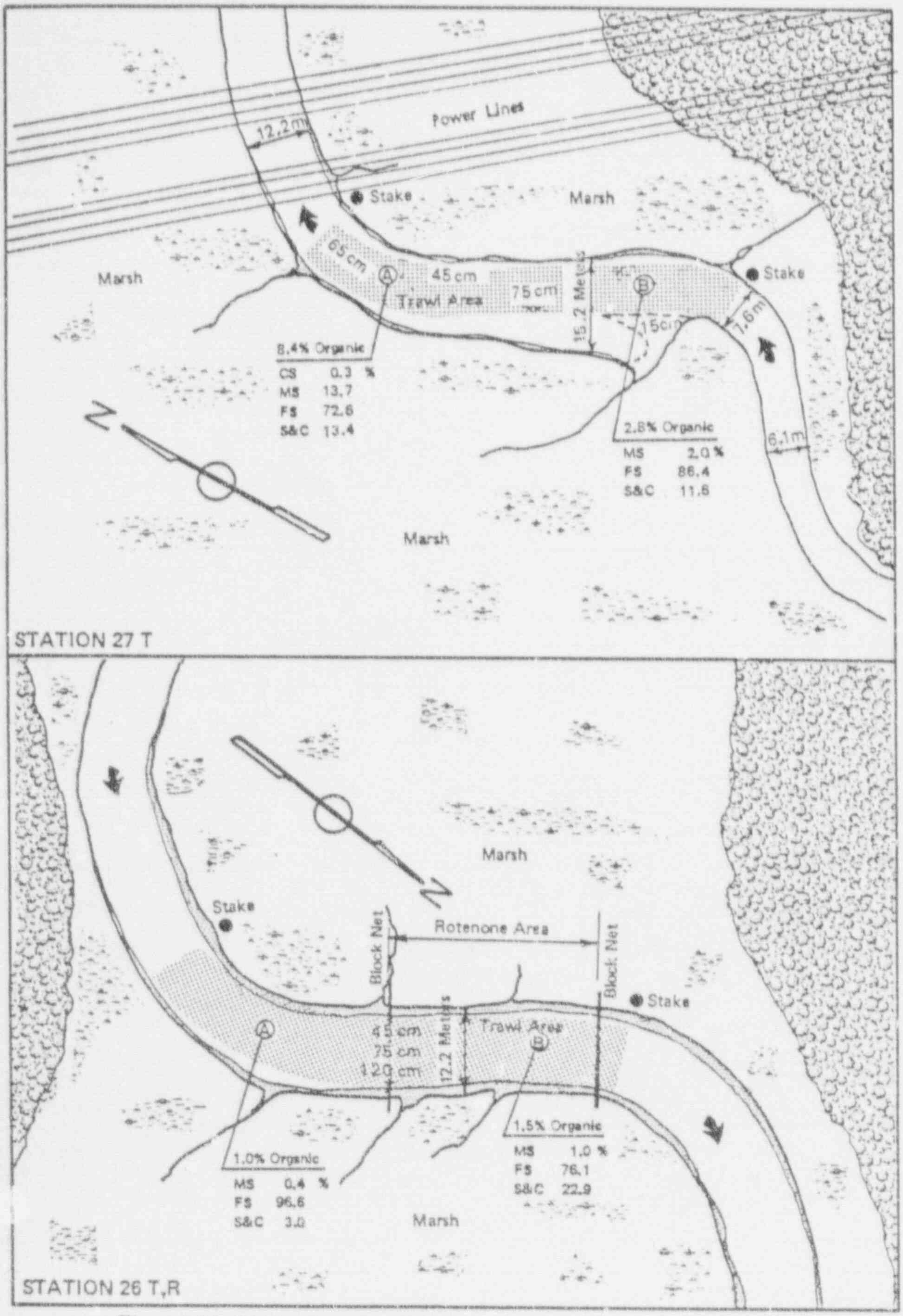


Figure 4.14 Walden Creek stations 26 (trawl and rotenone) and 27 (trawl)

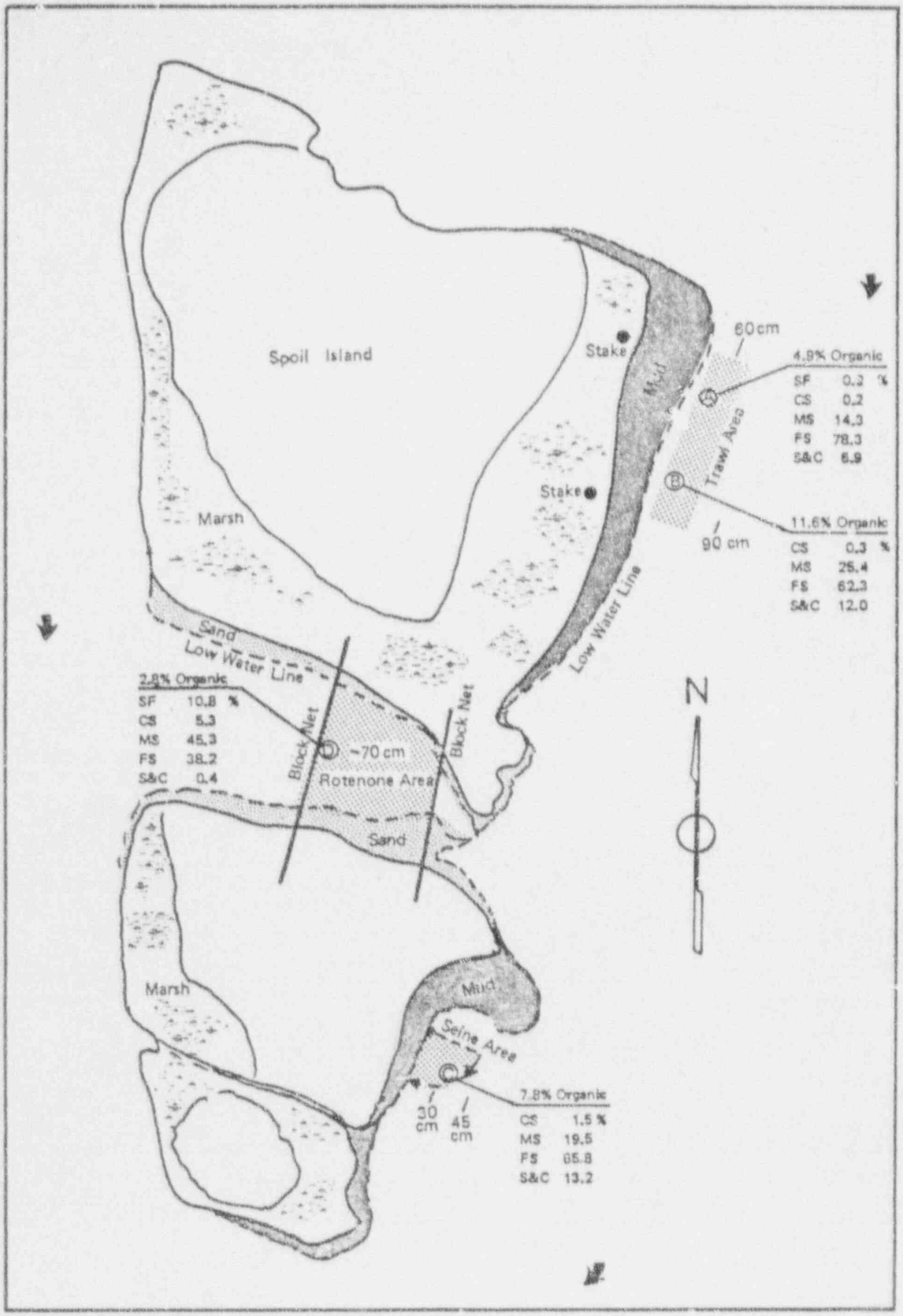


Figure 4.15 Mott's Creek bay sampling station 31 (trawl, seine, and rotenone)

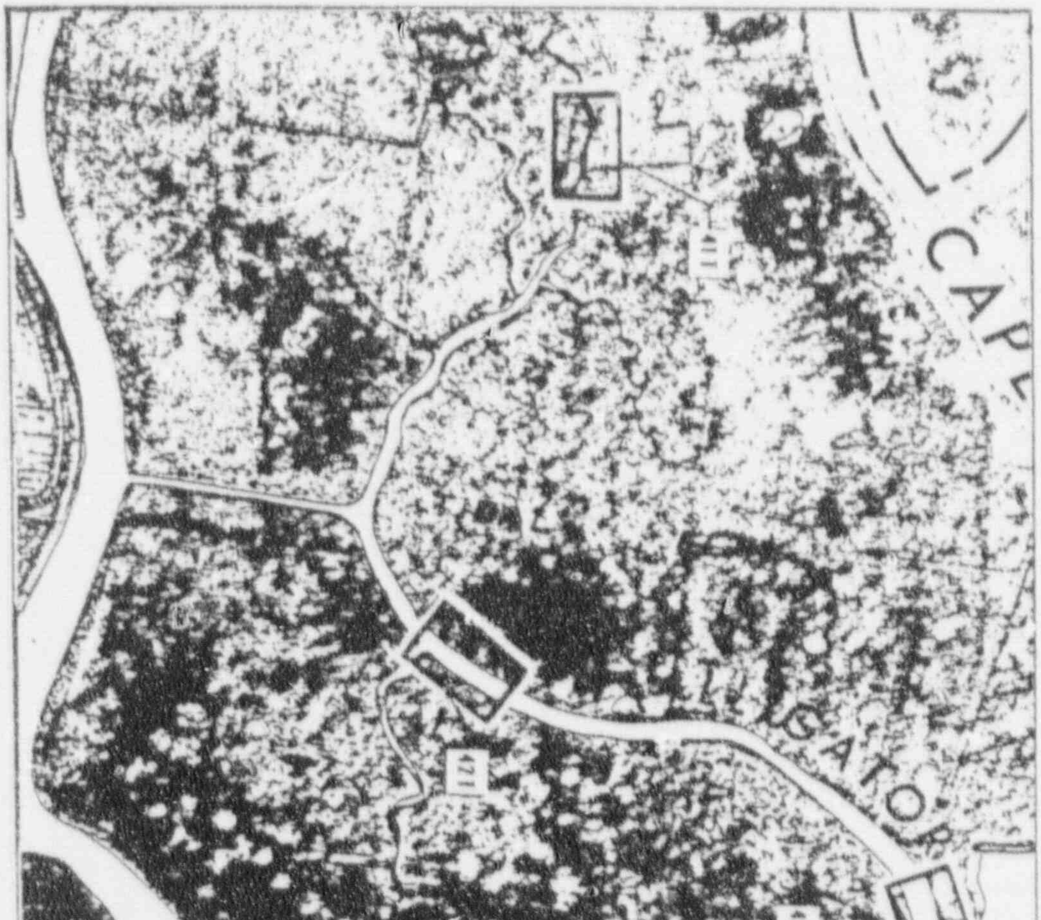


Figure 4.16 Alligator Creek sampling stations

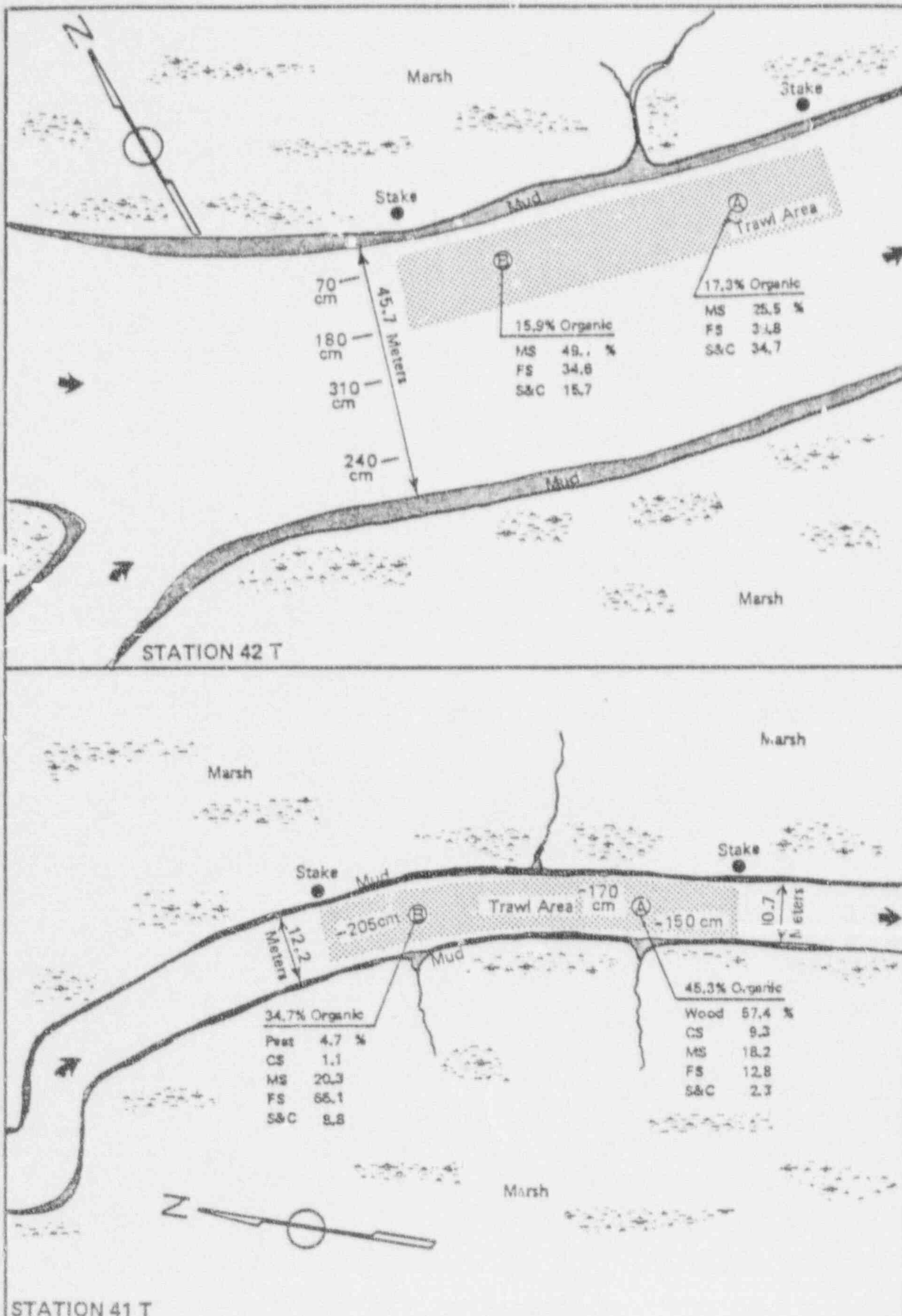


Figure 4.17 Alligator Creek stations 41 (trawl) and 42 (trawl)

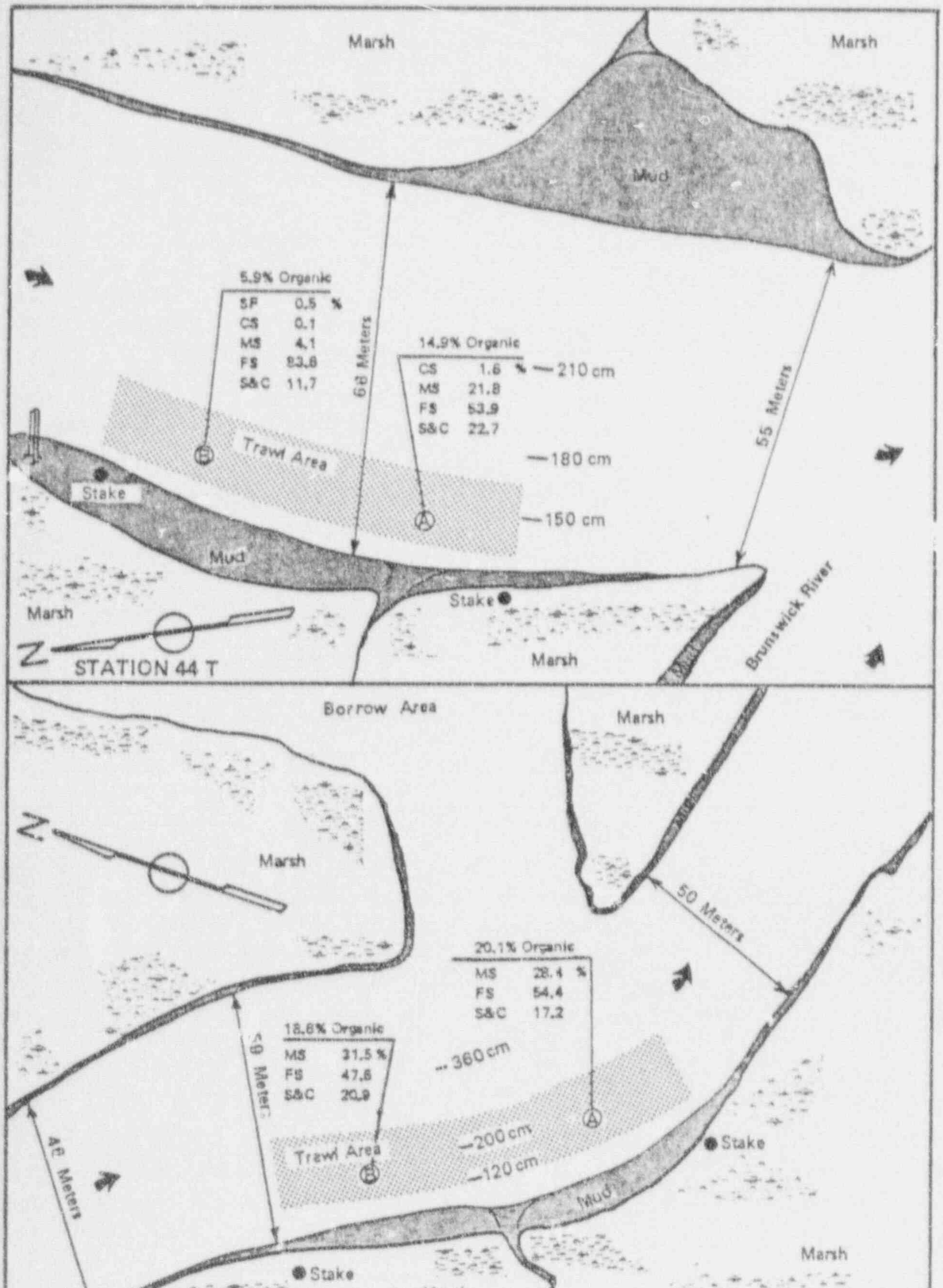


Figure 4.18 Alligator Creek stations 43 (trawl) and 44 (trawl)

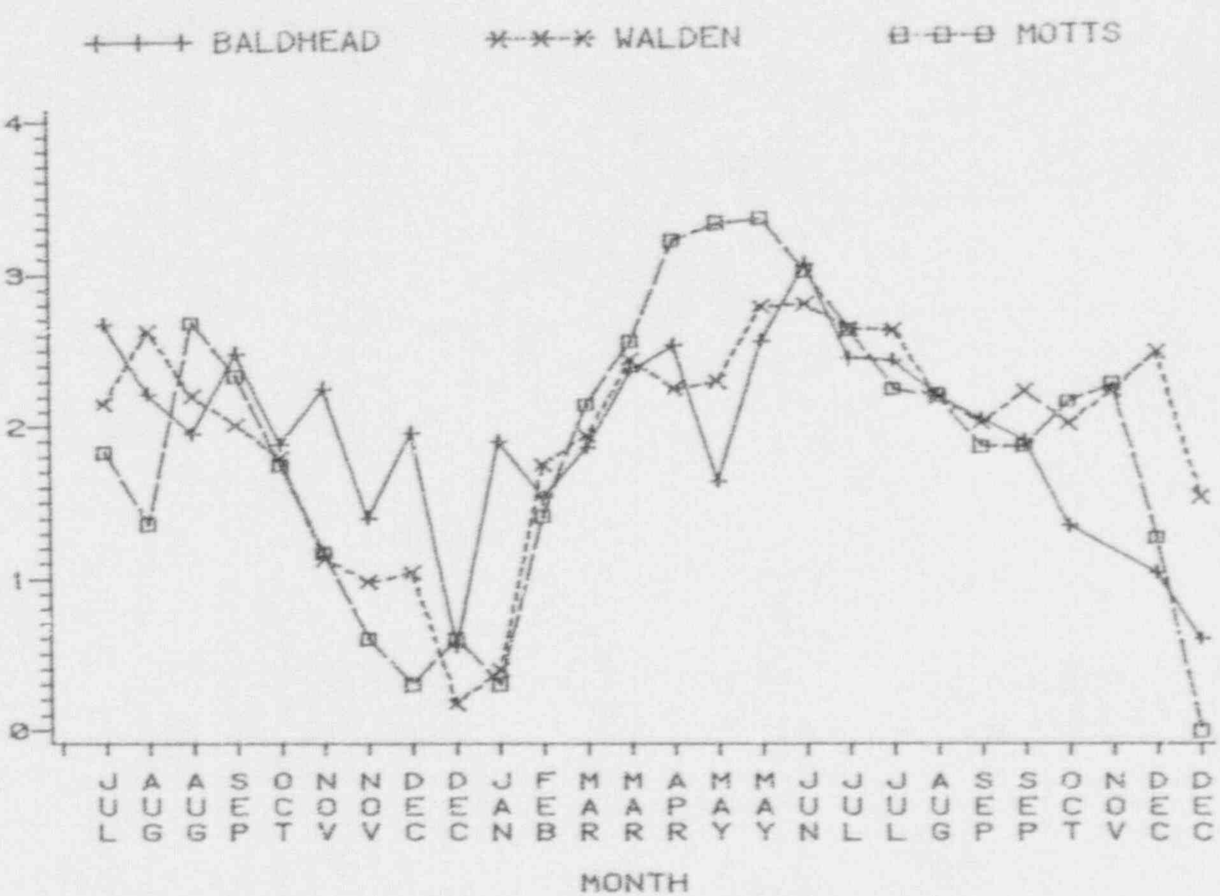


Figure 4.20 Average seine catch per unit effort (CPUE) of total organisms by creek for high marsh study July 1980 to December 1981

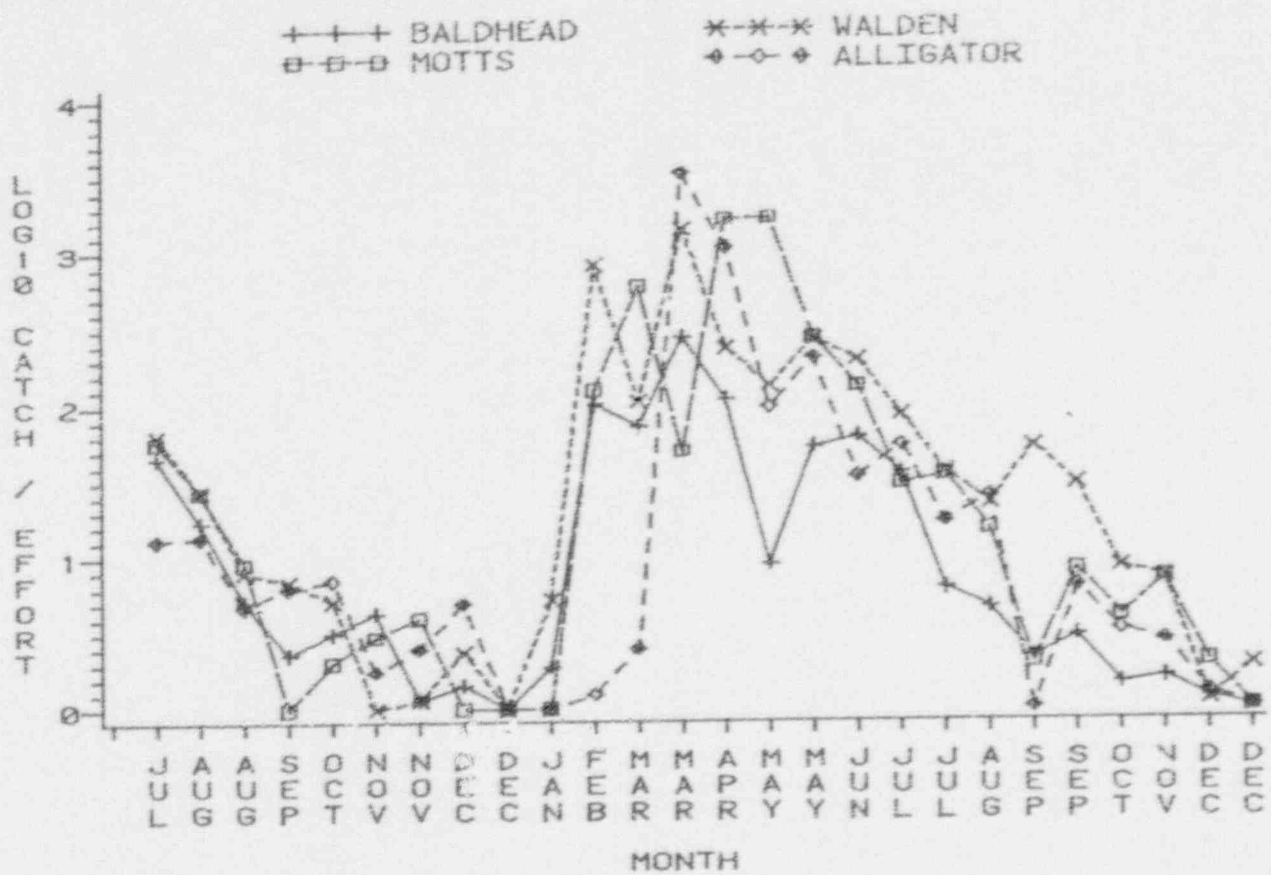


Figure 4.21 Average trawl catch per unit effort (CPUE) of spot by creek for high marsh study - July 1980 to December 1981

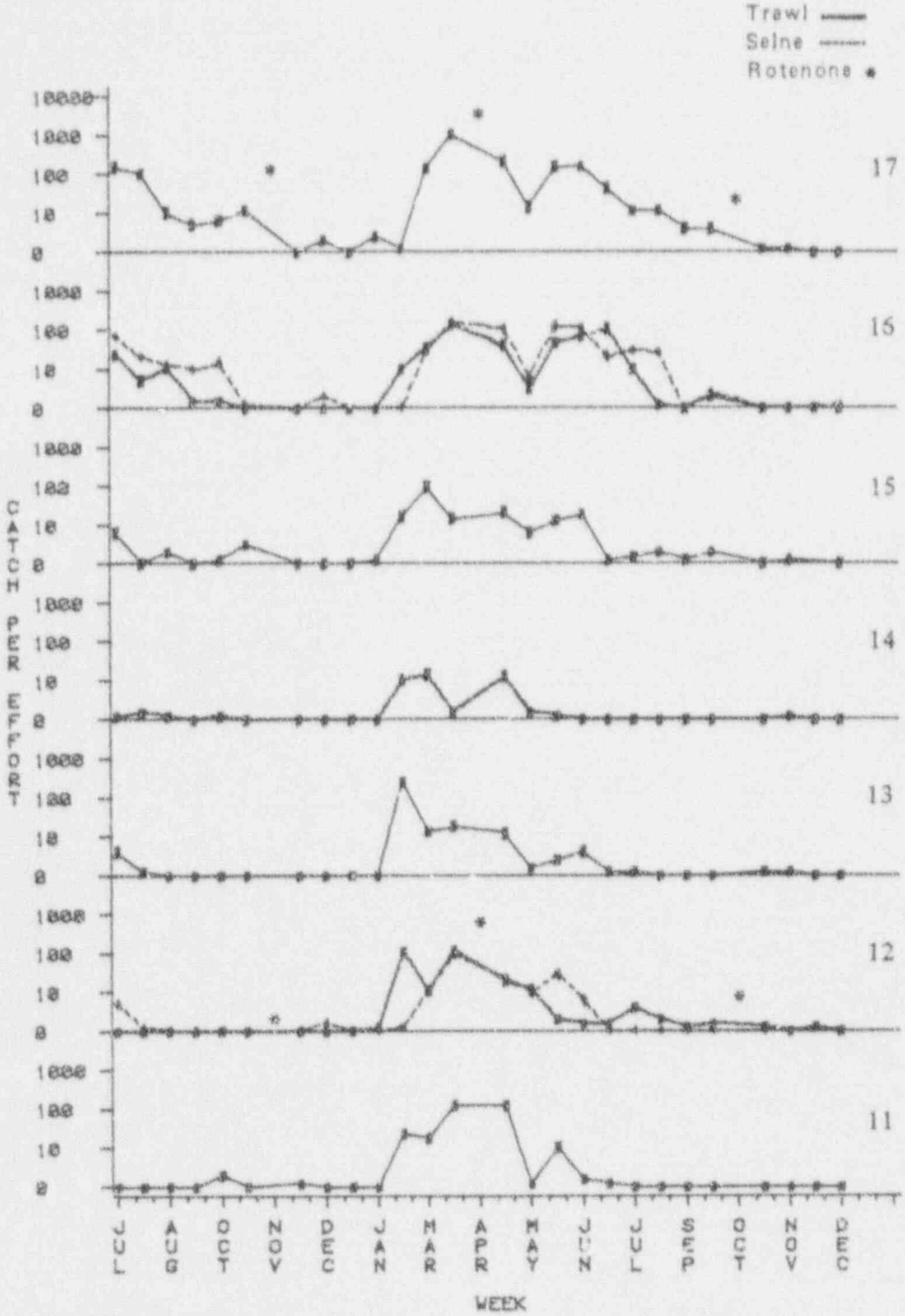


Figure 4.22 Catch per unit effort (CPUE) of spot by station in Baldhead Creek - July 1980 to December 1981

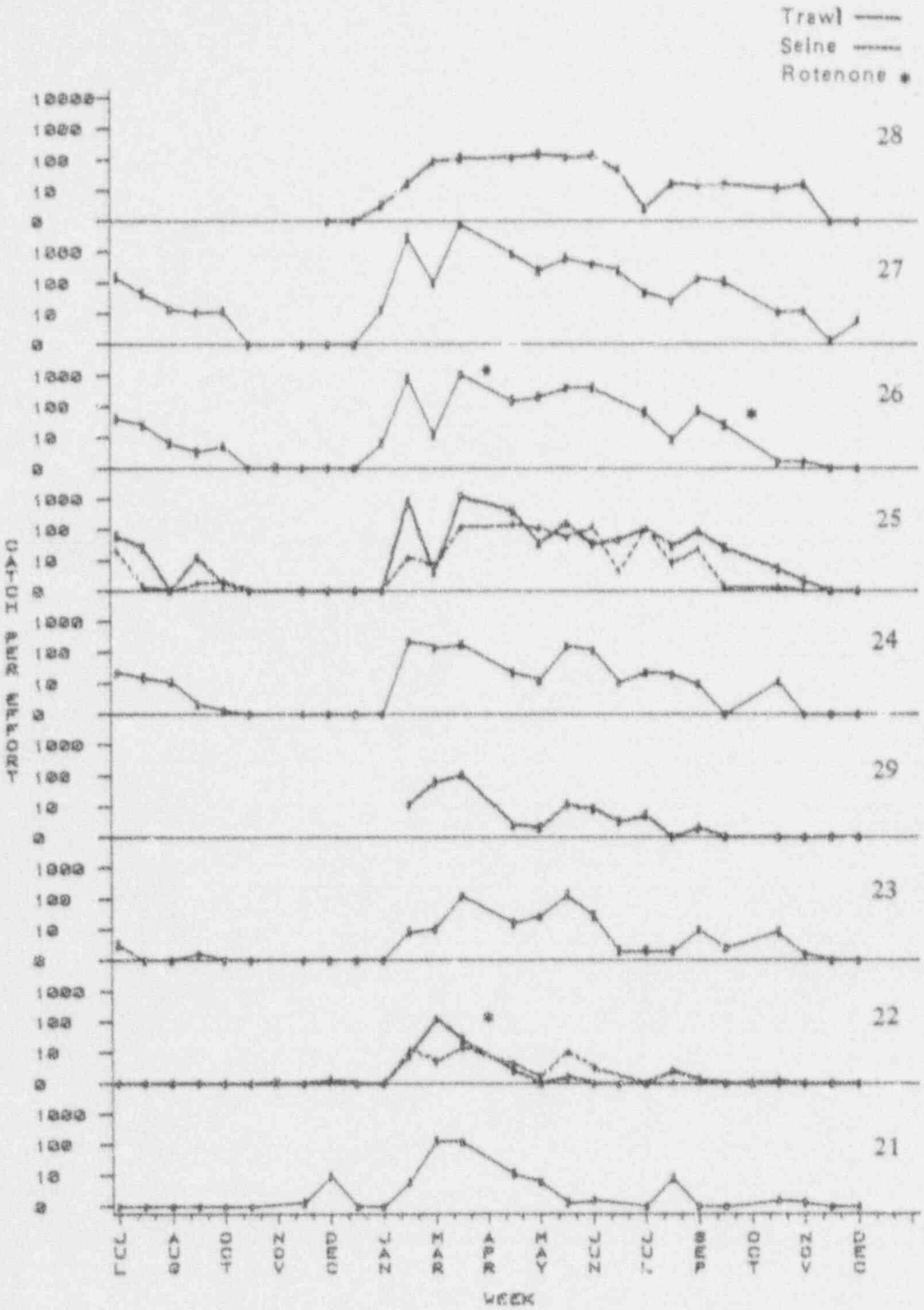


Figure 4.23 Catch per unit effort (CPUE) of spot by station in Walden Creek - July 1980 to December 1981

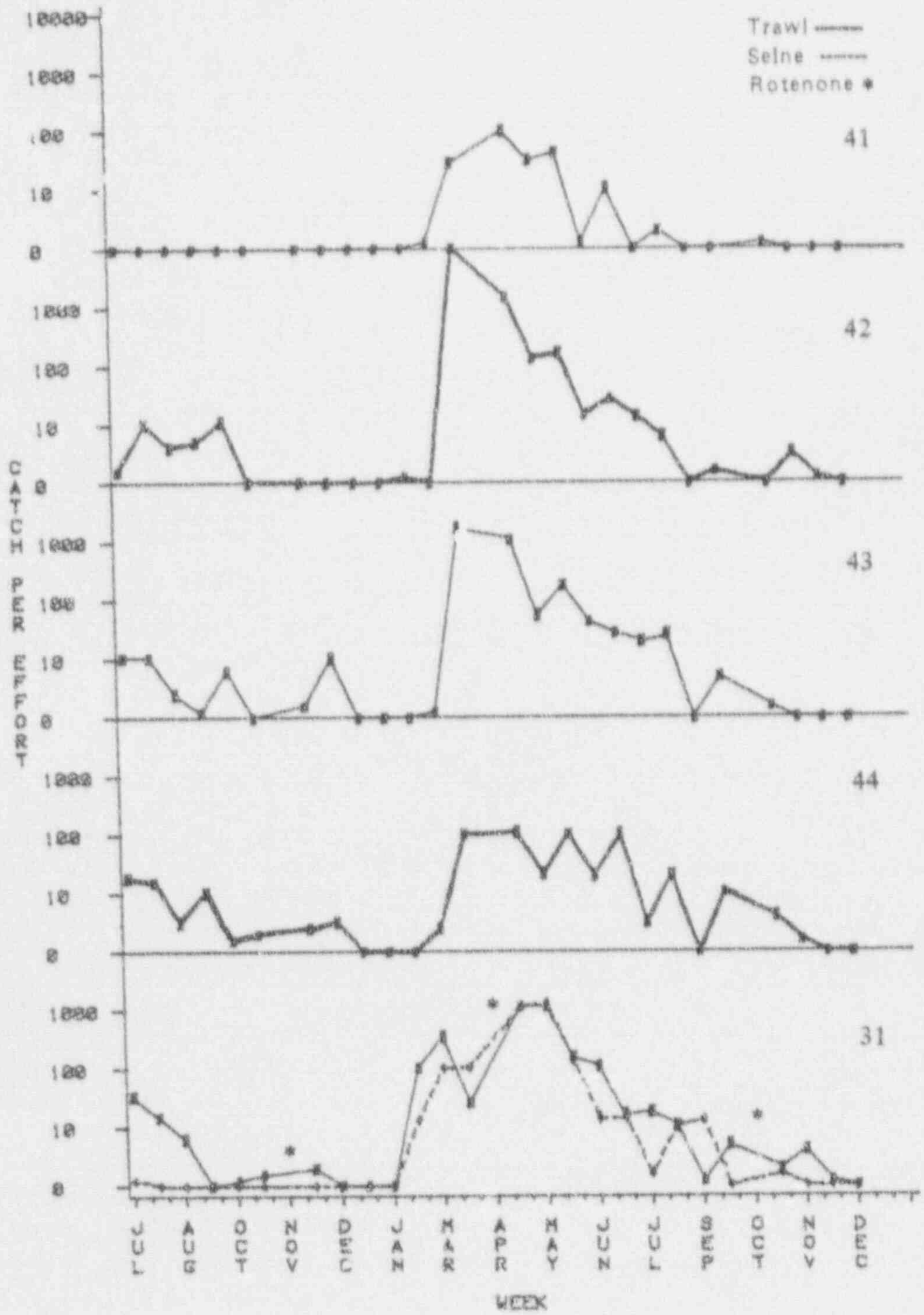


Figure 4.24 Catch per unit effort (CPUE) of spot by station in Mott's and Alligator Creeks - July 1980 to December 1981

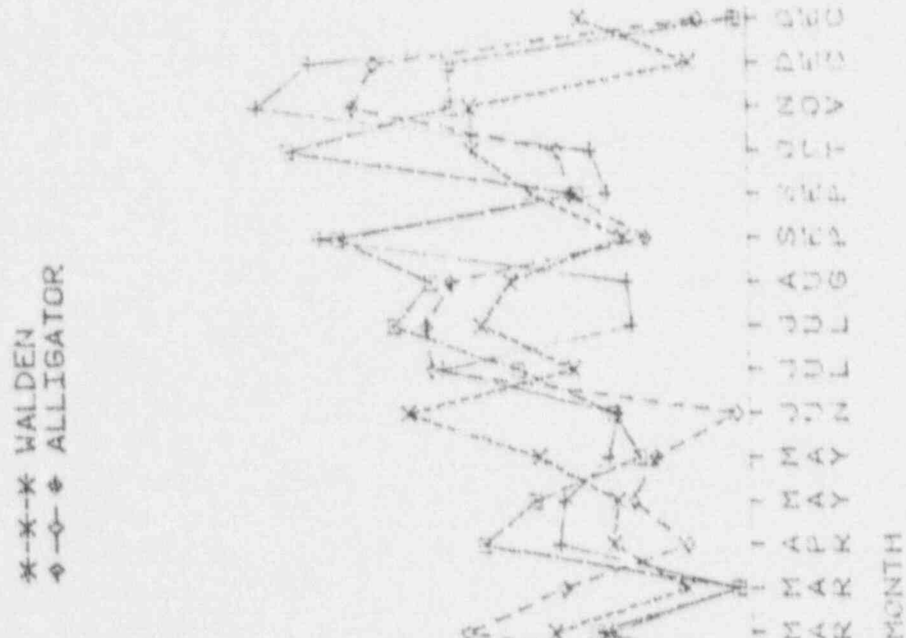


Figure 4.25 Average trawl catch per unit effort (CPUE) of bay anchovy by creek for high marsh study - July 1980 to December 1981

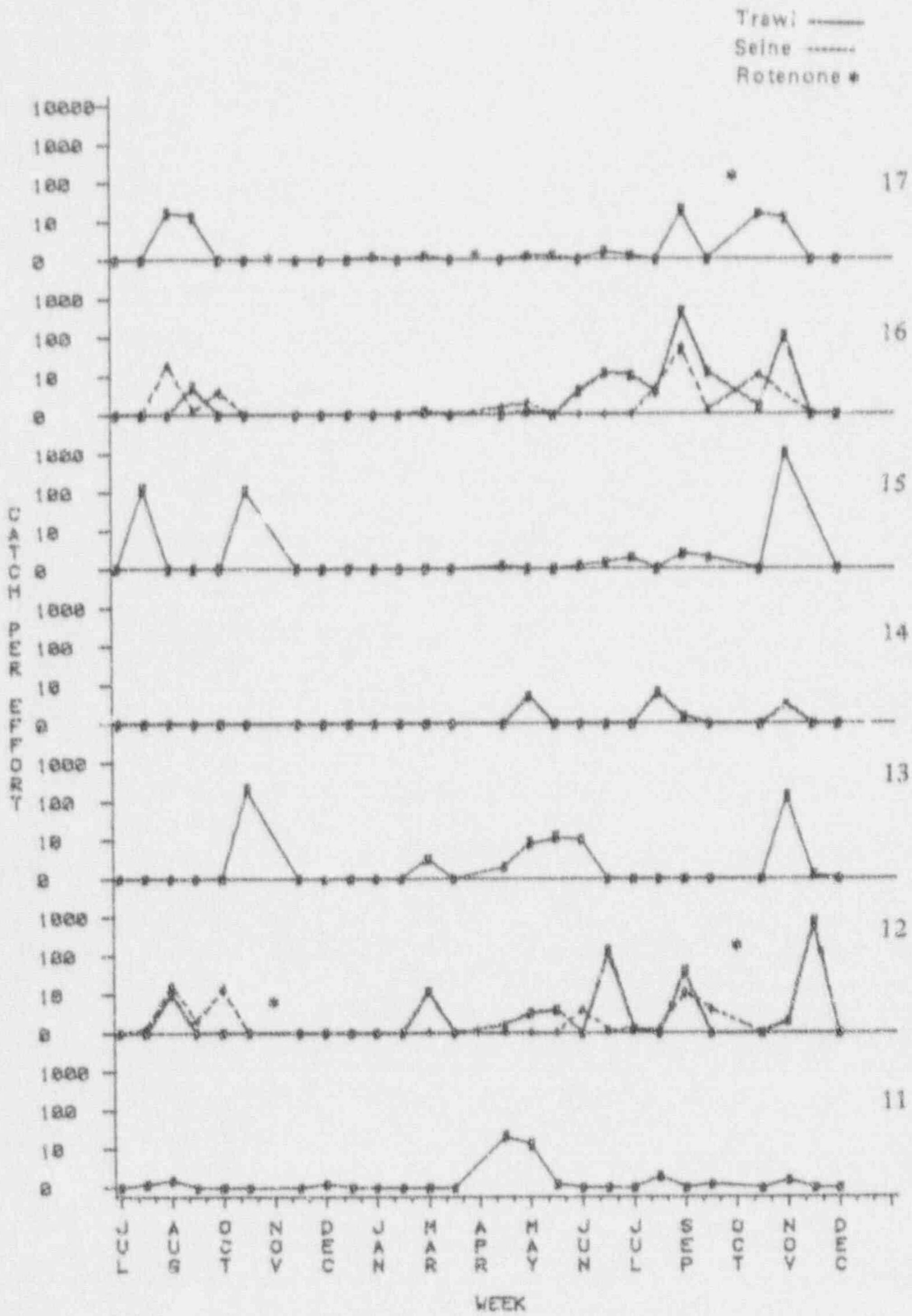


Figure 4.26 Catch per unit effort (CPUE) of bay anchovy by station in Baldhead Creek July 1980 to December 1981

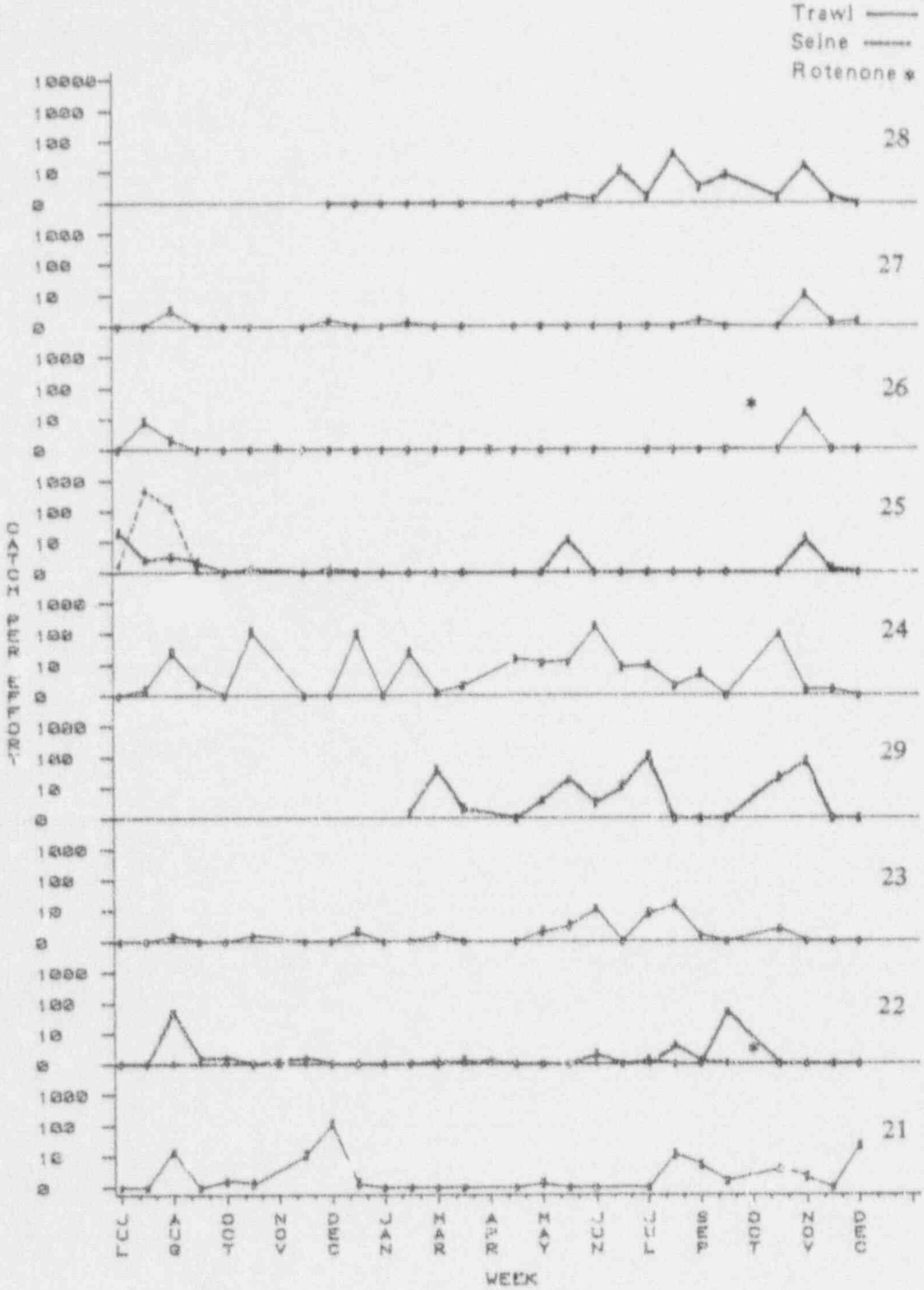


Figure 4.27 Catch per unit effort (CPUE) of bay anchovy by station in Walden Creek July 1980 to December 1981

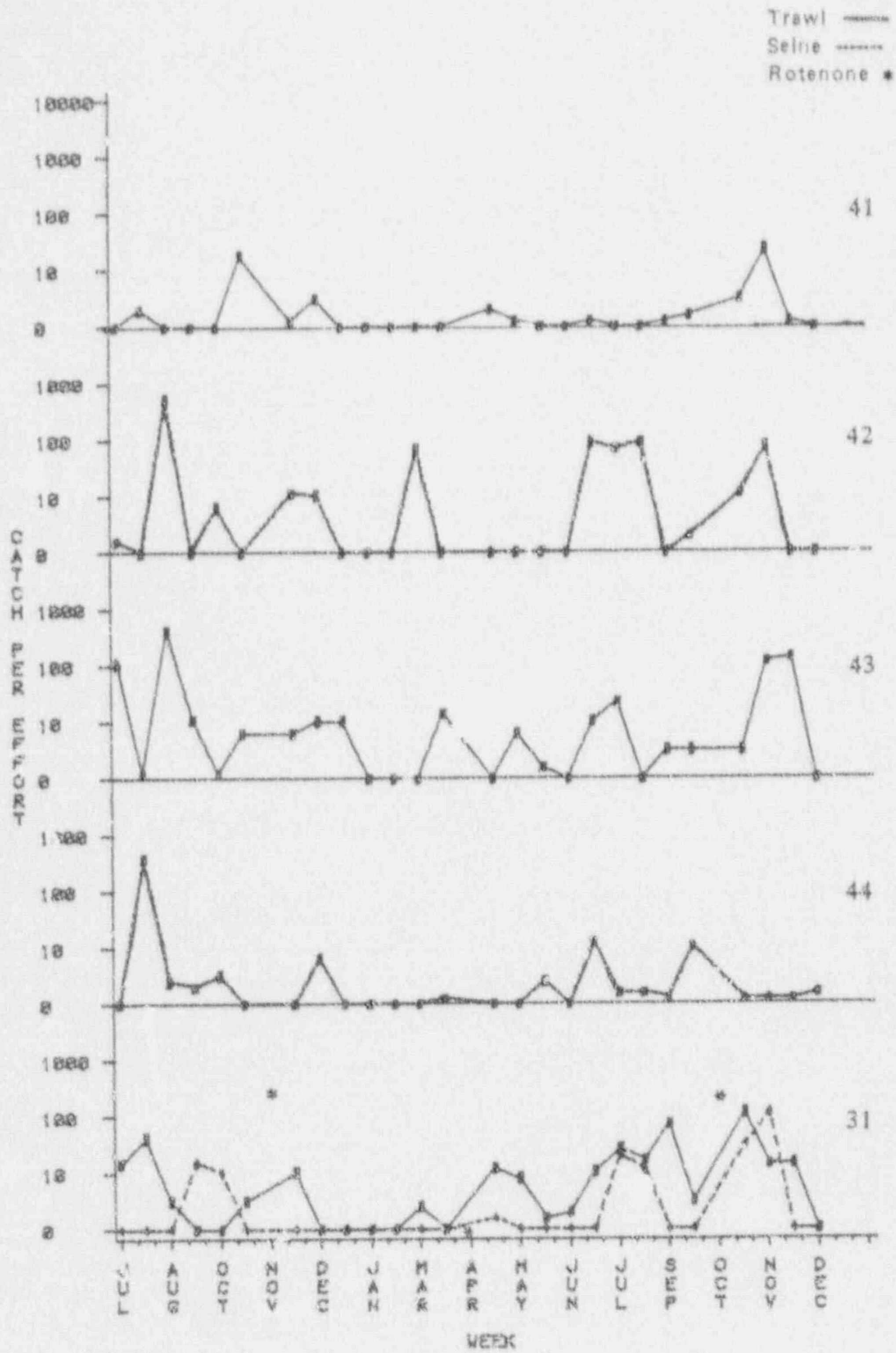


Figure 4.28 Catch per unit effort (CPUE) of bay anchovy by station in Mott's and Alligator Creeks - July 1980 to December 1981

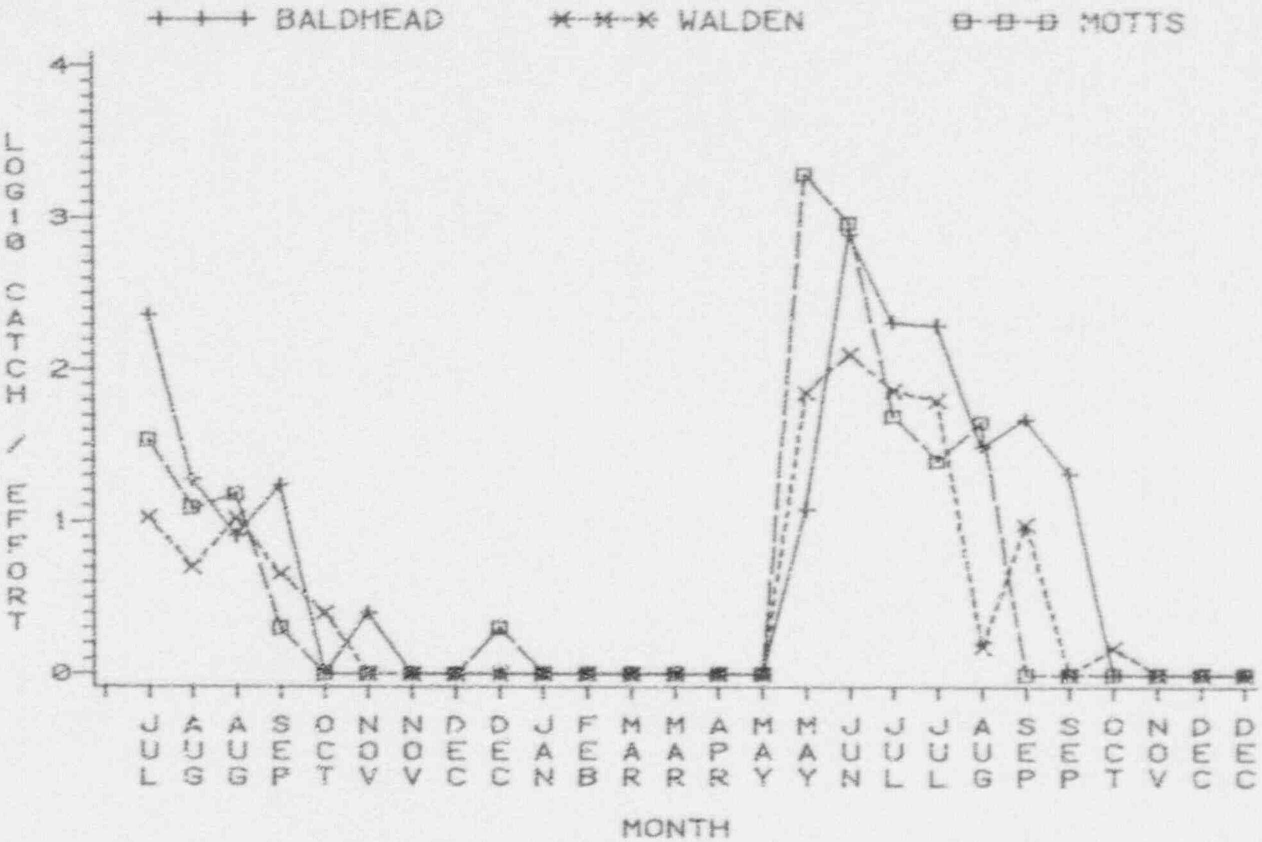


Figure 4.29 Average seine catch per unit effort (CPUE) of white mullet by creek for high marsh study - July 1980 to December 1981

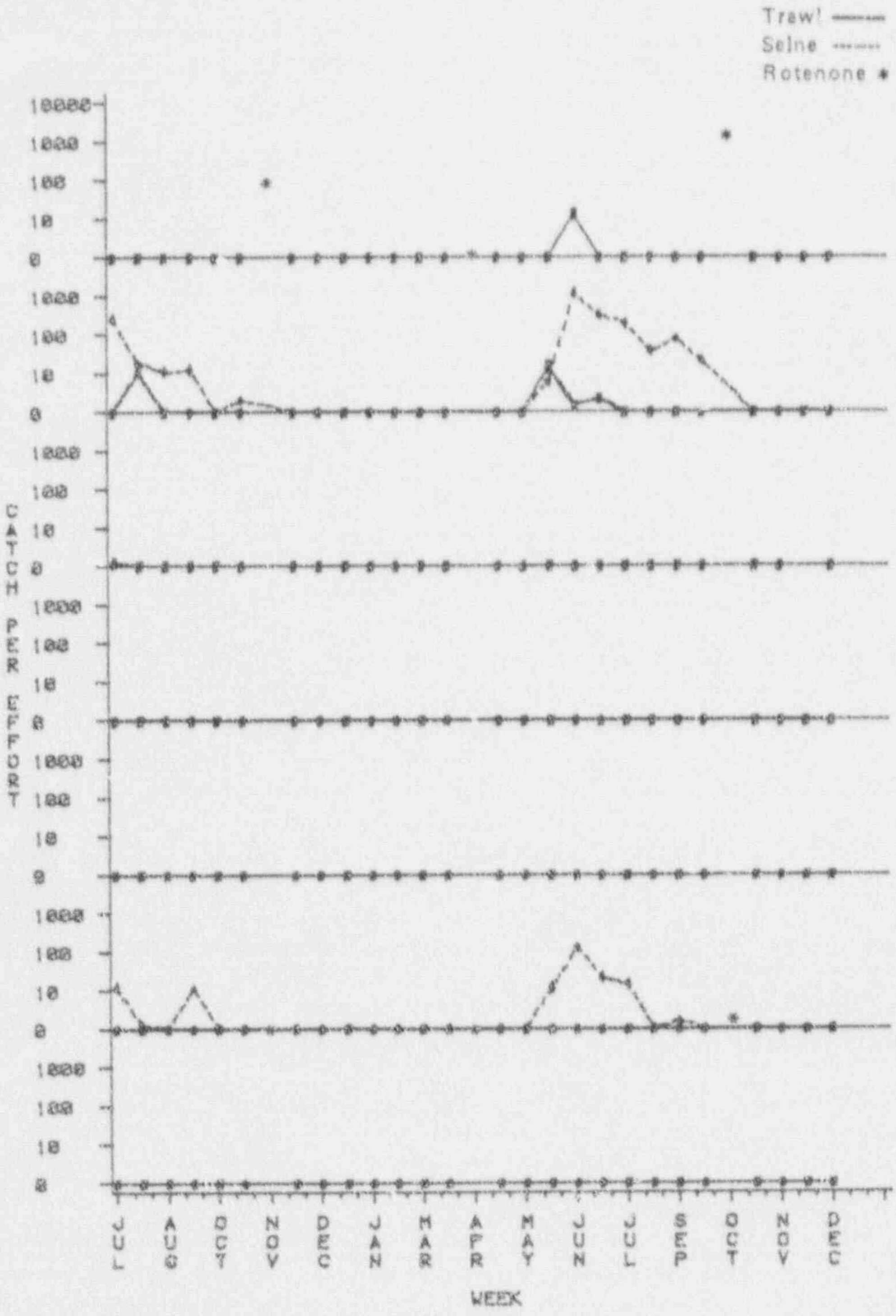


Figure 4.30 Catch per unit effort (CPUE) of white mullet by station in Baldhead Creek - July 1980 to December 1981

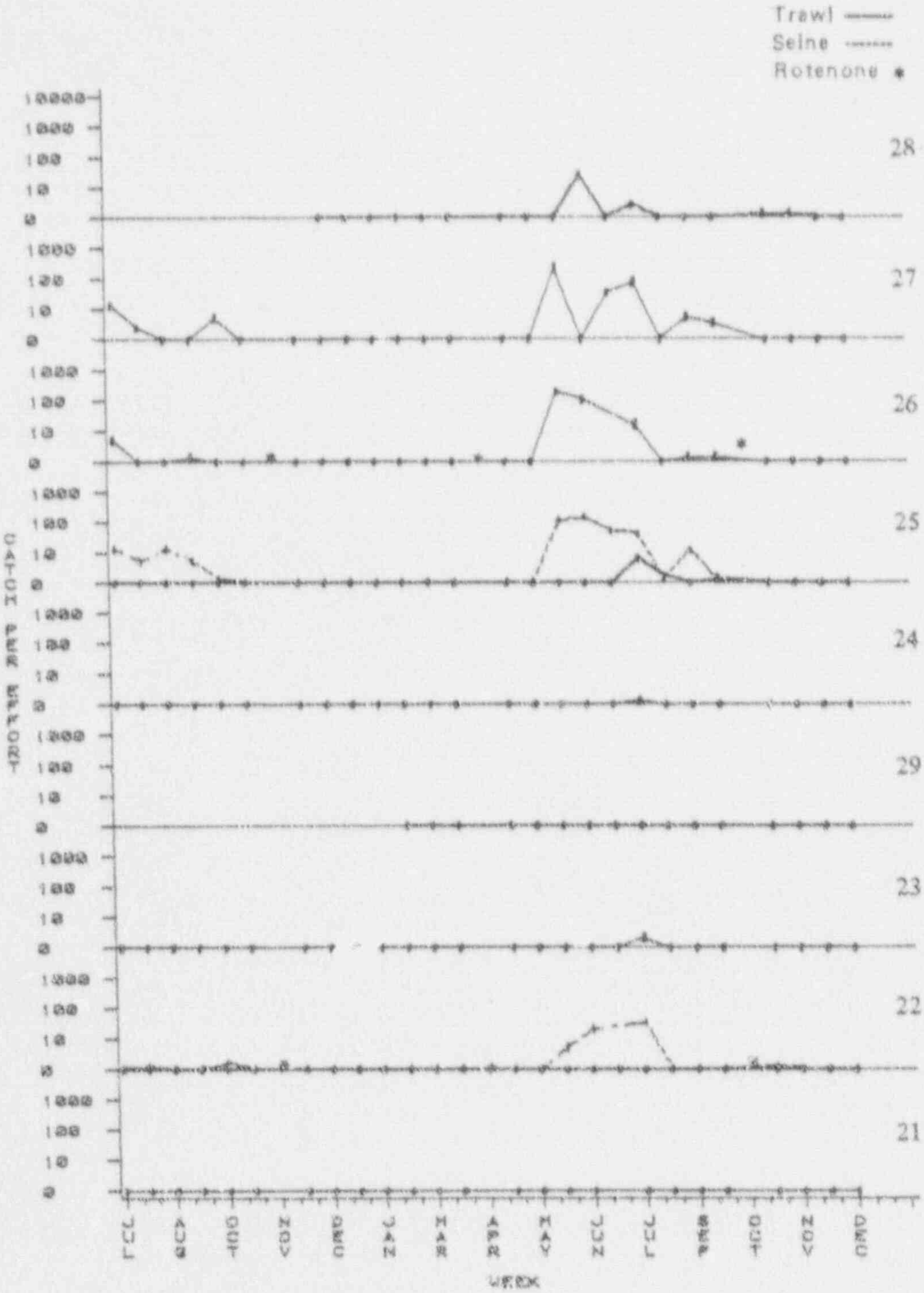


Figure 4.31 Catch per unit effort (CPUE) of white mullet by station in Walden Creek July 1980 to December 1981

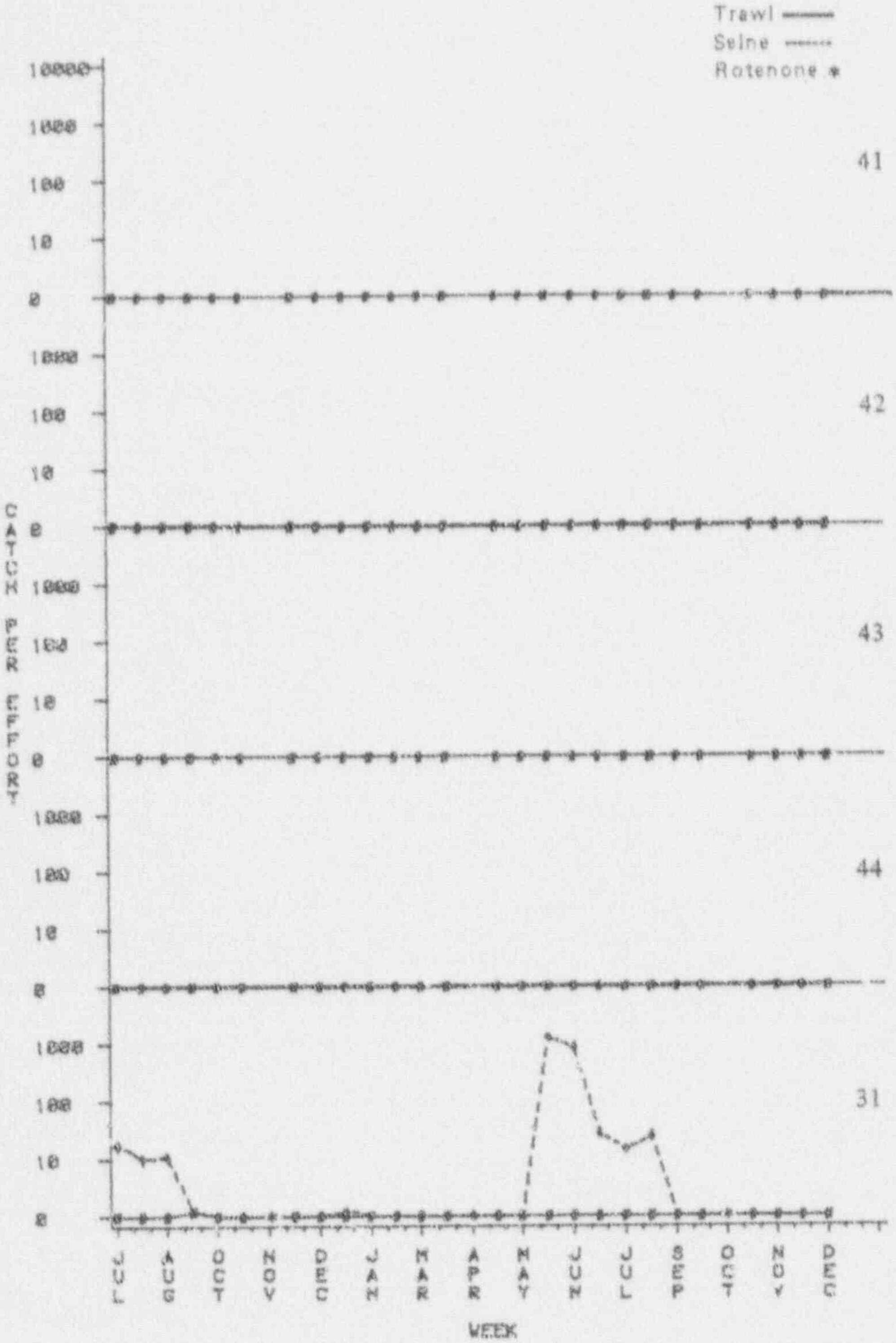


Figure 4.32 Catch per unit effort (CPUE) of white mullet by station in Mott's and Alligator Creeks - July 1980 to December 1981

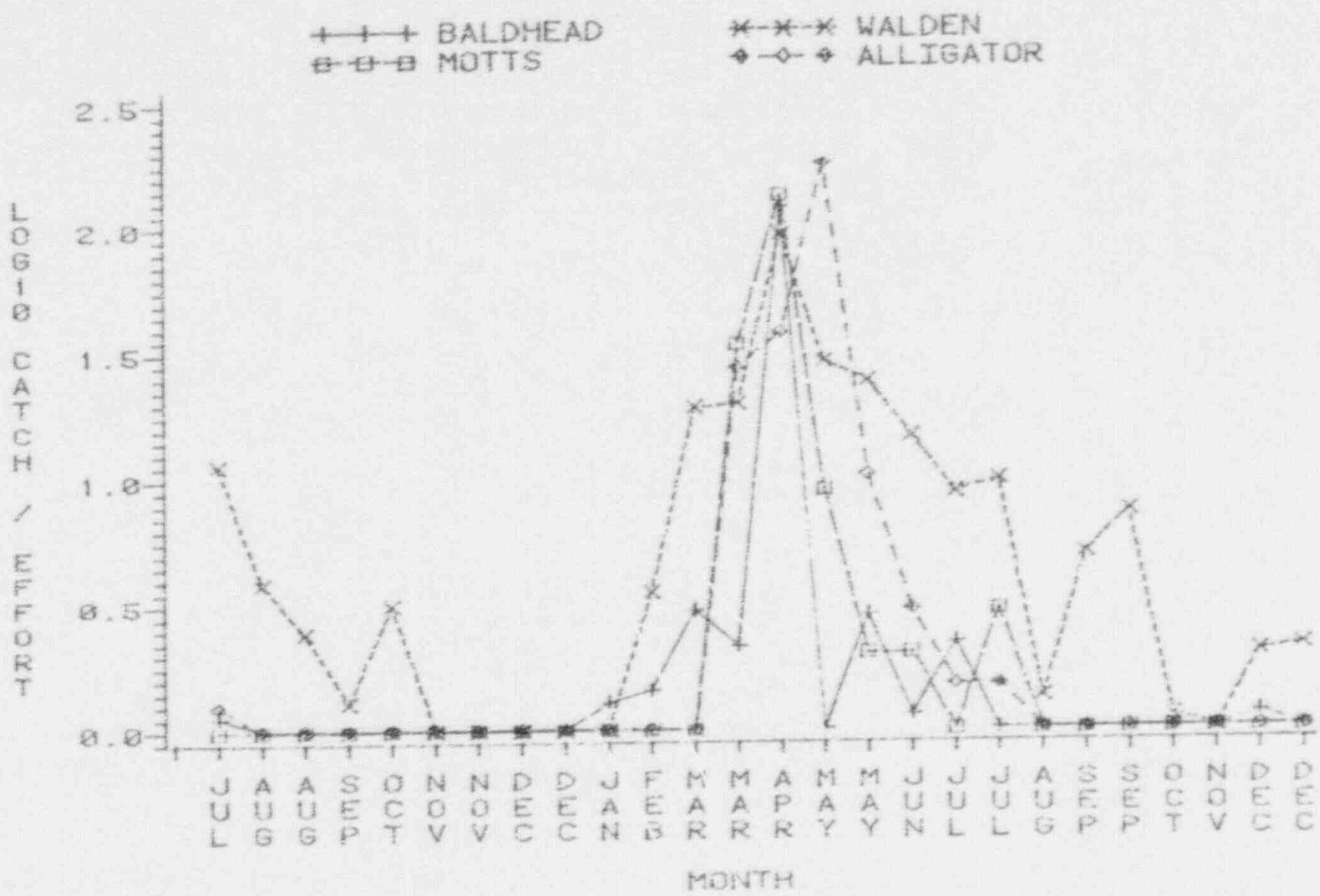


Figure 4.33 Average trawl catch per unit effort (CPUE) of Atlantic menhaden by creek for high marsh study - July 1980 to December 1981

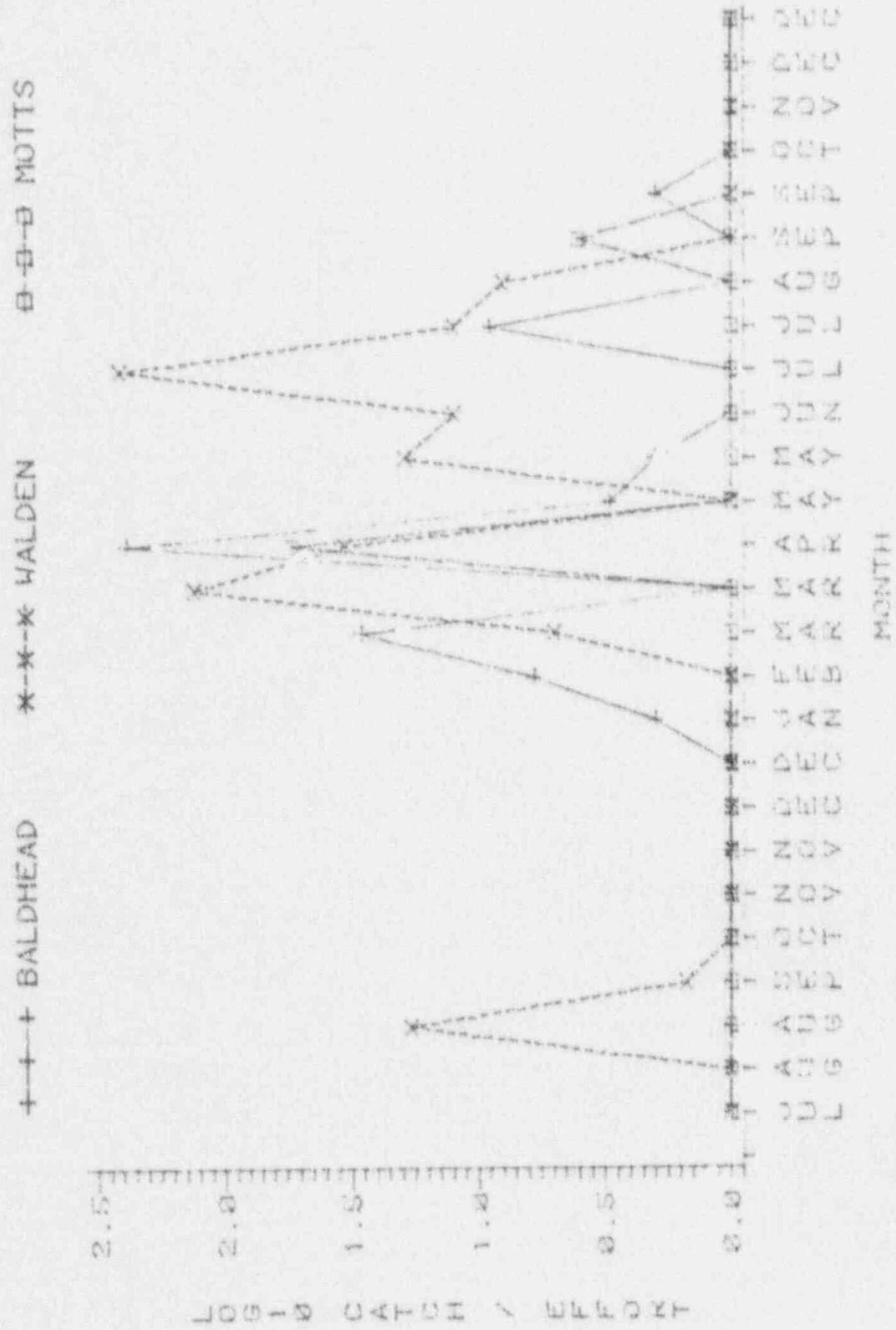


Figure 4.34 Average seine catch per unit effort (CPUE) of Atlantic menhaden by creek for high marsh study - July 1980 to December 1981

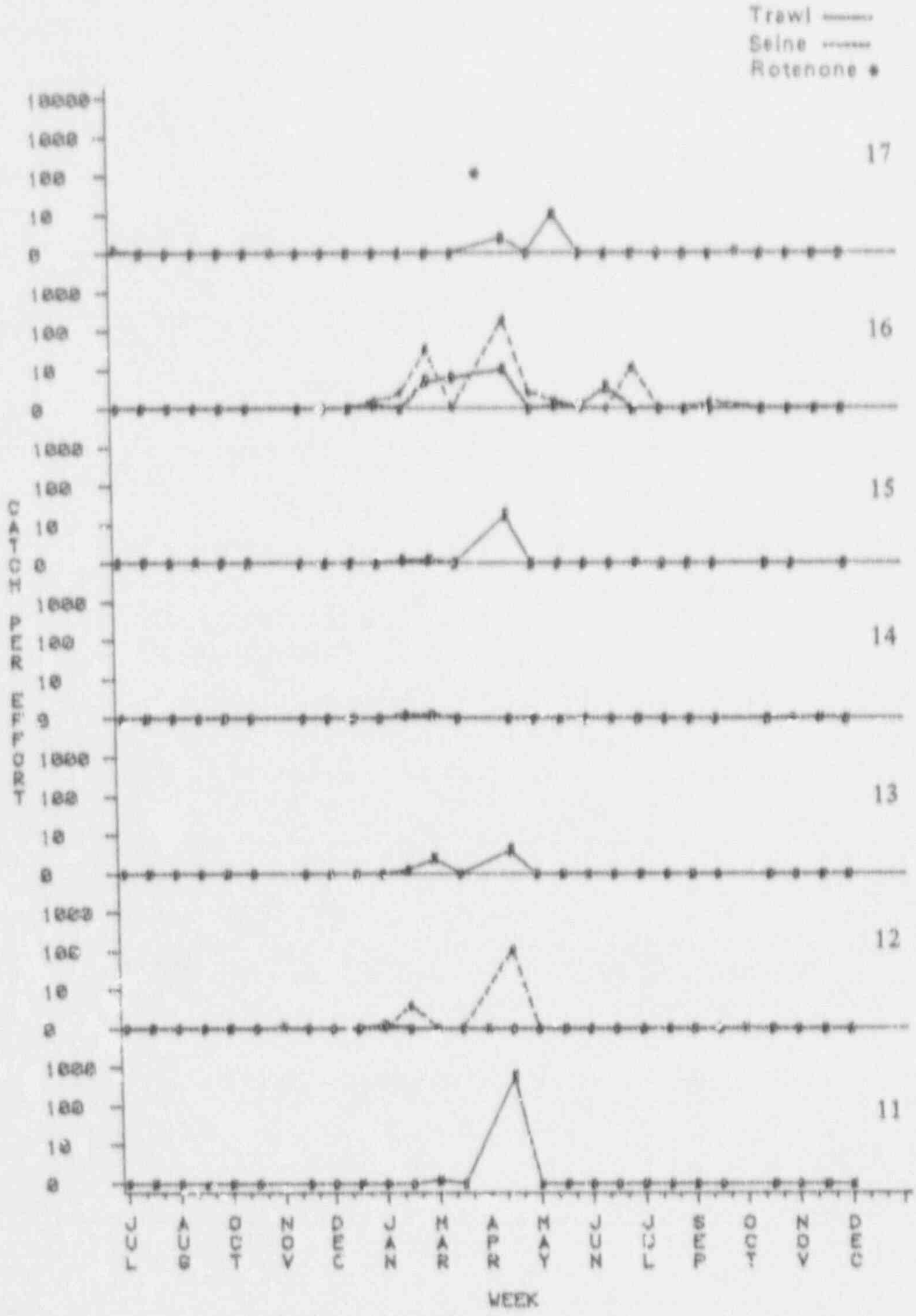


Figure 4.35 Catch per unit effort (CPUE) of Atlantic menhaden by station for Baldhead Creek - July 1980 to December 1981

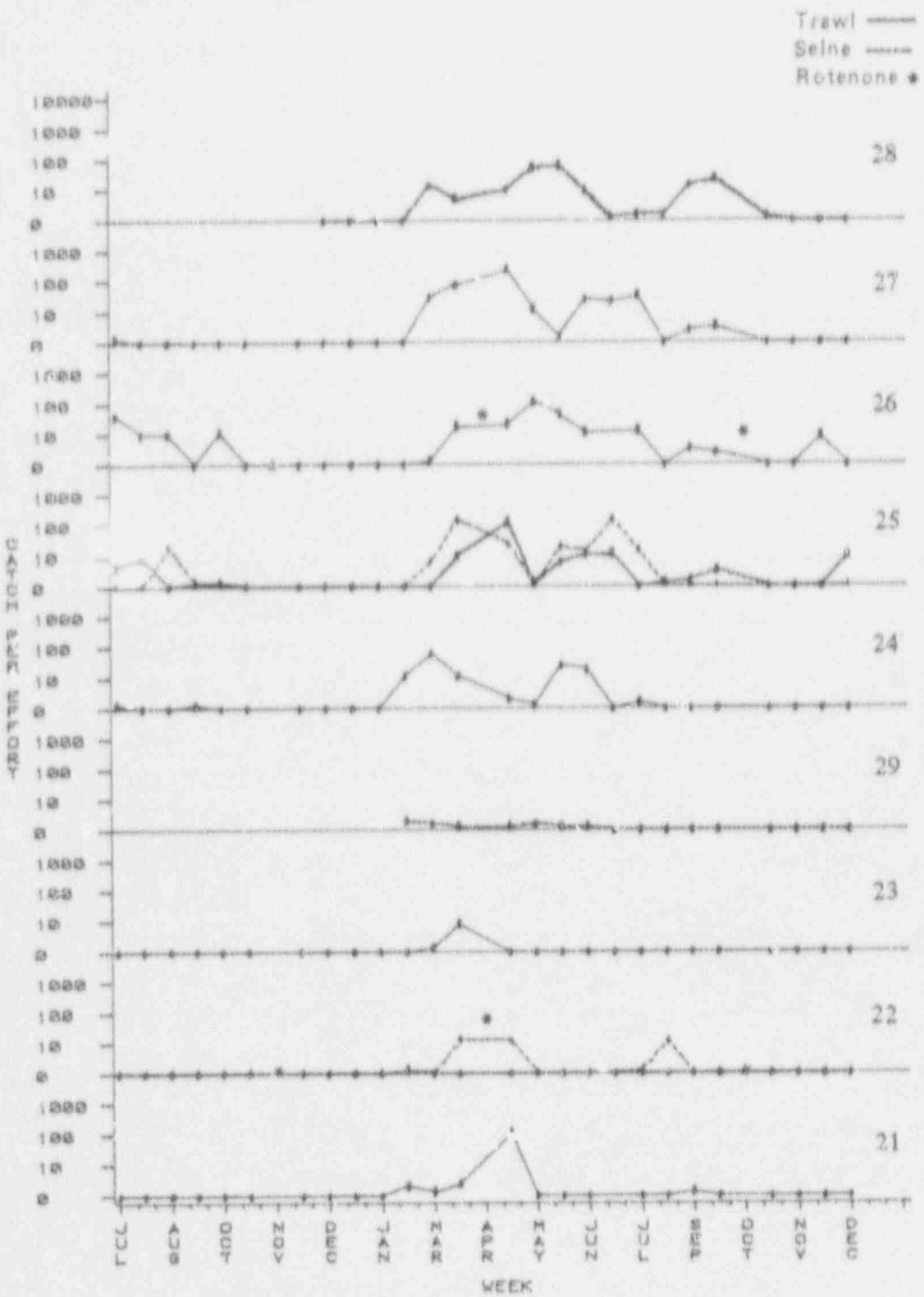


Figure 4.36 Catch per unit effort (CPUE) of Atlantic menhaden by station for Walden Creek - July 1980 to December 1981

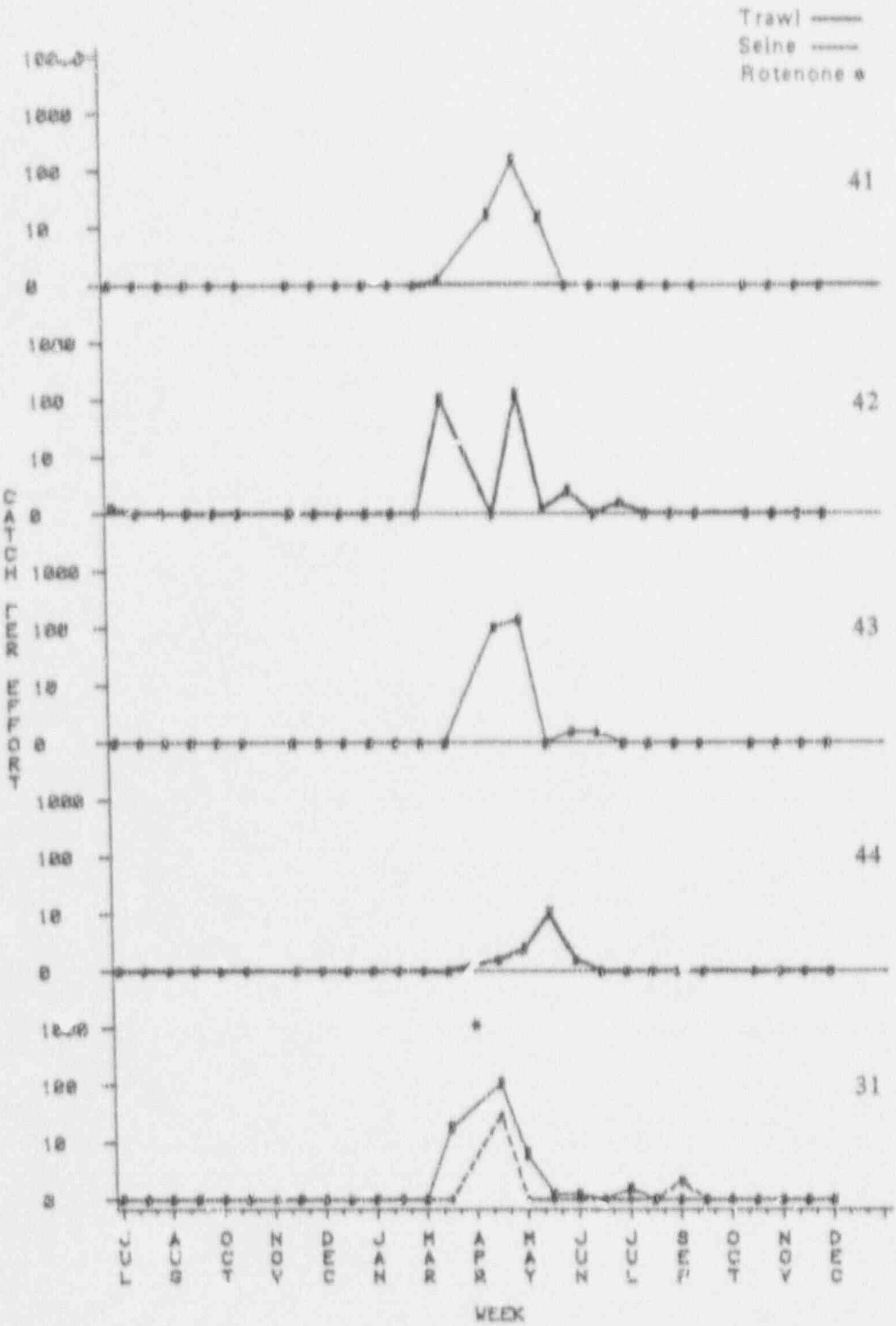


Figure 4.37 Catch per unit effort (CPUE) of Atlantic menhaden by station for Mott's and Alligator Creeks - July 1980 to December 1981

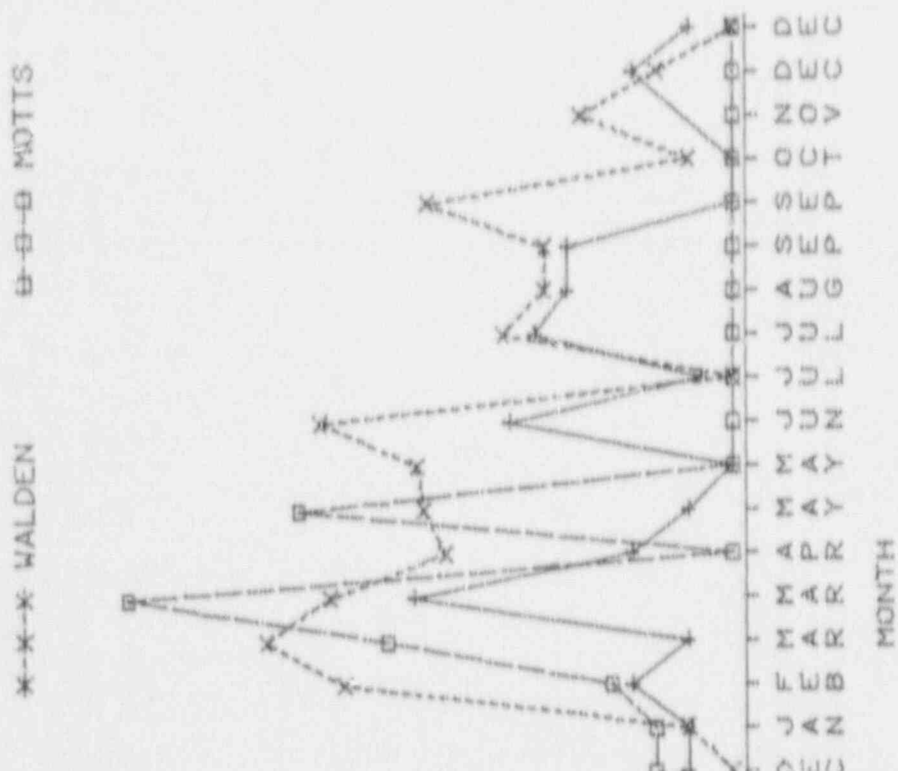


Figure 4.38 Average seine catch per unit effort (CPUE) of striped mullet by creek for high marsh study - July 1980 to December 1981

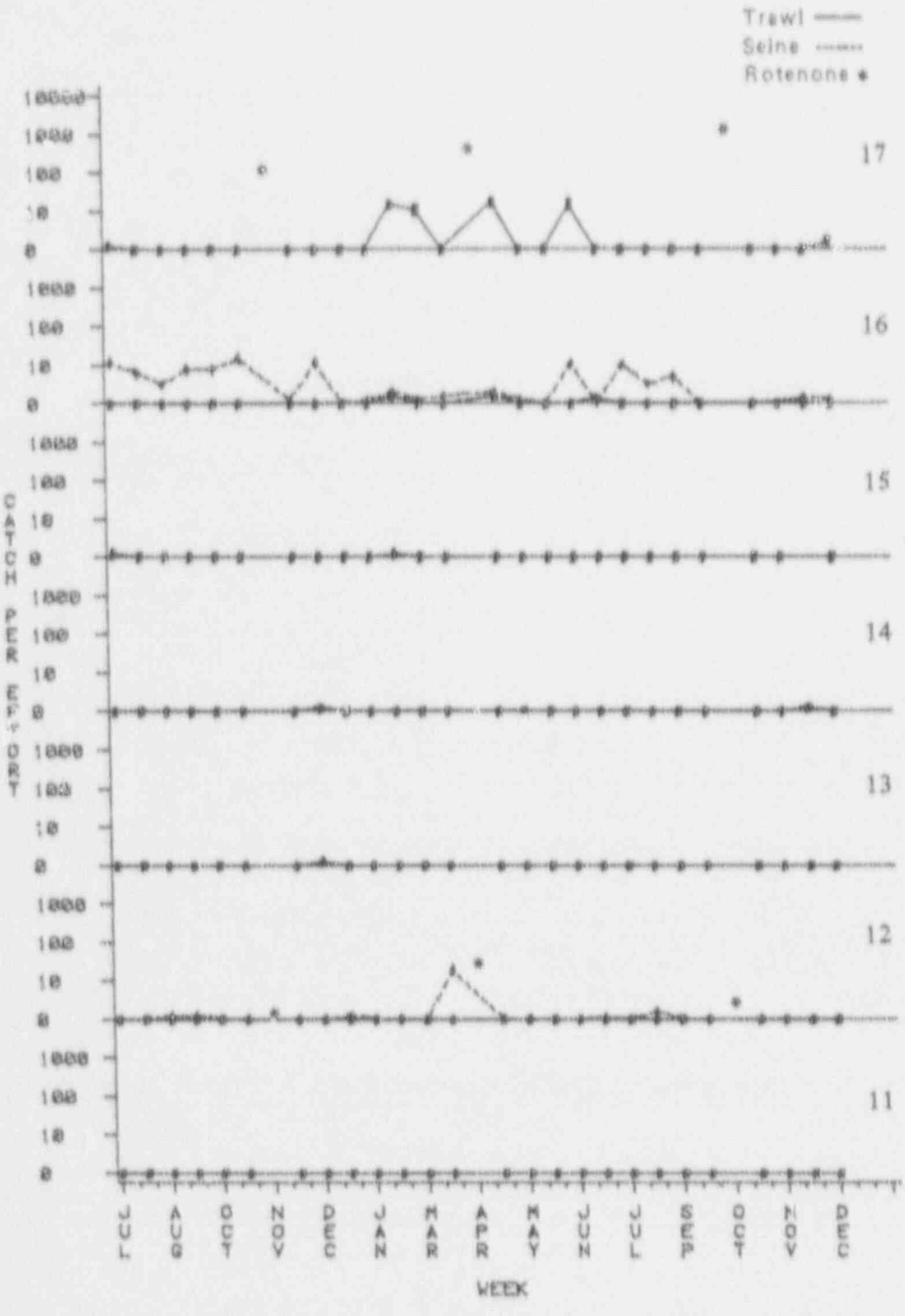


Figure 4.39 Catch per unit effort (CPUE) of striped mullet by station for Baldhead Creek - July 1980 to December 1981

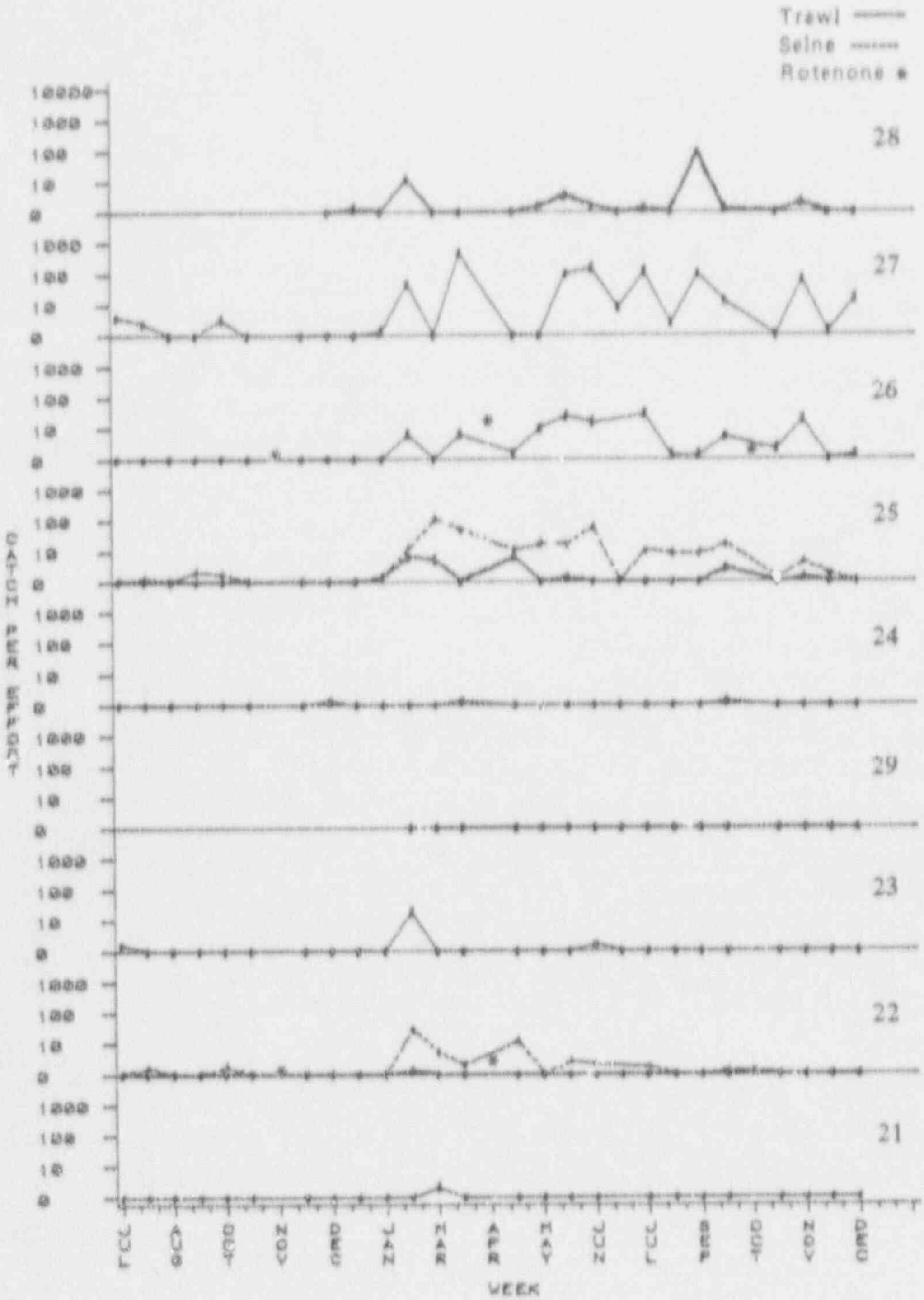


Figure 4.40 Catch per unit effort (CPUE) of striped mullet by station for Walden Creek - July 1980 to December 1981

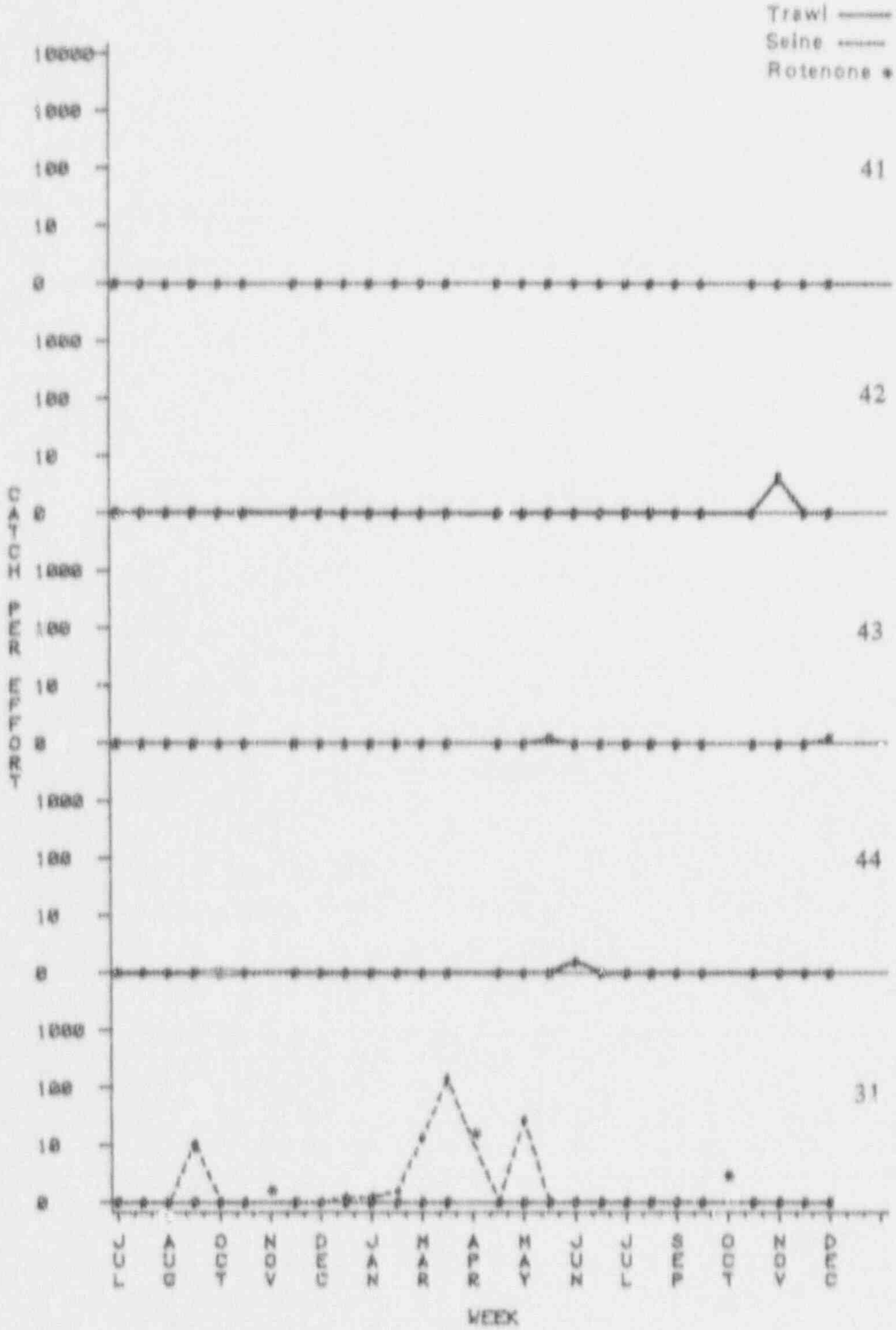


Figure 4.41 Catch per unit effort (CPUE) of striped mullet by station for Mott's and Alligator Creeks - July 1980 to December 1981

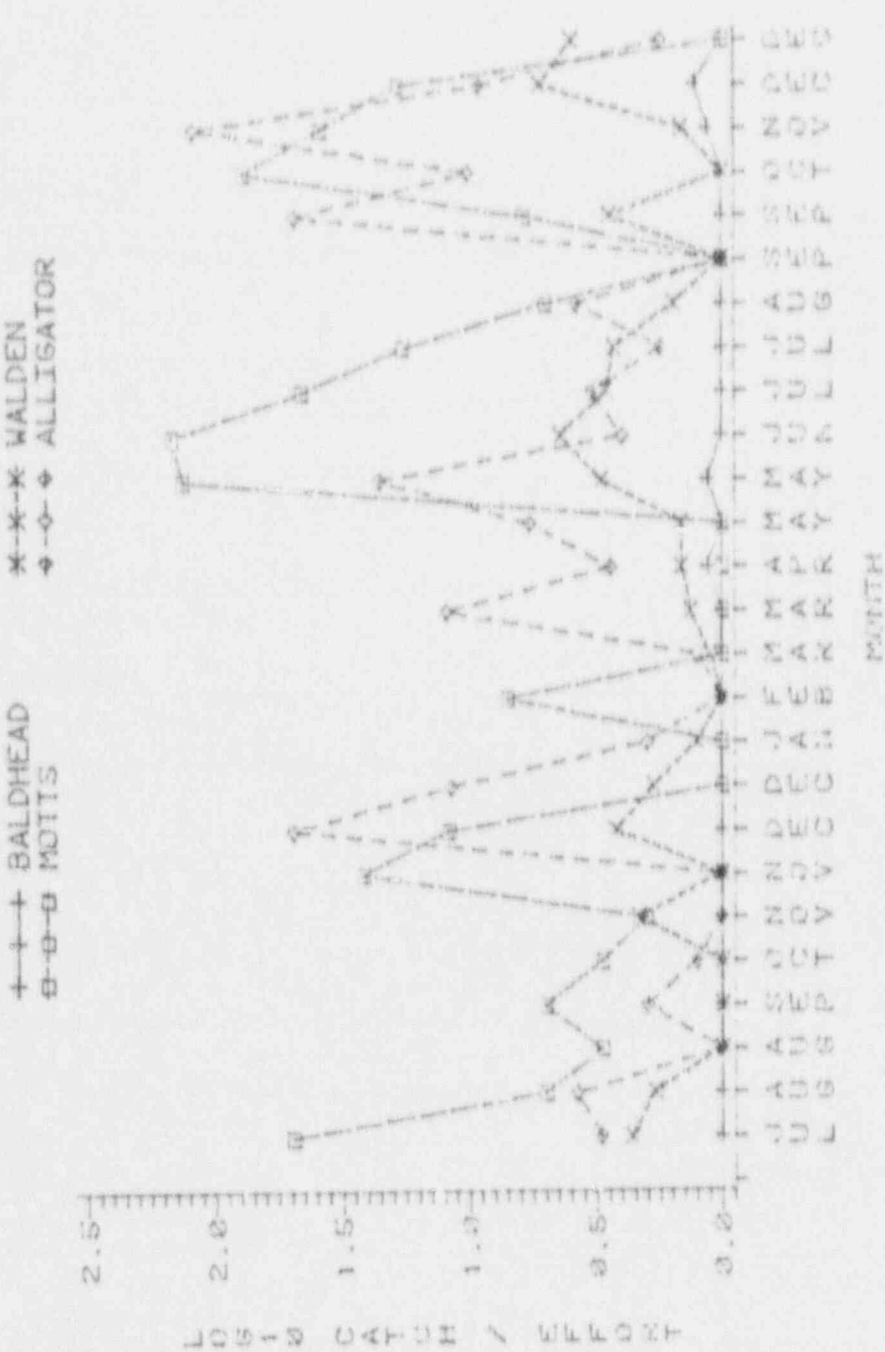


Figure 4.42 Average trawl catch per unit effort (CPUE) of croaker by creek for high marsh study - July 1980 to December 1981

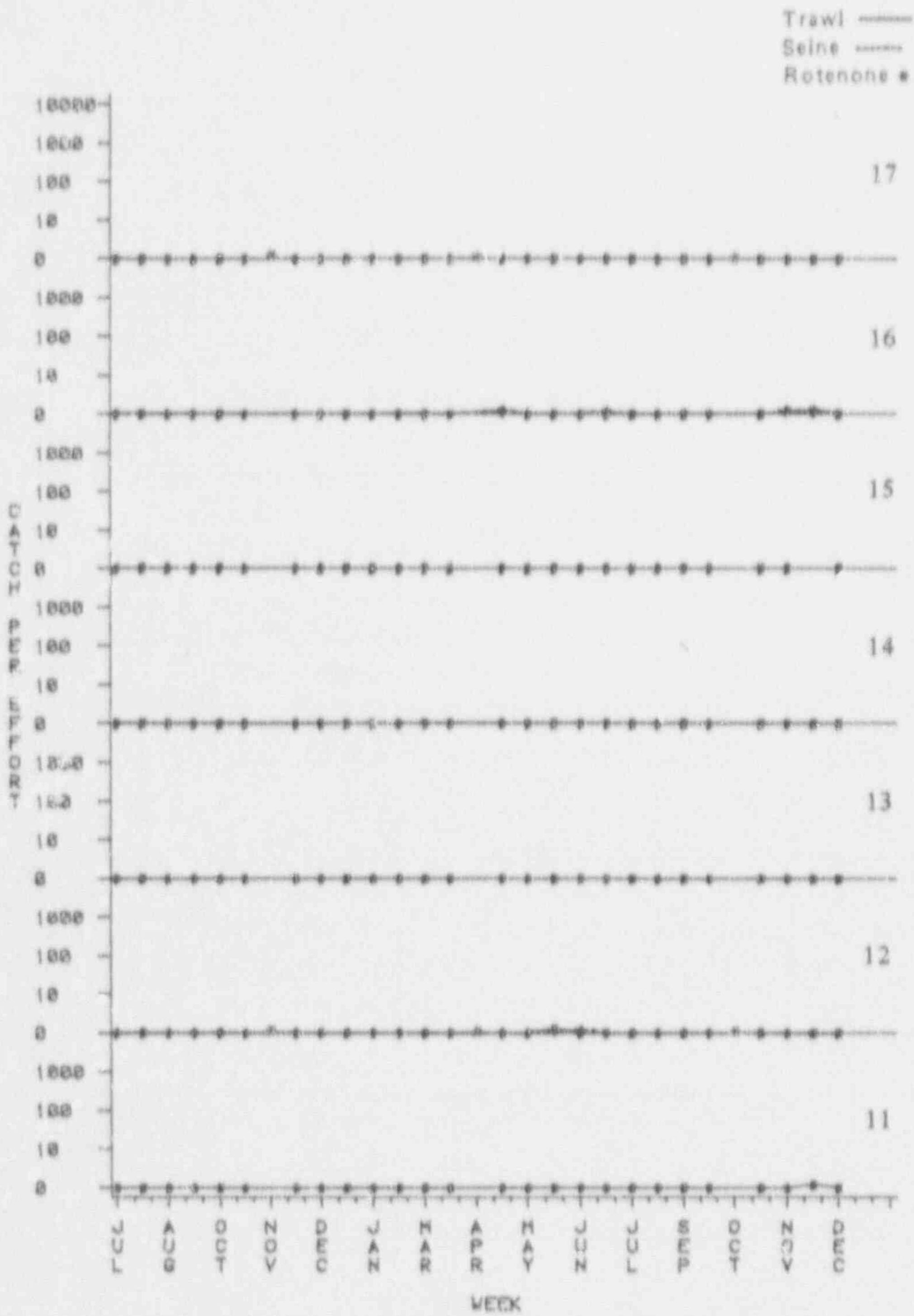


Figure 4.43 Catch per unit effort (CPUE) of croaker by station for Baldhead Creek July 1980 to December 1981

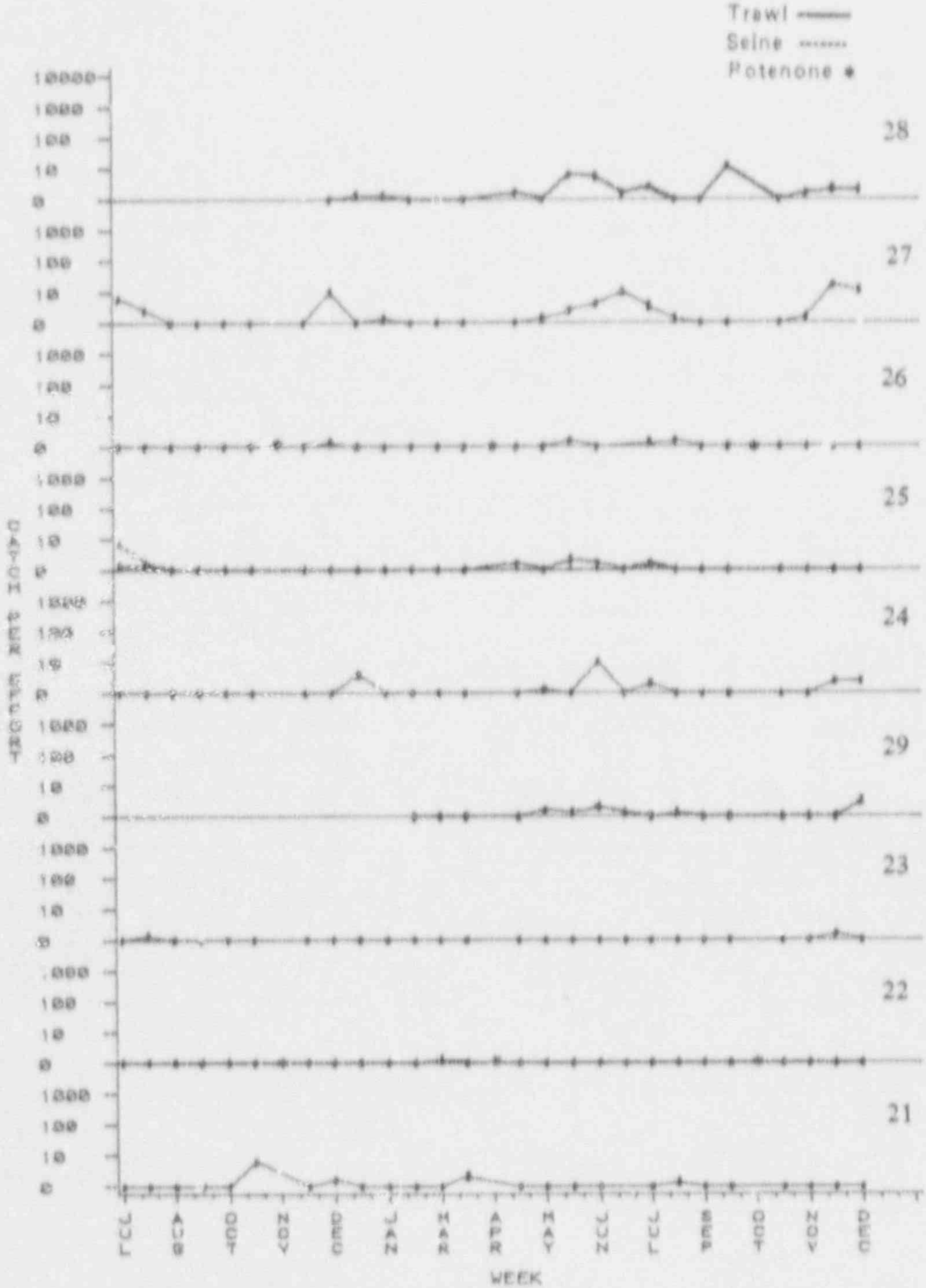


Figure 4.44 Catch per unit effort (CPUE) of Atlantic croaker by station in Walden Creek - July 1980 to December 1981

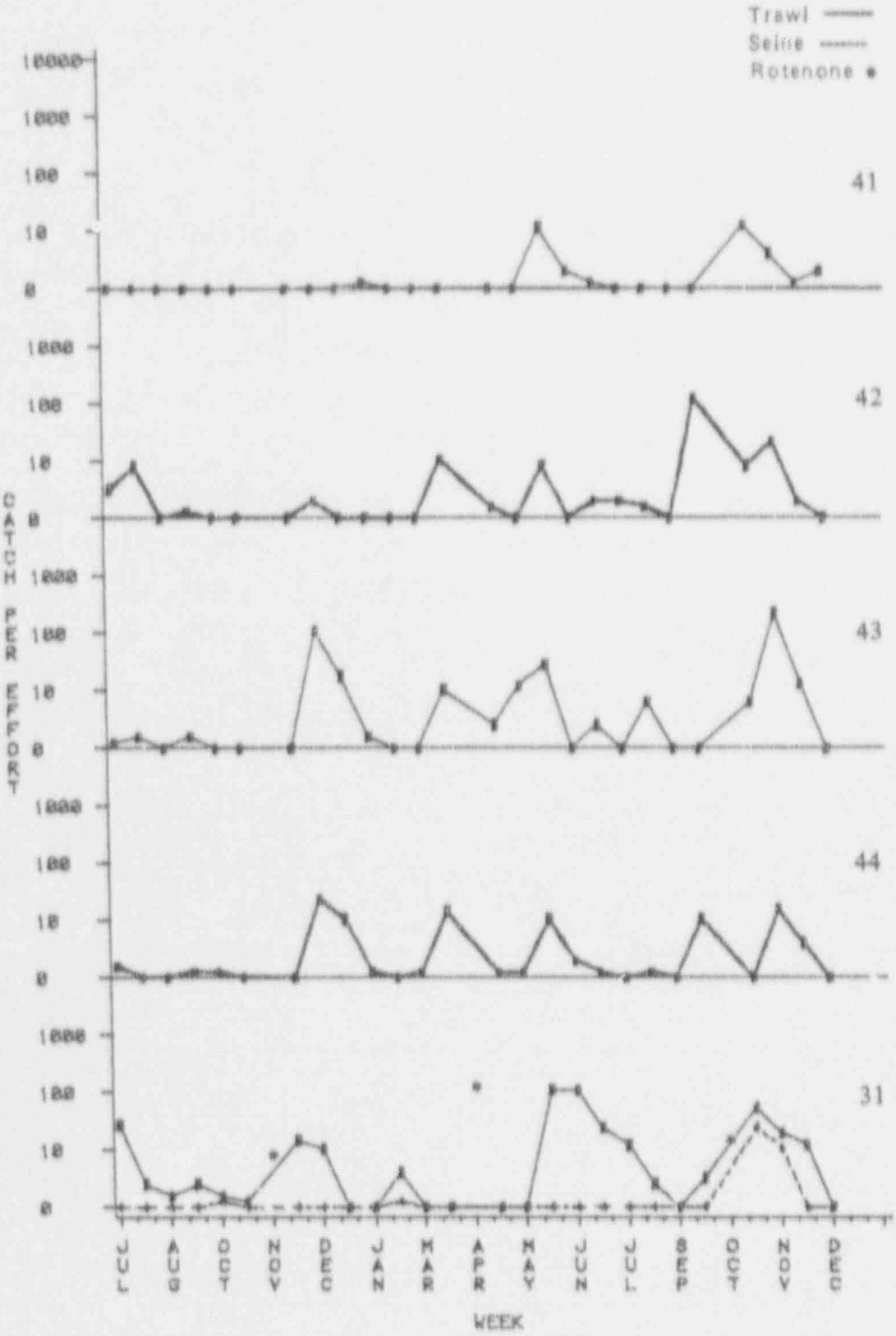


Figure 4.45 Catch per unit effort (CPUE) of croaker by station for Mott's and Alligator Creeks - July 1980 to December 1981

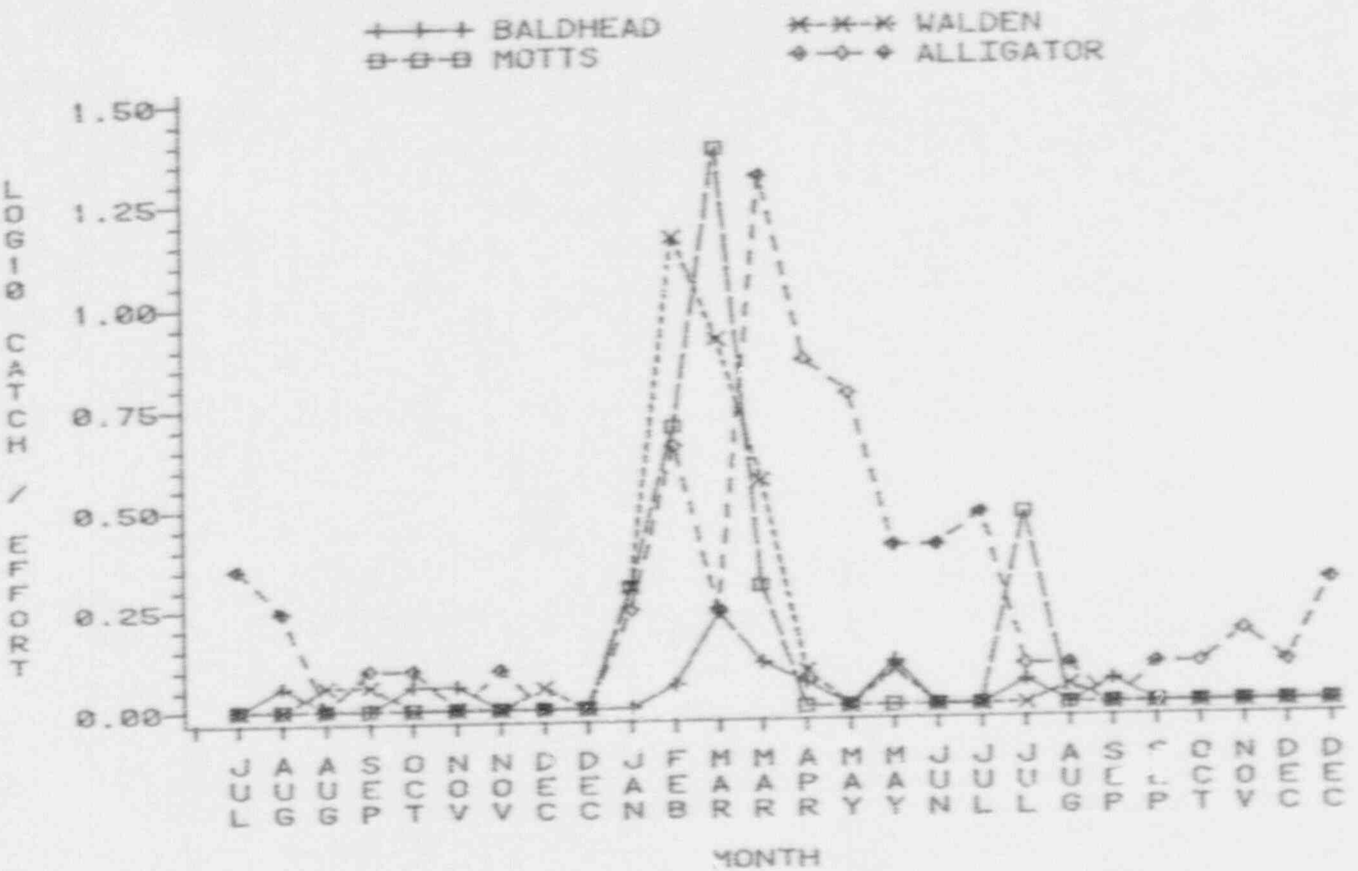


Figure 4.46 Average trawl catch per unit effort (CPUE) of flounders by creek for high marsh study - Ju[illegible] 1980 to December 1981

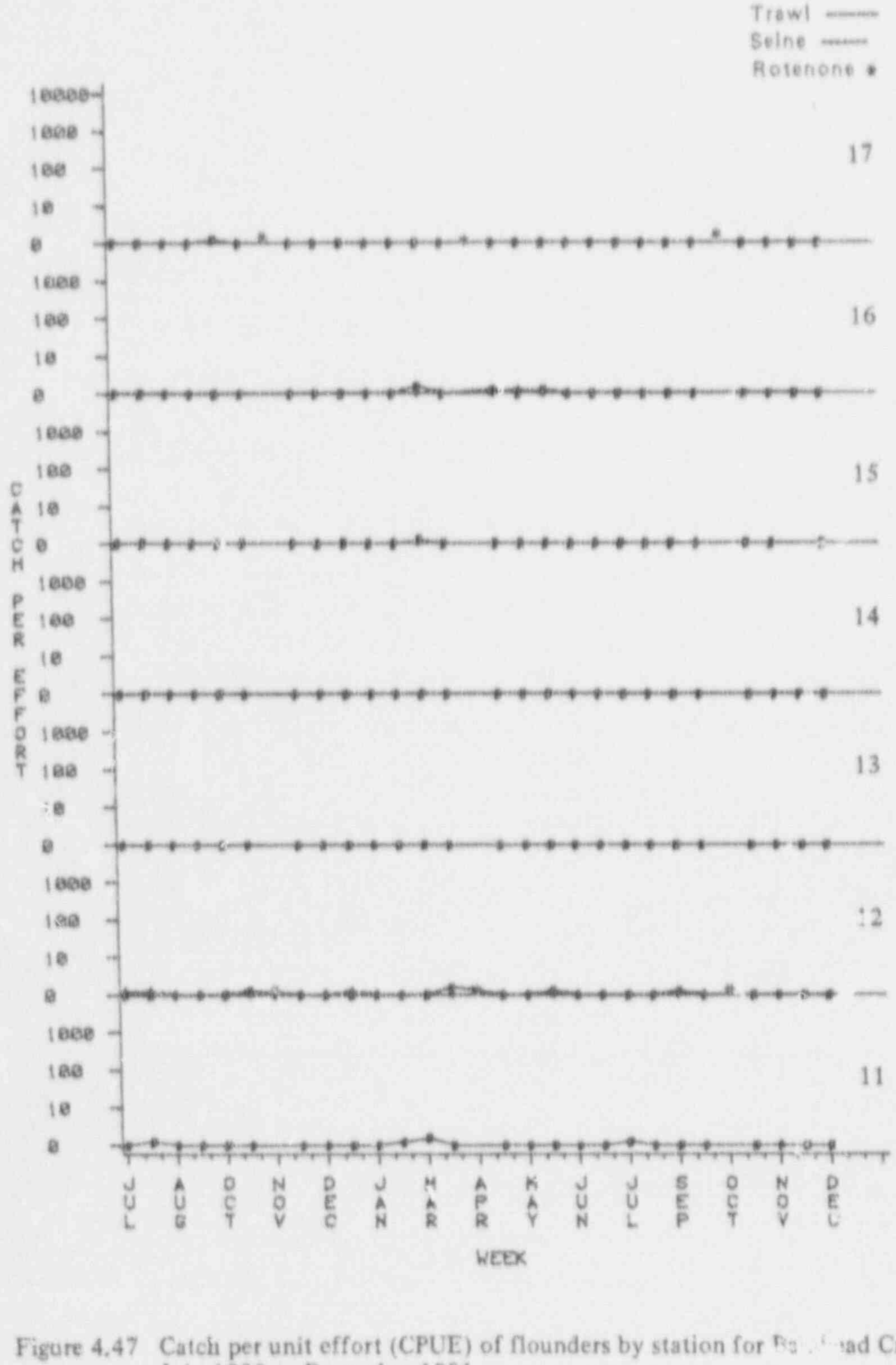


Figure 4.47 Catch per unit effort (CPUE) of flounders by station for Ba. ead Creek July 1980 to December 1981

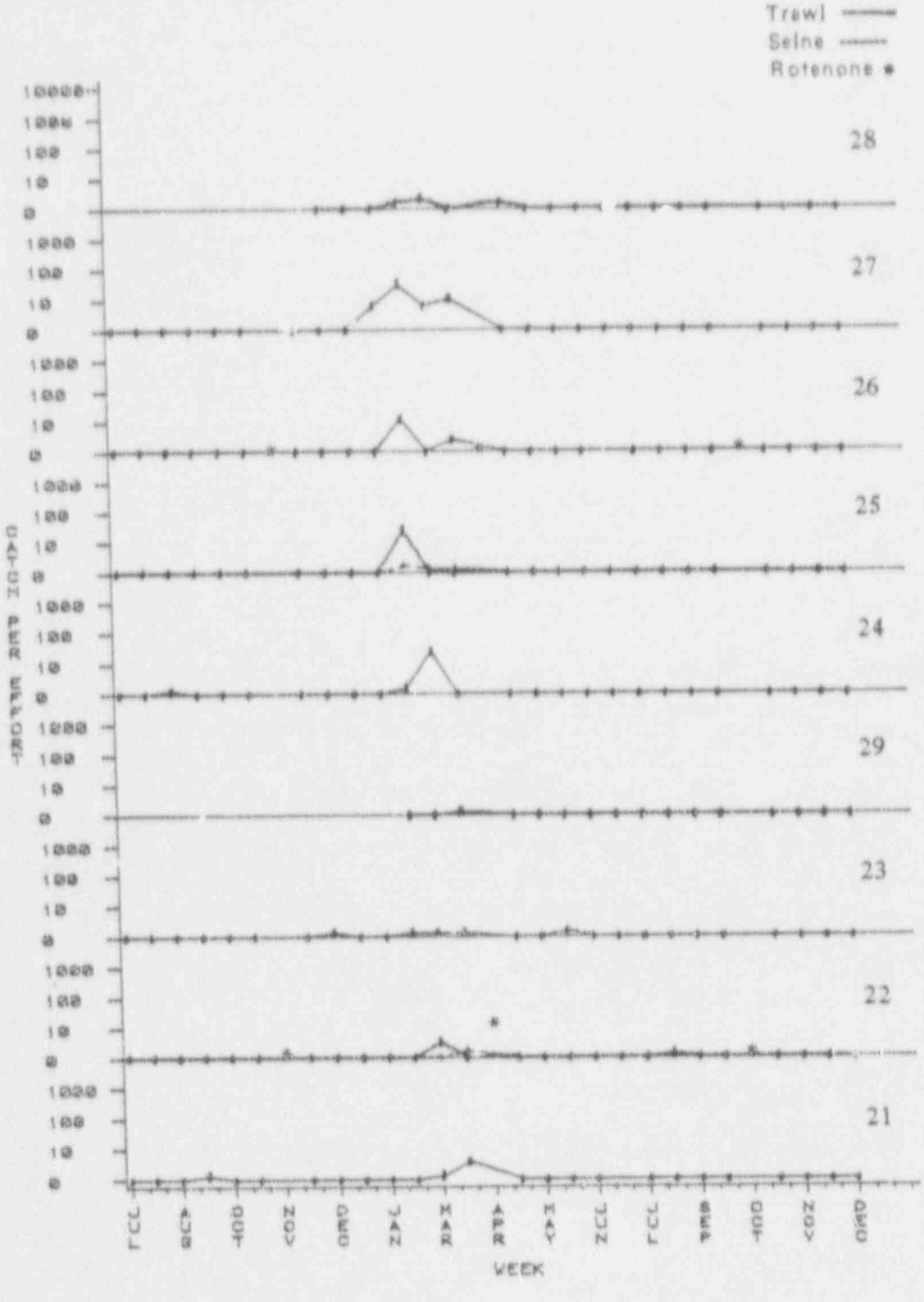


Figure 4.48 Catch per unit effort (CPUE) of flounders by station for Walden Creek July 1980 to December 1981

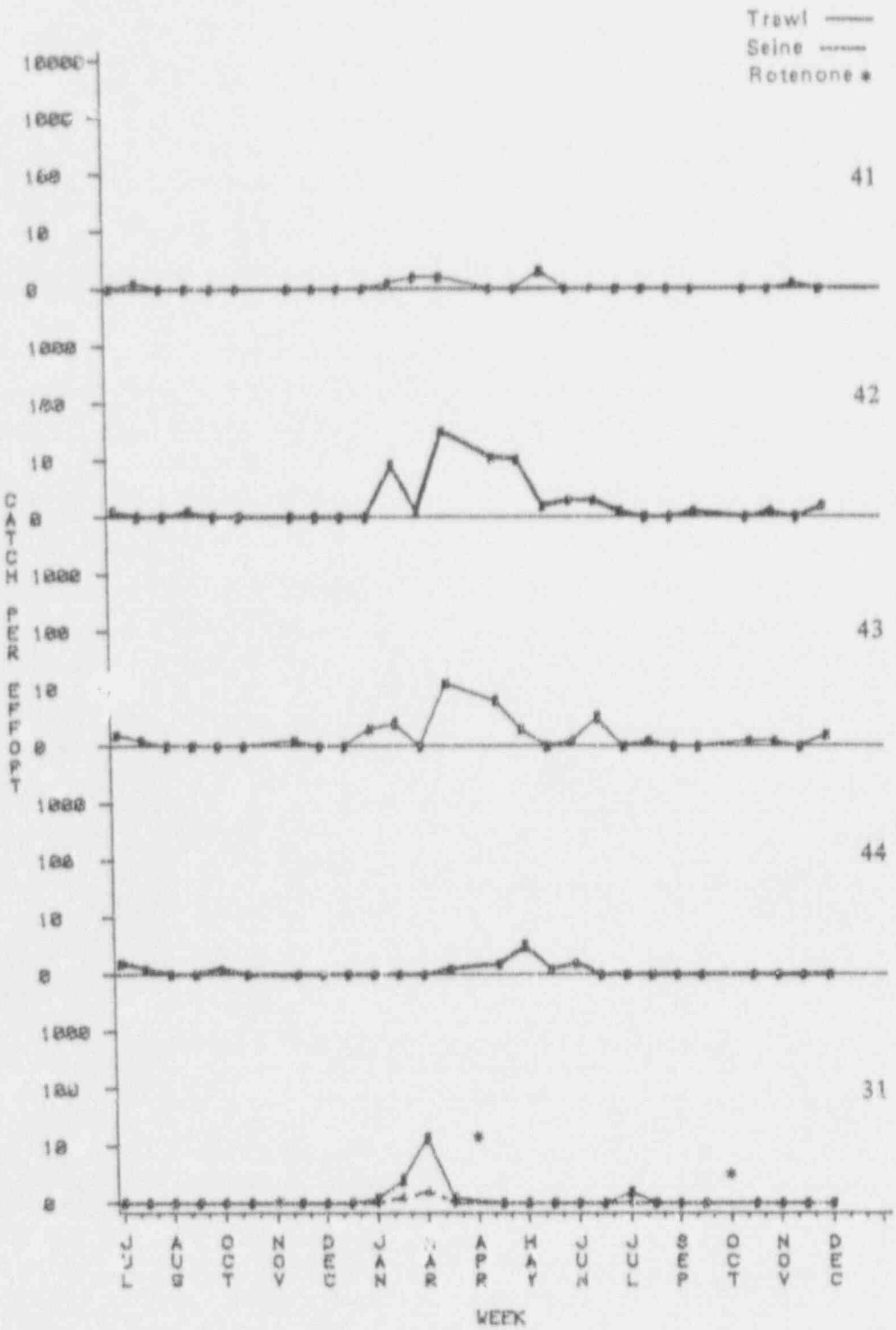


Figure 4.49 Catch per unit effort (CPUE) of flounders by station for Mott's and Alligator Creeks - July 1980 to December 1981

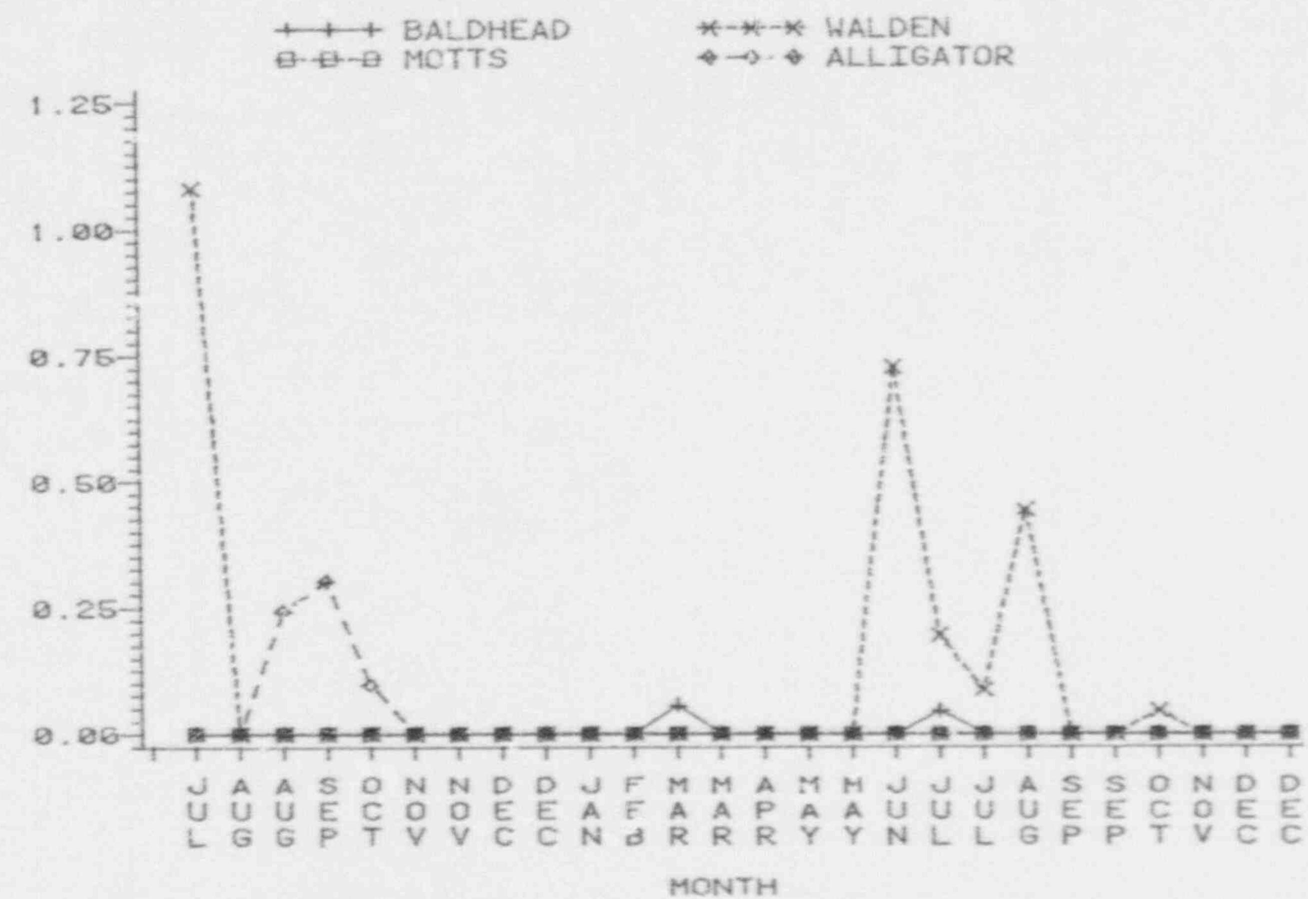


Figure 4.50 Average trawl catch per unit effort (CPUE) of weakfish by creek for high marsh study - July 1980 to December 1981

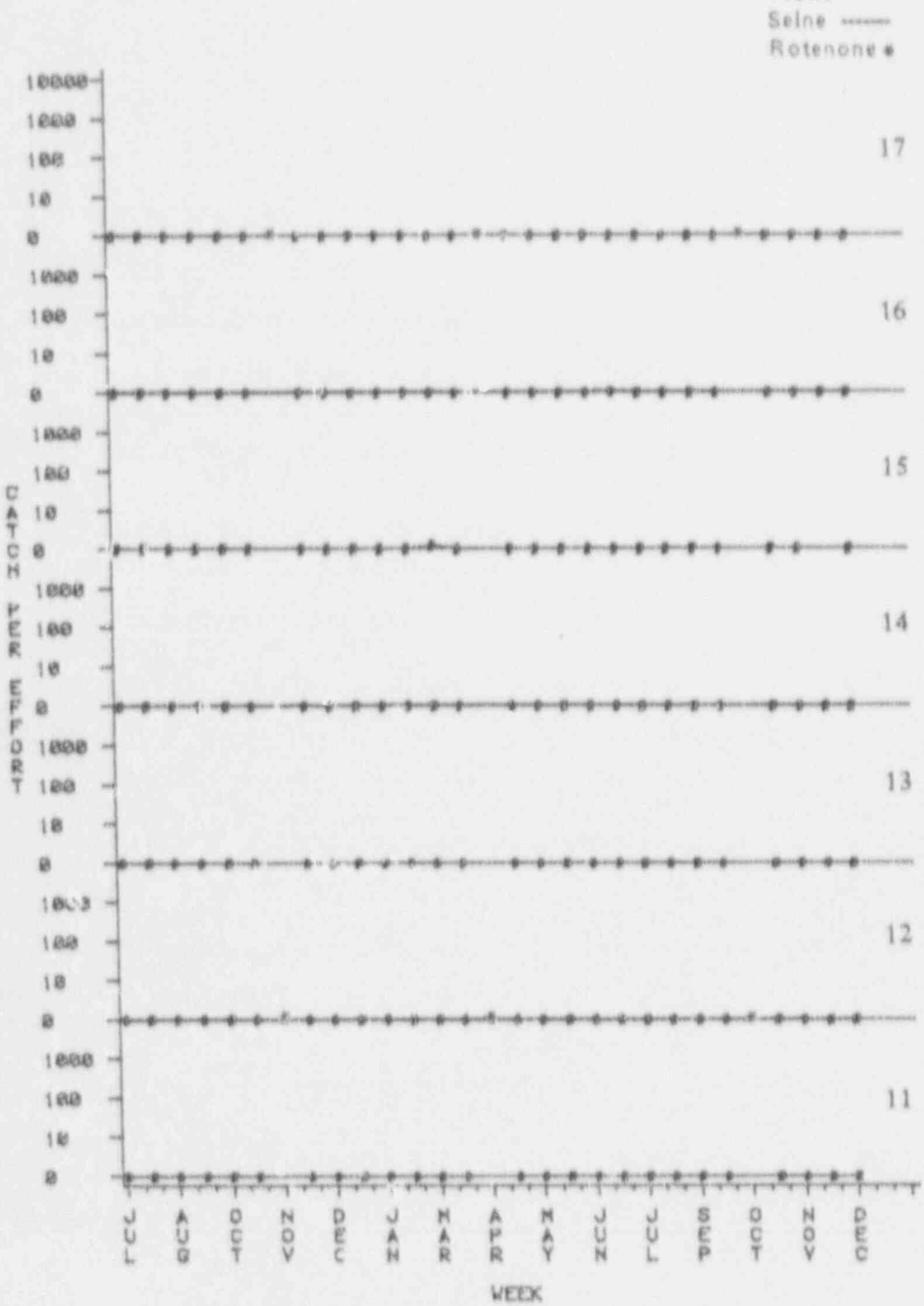


Figure 4.51 Catch per unit effort (CPUE) of weakfish by station for Baldhead Creek July 1980 to December 1981

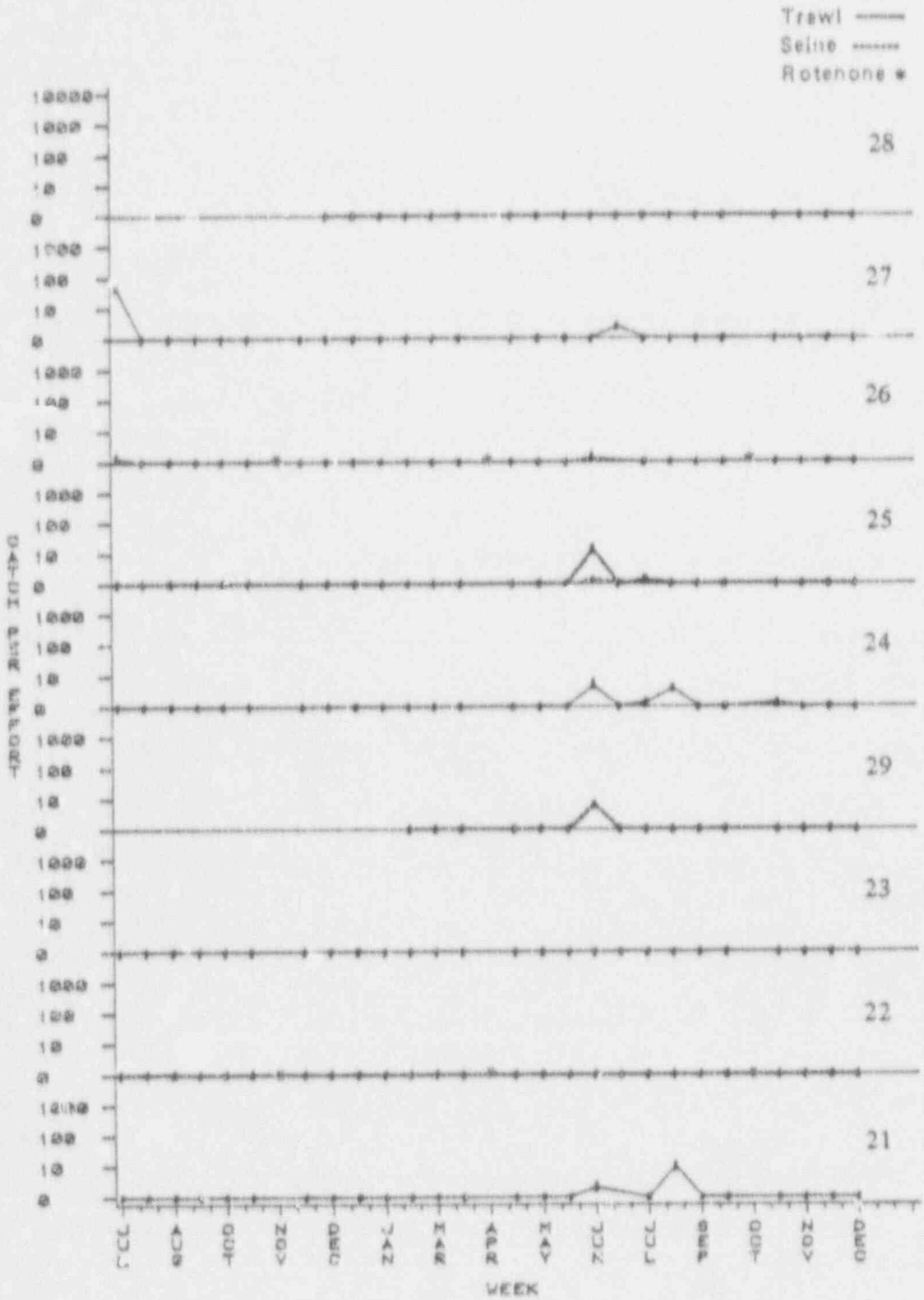


Figure 4.52 Catch per unit effort (CPUE) of weakfish by station for Walden Creek, July 1980 to December 1981

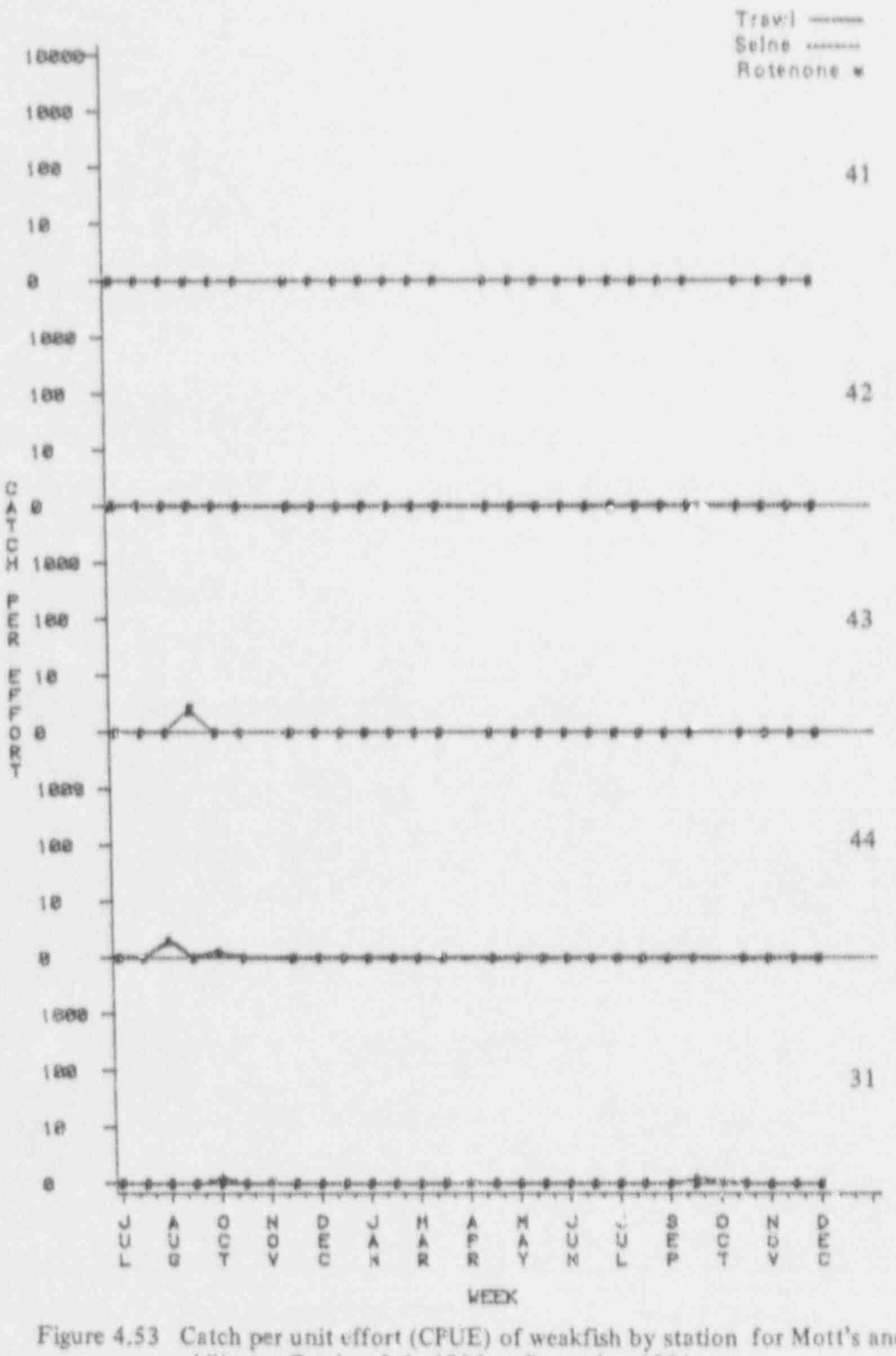


Figure 4.53 Catch per unit effort (CPUE) of weakfish by station for Mott's and Alligator Creeks - July 1980 to December 1981

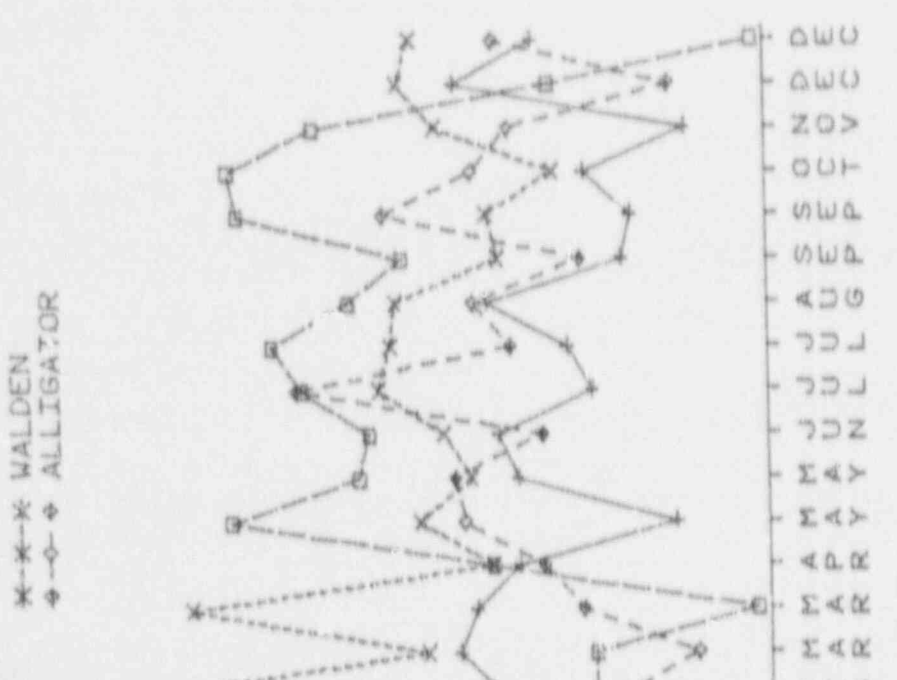


Figure 4.54 Average trawl catch per unit effort (CPUE) of blue crabs by creek for high marsh study - July 1980 to December 1981

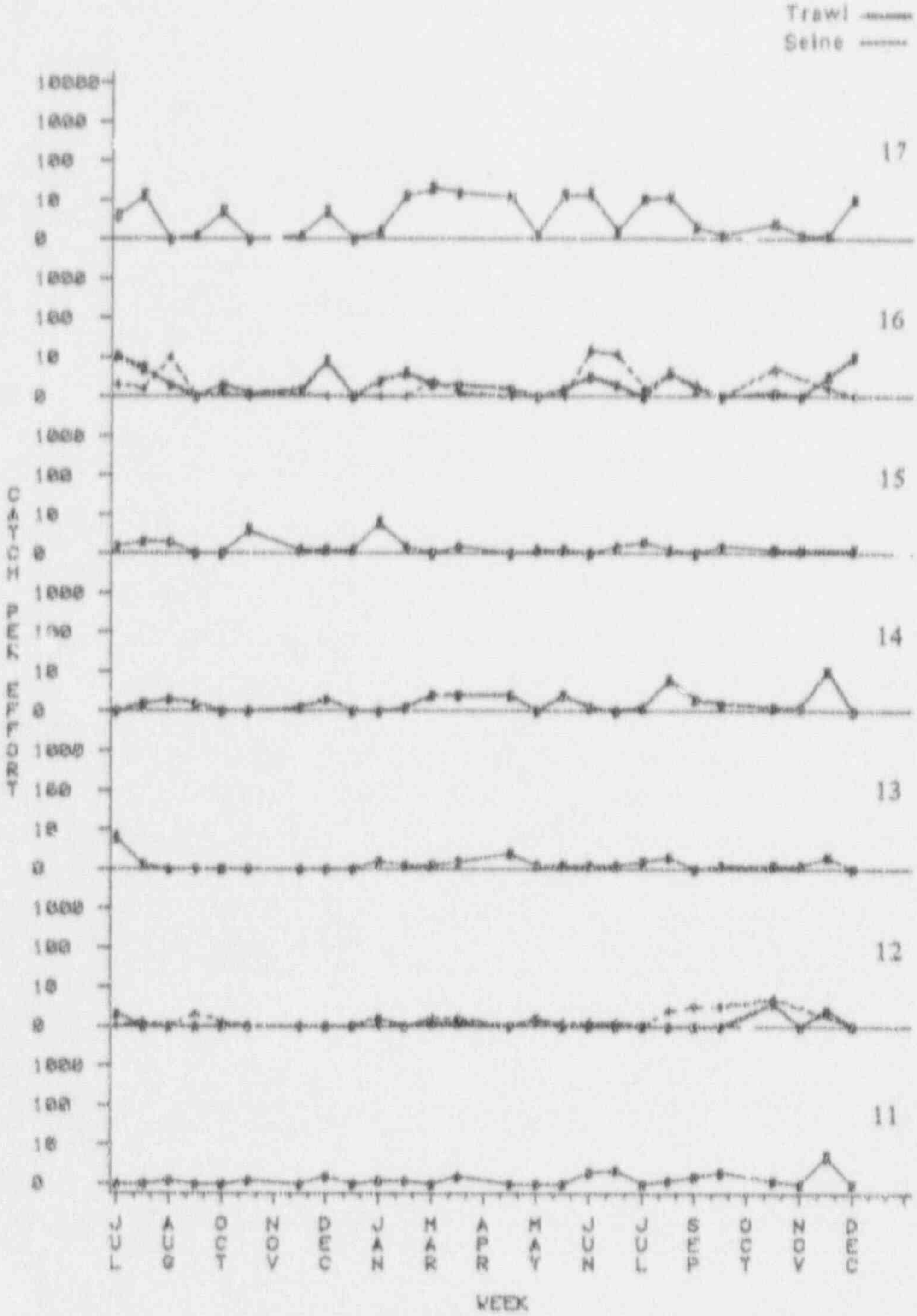


Figure 4.55 Catch per unit effort (CPUE) of blue crabs by station for Baldhead Creek July 1980 to December 1981

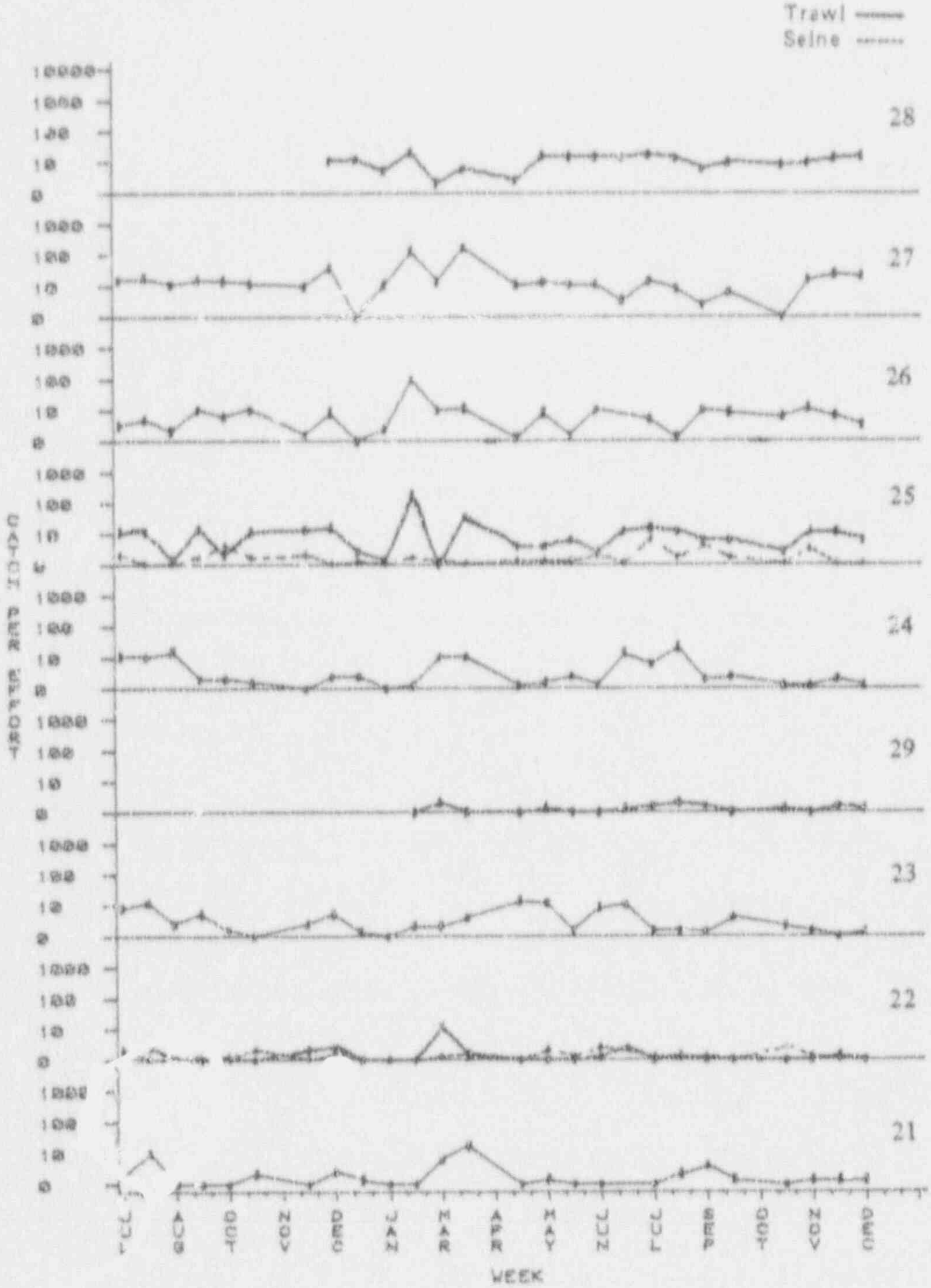


Figure 4.56 Catch per unit effort (CPUE) of blue crabs by station for Walden Creek July 1980 to December 1981

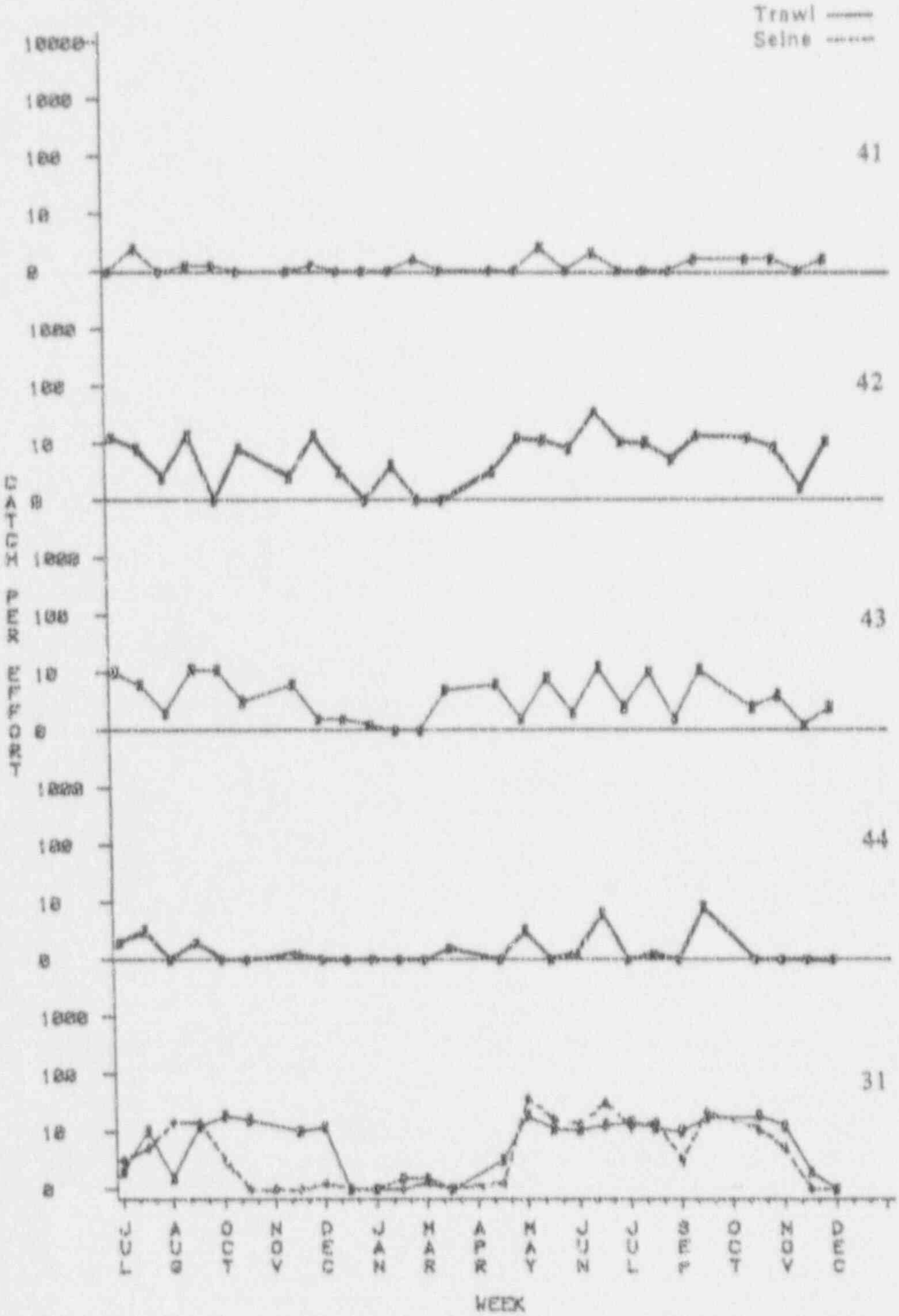


Figure 4.57 Catch per unit effort (CPUE) of blue crabs by station for Mott's and Alligator Creeks - July 1980 to December 1981

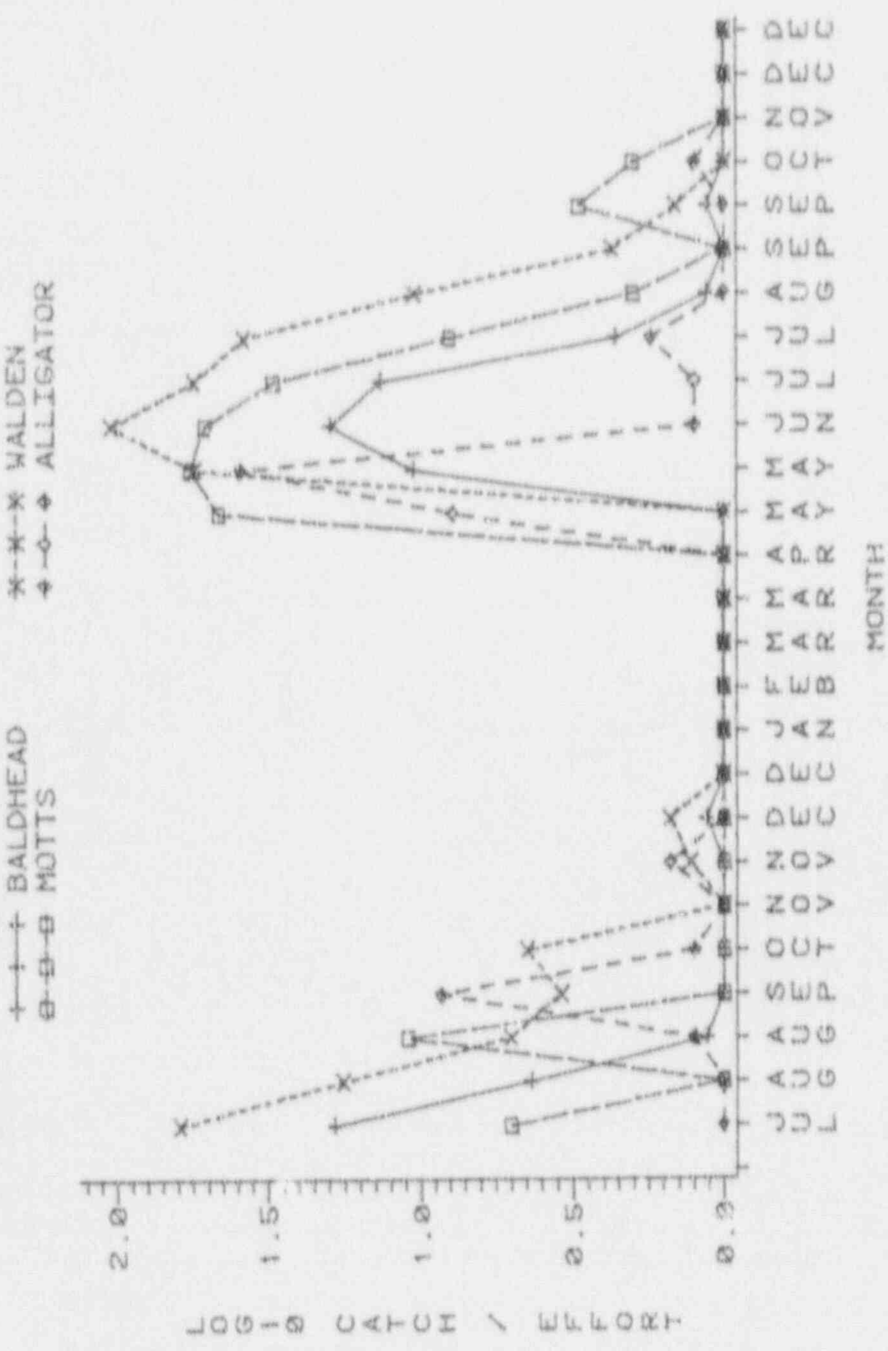


Figure 4.58 Average trawl catch per unit effort (CPUE) of brown shrimp by creek for high marsh study - July 1980 to December 1981

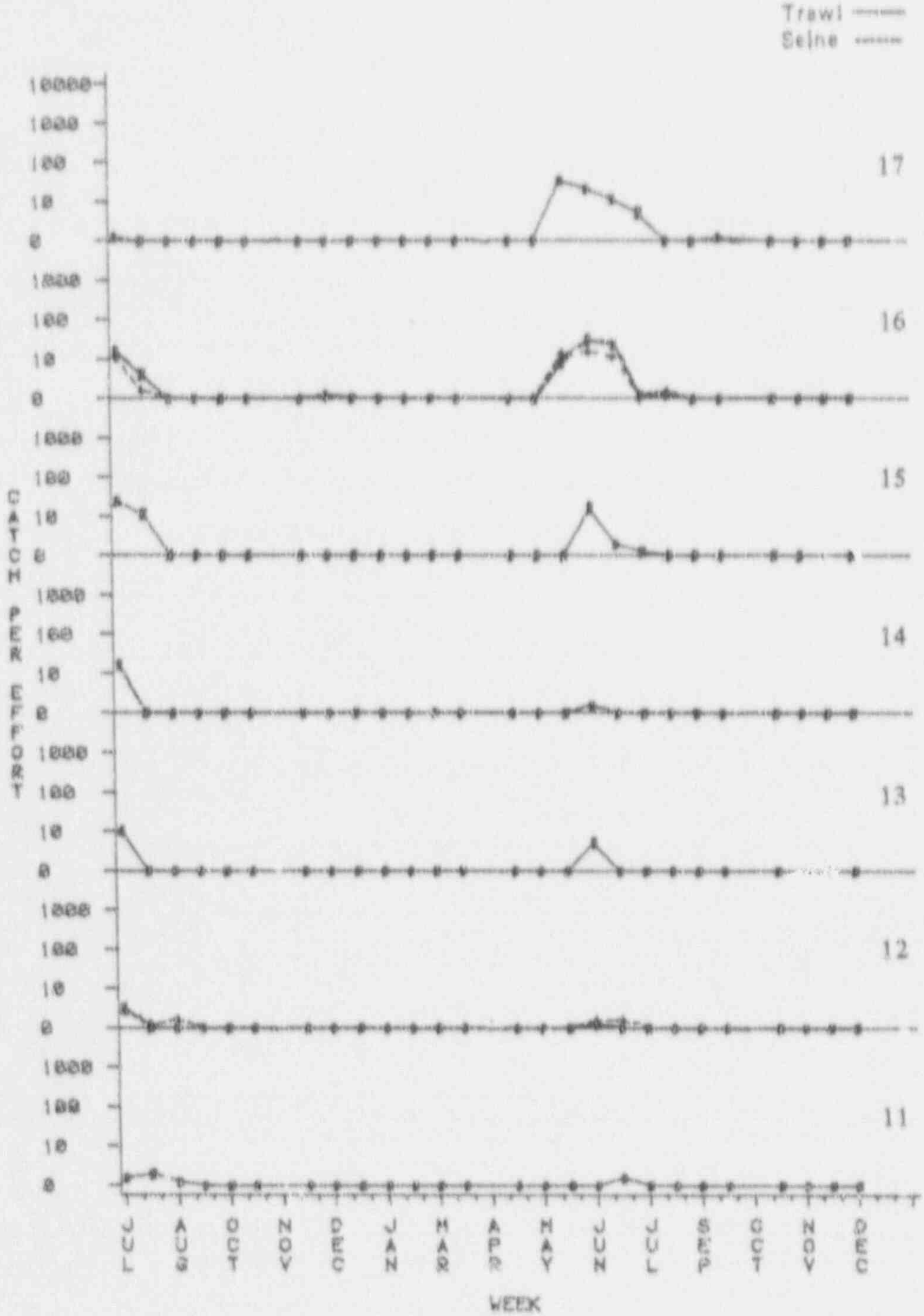


Figure 4.59 Catch per unit effort (CPUE) of brown shrimp by station for Baldhead Creek - July 1980 to December 1981

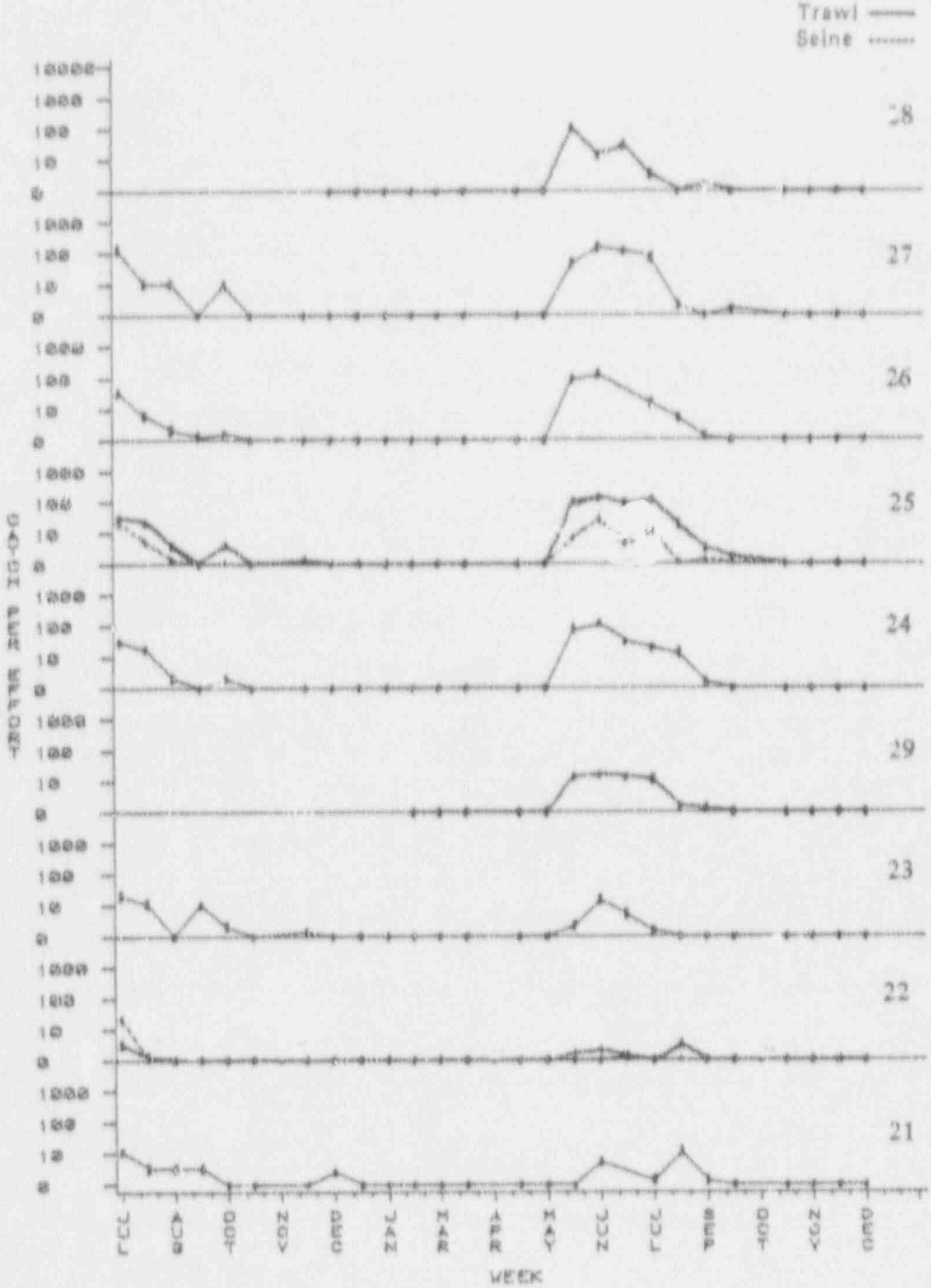


Figure 4.60 Catch per unit effort (CPUE) of brown shrimp by station for Walden Creek - July 1980 to December 1981

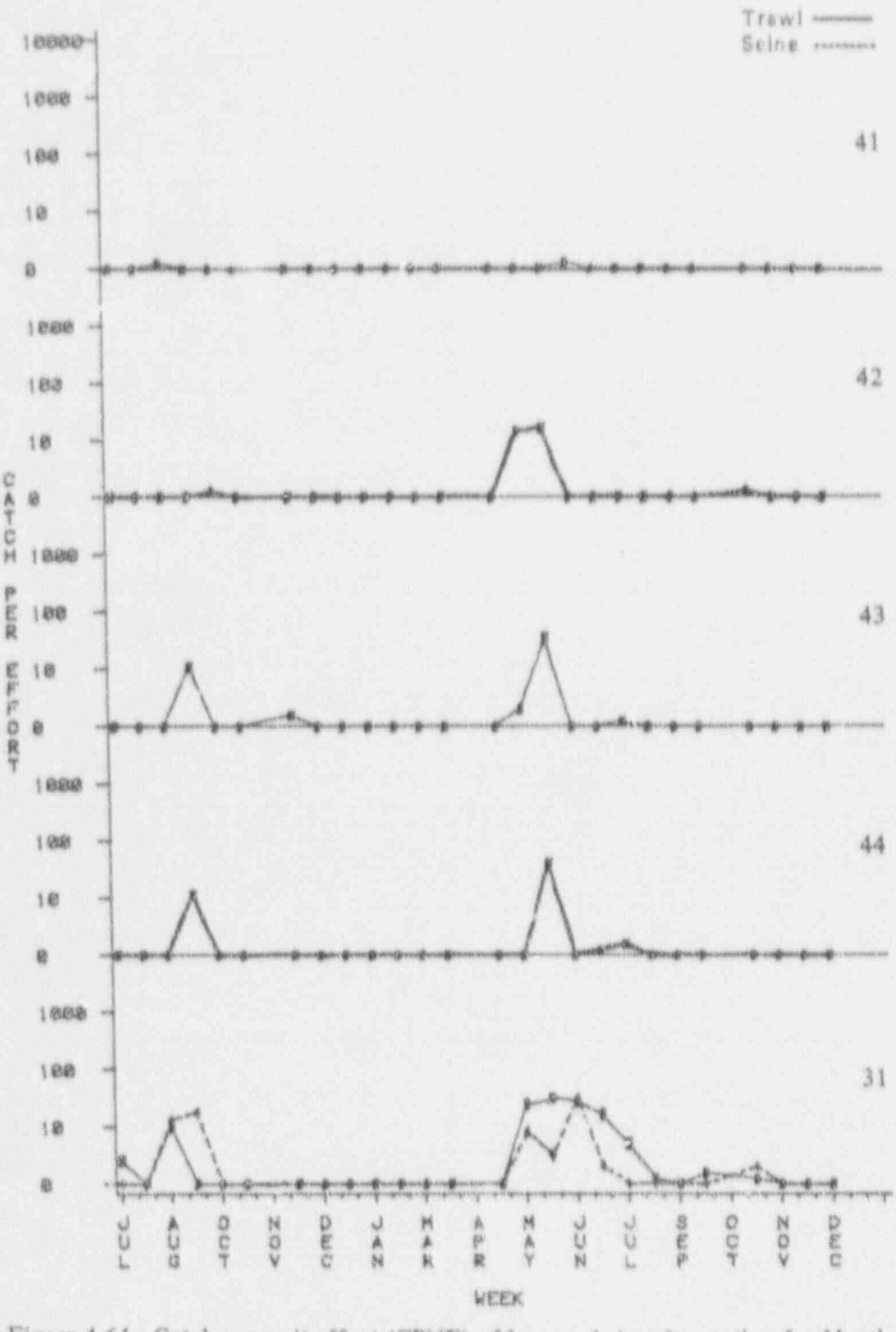


Figure 4.61 Catch per unit effort (CPUE) of brown shrimp by station for Mott's and Alligator Creeks - July 1980 to December 1981

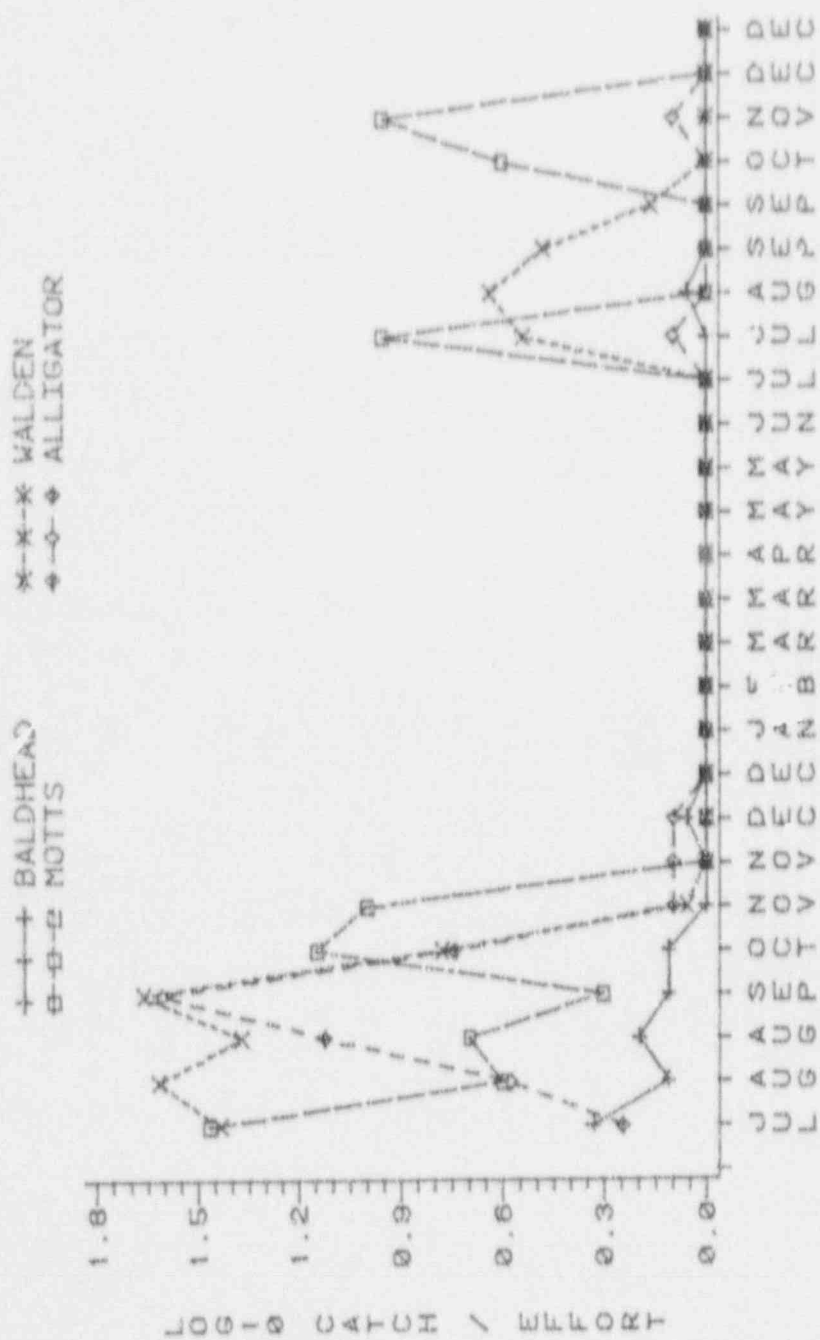


Figure 4.62 Average trawl catch per unit effort (CPUE) of white shrimp by creek for high marsh study - July 1980 to December 1981

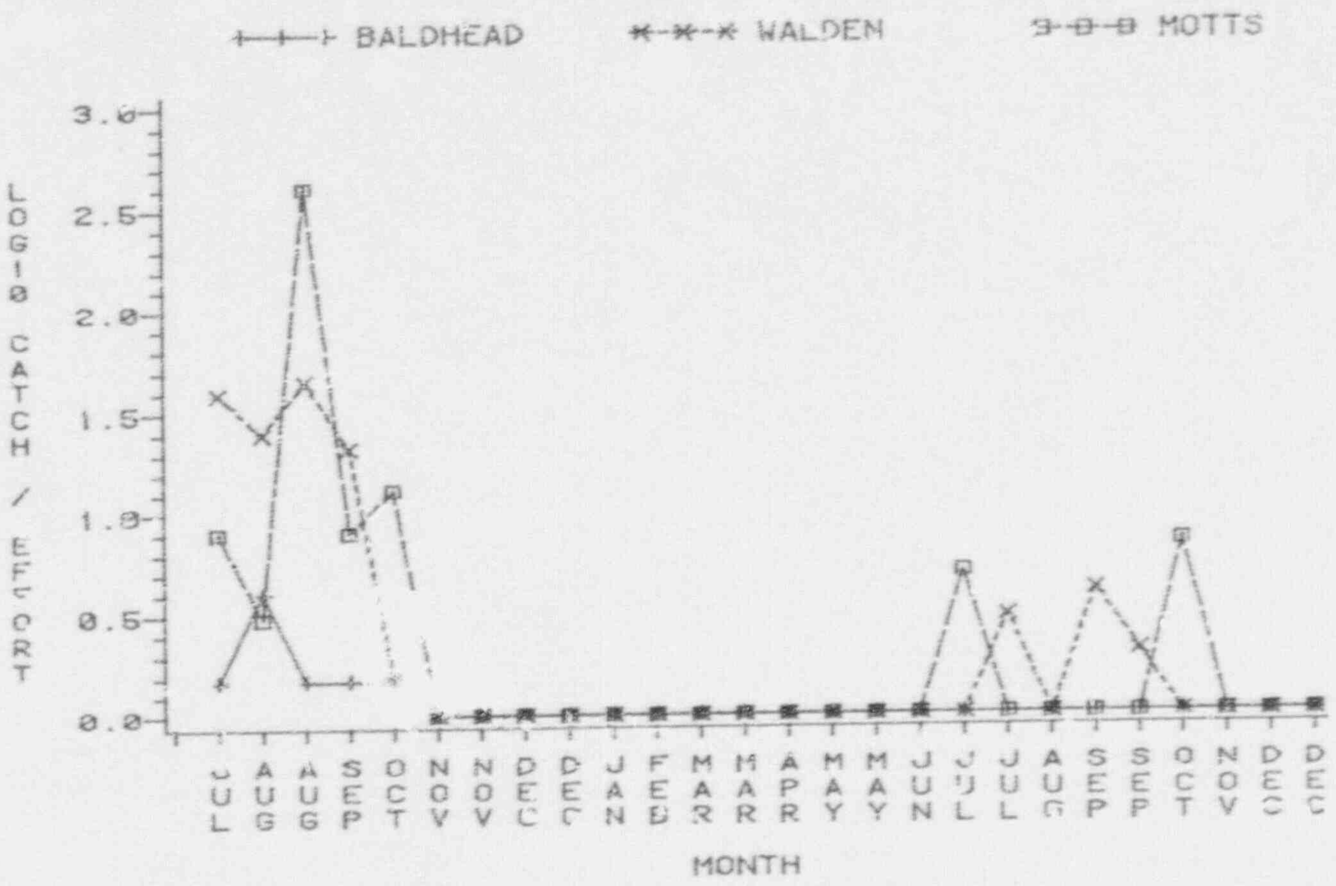


Figure 4.63 Average seine catch per unit effort (L JE) of white shrimp by creek for high marsh study - July 1980 to December 1981

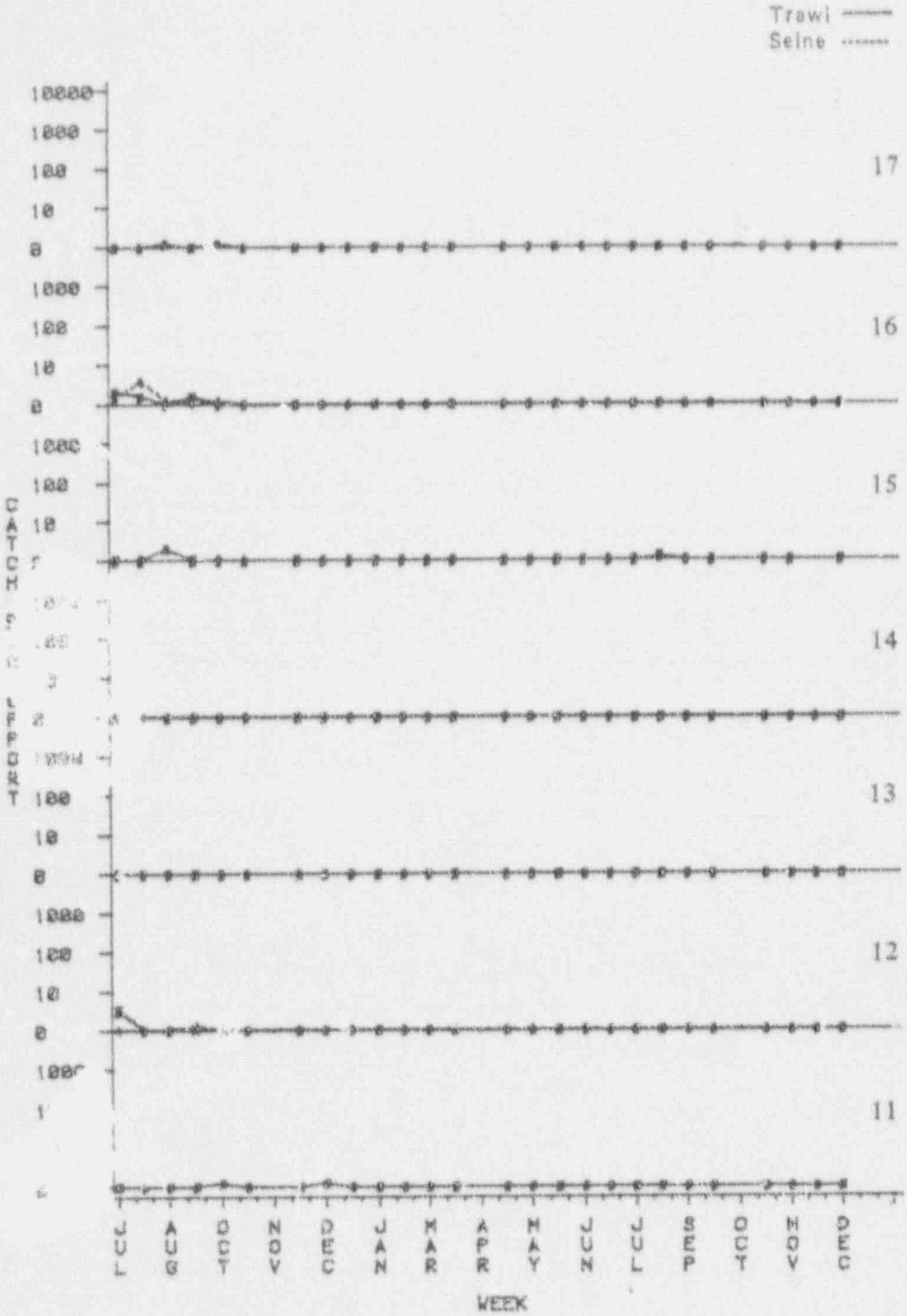


Figure 4.64 Catch per unit effort (CPUE) of white shrimp by station for Baldhead Creek - July 1980 to December 1981

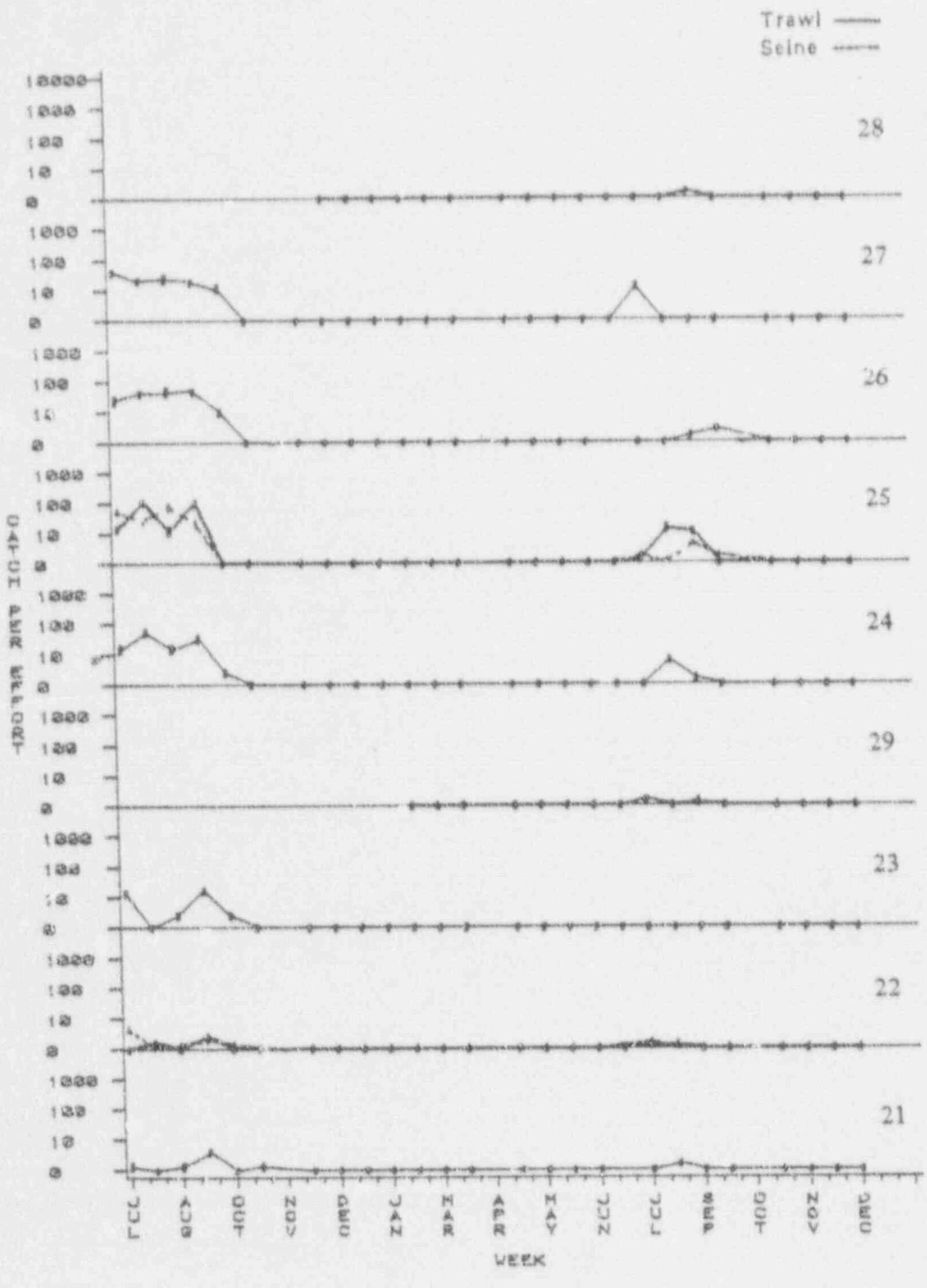


Figure 4.65 Catch per unit effort (CPUE) of white shrimp by station for Walden Creek July 1980 to December 1981

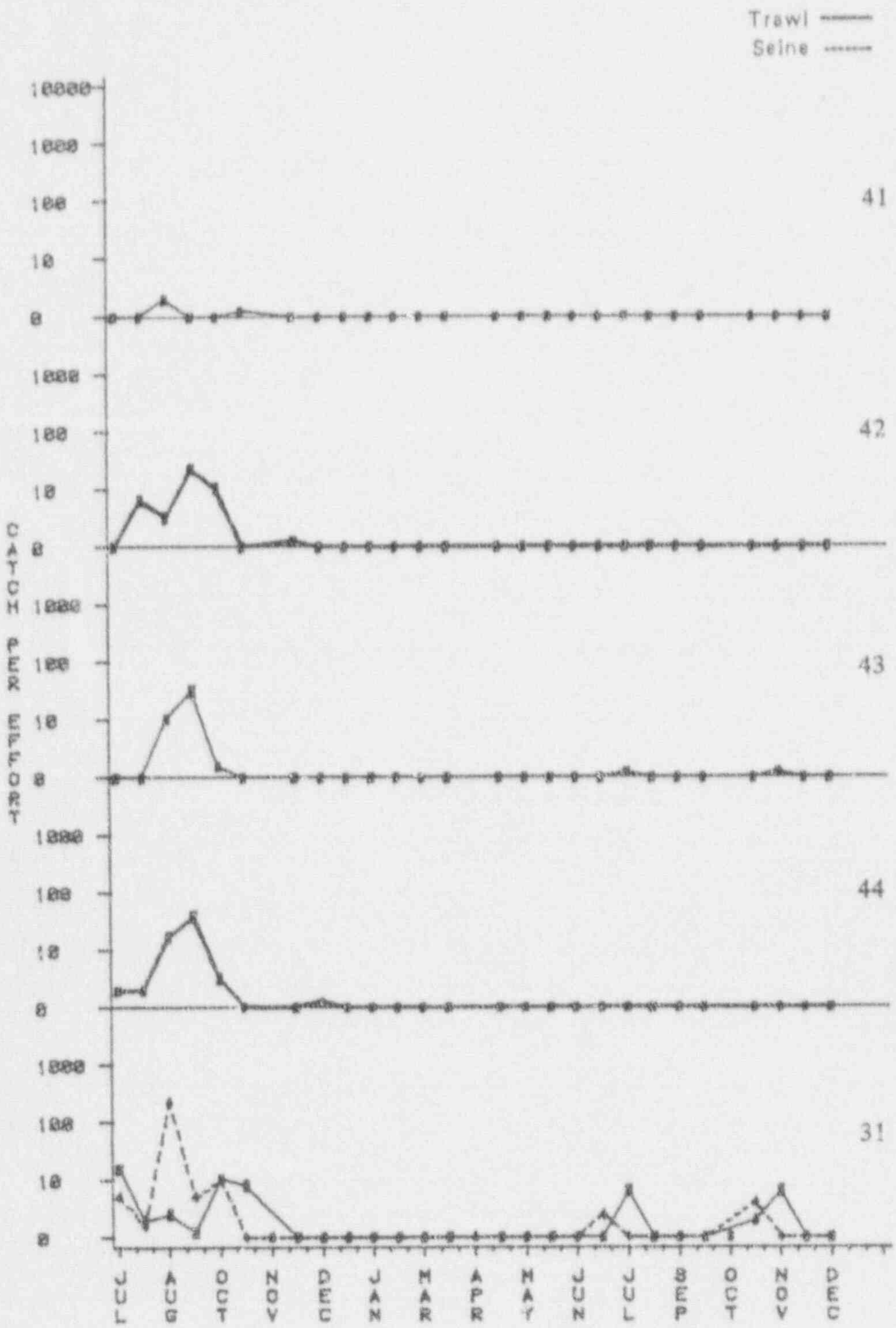


Figure 4.66 Catch per unit effort (CPUE) of white shrimp by station for Mott's and Alligator Creeks - July 1980 to December 1981

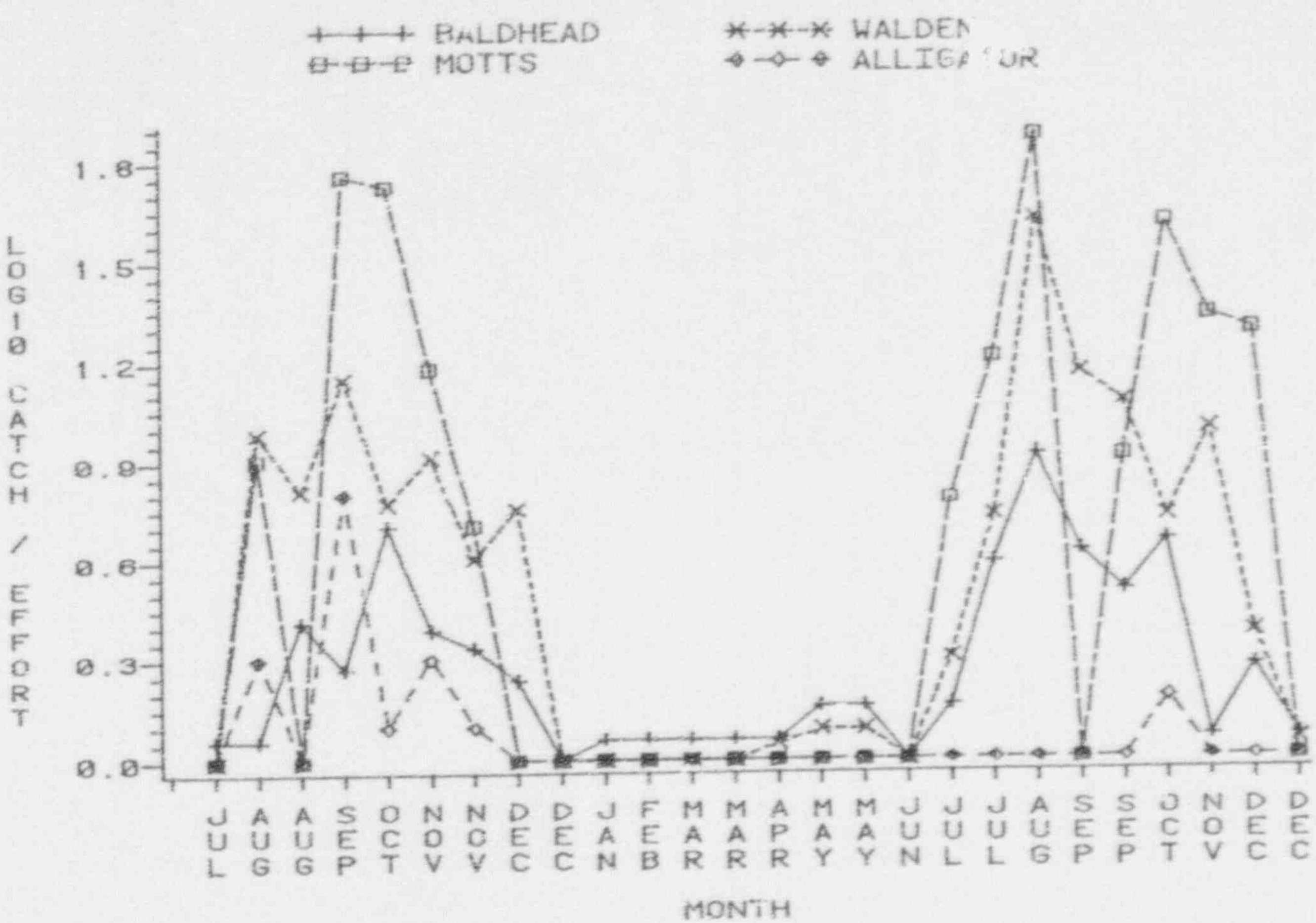


Figure 4.67 Average trawl catch per unit effort (CPUE) of pink shrimp by creek for high marsh study - July 1980 to December 1981

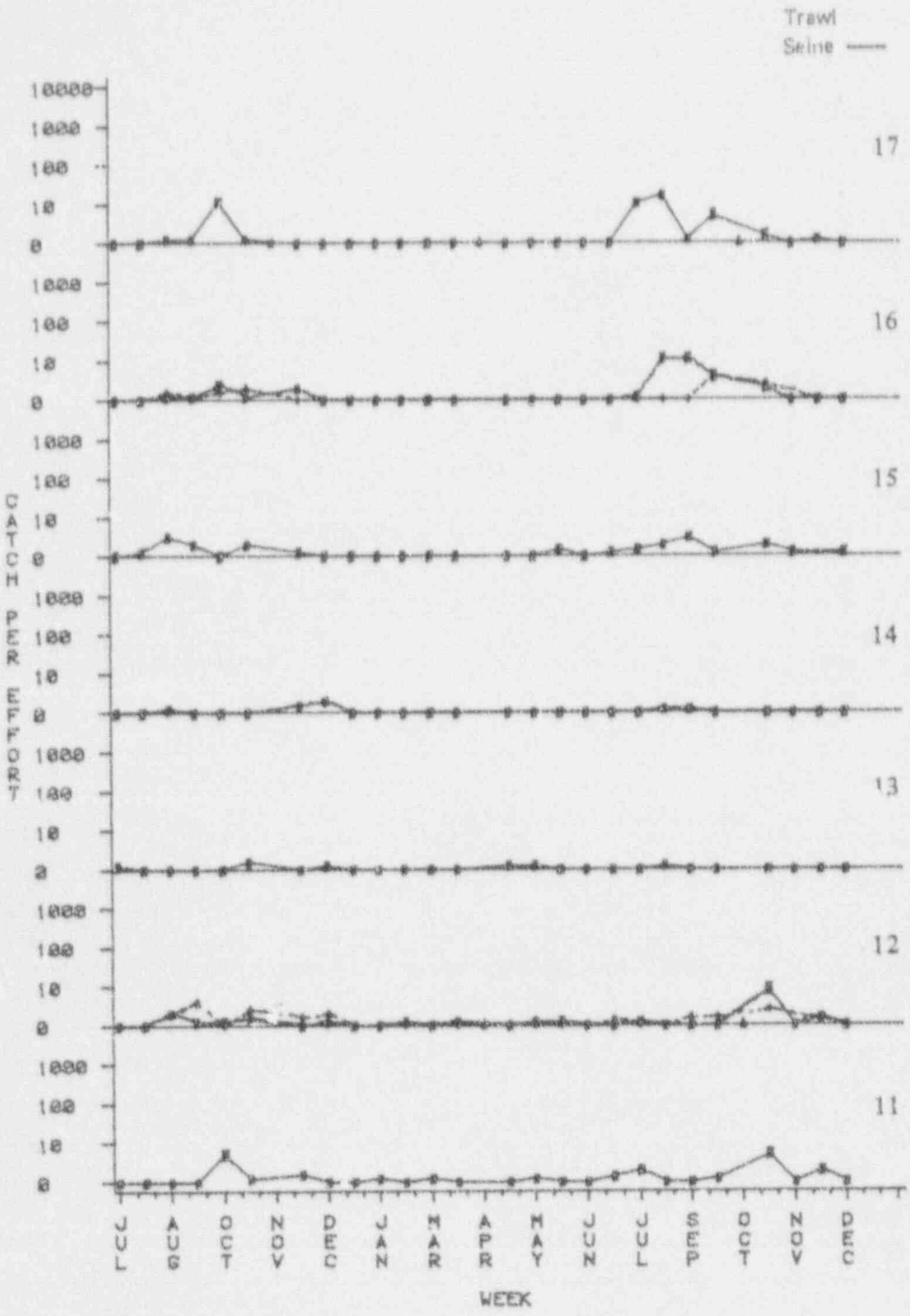


Figure 4.68 Catch per unit effort (CPUE) of pink shrimp by station for Baldhead Creek July 1980 to December 1981

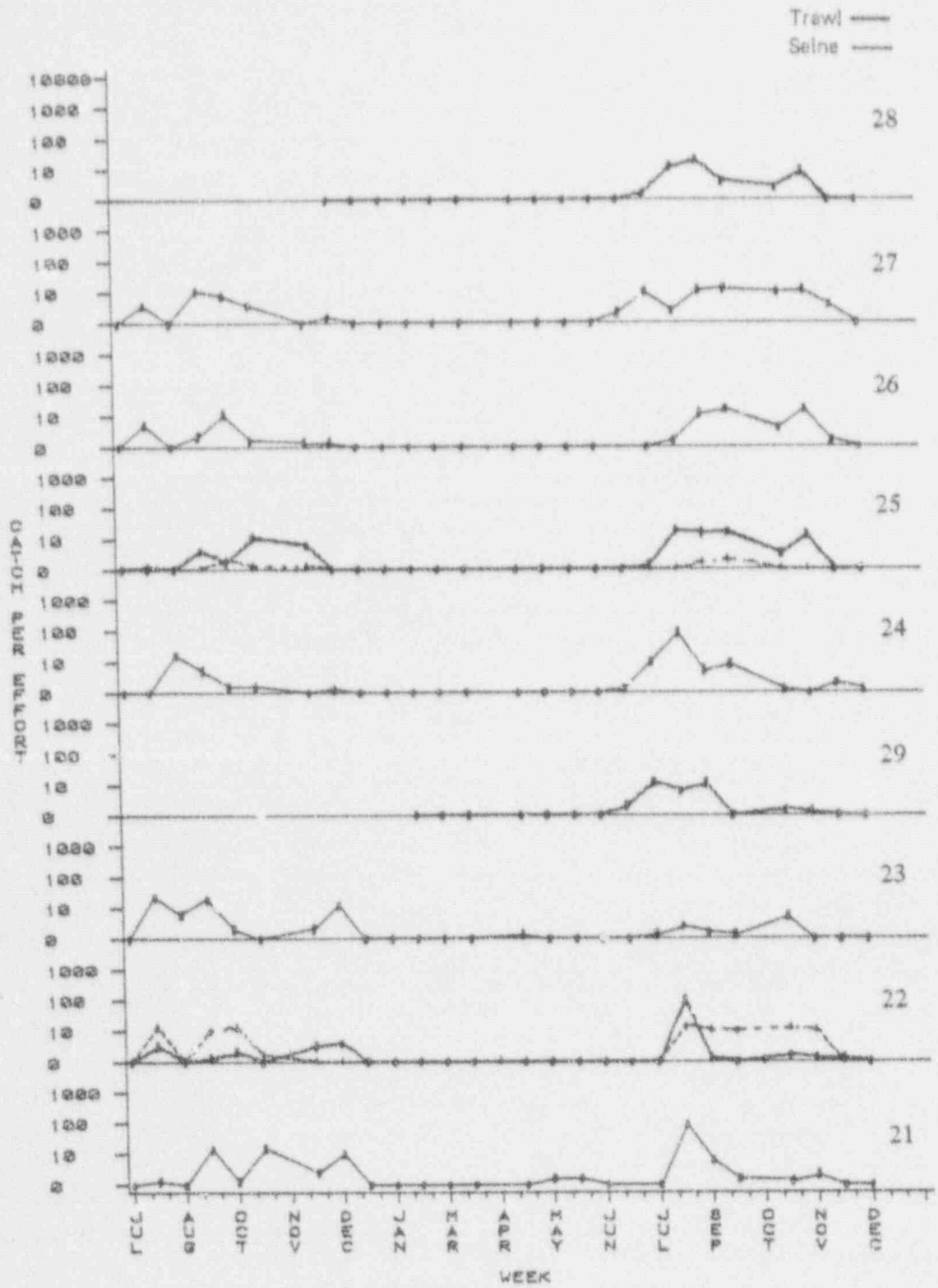


Figure 4.69 Catch per unit effort (CPUE) of pink shrimp by station for Walden Creek July 1980 to December 1981

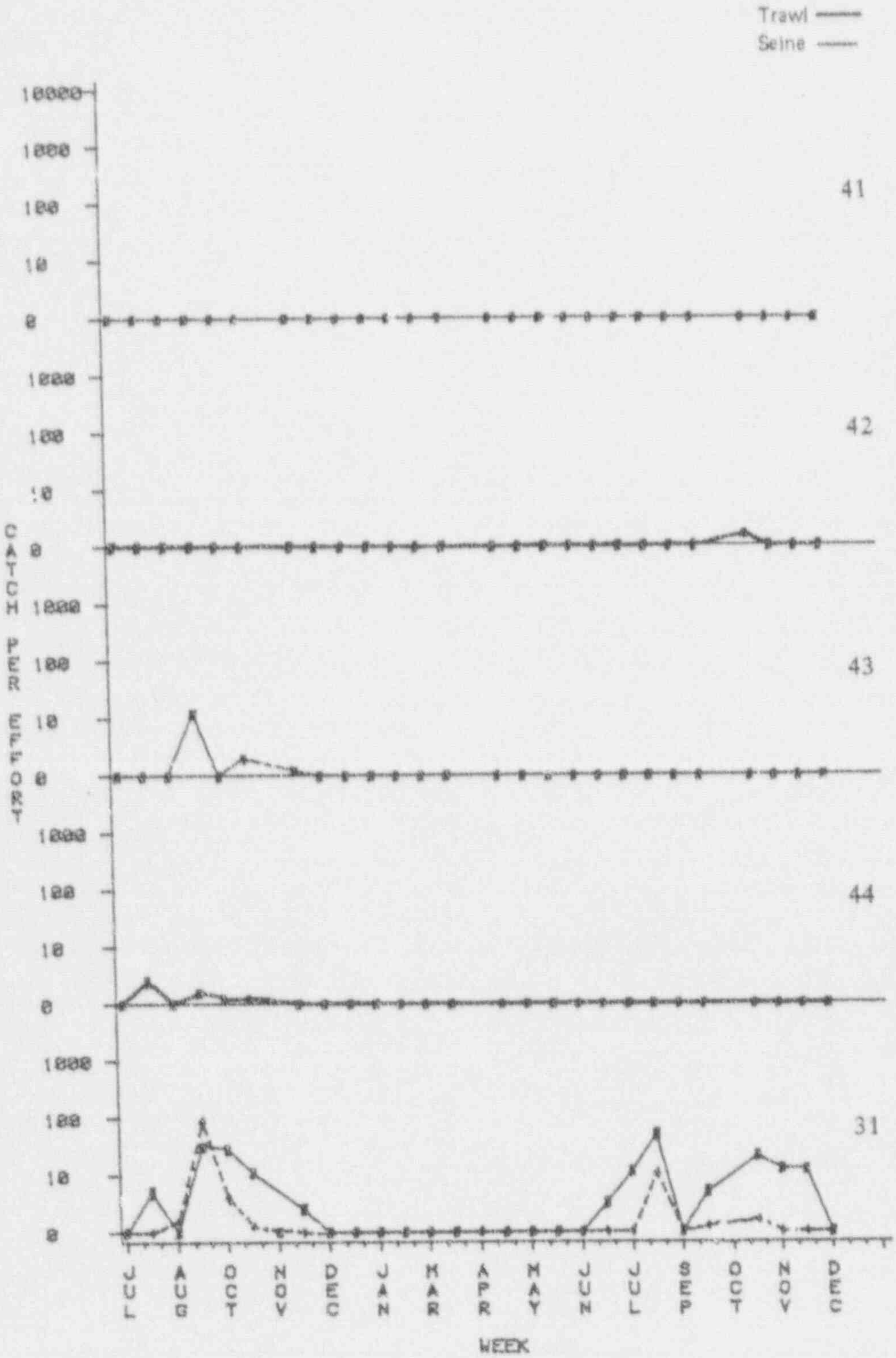


Figure 4.70 Catch per unit effort (CPUE) of pink shrimp by station for Mott's and Alligator Creeks - July 1980 to December 1981

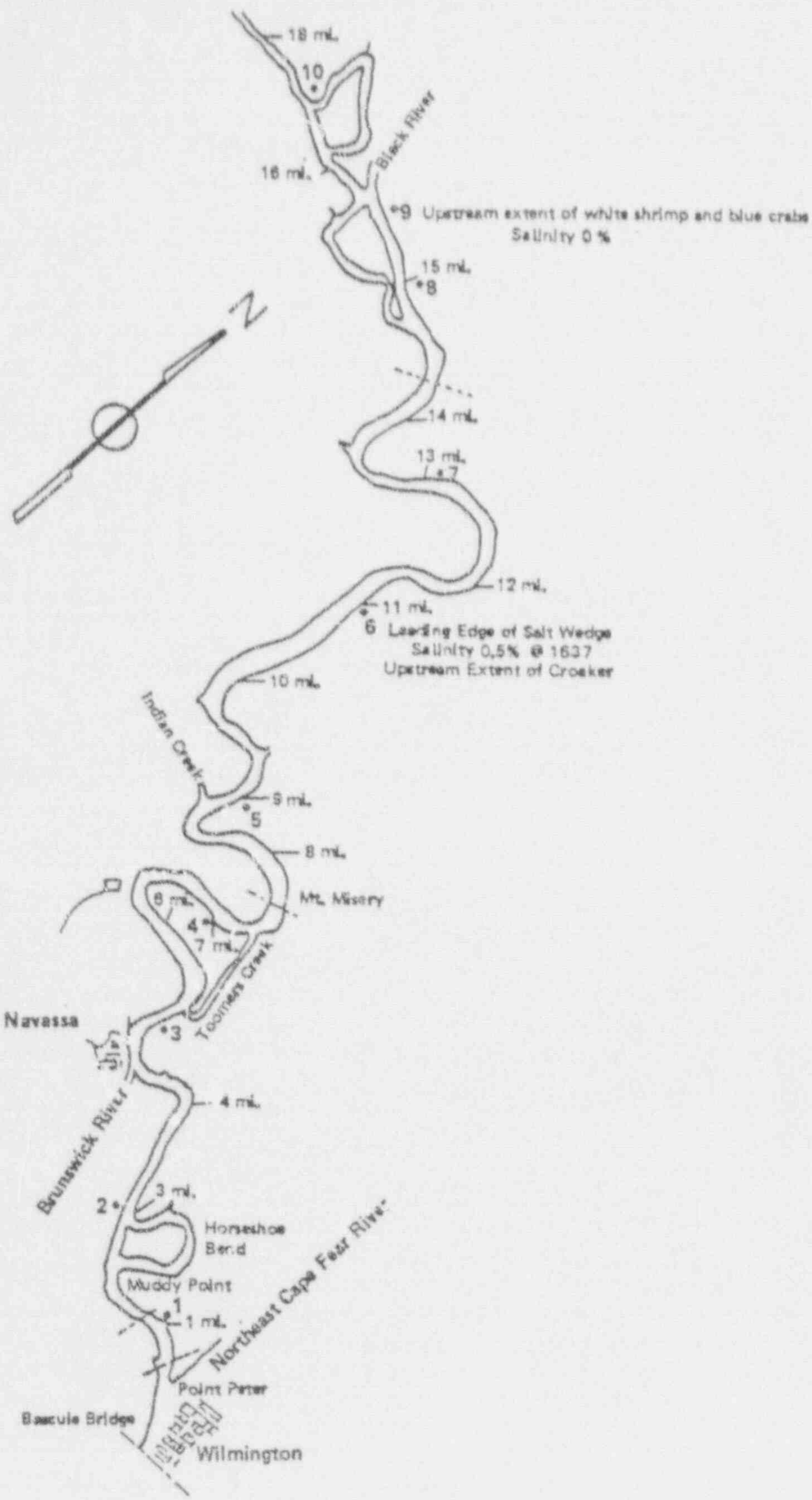


Figure 4.71 Upper Cape Fear River special study stations

BRUNSWICK STEAM ELECTRIC PLANT

ANNUAL BIOLOGICAL MONITORING REPORT 1981

VOLUME II

ENVIRONMENTAL TECHNOLOGY SECTION

CP&L
Carolina Power & Light Company

5.0 NEKTON MONITORING

5.1 Introduction

This portion of the long-term monitoring program is a continuation of the previous nekton sampling program conducted by the UNC although substantially reduced in scope. In general, this program provides catch per unit effort (CPUE) data which serve as a measure of the long-term changes in juvenile and adult populations of nekton in the CFE.

The major objectives of this program are to determine the relative seasonal abundance, species composition, and size distribution of the juvenile and adult fish and shellfish of the lower Cape Fear River.

The results of this program can be compared with results from previous nekton studies (Schwartz 1979a through 1979g) so that changes in size distribution, species abundance, and species composition may be determined.

In September 1980, changes were implemented to streamline this portion of the overall program, while still collecting sufficient data to realize the nekton monitoring program's objectives. Program changes will be explained in the appropriate sections.

5.2 Methods

5.2.1 Description of Sampling Stations

<u>January 1979 - August 1980</u>

Sampling station locations extended from the freshwater drainage canal, approximately 3.4 km (2.1 mi) west of Southport to Cape Fear River buoy 23, approximately 8.8 km (5.5 mi) northeast of Southport. Samples were collected at nine stations within this geographical area (Figure 5.1).

Station 1 was located in the freshwater drainage canal (FDC) between the first and second bends. This station was chosen because the FDC is a dredged canal like the intake canal but without the direct influence of the plant. Small trawl and gill net samples were collected at this station.

Station 2 was located in a slough east of Buoy 18 and north of a spoil island on the east side of the ship channel. Only the large trawl was used at this station.

Station 3 was located in the ship channel between Buoys 19 and 21. This was also a large trawl station.

Station 4 was located in the intake canal from the junction of Walden Creek and the intake canal eastward toward the Cape Fear River. This station was sampled with the large trawl, small trawl, and gill net.

Station 5 was located in the intake canal from the intake screens at the plant northeastward to near the first bend (uppermost) of the canal. This station was also sampled with the large trawl, small trawl, and gill net.

Station 6 was in the intake canal from its junction with Walden Creek westward toward the plant to the vicinity of the old Wilmington highway. Only small trawl and gill net samples were collected at this station.

Station 7 was in Walden Creek between the bridge and the first bend. Gill net and small trawl samples were collected at this station.

Station 8 was located near the entrance to a small cove 1.6 km (1 mi) northeast of the mouth of Walden Creek and just west of Buoy 23 at the north end of Snows Marsh. Gill nets and small trawls were used at this station.

Station 9 was located in the ship channel between buoy 23 and the southern entrance to Sunny Point Military Supply Depot. This was a large trawl station.

September 1980 - December 1980

During this period, three stations were sampled in addition to the stations described above. These additions extended the range of stations northward to Wilmington.

Station 10 was located in the Intracoastal Waterway between Markers 174 and 176 approximately two miles SSW of the western entrance to Snows Cut. This was a large trawl station.

Station 11 was in the Cape Fear River just east of the ships channel at buoy 42. This station was sampled with the small trawl.

Station 12 was located in Alligator Creek approximately 609.8 m (2000 ft) east of the Brunswick River. This was a small trawl station.

January 1981 - December 1981

Beginning in January 1981, an additional station in the intake canal was sampled. Station 13 was located between the two bends of the intake canal. This station was added in an attempt to obtain additional information on species composition and abundance in the intake canal so that the effectiveness of the proposed diversion device (completion date December 31, 1982) can be determined.

Stations 3 and 9 were dropped from the sampling program beginning in January 1981 when large trawls were discontinued as a sample method (see section 5.2.2). These stations were dropped because they were deep water stations that could not be safely sampled with the small trawl boat.

Stations 10 and 2, previously sampled with the large trawl, were sampled with the small trawl.

5.2.2 Sampling Design

September 1979 - August 1980

Adult and juvenile fish and shellfish were sampled in the lower CFE once every three weeks from January 1979 through August 1980. During the sample week, each station was sampled three times with either the small trawl and gill net or with the large trawl, and in two instances all three gears. Sampling trip dates and efforts are listed in Table 5.1.

The large trawl was a 12.5 m (41 ft) semiballoon otter trawl with a 47.6 mm (1-7/8 in) stretch mesh body and a 38.1 mm (1-1/2 in) stretch mesh intermediate and cod end. The small trawl was a 6.4 m (21 ft) semiballoon otter trawl with a 38.1 mm (1-1/2 in) stretch mesh webbing. The cod end was rigged with a 12.7 mm (1/2 in) stretch mesh inner liner. The gill nets were 91.4 m (100 yd) long, 65 meshes deep, and constructed of a 83 mm (3-1/4 in) stretch mesh monofilament. Gears used were identical to those used in the UNC nekton program.

Salinity and temperature measurements (surface and bottom) were taken each time a station was visited. Water samples were taken with a 2-liter (0.5 gallon) brass Kemmerer water sampler. Temperature was measured in degrees Celsius with a Fisher immersion thermometer, and salinity was measured in parts per thousand (ppt) with an American Optical refractometer. Temperature and salinity data are presented in Figures 5.2 through 5.3.

Trawl samples consisted of fish and shellfish captured in a 15-minute tow. The catches were sorted according to species, and a minimum and maximum total length, total number, and total weight were recorded. If the species was one of the dominant and/or commercially important species (bay anchovy, Atlantic croaker, summer flounder,

southern flounder, Atlantic menhaden, striped mullet, white mullet, spot, weakfish, spotted seatrout, white shrimp, pink shrimp, or brown shrimp), up to 25 total lengths were recorded from each sample.

When extremely large samples were collected, subsampling was utilized. A sample was subsampled by filling an 8.5 liter (2.3 gal) bucket from which the numbers, lengths, and weights of each species were recorded. The rest of the catch was weighed and released overboard. The total number of fishes caught in each tow was obtained by multiplying the number of fish of each species in the subsample by a factor determined by dividing the weight of all the fish by the weight of the subsample. This technique was identical to that used by UNC (Schwartz et al. 1979b).

Samples not worked up in the field were labeled, placed in plastic bags, put on ice, and worked up in the lab at a later time.

Gill net samples consisted of fish captured in a 24-hour set. (Blue crabs were not recorded for gill net data purposes because in most instances they were attracted to a net by the fish in it rather than being captured by the net.) Gill net samples were worked up in the same manner as trawl samples, although because of the small sample size, they were never subsampled.

<u>September 1980 - December 1980</u>

Two method changes were adopted in an attempt to streamline the nekton program. The first consisted of deleting gill nets from the sample program because we felt that the program's objectives could be met without them.

The second change was to reduce the length of tows from 15 minutes to 5 minutes. An experimental set of trawls was taken with 15 and 5 minutes duration. Using these data, comparisons of the 5-minute trawls to the 15-minute trawls taken earlier can be made, thus maintaining the continuity of the sample program while also allowing extra time to sample more stations.

January 1981 - December 1981

Beginning in January 1981, the large trawl was no longer used as a sampling gear. Due to problems of sampling in the ship's channel (hangs, currents), state and company personnel decided that effort could be better utilized by discontinuing use of the large trawl and concentrating sampling effort solely on the small trawl.

The decision was also made to take two instead of three samples at each station during a sample period. Two samples, along with the increase in the number of small trawl stations started in January 1981, would provide sufficient data to meet the program objectives.

5.3 Results and Discussion

Since the small trawl was the only gear type used during 1981, only those data will be presented in the results and discussion, however, large trawl and gill net data are shown along with small trawl data in Table 5.2.

Since both 5-minute and 15-minute trawl samples were taken, CPUE data was adjusted to a duration of 5 minutes for purposes of analysis.

Only stations 1 and 4 through 8 were analyzed in the all year model since these were the only stations that had three complete years of data.

5.3.1 Total Organisms

Of total organisms caught from January 1979 to December 1981, 70% were finfish and 30% were non-finfish (invertebrates and reptiles). Of the fish, bay anchovy (41%), spot (30%), croaker (14%), menhaden (4%), and weakfish (4%) accounted for 98% of the total caught (Table 5.3). Grass shrimp (53%), brown shrimp (17%), pink shrimp (7%), and blue crab (7%) account for 96% of the total non-finfish caught (Table 5.4).

For all years combined (January 1979 to December 1981), ANOVA calculations showed there was no significant difference among years of total organisms caught per effort. Analysis did show a significant difference among weeks with weeks 4-10 (March-July) generally having a higher CPUE than the other weeks. For stations, analysis showed that station 5 had a significantly greater CPUE than station 1, which showed a significantly greater catch than stations 6, 7, and 4. Station 8 had a significantly lower catch than the other stations (Table 5.7).

Analysis of CPUE of total organisms caught by year showed that in 1979 and 1980 stations 5 and 1 were significantly greater than the other stations. Data for 1981 show, however, that stations 5, 13, and 12 are generally higher than the others. Stations 13 and 12 were added in 1981; station 13 was in the intake canal while station 12 was in Alligator Creek (Table 5.8).

5.3.2 Species Accounts

Bay Anchovy

Bay anchovy was the most abundant fish caught from January 1979 to December 1981 with the small trawl (Table 5.3). The peaks of abundance generally occurred about the same time in 1979, 1980, and 1981. In general, bay anchovy displayed two peaks of abundance per year. The primary peak occurred during the summer months (July and August) and consisted mainly of age 0 recruits, although older individuals were present. A secondary peak generally occurred from November to February and was made up entirely of age 0 individuals (Figure 5.4). In 1979 and 1981 this secondary peak occurred in November and corresponded closely to a large drop in salinity (Figure 5.3).

The CPUE of bay anchovy with the small trawl was 110 for the entire study period (Table 5.5). Station 1 generally had larger catches of both classes, with stations 7 and 8 having significantly lower catches (Table 5.7).

The CPUE of bay anchovy was 53 in 1979, 96 in 1980, and 171 in 1981. All three years were significantly different for the young of the year, with 1981 also having higher catches for the juvenile and adults (Table 5.7). Individual year comparisons are given in Table 5.8.

Length frequency data (Figures 5.5 through 5.7) reflect the appearance of young of the year anchovies in June that is shown in Figure 5.4. Length distribution is generally increasing until June-July, when the recruitment of a new year class lowers the mean length. The fact that the older anchovies disappear from the catch may indicate that this is an annual species. Length distributions for all three years (1979-1981) show similar patterns.

Spot

Spot was the second most abundant fish caught with the small trawl for the period January 1979 - December 1981 (Table 5.3). Figure 5.8 compares the CPUE for age 0 and age 1 and older spot. Spot were collected throughout the year; their abundance was greatest from March to June.

The CPUE of spot was 80 for the combined years January 1979 - December 1981 (Table 5.5). Significantly larger numbers of both age 0 and age 1 and older spot were caught during late March and early April. Stations 8 (23 West) and 7 (Walden Creek) had significantly lower catches than the other stations (Table 5.7).

In 1979 the CPUE of all sizes of spot was 90. The CPUE in 1980 was 40 and in 1981 was 111 (Table 5.6). Analysis showed, however, that young of the year spot had significantly larger catches in 1979 than in 1980 or 1981. For older fish, 1981 had significantly larger catches.

In 1979 and 1980, significantly greater numbers of age 0 spot were caught at stations 5 and 6 (intake canal) than the other stations.

Analysis showed that station 12 (Alligator Creek) had significantly higher catches in 1981 (1981 was the first full year of sampling in Alligator Creek) (Table 5.8).

Length frequency distributions (Figures 5.9 through 5.11) show similar growth for 1979, 1980, and 1981.

Atlantic Croaker

Croaker ranked third in the top 10 most abundant fish in small trawl catches for the study period (Table 5.3). In general, the higher catches of age 0 croaker occurred from May to July for 1979, 1980, and 1981. For juveniles and adults, the higher catches occurred in April (Figure 5.12).

The CPUE of croaker was 38 for the overall study period (Table 5.5). Significantly more young of the year were caught in June than in other periods. The CPUE of age 1 and older croaker was larger in late April. Stations 1 and 5 had significantly larger catches of both classes of croaker than the other stations (Table 5.7).

In 1979 the CPUE of croaker was 55. The CPUE declined in 1980 to 37, then declined again in 1981 to 25 (Table 5.6). The CPUE of age 0 croaker was significantly higher in 1979 than 1980 and significantly higher in 1980 than 1981. For juveniles and adults the pattern was reversed (1981 higher than 1980 and 1980 higher than 1979) (Table 5.7). In 1979 and 1980, signficantly higher catches of age 0 croaker were taken at stations 1 and 5. In 1981, the catches at stations 12, 11, and 1 were significantly higher than the other stations (Table 5.8). Stations 11 and 12 were two upriver stations (buoy 42 east and Alligator Creek, respectively) while station 1 was in the freshwater discharge. For juveniles and adults, the catches were significantly higher at station 1 in 1979, stations 5, 8, and 1 in 1980. Station 5 was higher in 1981. Station 12 had lower catches in 1981 than the other stations (Table 5.8).

Length frequency distributions (Figures 5.13 through 5.15) show the recruitment of the new year class began in October and continued through May of the following year.

Atlantic Menhaden

Menhaden was the fourth most abundant fish caught in the small trawls (Table 5.3). Figure 5.16 compares the CPUE for age 0 and age 1 and older menhaden. Menhaden were only present for a short amount of time and consisted predominantly of age 1 and older fish. (For this reason, only these fish were analyzed.) Menhaden were most abundant from January to April.

The CPUE of menhaden was 11 for the total sample period (Table 5.5). February (week 3) had significantly higher catches than the other periods. Stations 4 and 5 generally had higher catches than the other stations (Table 5.7).

The CPUE of menhaden in 1979 was 4, in 1980 was 14, and in 1981 was 13 (Table 5.6). Analysis of catches by year shows that 1980 was significantly greater than 1981 which was significantly greater than 1979 (Table 5.7). In 1979, stations 4, 5, and 8 had significantly larger catches. In 1980, these stations were generally higher than the others. In 1981, two new stations, 10 (Snow's Cut) and 13 (intake canal), along with 5 and 4, were generally higher than the other stations (Table 5.8).

Length frequency distributions (Figures 5.17 through 5.19) show that new recruits appear around April and June. Catches are low after midsummer and no clear length frequency patterns can be seen.

Trout

Weakfish and spotted seatrout were the two commercially and recreationally important trout caught during the sampling period. Because of the small numbers collected, spotted seatrout were not included in the discussion below.

Weakfish was the fifth most abundant fish caught with the small trawl over the entire sampling period (Table 5.3). Figure 5.20 shows that weakfish were present from May to December with the peak abundance occurring around July.

For the period January 1979-December 1981, the CPUE of weakfish was 10 (Table 5.5). Significantly more weakfish were caught in July and August than at other times of the year. Station 5 had a significantly greater CPUE than station 1, which in turn had a significantly greater CPUE than all the other stations (Table 5.7).

The CPUE for weakfish was 7, 11, and 11 in 1979, 1980, and 1981, respectively, and were not significantly different (Table 5.7). The CPUE for young of the year trout at stations 5 and 1 were generally higher than the other stations for 1979 and 1980. In 1981, stations 10, 1, 5, 13, and 4 had significantly higher catches than the other stations (Table 5.8). All of these stations were in man-made canals: station 10 was in Snow's Cut, station 1 was in the freshwater drainage canal, and stations 5, 13, and 4 were in the intake canal.

Length distributions (Figure 5.21 through 5.23) show recruitment beginning in June and similar growth for age 0 fish for all three years. These figures also show the presence of juveniles in the first half of the year.

Flounder

Two species of commercially and recreationally important flounder were caught by the small trawl during the study period, the southern and the summer flounder. Of the two, the southern flounder was more abundant and ranked tenth in overall abundance (Table 5.3). During 1979 southern flounder comprised 0.58% of the small trawl catch. A slight decrease to 0.37% of the overall small trawl catch occurred in 1980 and a further decrease to 0.07% occurred in 1981 (Table 5.6).

The small numbers of flounder collected preclude any meaningful statistical analysis and length frequency comparisons.

Mullet

Mullet were collected in relatively small numbers (< 0.1% of the total catch) during the study period. Approximately 98% of the mullet were striped and the other 2% white (Table 5.2). The small catch precludes any annual comparison.

Other Finfish

In addition to the eleven commercially and recreationally important finfish, there were 131 other finfish species caught during the study period. Four species in this category were included in the top ten most abundant fish caught (Table 5.3). Blackcheek tonguefish *Symphurus plagiura*, star drum *Stellifer lanceolatus*, hogchoker *Trinectes maculatus*, and spotted hake *Urophysic regia* ranked 6, 7, 8, and 9 respectively.

Shrimp

Even though grass shrimp *Palaemonetes* spp. was the most abundant non-finfish, this section is restricted to the commercially important shrimp of the family Penaeidae. The species included are brown shrimp, pink shrimp, and white shrimp. Of these three, the white shrimp has historically been the most abundant species in the Cape Fear estuary. Recently, however, their numbers have been reduced because of the severe winters of 1976-1978. During this study brown shrimp ranked as the most abundant of the three, followed by pink shrimp and then white shrimp.

Brown Shrimp

Brown shrimp was the second most abundant non-finfish caught with the small trawl from January 1979 to December 1981 (Table 5.4). The

peak of abundance of brown shrimp generally occurred in June for each year of the sample period. Very few brown shrimp were caught either before or after this period (Figure 5.24).

The CPUE of brown shrimp was 20 for the period January 1979 through December 1981. Analysis showed that catches were significantly higher in mid-June (week 9). Station 5 had generally higher catches than the other stations (Table 5.7).

In 1979, the CPUE of brown shrimp was 31 as compared to 21 in 1980 and 10 in 1981 (Table 5.6). All three years were significantly different (Table 5.7). Catches were significantly greater in early June in 1979, in July in 1980, and late June in 1981. Stations 5 and 1 were higher in 1979 and 1980 while stations 11 and 10 were higher in 1981 (Table 5.8).

Length frequency distributions show brown shrimp first entered the small trawl samples in May of all three years. From May until August this species exhibited growth of approximately 100 mm. Beginning in September, the larger individuals appeared to leave the small trawl sample area as only smaller brown shrimp were caught. These smaller were caught until January at which time practically no brown shrimp were seen in small trawl samples (Figures 5.25 through 5.27).

Pink Shrimp

Pink shrimp was the third most abundant non-finfish caught in small trawls from January 1979 to December 1981 (Table 5.4). In general, the peak of abundance of pink shrimp occurred from August to October of the small trawl sample period. An exception to this general trend was seen in the 1980 data as the peak of abundance of pink shrimp occurred from January to May. This was a result of a large overwintering population of shrimp spawned in 1979, coupled with a very low pink shrimp population in 1980 (Figure 5.28).

The CPUE of pink shrimp for the entire sampling period was 8 (Table 5.5). Significantly more pink shrimp were caught in weeks 13 and 14 (September and October). Station 1 was significantly greater than station 5, which in turn was significantly greater than the other stations (Table 5.7).

In 1979, the CPUE of pink shrimp was 31. In 1980, the CPUE was 21 and in 1981 was 10 (Table 5.6). All three years were significantly different (Table 5.7). September 1979 and 1981 had significantly higher catches than the other months. January was significantly higher in 1980. Station 1 was significantly higher in 1979 and 1980. Station 5 had higher catches in 1981 (Table 5.8).

Length frequency distributions of pink shrimp caught with the small trawl data showed the general trend of individuals entering the catches in June-July. They increased very little in size during the fall, overwintered to some degree in the estuary, and achieved their peak growth from February to May. Pink shrimp were almost totally absent from the small trawl catches in June and July. Little variation was seen in this trend from 1979-1981 except for the time when young pink shrimp first entered the trawl catches. They were first caught in June, July, and August of 1981, 1980, and 1981 respectively (Figures 5.29 through 5.31).

White Shrimp

White shrimp was the sixth most abundant non-finfish caught during the entire sample period (Table 5.4). Abundance occurred from August to November but varied among years (Figure 5.32).

The CPUE of white shrimp for January 1979 through December 1981 was 7 (Table 5.5). The catches in October were generally higher than in other months. Station 5 had significantly greater catches than station 1 which had significantly greater catches than the other stations (Table 5.7).

The CPUE of white shrimp in 1979 was 3, in 1980 was 14, and in 1981 was 2 (Table 5.6). All three years were significantly different (Table 5.7). Fall catches were generally higher in all three years although individual peaks varied. Stations 1 and 5 had higher catches in 1979. In 1980, stations 5 and 11 were significantly higher than station 1 which was significantly higher than other stations (Table 5.8).

White shrimp first started appearing in the small trawl samples in August 1979 and in July 1980 and 1981 (Figures 5.33 through 5.35).

Blue Crabs

Because of the poor shrimp seasons following the severe winters of 1976-1978, blue crabs probably rank as the most important commercial species present in the CFE.

Blue crabs ranked as the fourth most abundant non-finfish species captured with the small trawl for January 1979 - December 1981 (Table 5.4). Blue crabs were present throughout all years of the study period.

The blue crab CPUE from January 1979-December 1981 was 8 (Table 5.5). Significantly greater catches occurred in weeks 5-6 (late March-early April) of the study period. Station 1 showed significantly less numbers in the catches than the other stations (Table 5.7).

In 1979, the CPUE of blue crabs was 11. Blue crab CPUE in 1980 was 6 and in 1981 was 7 (Table 5.6). All three years were significantly different (Table 5.7). Generally, greater catches of blue crabs occurred between March and August except in 1981 when a significantly greater CPUE occurred in early September (week 12). In 1979 and 1980 generally higher catches were taken in the intake canal. In 1981 significantly greater catches occurred upriver where station 11 had significantly higher catches than all the other stations except station 12 (Table 5.8).

5.4 Summary

Nekton monitoring from January 1979 to December 1981 showed no significant difference among years for catch per unit effort of total organisms. Differences in catch rates of individual species did vary among years, and differences were seen among sampling weeks. These differences were expected and are attributable to natural variation.

The most significant result of this program to date has been the documentation, with the addition in 1981 of stations at Alligator Creek, 42 East, and Snow's Cut, of well populated nursery areas upriver from BSEP. In 1981 these areas showed greater catches of spot, croaker, and brown shrimp than the downriver areas. Because of these abundances, it is unlikely that BSEP is limiting recruitment to these upriver areas and therefore is probably not having an adverse effect on the CFE.

TABLE 5.1 TRIP NUMBER, DATES, EFFORTS AND ANALYSIS WEEK FOR NEKTON STUDY, 1979 TO 1981.

TRIP	SAMPLE DATES	NUMBER OF EFFORTS LT	ST	GN	ANALYSIS WEEK
1	08JAN79-11JAN79	15	18	12	1
2	30JAN79-01FEB79	15	18	12	2
3	20FEB79-22FEB79	12	18	12	3
4	13MAR79-16MAR79	12	18	12	4
5	03APR79-05APR79	12	18	12	5
6	24APR79-26APR79	12	18	12	6
7	15MAY79-16MAY79	12	18	12	7
8	04JUN79-07JUN79	15	18	12	8
9	24JUN79-27JUN79	15	18	12	9
10	17JUL79-19JUL79	0	18	12	10
11	07AUG79-10AUG79	15	18	12	11
12	28AUG79-30AUG79	13	18	12	12
13	18SEP79-20SEP79	15	18	12	13
14	09OCT79-11OCT79	15	18	12	14
15	30OCT79-01NOV79	15	18	12	15
16	19NOV79-21NOV79	5	18	12	16
17	11DEC79-13DEC79	15	18	12	17
18	07JAN80-08JAN80	15	18	11	1
19	22JAN80-25JAN80	15	18	12	2
20	12FEB80-15FEB80	15	18	12	3
21	05MAR80-07MAR80	10	18	12	4
22	25MAR80-27MAR80	11	18	12	5
23	16APR80-18APR80	10	18	10	6
24	06MAY80-08MAY80	0	18	12	7
25	28MAY80-04JUN80	14	18	12	8
26	17JUN80-19JUN80	15	18	10	9
27	08JUL80-10JUL80	6	18	10	10
28	29JUL80-31JUL80	15	18	11	11
29	19AUG80-21AUG80	15	18	12	12
30	09SEP80-17SEP80	18	24	0	13
31	30SEP80-04OCT80	18	24	0	14
32	21OCT80-22OCT80	18	24	0	15
33	11NOV80-12NOV80	0	24	0	16
34	03DEC80-05DEC80	0	24	0	17
35	22DEC80-23DEC80	0	24	0	18
36	14JAN81-15JAN81	0	22	0	1
37	03FEB81-04FEB81	0	22	0	2
38	25FEB81-26FEB81	0	22	0	3
39	18MAR81-19MAR81	0	22	0	4
40	08APR81-09APR81	0	22	0	5
41	28APR81-29APR81	0	22	0	6
42	18MAY81-19MAY81	0	22	0	7
43	09JUN81-10JUN81	0	22	0	8
44	30JUN81-01JUL81	0	22	0	9
45	22JUL81-23JUL81	0	22	0	10
46	12AUG81-13AUG81	0	22	0	11
47	01SEP81-02SEP81	0	22	0	12
48	23SEP81-24SEP81	0	22	0	13
49	13OCT81-15OCT81	0	22	0	14
50	03NOV81-04NOV81	0	22	0	15
51	23NOV81-25NOV81	0	22	0	16
52	16DEC81-17DEC81	0	22	0	17
	TOTAL	408	1040	340	

TABLE 5.2 TOTAL NUMBER, TOTAL WEIGHT AND PERCENT TOTAL BY GEAR OF SPECIES COLLECTED IN NEKTON STUDY, 1979 TO 1981.

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
CARCHARHINIDAE	*	*	*	*	*	*
REQUIEM SHARKS	*	*	*	*	*	*
CARCHARHINUS OBSCURUS	0	0	0	0	3	7747
DUSKY SHARK	0.00	0.00	0.00	0.09	0.06	0.48
CARCHARHINUS PLUMBEUS	1	5448	0	0	14	29393
SANDBAR SHARK	0.00	0.12	0.00	0.00	0.26	1.83
RHIZOPRIONODON TERRAENOVAE	145	29051	23	3654	503	192853
ATLANTIC SHARPNOSE SHARK	0.06	0.66	0.00	0.17	9.33	12.01
SPHYRNIDAE	*	*	*	*	*	*
HAMMERHEAD SHARKS	*	*	*	*	*	*
SPHYRNA LEWINI	0	0	0	0	1	438
SCALLOPED HAMMERHEAD	0.00	0.00	0.00	0.00	0.02	0.03
DASYATIDAE	*	*	*	*	*	*
STINGRAYS	*	*	*	*	*	*
DASYATIS AMERICANA	6	709	0	0	0	0
SOUTHERN STINGRAY	0.00	0.02	0.00	0.00	0.00	0.00
DASYATIS SABINA	36	21035	12	4997	0	0
ATLANTIC STINGRAY	0.01	0.47	0.00	0.23	0.00	0.00
DASYATIS SAYI	1	454	0	0	0	0
BLUNTNOSE STINGRAY	0.00	0.01	0.00	0.00	0.00	0.00
GYMNURA MICRURA	7	10750	1	312	0	0
SMOOTH BUTTERFLY RAY	0.00	0.24	0.00	0.01	0.00	0.00
MYLIOBATIDAE	*	*	*	*	*	*
EAGLE RAYS	*	*	*	*	*	*
RHINOPTERA BONASUS	4	24062	0	0	0	0
COWNOSE RAY	0.00	0.54	0.00	0.00	0.00	0.00
ACIPENSERIDAE	*	*	*	*	*	*
STURGEONS	*	*	*	*	*	*
ACIPENSER OXYRHYNCHUS	11	8446	6	4222	37	27530
ATLANTIC STURGEON	0.00	0.19	0.00	0.20	0.69	1.71
LEPISOSTEIDAE	*	*	*	*	*	*
GARS	*	*	*	*	*	*
LEPISOSTEUS OSSEUS	0	0	8	3749	61	103053
LONGNOSE GAR	0.00	0.00	0.00	0.17	1.13	6.42

TABLE 5.2 (CONTINUED).

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
ELOPIDAE	*	*	*	*	*	*
TARPONS	*	*	*	*	*	*
ELOPS SAURUS	4	723	4	336	8	3608
LADYFISH	0.00	0.02	0.00	0.02	0.15	0.22
ELOPS SAURUS(LEPTOCEPHALUS)	0	0	1	1	0	0
LADYFISH(LEPTOCEPHALUS)	0.00	0.00	0.00	0.00	0.00	0.00
ANGUILLIDAE	*	*	*	*	*	*
FRESHWATER EELS	*	*	*	*	*	*
ANGUILLA ROSTRATA	79	14595	[illegible]8	28318	0	0
AMERICAN EEL	0.03	0.33	0.08	1.31	0.00	0.00
CONGRIDAE	*	*	*	*	*	*
CONGER EELS	*	*	*	*	*	*
CONGER OCEANICUS	1	96	7	855	0	0
CONGER EEL	0.00	0.00	0.00	0.04	0.00	0.00
OPHICHTHIDAE	*	*	*	*	*	*
SNAKE EELS	*	*	*	*	*	*
MYROPHIS PUNCTATUS	0	0	7	44	0	0
SPECKLED WORM EEL	0.00	0.00	0.00	0.00	0.00	0.00
OPHICHTHUS GOMESI	1	134	19	473	0	0
SHRIMP EEL	0.00	0.00	0.00	0.02	0.00	0.00
CLUPEIDAE	*	*	*	*	*	*
HERRINGS	*	*	*	*	*	*
ALOSA SP.	0	0	3	5	0	0
SHAD UNID.(ALOSA)	0.00	0.00	0.00	0.00	0.00	0.00
ALOSA AESTIVALIS	126	4524	114	1312	50	14314
BLUEBACK HERRING	0.05	0.10	0.02	0.06	0.93	0.89
ALOSA MEDIOCRIS	11	527	2	630	9	4309
HICKORY SHAD	0.00	0.01	0.00	0.03	0.17	0.27
ALOSA PSEUDOHARENGUS	5	95	0	0	0	0
ALEWIFE	0.00	0.00	0.00	0.00	0.00	0.00
ALOSA SAPIDISSIMA	63	2489	84	982	16	7256
AMERICAN SHAD	0.02	0.06	0.02	0.04	0.30	0.45
BREVOORTIA TYRANNUS	154608	2371146	23263	260441	3561	811200
ATLANTIC MENHADEN	59.43	53.47	4.44	12.03	66.08	50.52

TABLE 5.2 (CONTINUED).

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
DOROSOMA CEPEDIANUM	57	1820	42	927	30	9000
GIZZARD SHAD	0.02	0.04	0.01	0.04	0.56	0.56
DOROSOMA PETENENSE	5	290	2	16	0	0
THREADFIN SHAD	0.00	0.01	0.00	0.00	0.00	0.00
OPISTHONEMA OGLINUM	27	1118	[illegible]	377	5	658
ATLANTIC THREAD HERRING	0.01	0.03	0.00	0.02	0.09	0.04
ENGRAULIDAE	*	*	*	*	*	*
ANCHOVIES	*	*	*	*	*	*
ANCHOA SP.	0	0	2	1	0	0
ANCHOVY UNID.(ANCHOA)	0.00	0.00	0.00	0.00	0.00	0.00
ANCHOA HEPSETUS	91	718	723	3298	0	0
STRIPED ANCHOVY	0.04	0.02	0.14	0.15	0.00	0.00
ANCHOA MITCHILLI	2731	6394	181181	183183	0	0
BAY ANCHOVY	1.05	0.14	34.52	8.46	0.00	0.00
SYNODONTIDAE	*	*	*	*	*	*
LIZARDFISHES	*	*	*	*	*	*
SYNODUS FOETENS	27	1412	127	4592	1	0
INSHORE LIZARDFISH	0.01	0.03	0.02	0.21	0.02	0.00
CYPRINIDAE	*	*	*	*	*	*
CARPS AND MINNOWS	*	*	*	*	*	*
NOTEMIGONUS CRYSOLEUCAS	0	0	1	6	0	0
GOLDEN SHINER	0.00	0.00	0.00	0.00	0.00	0.00
CATOSTOMIDAE	*	*	*	*	*	*
SUCKERS	*	*	*	*	*	*
ERIMYZON SUCETTA	0	0	0	0	1	360
LAKE CHUBSUCKER	0.00	0.00	0.00	0.00	0.02	0.02
ICTALURIDAE	0	0	24	4	0	0
BULLHEAD CATFISHES	0.00	0.00	0.00	0.00	0.00	0.00
ICTALURUS CATUS	3	563	150	7194	8	3876
WHITE CATFISH	0.00	0.01	0.03	0.33	0.15	0.24
ICTALURUS FURCATUS	0	0	7	693	0	0
BLUE CATFISH	0.00	0.00	0.00	0.03	0.00	0.00
ICTALURUS NEBULOSUS	0	0	6	389	0	0
BROWN BULLHEAD	0.00	0.00	0.00	0.02	0.00	0.00

TABLE 5.2 (CONTINUED).

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
ICTALURUS PLATYCEPHALUS	0	0	1	75	0	0
FLAT BULLHEAD	0.00	0.00	0.00	0.00	0.00	0.00
ICTALURUS PUNCTATUS	0	0	42	1460	0	0
CHANNEL CATFISH	0.00	0.00	0.01	0.07	0.00	0.00
ARIIDAE	*	*	*	*	*	*
SEA CATFISHES	*	*	*	*	*	*
ARIUS FELIS	3	642	1	157	0	0
HARDHEAD CATFISH	0.00	0.01	0.00	0.01	0.00	0.00
BATRACHOIDIDAE	*	*	*	*	*	*
TOADFISHES	*	*	*	*	*	*
OPSANUS TAU	80	9023	1137	78425	0	0
OYSTER TOADFISH	0.03	0.20	0.22	3.62	0.00	0.00
GOBIESOCIDAE	*	*	*	*	*	*
CLINGFISHES	*	*	*	*	*	*
GOBIESOX STRUMOSUS	4	10	51	148	0	0
SKILLETFISH	0.00	0.00	0.01	0.01	0.00	0.00
GADIDAE	*	*	*	*	*	*
CODFISHES	*	*	*	*	*	*
UROPHYCIS SP.	0	0	1	1	0	0
HAKE UNID.(UROPHYCIS)	0.00	0.00	0.00	0.00	0.00	0.00
UROPHYCIS FLORIDANA	115	2977	512	8045	0	0
SOUTHERN HAKE	0.04	0.07	0.10	0.37	0.00	0.00
UROPHYCIS REGIA	5795	113458	2661	36883	0	0
SPOTTED HAKE	2.23	2.56	0.51	1.70	0.00	0.00
OPHIDIIDAE	5	117	310	3267	0	0
CUSK-EELS	0.00	0.00	0.06	0.15	0.00	0.00
OPHIDION WELSHI	11	282	921	6709	0	0
CRESTED CUSK-EEL	0.00	0.01	0.18	0.31	0.00	0.00
CYPRINODONTIDAE	*	*	*	*	*	*
KILLIFISHES	*	*	*	*	*	*
FUNDULUS HETEROCLITUS	0	0	12	48	0	0
MUMMICHOG	0.00	0.00	0.00	0.00	0.00	0.00
ATHERINIDAE	*	*	*	*	*	*
SILVERSIDES	*	*	*	*	*	*

TABLE 5.2 (CONTINUED).

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
MEMBRAS MARTINICA	1	2	2	4	0	0
ROUGH SILVERSIDE	0.00	0.00	0.00	0.00	0.00	0.00
MENIDIA BERYLLINA	0	9	21	22	0	0
INLAND SILVERSIDE	0.00	0.00	0.00	0.00	0.00	0.00
MENIDIA MENIDIA	14	37	1667	6253	0	0
ATLANTIC SILVERSIDE	0.01	0.00	0.32	0.29	0.00	0.00
SYNGNATHIDAE	*	*	*	*	*	*
PIPEFISHES	*	*	*	*	*	*
HIPPOCAMPUS ERECTUS	1	2	1	1	0	0
LINED SEAHORSE	0.00	0.00	0.00	0.00	0.00	0.00
SYNGNATHUS FUSCUS	1	9	26	34	0	0
NORTHERN PIPEFISH	0.00	0.00	0.06	0.00	0.00	0.00
SYNGNATHUS LOUISIANAE	0	0	18	91	0	0
CHAIN PIPEFISH	0.00	0.00	0.00	0.00	0.00	0.00
PERCICHTHYIDAE	*	*	*	*	*	*
TEMPERATE BASSES	*	*	*	*	*	*
MORONE SAXATILIS	0	0	3	55	2	1136
STRIPED BASS	0.00	0.00	0.00	0.00	0.04	0.07
SERRANIDAE	1	4	0	0	0	0
SEA BASSES	0.00	0.00	0.00	0.00	0.00	0.00
CENTROPRISTIS PHILADELPHICA	15	462	12	406	0	0
ROCK SEA BASS	0.01	0.01	0.00	0.02	0.00	0.00
CENTROPRISTIS STRIATA	17	678	2	47	0	0
BLACK SEA BASS	0.01	0.02	0.00	0.00	0.00	0.00
EPINEPHELUS MORIO	0	0	1	13	0	0
RED GROUPER	0.00	0.00	0.00	0.00	0.00	0.00
MYCTEROPERCA SP.(LARVAE)	0	0	1	1	0	0
GROUPER LARVAE(MYCTEROPERCA	0.00	0.00	0.00	0.00	0.00	0.00
MYCTEROPERCA MICROLEPIS	0	0	3	74	0	0
GAG	0.00	0.00	0.00	0.00	0.00	0.00
CENTRARCHIDAE	*	*	*	*	*	*
SUNFISHES	*	*	*	*	*	*
LEPOMIS GIBBOSUS	0	0	45	2278	0	0
PUMPKINSEED	0.00	0.00	0.01	0.11	0.00	0.00

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
LEPOMIS GULOSUS	0	6	9	1125	0	0
WARMOUTH	0.00	0.00	0.00	0.05	0.00	0.00
LEPOMIS MACROCHIRUS	0	0	11	323	0	0
BLUEGILL	0.00	0.00	0.00	0.01	0.00	0.00
MICROPTERUS SALMOIDES	0	0	8	2513	0	0
LARGEMOUTH BASS	0.00	0.00	0.00	0.12	0.00	0.00
POMOXIS NIGROMACULATUS	0	0	2	436	0	0
BLACK CRAPPIE	0.00	0.00	0.00	0.02	0.00	0.00
PERCIDAE	*	*	*	*	*	*
PERCHES	*	*	*	*	*	*
PERCA FLAVESCENS	0	0	2	125	0	0
YELLOW PERCH	0.00	0.00	0.00	0.01	0.00	0.00
POMATOMIDAE	*	*	*	*	*	*
BLUEFISHES	*	*	*	*	*	*
POMATOMUS SALTATRIX	48	3375	74	2399	302	133610
BLUEFISH	0.02	0.08	0.01	0.11	5.60	8.32
RACHYCENTRIDAE	*	*	*	*	*	*
COBIAS	*	*	*	*	*	*
RACHYCENTRON CANADUM	0	0	1	84	0	0
COBIA	0.00	0.00	0.00	0.00	0.00	0.00
CARANGIDAE	*	*	*	*	*	*
JACKS	*	*	*	*	*	*
CARANX HIPPOS	4	164	11	49	2	255
CREVALLE JACK	0.00	0.00	0.00	0.00	0.04	0.02
CHLOROSCOMBRUS CHRYSURUS	115	918	51	249	6	532
ATLANTIC BUMPER	0.04	0.02	0.01	0.01	0.11	0.03
SELENE SETAPINNIS	2	11	43	20	0	0
ATLANTIC MOONFISH	0.00	0.00	0.01	0.00	0.00	0.00
SELENE VOMER	185	3357	313	2668	0	0
LOOKDOWN	0.07	0.08	0.06	0.12	0.00	0.00
TRACHINOTUS CAROLINUS	5	478	0	0	3	452
FLORIDA POMPANO	0.00	0.01	0.00	0.00	0.06	0.03
LUTJANIDAE	*	*	*	*	*	*
SNAPPERS	*	*	*	*	*	*

TABLE 5.2 (CONTINUED).

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
LUTJANUS GRISEUS	6	[illegible]	22	387	0	0
GRAY SNAPPER	0.00	[illegible]	0.00	0.02	0.00	0.00
LUTJANUS SYNAGRIS	0	0	1	1	0	0
LANE SNAPPER	0.00	0.00	0.00	0.00	0.00	0.00
GERREIDAE	0	0	2	2	0	0
MOJARRAS	0.00	0.00	0.00	0.00	0.00	0.00
DIAPTERUS AURATUS	0	0	11	158	0	0
IRISH POMPANO	0.00	0.00	0.00	0.01	0.00	0.00
EUCINOSTOMUS SP.	0	0	1	1	0	0
MOJARRA UNID.(EUCINOSTOMUS)	0.00	0.00	0.00	0.00	0.00	0.00
EUCINOSTOMUS ARGENTEUS	8	107	139	757	0	0
SPOTFIN MOJARRA	0.00	0.00	0.03	0.03	0.00	0.00
EUCINOSTOMUS GULA	1	21	0	0	0	0
SILVER JENNY	0.00	0.00	0.00	0.00	0.00	0.00
HAEMULIDAE	*	*	*	*	*	*
GRUNTS	*	*	*	*	*	*
ORTHOPRISTIS CHRYSOPTERA	60	4809	25	855	6	0
PIGFISH	0.02	0.11	0.00	0.04	0.00	0.00
SPARIDAE	*	*	*	*	*	*
PORGIES	*	*	*	*	*	*
ARCHOSARGUS PROBATOCEPHALUS	9	591	162	6293	1	173
SHEEPSHEAD	0.00	0.01	0.03	0.29	0.02	[illegible]
LAGODON RHOMBOIDES	171	6616	767	16359	[illegible]	[illegible]
PINFISH	0.07	0.15	0.15	0.76	[illegible]	[illegible]
SCIAENIDAE	*	*	*	*	*	*
DRUMS	*	*	*	*	*	*
BAIRDIELLA CHRYSOURA	1684	63981	1906	40961	1	57
SILVER PERCH	0.65	1.44	0.36	1.89	0.02	0.00
CYNOSCION NEBULOSUS	485	26591	277	13410	151	91565
SPOTTED SEATROUT	0.19	0.60	0.05	0.62	2.80	5.79
CYNOSCION NOTHUS	0	0	2	4	0	0
SILVER SEATROUT	0.00	0.00	0.00	0.00	0.00	0.00
CYNOSCION REGALIS	7154	177827	20612	69546	21	10234
WEAKFISH	2.75	4.01	3.93	3.21	0.39	0.64

TABLE 5.2 (CONTINUED).

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
LARIMUS FASCIATUS	33	543	13	98	0	0
BANDED DRUM	0.01	0.01	0.00	0.00	0.00	0.00
LEIOSTOMUS XANTHURUS	25382	489919	164395	807462	301	70751
SPOT	9.77	11.05	31.32	37.31	5.59	4.41
MENTICIRRHUS SP.	60	5181	301	741	2	454
KINGFISH UNID.(MENTICIRRHUS	0.02	0.12	0.06	0.03	0.04	0.03
MENTICIRRHUS AMERICANUS	47	6449	333	1218	8	2470
SOUTHERN KINGFISH	0.02	0.15	0.06	0.06	0.15	0.15
MENTICIRRHUS LITTORALIS	8	134	1	28	0	3
GULF KINGFISH	0.00	0.00	0.00	0.00	0.00	0.00
MENTICIRRHUS SAXATILIS	2	20	12	65	0	5
NORTHERN KINGFISH	0.00	0.00	0.00	0.00	0.00	0.00
MICROPOGONIAS UNDULATUS	24391	384163	98966	340699	128	25097
ATLANTIC CROAKER	9.39	8.66	18.86	15.74	2.38	1.56
POGONIAS CROMIS	5	4022	21	2356	7	1240
BLACK DRUM	0.00	0.09	0.00	0.11	0.13	0.08
SCIAENOPS OCELLATUS	0	0	8	13	17	9791
RED DRUM	0.00	0.00	0.00	0.00	0.32	0.61
STELLIFER LANCEOLATUS	31810	370122	4490	19700	0	0
STAR DRUM	12.24	8.35	0.86	0.91	0.00	0.00
EPHIPPIDAE	*	*	*	*	*	*
SPADEFISHES	*	*	*	*	*	*
CHAETODIPTERUS FABER	192	1779	222	1684	0	0
ATLANTIC SPADEFISH	0.07	0.04	0.04	0.08	0.00	0.00
LABRIDAE	*	*	*	*	*	*
WRASSES	*	*	*	*	*	*
TAUTOGA ONITIS	0	0	1	10	0	0
TAUTOG	0.00	0.00	0.00	0.00	0.00	0.00
MUGILIDAE	*	*	*	*	*	*
MULLETS	*	*	*	*	*	*
MUGIL CEPHALUS	61	3063	429	9145	58	25212
STRIPED MULLET	0.02	0.07	0.08	0.42	1.08	1.57
MUGIL CUREMA	0	0	12	402	0	0
WHITE MULLET	0.00	0.00	0.00	0.02	0.00	0.00

TABLE 5.2 (CONTINUED).

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
SPHYRAENIDAE	*	*	*	*	*	*
BARRACUDAS	*	*	*	*	*	*
SPHYRAENA BOREALIS	0	0	1	1	0	0
NORTHERN SENNET	0.00	0.00	0.00	0.00	0.00	0.00
URANOSCOPIDAE	0	0	5	10	0	0
STARGAZERS	0.00	0.00	0.00	0.00	0.00	0.00
ASTROSCOPUS SP.	0	0	15	53	0	0
STARGAZER UNID.(ASTROSCOPUS	0.00	0.00	0.00	0.00	0.00	0.00
ASTROSCOPUS GUTTATUS	10	1643	22	238	0	0
NORTHERN STARGAZER	0.00	0.04	0.00	0.01	0.00	0.00
ASTROSCOPUS Y-GRAECUM	15	1208	26	221	0	0
SOUTHERN STARGAZER	0.01	0.03	0.00	0.01	0.00	0.00
BLENNIIDAE	0	0	1	4	0	0
COMBTOOTH BLENNIES	0.00	0.00	0.00	0.00	0.00	0.00
CHASMODES BOSQUIANUS	0	0	64	183	0	0
STRIPED BLENNY	0.00	0.00	0.01	0.01	0.00	0.00
HYPSOBLENNIUS HENTZI	19	166	50	257	0	0
FEATHER BLENNY	0.01	0.00	0.01	0.01	0.00	0.00
HYPSOBLENNIUS IONTHAS	2	7	125	508	0	0
FRECKLED BLENNY	0.00	0.00	0.02	0.02	0.00	0.00
GOBIIDAE	*	*	*	*	*	*
GOBIES	*	*	*	*	*	*
BATHYGOBIUS SOPORATOR	1	10	0	0	0	0
FRILLFIN GOBY	0.00	0.00	0.00	0.00	0.00	0.00
GOBIONELLUS BOLEOSOMA	0	0	88	56	0	0
DARTER GOBY	0.00	0.00	0.02	0.00	0.00	0.00
GOBIONELLUS HASTATUS	6	58	55	233	0	0
SHARPTAIL GOBY	0.00	0.00	0.01	0.01	0.00	0.00
GOBIONELLUS SHUFELDTI	0	0	101	75	0	0
FRESHWATER GOBY	0.00	0.00	0.02	0.00	0.00	0.00
GOBIOSOMA BOSCI	0	0	51	63	0	0
NAKED GOBY	0.00	0.00	0.01	0.00	0.00	0.00
GOBIOSOMA GINSBURGI	0	0	4	10	0	0
SEABOARD GOBY	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 5.2 (CONTINUED).

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
GOBIOSOMA ROBUSTUM CODE GOBY	0 0.00	0 0.00	1 0.00	1 0.00	0 0.00	0 0.00
MICROGOBIUS SP. GOBY UNID.(MICROGOBIUS)	1 0.00	42 0.00	1 0.00	1 0.00	0 0.00	0 0.00
MICROGOBIUS GULOSUS CLOWN GOBY	0 0.00	0 0.00	6 0.00	6 0.00	0 0.00	0 0.00
MICROGOBIUS THALASSINUS GREEN GOBY	0 0.00	0 0.00	32 0.01	25 0.00	0 0.00	0 0.00
TRICHIURIDAE CUTLASSFISHES	. .	. .	. .	. .	. .	. .
TRICHIURUS LEPTURUS ATLANTIC CUTLASSFISH	611 0.24	67327 1.52	134 0.03	3279 0.15	2 0.04	199 0.01
SCOMBRIDAE MACKERELS	. .	. .	. .	. .	. .	. .
SCOMBEROMORUS CAVALLA KING MACKEREL	1 0.00	20 0.00	1 0.00	2 0.00	0 0.00	0 0.00
SCOMBEROMORUS MACULATUS SPANISH MACKEREL	28 0.01	1049 0.02	4 0.00	120 0.01	2 0.04	956 0.06
STROMATEIDAE BUTTERFISHES	. .	. .	. .	. .	. .	. .
PEPRILUS ALEPIDOTUS HARVESTFISH	301 0.12	7824 0.18	51 0.01	1295 0.06	7 0.13	694 0.04
PEPRILUS TRIACANTHUS BUTTERFISH	180 0.07	2649 0.06	20 0.00	47 0.00	0 0.00	0 0.00
TRIGLIDAE SEAROBINS	. .	. .	. .	. .	. .	. .
PRIONOTUS SP. SEAROBIN UNID.(PRIONOTUS)	0 0.00	0 0.00	35 0.01	35 0.00	0 0.00	0 0.00
PRIONOTUS CAROLINUS NORTHERN SEAROBIN	4 0.00	29 0.00	1 0.00	2 0.00	0 0.00	0 0.00
PRIONOTUS SCITULUS LEOPARD SEAROBIN	12 0.00	80 0.00	28 0.01	115 0.01	0 0.00	0 0.00
PRIONOTUS TRIBULUS BIGHEAD SEAROBIN	468 0.18	2529 0.06	1376 0.26	3991 0.18	0 0.00	0 0.00

TABLE 5.2 (CONTINUED).

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
BOTHIDAE	*	*	*	*	*	*
LEFTEYE FLOUNDERS	*	*	*	*	*	*
ANCYLOPSETTA QUADROCELLATA	34	550	72	563	1	28
OCELLATED FLOUNDER	0.01	0.01	0.01	0.03	0.02	0.00
CITHARICHTHYS SPILOPTERUS	115	1321	486	2225	0	0
BAY WHIFF	0.04	0.03	0.09	0.10	0.00	0.00
ETROPUS CROSSOTUS	209	1406	768	4448	0	0
FRINGED FLOUNDER	0.08	0.03	0.15	0.21	0.00	0.00
PARALICHTHYS SP.	0	0	187	23	0	0
FLOUNDER UNID.(PARALICHTHYS	0.00	0.00	0.04	0.00	0.00	0.00
PARALICHTHYS DENTATUS	126	17155	545	13929	7	634
SUMMER FLOUNDER	0.05	0.39	0.10	0.64	0.13	0.05
PARALICHTHYS LETHOSTIGMA	1452	135066	2037	95015	41	14082
SOUTHERN FLOUNDER	0.56	3.05	0.39	4.39	0.76	0.88
SCOPHTHALMUS AQUOSUS	123	2039	273	4422	2	74
WINDOWPANE	0.05	0.05	0.05	0.20	0.04	0.00
SOLEIDAE	*	*	*	*	*	*
SOLES	*	*	*	*	*	*
TRINECTES MACULATUS	153	2905	3604	10790	0	0
HOGCHOKER	0.06	0.07	0.69	0.50	0.00	0.00
CYNOGLOSSIDAE	*	*	*	*	*	*
TONGUEFISHES	*	*	*	*	*	*
SYMPHURUS SP.	12	181	108	452	0	0
TONGUEFISH UNID.(SYMPHURUS)	0.00	0.00	0.02	0.02	0.00	0.00
SYMPHURUS PLAGIUSA	62	808	7028	23112	0	0
BLACKCHEEK TONGUEFISH	0.02	0.02	1.34	1.07	0.00	0.00
BALISTIDAE	*	*	*	*	*	*
LEATHERJACKETS	*	*	*	*	*	*
ALUTERUS SCHOEPFI	1	32	0	0	0	0
ORANGE FILEFISH	0.00	0.00	0.00	0.00	0.00	0.00
MONACANTHUS HISPIDUS	3	7	69	200	0	0
PLANEHEAD FILEFISH	0.00	0.00	0.01	0.01	0.00	0.00
TETRAODONTIDAE	*	*	*	*	*	*
PUFFERS	*	*	*	*	*	*

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
LAGOCEPHALUS LAEVIGATUS	0	0	3	49	0	0
SMOOTH PUFFER	0.00	0.00	0.00	0.00	0.00	0.00
SPHOEROIDES MACULATUS	1	10	7	7	0	0
NORTHERN PUFFER	0.00	0.00	0.00	0.00	0.00	0.00
DIODONTIDAE	*	*	*	*	*	*
PORCUPINEFISHES	*	*	*	*	*	*
CHILOMYCTERUS SCHOEPFI	1	1	10	243	0	0
STRIPED BURRFISH	0.00	0.00	0.00	0.01	0.00	0.00
FISH UNID.	0	0	0	0	6	0
FISH UNID.	0.00	0.00	0.00	0.00	0.11	0.00
TOTAL FISH	259794	4434729	524865	2164199	5389	1605761
	99.92	100.01	99.94	99.91	100.04	99.98
SQUILLA EMPUSA	311	2824	921	9239	0	0
MANTIS SHRIMP	0.93	0.33	0.34	0.69	0.00	0.00
PENAEUS AZTECUS	10437	121367	54474	323205	0	0
BROWN SHRIMP	31.13	13.99	20.17	24.04	0.00	0.00
PENAEUS DUORARUM	3546	18282	19363	46962	0	0
PINK SHRIMP	10.58	2.11	7.17	3.49	0.00	0.00
PENAEUS SETIFERUS	8823	116510	11311	100629	0	0
WHITE SHRIMP	26.32	13.43	4.19	7.48	0.00	0.00
TRACHYPENEUS CONSTRICTUS	89	94	11731	3476	0	0
T-CON OR HARDBACK SHRIMP	0.27	0.01	4.34	0.26	0.00	0.00
SICYONIA SP.	0	0	1	1	0	0
ROCK SHRIMP	0.00	0.00	0.00	0.00	0.00	0.00
MACROBRACHIUM SP.	0	0	6	50	0	0
FRESHWATER PRAWNS	0.00	0.00	0.00	0.00	0.00	0.00
PALAEMONETES SP.	148	55	146053	41267	0	0
GRASS SHRIMP	0.44	0.01	54.07	3.07	0.00	0.00
ALPHEUS SP.	5	7	136	234	0	0
SNAPPING SHRIMP	0.01	0.00	0.05	0.02	0.00	0.00
CRANGON SEPTEMSPINOSA	0	0	15	15	0	0
SAND SHRIMP	0.00	0.00	0.01	0.00	0.00	0.00
UPOGEBIA SP. AND CALLIANASSA SP.	9	18	8	16	0	0
MUD SHRIMPS	0.01	0.00	0.00	0.00	0.00	0.00

TABLE 5.2 (CONTINUED).

SPECIES	LARGE TRAWLS NUMBER %TOTAL	LARGE TRAWLS WT(GM) %TOTAL	SMALL TRAWLS NUMBER %TOTAL	SMALL TRAWLS WT(GM) %TOTAL	GILL NETS NUMBER %TOTAL	GILL NETS WT(GM) %TOTAL
OVALIPES SP. CALICO CRABS	9 0.03	44 0.01	3 0.00	6 0.00	0 0.00	0 0.00
PORTUNUS SP. SWIMMING CRABS	59 0.18	436 0.05	41 0.02	41 0.01	0 0.00	0 0.00
CALLINECTES SP. BLUE CRABS	8869 26.45	585494 67.47	18184 6.73	768920 57.19	14 51.85	1890 27.19
APLYSIA SP. SEA HARES	0 0.00	0 0.00	3 0.00	137 0.01	0 0.00	0 0.00
LOLLIGUNCULA BREVIS BRIEF SQUID	1204 3.59	11599 1.34	7834 2.90	28610 2.13	0 0.00	0 0.00
CHELYDRA SERPENTINA SNAPPING TURTLE	0 0.00	0 0.00	1 0.00	5300 0.39	0 0.00	0 0.00
MALACLEMYS TERRAPIN DIAMONDBACK TERRAPIN	13 0.04	4750 0.55	16 0.01	5297 0.39	13 48.15	5060 72.81
CHRYSEMYS CONCINNA RIVER COOTER	0 0.00	0 0.00	5 0.00	11003 0.82	0 0.00	0 0.00
CHELONIA MYDAS ATLANTIC GREEN TURTLE	1 0.00	6356 0.73	0 0.00	0 0.00	0 0.00	0 0.00
CARETTA CARETTA ATLANTIC LOGGERHEAD	2 0.01	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
TOTAL NON-FISH	33525 100.01	867836 100.03	270106 100.00	1344448 99.99	27 100.00	6950 100.00
TOTAL ORGANISMS	293319	5302565	794971	3508647	5416	1612711
TOTAL EFFORTS	408		1040		340	

Table 5.3 Ten most abundant fish caught in small trawls and percent of total number and weight, January 1979 to December 1981 (adjusted for duration)

	All Years			1979			1980			1981		
Species	Rank	% Total Number	% Total Weight	Rank	% Total Number	% Total Weight	Rank	% Total Number	% Total Weight	Rank	% Total Number	% Total Weight
Bay Anchovy	1	41	9	3	24	11	1	44	8	1	49	8
Spot	2	30	42	1	40	29	2	18	34	2	32	52
Croaker	3	14	15	2	25	16	3	17	15	3	7	14
Menhaden	4	4	10	5	2	7	4	6	15	4	4	9
Weakfish	5	4	3	4	3	4	5	5	4	5	3	2
Blackcheek Tonguefish	6	1	1	6	2	2	7	1	1	9	<1	<1
Star Drum	7	1	1	9	<1	1	6	2	2	7	1	<1
Hogchoker	8	1	1				8	1	1	6	1	1
Spotted Hake	9	1	2	8	<1	2	10	1	1	8	1	2
Southern Flounder	10	<1	3	7	1	8						
		98%	87%		99%	80%		95%	81%		99%	90%

Table 5.4 Six most abundant non-finfish caught in small trawls and percent of total number and weight, January 1979 to December 1981 (adjusted for duration)

	All Years			1979			1980			1981		
Species	Rank	% Tot-l Number	% Total Weight	Lank	% Total Number	% Total Weight	Rank	% Total Number	% Total Weight	Rank	% Total Number	% Total Weight
Grass Shrimp	1	53	3	1	64	4	1	35	2	1	53	3
Brown Shrimp	2	17	21	2	18	20	2	23	27	3	11	16
Pink Shrimp	3	7	3	3	8	4	6	5	2	4	8	3
Blue Crabs	4	7	56	4	6	65	5	7	43	5	8	60
Hardback Shrimp	5	6	<1				4	6	<1	2	12	<1
White Shrimp	6	6	10	6	2	4	3	16	21		—	—
		96%	94%		98%	97%		92%	96%		92%	83%

Table 5.5 Mean number, mean weight, and percent total for all years of species collected in nekton small trawl, 1979-1981 (adjusted for duration)

Species	Number	% Total	Weight	% Total
Bay Anchovy	110	41	100	9
Spot	80	30	474	42
Croaker	38	14	167	15
Menhaden	11	4	116	10
Weakfish	10	4	33	3
Southern Flounder	1	1	37	3
Brown Shrimp	20	17	125	21
Pink Shrimp	8	7	20	3
White Shrimp	7	6	59	10

TABLE 5.6 MEAN NUMBER, MEAN WEIGHT AND PERCENT TOTAL BY YEAR OF SPECIES COLLECTED IN NEKTON SMALL TRAWLS, 1979-1981.

SPECIES	JAN-DEC 1979 NUMBER %TOTAL	JAN-DEC 1979 WT(GM) %TOTAL	JAN-DEC 1980 NUMBER %TOTAL	JAN-DEC 1980 WT(GM) %TOTAL	JAN-DEC 1981 NUMBER %TOTAL	JAN-DEC 1981 WT(GM) %TOTAL
CARCHARHINIDAE	*	*	*	*	*	*
REQUIEM SHARKS	*	*	*	*	*	*
RHIZOPRIONODON TERRAENOVAE	0	1	0	1	0	5
ATLANTIC SHARPNOSE SHARK	0.00	0.15	0.00	0.07	0.01	0.33
DASYATIDAE	*	*	*	*	*	*
STINGRAYS	*	*	*	*	*	*
DASYATIS SABINA	0	2	0	1	0	5
ATLANTIC STINGRAY	0.00	0.32	0.00	0.10	0.00	6.30
GYMNURA MICRURA	0	0	0	0	0	0
SMOOTH BUTTERFLY RAY	0.00	0.00	0.00	0.03	0.00	0.00
ACIPENSERIDAE	*	*	*	*	*	*
STURGEONS	*	*	*	*	*	*
ACIPENSER OXYRHYNCHUS	0	1	0	6	0	0
ATLANTIC STURGEON	0.00	0.20	0.00	0.61	0.00	0.00
LEPISOSTEIDAE	*	*	*	*	*	*
GARS	*	*	*	*	*	*
LEPISOSTEUS OSSEUS	0	2	0	2	0	3
LONGNOSE GAR	0.00	0.28	0.01	0.16	0.00	0.21
ELOPIDAE	*	*	*	*	*	*
TARPONS	*	*	*	*	*	*
ELOPS SAURUS	0	0	0	0	0	0
LADYFISH	0.00	0.05	0.00	0.00	0.00	0.00
ELOPS SAURUS(LEPTOCEPHALUS)	0	0	0	0	0	0
LADYFISH(LEPTOCEPHALUS)	0.00	0.00	0.00	0.00	0.06	0.00
ANGUILLIDAE	*	*	*	*	*	*
FRESHWATER EELS	*	*	*	*	*	*
ANGUILLA ROSTRATA	0	16	0	10	0	11
AMERICAN EEL	0.11	2.17	0.07	0.98	0.03	0.73
CONGRIDAE	*	*	*	*	*	*
CONGER EELS	*	*	*	*	*	*
CONGER OCEANICUS	0	0	0	2	0	0
CONGER EEL	0.00	0.02	0.00	0.16	0.00	0.00
OPHICHTHIDAE	*	*	*	*	*	*
SNAKE EELS	*	*	*	*	*	*

SPECIES	JAN-DEC 1979 NUMBER %TOTAL	JAN-DEC 1979 WT(GM) %TOTAL	JAN-DEC 1980 NUMBER %TOTAL	JAN-DEC 1980 WT(GM) %TOTAL	JAN-DEC 1981 NUMBER %TOTAL	JAN-DEC 1981 WT(GM) %TOTAL
MYROPHIS PUNCTATUS	0	0	0	0	0	0
SPECKLED WORM EEL	0.00	0.01	0.00	0.00	0.00	0.00
OPHICHTHUS GOMESI	0	0	0	0	0	0
SHRIMP EEL	0.00	0.01	0.01	0.03	0.00	0.01
CLUPEIDAE	*	*	*	*	*	*
HERRINGS	*	*	*	*	*	*
ALOSA SP.	0	0	0	0	0	0
SHAD UNID.(ALOSA)	0.00	0.00	0.00	0.00	0.00	0.00
ALOSA AESTIVALIS	0	0	0	1	3	0
BLUEBACK HERRING	0.02	0.07	0.03	0.07	0.02	0.03
ALOSA MEDIOCRIS	0	1	0	0	0	0
HICKORY SHAD	0.00	0.08	0.00	0.01	0.00	0.00
ALOSA SAPIDISSIMA	0	0	0	0	0	1
AMERICAN SHAD	0.01	0.02	0.02	0.05	0.02	0.05
BREVOORTIA TYRANNUS	4	49	14	152	13	136
ATLANTIC MENHADEN	1.81	6.59	6.25	15.31	3.67	8.60
DOROSOMA CEPEDIANUM	0	0	0	1	0	0
GIZZARD SHAD	0.01	0.06	0.01	0.06	0.00	0.01
DOROSOMA PETENENSE	0	0	0	0	0	0
THREADFIN SHAD	0.00	0.00	0.00	0.00	0.00	0.00
OPISTHONEMA OGLINUM	0	0	0	0	0	1
ATLANTIC THREAD HERRING	0.00	0.01	0.00	0.01	0.00	0.03
ENGRAULIDAE	*	*	*	*	*	*
ANCHOVIES	*	*	*	*	*	*
ANCHOA SP.	0	0	0	0	0	0
ANCHOVY UNID.(ANCHOA)	0.00	0.00	0.00	0.00	0.00	0.00
ANCHOA HEPSETUS	0	1	0	1	1	4
STRIPED ANCHOVY	0.15	0.20	0.09	0.09	0.20	0.24
ANCHOA MITCHILLI	53	79	96	84	171	134
BAY ANCHOVY	23.66	10.73	44.19	8.43	48.82	8.47
SYNODONTIDAE	*	*	*	*	*	*
LIZARDFISHES	*	*	*	*	*	*
SYNODUS FOETENS	0	1	0	5	0	2
INSHORE LIZARDFISH	0.01	0.09	0.05	0.55	0.02	0.14

TABLE 5.6 (CONTINUED).

SPECIES	JAN-DEC 1979 NUMBER %TOTAL	JAN-DEC 1979 WT(GM) %TOTAL	JAN-DEC 1980 NUMBER %TOTAL	JAN-DEC 1980 WT(GM) %TOTAL	JAN-DEC 1981 NUMBER %TOTAL	JAN-DEC 1981 WT(GM) %TOTAL
CYPRINIDAE	*	*	*	*	*	*
CARPS AND MINNOWS	*	*	*	*	*	*
NOTEMIGONUS CRYSOLEUCAS	0	0	0	0	0	0
GOLDEN SHINER	0.00	0.00	0.00	0.00	0.00	0.00
ICTALURIDAE	6	0	0	0	0	0
BULLHEAD CATFISHES	0.90	0.00	0.00	0.00	0.02	0.00
ICTALURUS CATUS	0	4	5	6	0	5
WHITE CATFISH	0.00	0.50	0.02	0.55	0.10	0.32
ICTALURUS FURCATUS	0	0	0	0	0	2
BLUE CATFISH	0.00	0.00	0.00	0.02	0.00	0.11
ICTALURUS NEBULOSUS	0	0	0	0	0	1
BROWN BULLHEAD	0.00	0.00	0.00	0.00	0.00	0.07
ICTALURUS PLATYCEPHALUS	0	0	0	0	0	0
FLAT BULLHEAD	0.00	0.00	0.00	0.00	0.00	0.01
ICTALURUS PUNCTATUS	0	0	0	0	0	4
CHANNEL CATFISH	0.00	0.00	0.00	0.00	0.03	0.25
ARIIDAE	*	*	*	*	*	*
SEA CATFISHES	*	*	*	*	*	*
ARIUS FELIS	0	0	0	0	0	0
HARDHEAD CATFISH	0.00	0.00	0.00	0.00	0.00	0.03
BATRACHOIDIDAE	*	*	*	*	*	*
TOADFISHES	*	*	*	*	*	*
OPSANUS TAU	1	56	0	24	0	15
OYSTER TOADFISH	0.34	7.56	0.17	2.41	0.07	0.95
GOBIESOCIDAE	*	*	*	*	*	*
CLINGFISHES	*	*	*	*	*	*
GOBIESOX STRUMOSUS	0	0	0	0	0	0
SKILLETFISH	0.01	0.00	0.01	0.00	0.01	0.01
GADIDAE	*	*	*	*	*	*
CODFISHES	*	*	*	*	*	*
UROPHYCIS SP.	0	0	0	0	6	0
HAKE UNID.(UROPHYCIS)	0.00	0.00	0.00	0.00	0.00	0.00
UROPHYCIS FLORIDANA	0	6	0	1	0	4
SOUTHERN HAKE	0.16	0.79	0.06	0.11	0.04	0.24

SPECIES	JAN-DEC 1979 NUMBER %TOTAL	JAN-DEC 1979 WT(GM) %TOTAL	JAN-DEC 1980 NUMBER %TOTAL	JAN-DEC 1980 WT(GM) %TOTAL	JAN-DEC 1981 NUMBER %TOTAL	JAN-DEC 1981 WT(GM) %TOTAL
UROPHYCIS REGIA	1	17	1	11	2	24
SPOTTED HAKE	0.46	2.37	0.43	1.11	0.53	1.50
OPHIDIIDAE	0	2	0	1	0	0
CUSK-EELS	0.10	0.28	0.05	0.13	0.00	0.00
OPHIDION WELSHI	0	3	1	3	0	1
CRESTED CUSK-EEL	0.14	0.41	0.25	0.35	0.04	0.05
CYPRINODONTIDAE	*	*	*	*	*	*
KILLIFISHES	*	*	*	*	*	*
FUNDULUS HETEROCLITUS	0	0	0	0	0	0
MUMMICHOG	0.00	0.01	0.00	0.00	0.00	0.00
ATHERINIDAE	*	*	*	*	*	*
SILVERSIDES	*	*	*	*	*	*
MEMBRAS MARTINICA	0	0	0	0	0	0
ROUGH SILVERSIDE	0.00	0.00	0.00	0.00	0.00	0.00
MENIDIA BERYLLINA	0	0	0	0	0	0
INLAND SILVERSIDE	0.01	0.00	0.00	0.00	0.00	0.00
MENIDIA MENIDIA	0	1	2	6	1	2
ATLANTIC SILVERSIDE	0.12	0.15	0.77	0.57	0.21	0.13
SYNGNATHIDAE	*	*	*	*	*	*
PIPEFISHES	*	*	*	*	*	*
HIPPOCAMPUS ERECTUS	0	0	0	0	0	0
LINED SEAHORSE	0.00	0.00	0.00	0.00	0.00	0.00
SYNGNATHUS FUSCUS	0	0	0	0	0	0
NORTHERN PIPEFISH	0.00	0.00	0.00	0.00	0.01	0.00
SYNGNATHUS LOUISIANAE	0	0	0	0	0	0
CHAIN PIPEFISH	0.00	0.01	0.00	0.00	0.01	0.01
PERCICHTHYIDAE	*	*	*	*	*	*
TEMPERATE BASSES	*	*	*	*	*	*
MORONE SAXATILIS	0	0	0	0	0	0
STRIPED BASS	0.00	0.00	0.00	0.01	0.00	0.00
SERRANIDAE	*	*	*	*	*	*
SEA BASSES	*	*	*	*	*	*
CENTROPRISTIS PHILADELPHICA	0	0	0	0	0	0
ROCK SEA BASS	0.00	0.01	0.00	0.03	0.00	0.03

TABLE 5.6 (CONTINUED).

SPECIES	JAN-DEC 1979 NUMBER %TOTAL	JAN-DEC 1979 WT(GM) %TOTAL	JAN-DEC 1980 NUMBER %TOTAL	JAN-DEC 1980 WT(GM) %TOTAL	JAN-DEC 1981 NUMBER %TOTAL	JAN-DEC 1981 WT(GM) %TOTAL
CENTROPRISTIS STRIATA	0	0	0	9	0	0
BLACK SEA BASS	0.00	0.00	0.00	0.01	0.00	0.00
EPINEPHELUS MORIO	0	0	0	0	0	0
RED GROUPER	0.00	0.00	0.00	0.00	0.00	0.00
MYCTEROPERCA SP.(LARVAE)	0	0	0	0	0	0
GROUPER LARVAE(MYCTEROPERCA	[illegible]	0.00	0.00	0.00	0.00	0.00
MYCTEROPERCA MICROLEPIS	0	0	0	0	0	0
GAG	0.00	0.00	0.00	0.00	0.00	0.01
CENTRARCHIDAE	.	.	.	.	.	.
SUNFISHES	.	.	.	.	.	.
LEPOMIS GIBBOSUS	0	0	8	2	0	4
PUMPKINSEED	0.00	0.00	0.02	0.22	0.07	0.25
LEPOMIS GULOSUS	0	0	0	2	0	1
WARMOUTH	0.00	0.00	0.01	0.21	0.00	0.06
LEPOMIS MACROCHIRUS	0	0	0	0	0	1
BLUEGILL	0.00	0.00	0.00	0.01	0.01	0.05
MICROPTERUS SALMOIDES	0	0	0	0	0	7
LARGEMOUTH BASS	0.00	0.00	0.00	0.02	0.00	0.41
POMOXIS NIGROMACULATUS	0	0	0	0	0	1
BLACK CRAPPIE	0.00	0.00	0.00	0.02	0.00	0.05
PERCIDAE	.	.	.	.	.	.
PERCHES	.	.	.	.	.	.
PERCA FLAVESCENS	0	0	0	0	0	0
YELLOW PERCH	0.00	0.00	0.00	0.00	0.00	0.02
POMATOMIDAE	.	.	.	.	.	.
BLUEFISHES	.	.	.	.	.	.
POMATOMUS SALTATRIX	0	1	0	3	0	1
BLUEFISH	0.00	0.03	0.06	0.31	0.01	0.09
RACHYCENTRIDAE	.	.	.	.	.	.
COBIAS	.	.	.	.	.	.
RACHYCENTRON CANADUM	0	0	0	0	0	0
COBIA	0.00	0.00	0.00	0.00	0.00	0.01
CARANGIDAE	.	.	.	.	.	.
JACKS	.	.	.	.	.	.

SPECIES	JAN[illegible] 197[illegible] NUMBER %TOTAL	WT(GM) %TOTAL	JA[illegible] 19[illegible] NUMBER %TOTAL	WT(GM) %TOTAL	[illegible]C 19[illegible] [illegible]	WT(GM) %TOTAL
CARANX HIPPOS	0	0	0	[illegible]	[illegible]	0
CREVALLE JACK	0.00	0.01	0.00	[illegible]	[illegible]	0.00
CHLOROSCOMBRUS CHRYSURUS	0	0	0	0	0	0
ATLANTIC BUMPER	0.01	0.01	0.02	0.03	0.02	0.07
SELENE SETAPINNIS	0	0	0	0	0	0
ATLANTIC MOONFISH	0.00	0.00	0.02	0.00	0.00	0.00
SELENE VOMER	0	2	0	1	0	1
LOOKDOWN	0.10	0.22	0.04	0.09	0.07	0.05
LUTJANIDAE	*	*	*	*	*	*
SNAPPERS	*	*	*	*	*	*
LUTJANUS GRISEUS	0	0	0	1	0	0
GRAY SNAPPER	0.01	0.02	0.01	0.05	0.00	0.00
LUTJANUS SYNAGRIS	0	0	0	0	0	0
LANE SNAPPER	0.00	0.00	0.00	0.00	0.00	0.00
GERREIDAE	0	0	0	0	0	0
MOJARRAS	0.00	0.00	0.00	0.00	0.00	0.00
DIAPTERUS AURATUS	0	0	0	0	0	[illegible]
IRISH POMPANO	0.00	0.02	0.01	0.00	0.09	[illegible].02
EUCINOSTOMUS SP.	0	0	0	0	[illegible]	[illegible]
MOJARRA UNID.(EUCINOSTOMUS)	0.00	0.00	0.00	0.00	0.0[illegible]	[illegible]
EUCINOSTOMUS ARGENTEUS	0	0	0	0	[illegible]	[illegible]
SPOTFIN MOJARRA	0.03	0.05	0.07	0.04	[illegible]	[illegible]
HAEMULIDAE	*	*	*	*	*	*
GRUNTS	*	*	*	*	*	*
ORTHOPRISTIS CHRYSOPTERA	0	0	0	0	[illegible]	2
PIGFISH	0.00	0.00	0.00	0.01	0.01	0.13
SPARIDAE	*	*	*	*	*	*
PORGIES	*	*	*	*	*	*
ARCHOSARGUS PROBATOCEPHALUS	0	3	0	5	0	3
SHEEPSHEAD	0.03	0.36	0.07	0.49	0.02	0.19
LAGODON RHOMBOIDES	0	9	0	7	0	8
PINFISH	0.20	1.27	0.14	0.71	0.08	0.48
SCIAENIDAE	*	*	*	*	*	*
DRUMS	*	*	*	*	*	*

TABLE 5.6 (CONTINUED).

SPECIES	JAN-DEC 1979 NUMBER %TOTAL	JAN-DEC 1979 WEIGHT %TOTAL	JAN-DEC 1980 NUMBER %TOTAL	JAN-DEC 1980 WEIGHT %TOTAL	JAN-DEC 1981 NUMBER %TOTAL	JAN-DEC 1981 WEIGHT %TOTAL
BAIRDIELLA CHRYSOURA	1	12	1	22	1	40
SILVER PERCH	0.27	1.69	0.52	[illegible].19	0.39	2.56
CYNOSCION NEBULOSUS	0	6	0	7	0	2
SPOTTED SEATROUT	0.06	0.78	0.07	0.75	0.07	0.11
CYNOSCION NOTHUS	0	0	0	0	0	0
SILVER SEATROUT	0.00	0.00	0.00	0.00	0.00	0.00
CYNOSCION REGALIS	7	27	11	36	11	34
WEAKFISH	3.06	3.73	4.86	3.65	3.13	2.15
LARIMUS FASCIATUS	0	0	0	0	0	0
BANDED DRUM	0.01	0.01	0.00	0.00	0.00	0.00
LEIOSTOMUS XANTHURUS	90	216	40	334	111	819
SPOT	40.17	29.36	18.41	33.55	31.62	51.92
MENTICIRRHUS SP.	0	0	0	0	0	0
KINGFISH UNID.(MENTICIRRHUS	0.05	0.05	0.03	0.03	0.10	0.07
MENTICIRRHUS AMERICANUS	0	0	0	1	0	1
SOUTHERN KINGFISH	0.07	0.03	0.08	0.11	0.11	0.04
MENTICIRRHUS LITTORALIS	0	0	0	0	0	0
GULF KINGFISH	0.00	0.00	0.00	0.00	0.00	0.00
MENTICIRRHUS SAXATILIS	0	0	0	0	0	0
NORTHERN KINGFISH	0.00	0.00	0.00	0.00	0.01	0.01
MICROPOGONIAS UNDULATUS	55	117	37	151	25	223
ATLANTIC CROAKER	24.78	15.83	16.99	15.21	7.20	14.17
POGONIAS CROMIS	0	2	0	1	0	1
BLACK DRUM	0.01	0.22	0.01	0.14	0.00	0.03
SCIAENOPS OCELLATUS	0	0	0	0	0	0
RED DRUM	0.00	0.00	0.00	0.00	0.00	0.00
STELLIFER LANCEOLATUS	1	5	4	19	2	7
STAR DRUM	0.45	0.65	1.82	1.88	0.67	0.44
EPHIPPIDAE	-	-	-	-	-	-
SPADEFISHES	-	-	-	-	-	-
CHAETODIPTERUS FABER	0	0	0	1	0	1
ATLANTIC SPADEFISH	0.02	0.05	0.07	0.14	0.03	0.04
LABRIDAE	-	-	-	-	-	-
WRASSES	-	-	-	-	-	-

SPECIES	JAN-[illegible]979 NUMBER %TOTAL	JAN-[illegible]979 WEIGHT %TOTAL	JAN-[illegible] 198[illegible] NUMBER %TOTAL	JAN-[illegible] 198[illegible] WEIGHT %TOTAL	J[illegible]C 1[illegible] NUMBER %TOTAL	J[illegible]C 1[illegible] WEIGHT %TOTAL
TAUTOGA ONITIS	0	0	0	0	0	0
TAUTOG	0.00	0.00	0.00	0.00	0.00	0.00
MUGILIDAE	*	*	*	*	*	*
MULLETS	*	*	*	*	*	*
MUGIL CEPHALUS	0	2	0	5	0	9
STRIPED MULLET	0.07	0.32	0.11	0.47	0.05	0.56
MUGIL CUREMA	0	0	0	0	0	0
WHITE MULLET	0.00	0.05	0.00	0.00	0.00	0.01
SPHYRAENIDAE	*	*	*	*	*	*
BARRACUDAS	*	*	*	*	*	*
SPHYRAENA BOREALIS	0	0	0	0	0	0
NORTHERN SENNET	0.00	0.00	0.00	0.00	0.00	0.00
URANOSCOPIDAE	0	0	0	0	0	0
STARGAZERS	0.00	0.00	0.00	0.00	0.00	0.00
ASTROSCOPUS SP.	0	0	0	0	0	0
STARGAZER UNID.(ASTROSCOPUS	0.00	0.00	0.02	0.01	0.00	0.00
ASTROSCOPUS GUTTATUS	0	0	0	0	0	0
NORTHERN STARGAZER	0.00	0.01	0.01	0.02	0.00	0.00
ASTROSCOPUS Y-GRAECUM	0	0	0	0	0	0
SOUTHERN STARGAZER	0.01	0.01	0.00	0.00	0.00	0.01
BLENNIIDAE	0	0	0	0	0	0
COMBTOOTH BLENNIES	0.00	0.00	0.00	0.00	0.00	0.00
CHASMODES BOSQUIANUS	0	0	0	0	0	0
STRIPED BLENNY	0.01	0.01	0.01	0.01	0.01	0.01
HYPSOBLENNIUS HENTZI	0	0	0	0	0	0
FEATHER BLENNY	0.01	0.01	0.01	0.02	0.01	0.01
HYPSOBLENNIUS IONTHAS	0	0	0	0	0	0
FRECKLED BLENNY	0.05	0.06	0.01	0.01	0.00	0.00
GOBIIDAE	*	*	*	*	*	*
GOBIES	*	*	*	*	*	*
GOBIONELLUS BOLEOSOMA	0	0	0	0	0	0
DARTER GOBY	0.03	0.00	0.02	0.00	0.00	0.00
GOBIONELLUS HASTATUS	0	0	0	0	0	0
SHARPTAIL GOBY	0.01	0.02	0.02	0.01	0.00	0.00

TABLE 5.6 (CONTINUED).

SPECIES	JAN-DEC 1979 NUMBER %TOTAL	JAN-DEC 1979 WT(GM) %TOTAL	JAN-DEC 1980 NUMBER %TOTAL	JAN-DEC 1980 WT(GM) %TOTAL	JAN-DEC 1981 NUMBER %TOTAL	JAN-DEC 1981 WT(GM) %TOTAL
GOBIONELLUS SHUFELDTI	0	0	0	0	0	0
FRESHWATER GOBY	0.00	0.00	0.09	0.01	0.02	0.01
GOBIOSOMA BOSCI	0	0	0	0	0	0
NAKED GOBY	0.01	0.01	0.01	0.00	0.01	0.00
GOBIOSOMA GINSBURGI	0	0	0	0	0	0
SEABOARD GOBY	0.00	0.00	0.00	0.00	0.00	0.00
GOBIOSOMA ROBUSTUM	0	0	0	0	0	0
CODE GOBY	0.00	0.00	0.00	0.00	0.00	0.00
MICROGOBIUS SP.	0	0	0	0	0	0
GOBY UNID.(MICROGOBIUS)	0.00	0.00	0.09	0.00	0.03	0.00
MICROGOBIUS GULOSUS	0	0	0	0	0	0
CLOWN GOBY	0.00	0.00	0.00	0.00	0.00	0.00
MICROGOBIUS THALASSINUS	0	0	0	0	0	0
GREEN GOBY	0.01	0.00	0.02	0.00	0.00	0.00
TRICHIURIDAE	*	*	*	*	*	*
CUTLASSFISHES	*	*	*	*	*	*
TRICHIURUS LEPTURUS	0	0	0	4	0	0
ATLANTIC CUTLASSFISH	0.00	0.01	0.05	0.38	0.01	0.02
SCOMBRIDAE	*	*	*	*	*	*
MACKERELS	*	*	*	*	*	*
SCOMBEROMORUS CAVALLA	0	0	0	0	0	0
KING MACKEREL	0.00	0.00	0.00	0.00	0.00	0.00
SCOMBEROMORUS MACULATUS	0	0	0	0	0	0
SPANISH MACKEREL	0.00	0.00	0.00	0.02	0.00	0.00
STROMATEIDAE	*	*	*	*	*	*
BUTTERFISHES	*	*	*	*	*	*
PEPRILUS ALEPIDOTUS	0	1	0	0	0	1
HARVESTFISH	0.01	0.10	0.01	0.04	0.01	0.06
PEPRILUS TRIACANTHUS	0	0	0	0	0	0
BUTTERFISH	0.00	0.00	0.00	0.00	0.01	0.00
TRIGLIDAE	*	*	*	*	*	*
SEAROBINS	*	*	*	*	*	*
PRIONOTUS SP.	0	0	0	0	0	0
SEAROBIN UNID.(PRIONOTUS)	0.00	0.00	0.01	0.00	0.00	0.00

SPECIES	[illegible]AN-[illegible]979		JAN[illegible]198[illegible]		[illegible]C 19[illegible]	
	NUMBER %TOTAL	WT(GM) %TOTAL	NUMBER %TOTAL	WT(GM) %TOTAL	NUMBER %TOTAL	WT(GM) %TOTAL
PRIONOTUS CAROLINUS	0	0	0	0	0	0
NORTHERN SEAROBIN	0.00	0.00	0.00	0.00	0.00	0.00
PRIONOTUS SCITULUS	0	0	0	0	0	0
LEOPARD SEAROBIN	0.00	0.00	0.00	0.01	0.01	0.01
PRIONOTUS TRIBULUS	1	1	1	2	0	2
BIGHEAD SEAROBIN	0.29	0.18	0.36	0.19	0.14	0.14
BOTHIDAE	*	*	*	*	*	*
LEFTEYE FLOUNDERS	*	*	*	*	*	*
ANCYLOPSETTA QUADROCELLATA	0	0	0	0	0	0
OCELLATED FLOUNDER	0.00	0.01	0.02	0.04	0.02	0.02
CITHARICHTHYS SPILOPTERUS	0	1	0	1	0	1
BAY WHIFF	0.13	0.16	0.11	0.[illegible]2	0.02	0.03
ETROPUS CROSSOTUS	0	1	0	4	0	2
FRINGED FLOUNDER	0.14	0.20	0.18	0.35	0.11	0.11
PARALICHTHYS SP.	0	0	0	0	0	0
FLOUNDER UNID.(PARALICHTHYS	0.00	0.00	0.01	0.00	0.13	0.00
PARALICHTHYS DENTATUS	0	7	0	7	0	6
SUMMER FLOUNDER	0.15	0.91	0.09	0.68	0.04	[illegible].39
PARALICHTHYS LETHOSTIGMA	1	58	1	38	0	19
SOUTHERN FLOUNDER	0.58	7.83	0.37	3.82	0.07	1.17
SCOPHTHALMUS AQUOSUS	0	2	0	2	0	3
WINDOWPANE	0.05	0.23	0.03	0.22	0.07	0.18
SOLEIDAE	*	*	*	*	*	*
SOLES	*	*	*	*	*	*
TRINECTES MACULATUS	1	4	2	5	5	9
HOGCHOKER	0.28	0.58	1.14	0.53	1.40	0.54
CYNOGLOSSIDAE	*	*	*	*	*	*
TONGUEFISHES	*	*	*	*	*	*
SYMPHURUS SP.	0	0	0	0	0	0
TONGUEFISH UNID.(SYMPHURUS)	0.03	0.04	0.02	0.02	0.00	0.00
SYMPHURUS PLAGIUSA	4	12	3	11	2	7
BLACKCHEEK TONGUEFISH	1.64	1.62	1.46	1.09	0.45	0.46
BALISTIDAE	*	*	*	*	*	*
LEATHERJACKETS	*	*	*	*	*	*

TABLE 5.6 (CONTINUED).

SPECIES	JAN-DEC 1979 NUMBER %TOTAL	JAN-DEC 1979 WT(GM) %TOTAL	JAN-DEC 1980 NUMBER %TOTAL	JAN-DEC 1980 WT(GM) %TOTAL	JAN-DEC 1981 NUMBER %TOTAL	JAN-DEC 1981 WT(GM) %TOTAL
MONACANTHUS HISPIDUS	0	0	0	0	0	0
PLANEHEAD FILEFISH	0.01	0.00	0.01	0.01	0.03	0.02
TETRAODONTIDAE	*	*		*	*	*
PUFFERS	*	*	*	*	*	*
LAGOCEPHALUS LAEVIGATUS	0	0	0	0	0	0
SMOOTH PUFFER	0.00	0.00	0.00	0.00	0.00	0.00
SPHOEROIDES MACULATUS	0	0	0	0	0	0
NORTHERN PUFFER	0.00	0.00	0.00	0.00	0.00	0.00
DIODONTIDAE	*	*	*	*	*	*
PORCUPINEFISHES	*	*	*	*	*	*
CHILOMYCTERUS SCHOEPFI	0	0	0	0	0	0
STRIPED BURRFISH	0.00	0.02	0.00	0.02	0.00	0.01
TOTAL FISH	223	737	217	996	351	1577
	99.92	99.97	99.96	99.99	99.97	99.96
SQUILLA EMPUSA	0	3	1	9	0	4
MANTIS SHRIMP	0.17	0.37	0.75	1.62	0.47	0.80
PENAEUS AZTECUS	31	145	21	149	10	86
BROWN SHRIMP	17.51	20.09	23.39	26.51	11.31	15.54
PENAEUS DUORARUM	14	30	5	14	7	17
PINK SHRIMP	7.96	4.21	5.02	2.47	7.80	3.05
PENAEUS SETIFERUS	3	31	14	115	2	29
WHITE SHRIMP	1.69	4.35	15.74	20.48	2.34	5.16
TRACHYPENEUS CONSTRICTUS	2	1	7	2	11	3
T-CON OR HARDBACK SHRIMP	1.11	0.12	7.58	0.38	12.11	0.49
SICYONIA SP.	0	0	0	0	0	0
ROCK SHRIMP	0.00	0.00	0.00	0.00	0.00	0.00
MACROBRACHIUM SP.	0	0	0	0	0	0
FRESHWATER PRAWNS	0.00	0.00	0.00	0.00	0.02	0.02
PALAEMONETES SP.	112	31	32	9	48	14
GRASS SHRIMP	63.53	4.27	35.09	1.58	53.26	2.88
ALPHEUS SP.	0	0	0	0	0	0
SNAPPING SHRIMP	0.03	0.01	0.07	0.02	0.09	0.0[illegible]
CRANGON SEPTEMSPINOSA	0	0	0	0	0	0
SAND SHRIMP	0.01	0.00	0.00	0.00	0.00	0.00

SPECIES	JAN-DEC 1979 NUMBER %TOTAL	JAN-DEC 1979 WEIGHT %TOTAL	JAN-DEC 1980 NUMBER %TOTAL	JAN-DEC 1980 WEIGHT %TOTAL	JAN-DEC 1981 NUMBER %TOTAL	JAN-DEC 1981 WEIGHT %TOTAL
UPOGEBIA SP. AND CALLIANASSA SP. MUD SHRIMPS	0 0.00	0 0.00	0 0.01	0 0.00	0 0.00	0 0.00
OVALIPES SP. CALICO CRABS	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
PORTUNUS SP. SWIMMING CRABS	0 0.00	0 0.00	0 0.03	0 0.01	0 0.03	0 0.01
CALLINECTES SP. BLUE CRABS	11 6.09	466 64.58	6 6.86	244 43.33	7 7.79	332 60.04
APLYSIA SP. SEA HARES	1 0.00	0 0.00	0 0.00	0 0.00	0 0.01	0 0.07
LOLLIGUNCULA BREVIS BRIEF SQUID	3 1.89	12 1.70	5 5.45	18 3.23	4 4.73	19 3.40
CHELYDRA SERPENTINA SNAPPING TURTLE	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	14 2.55
MALACLEMYS TERRAPIN DIAMONDBACK TERRAPIN	0 0.00	2 0.28	0 0.01	2 0.37	0 0.01	3 0.56
CHRYSEMYS CONCINNA RIVER COOTER	0 0.00	0 0.00	0 0.00	0 0.00	0 0.01	29 5.32
TOTAL NON-FISH	177 99.99	722 99.99	92 100.00	563 100.00	90 99.98	553 100.01
TOTAL ORGANISMS	400	1458	309	1558	442	2130
TOTAL EFFORTS	306		360		374	

Table 5.7 Results of ANOVA and Duncan's multiple range comparison for nekton CPUE - small trawl (all years combined).

SPECIES	Total Organisms
Week	***
Duncan's MR	5 8 9 10 4 6 7 3 11 12 2 17 1 16 14 15 13
Year	NS
Duncan's MR	
Week X Year	***
Station	***
Duncan's MR	05 01 06 07 04 08
Week X Station	***
Year X Station	NS
Week analyzed	1-17
$\overline{\text{Log}}$	2.260
s^2	0.191
R^2	0.473

NS p>.05
* $.01 < p \leq .05$
** $.001 < p \leq .01$
*** $p \leq .001$

'able 5.7 (continued)

SPECIES	Bay anchovy - young of year
'eek	***
uncan's MR	17 11 12 16 15 10 13 14 9 8
'ear	***
uncan's MR	81 80 79
'eek X Year	***
tation	***
uncan's MR	01 06 05 04 08 07
eek X Station	***
ear X Station	NS
eeks analyzed	8-17
og	1.020
2	0.467
2	0.600

SPECIES	Bay anchovy - juveniles and adults
eek	***
uncan's MR	8 1 9 6 3 7 10 4 5 2 11 12
e	*
uncan's MR	81 79 80
ek X Year	***
tation	***
uncan's MR	01 04 05 06 08 07
ek X Station	***
ear X Station	***
eeks analyzed	1-12
og	0.998
2	0.304
2	0.615

S p>.05
.01<p≤.05
* .001<p≤.01
** p≤.001

Table 5.7 (continued)

SPECIES	Spot - young of year
Week	***
Duncan's MR	5 7 8 4 9 6 17 10 11 16 3 12 13 14 1 2
Year	***
Duncan's MR	79 80 81
Week X Year	***
Station	***
Duncan's MR	05 06 01 04 08 07
Week X Station	***
Year X Station	***
Weeks analyzed	1-17
$\overline{\text{Log}}$	0.784
S^2	0.203
R^2	0.741

SPECIES	Spot - juveniles and adults
Week	***
Duncan's MR	5 6 4 3 1 7 2 8 9 10 11 17 16 15 12 13 14
Year	***
Duncan's MR	81 80 79
Week X Year	***
Station	***
Duncan's MR	05 01 04 06 08 07
Week X Station	***
Year X Station	**
Weeks analyzed	1-17
$\overline{\text{Log}}$	0.509
S^2	0.101
R^2	0.821

NS $p>.05$
* $.01<p\leq.05$
** $.001<p\leq.01$
*** $p\leq.001$

ble 5.7 (continued)

ECIES	Croaker - young of year
ek	***
can's MR	8 7 9 10 11 6 12 5 3 2 4 1 14 13 15 17 16
ar	***
can's MR	79 80 81
k X Year	***
tation	***
can's MR	01 05 04 06 08 07
k X Station	***
ear X Station	***
ks analyzed	1-17
og	0.802
2	0.153
	0.763

ECIES	Croaker - juveniles and adults
ek	***
can's MR	6 7 5 8 9 4 10 3 1 2
r	***
can's MR	81 80 79
k X Year	***
tion	***
can's MR	05 01 08 07 04 06
k X Station	***
ear X Station	***
ks analyzed	1-10
g	0.348
2	0.047
2	0.806

p>.05
* .01<p≤.05
** .001<p≤.01
*** p≤.001

Table 5.7 (continued)

SPECIES	Menhaden - juveniles and adults
Week	***
Duncan's MR	3 4 2 1 5 8 7 6 9
Year	***
Duncan's MR	80 81 79
Week X Year	***
Station	***
Duncan's MR	04 05 08 06 07 01
Week X Station	***
Year X Station	***
Weeks analyzed	1-9
$\overline{\text{Log}}$	0.415
S^2	0.165
R^2	0.679

SPECIES	Weakfish
Week	***
Duncan's MR	10 9 11 12 13 14 8 15 16 17
Year	NS
Duncan's MR	
Week X Year	***
Station	***
Duncan's MR	05 01 04 08 06 07
Week X Station	***
Year X Station	NS
Weeks analyzed	8-17
$\overline{\text{Log}}$	0.577
S^2	0.137
R^2	0.772

NS $p>.05$
* $.01<p\leq.05$
** $.001<p\leq.01$
*** $p\leq.001$

Table 5.7 (continued)

SPECIES	Brown Shrimp
Week	***
Duncan's MR	9 8 10 11 12 7 14 13 16 15 17
Year	***
Duncan's MR	79 80 81
Week X Year	***
Station	***
Duncan's MR	05 01 07 06 04 08
Week X Station	***
Year X Station	***
Weeks analyzed	7-17
Log	0.784
s^2	0.127
R^2	0.840

SPECIES	Pink Shrimp
Week	***
Duncan's MR	13 14 15 1 16 2 12 17 11 7 5 8 6 3 4 10 9
Year	***
Duncan's MR	79 81 80
Week X Year	***
Station	***
Duncan's MR	01 05 07 04 06 08
Week X Station	***
Year X Station	*
Weeks analyzed	1-17
Log	0.474
s^2	0.107
R^2	0.735

NS $p>.05$
* $.01<p\leq.05$
** $.001<p\leq.01$
*** $p\leq.001$

Table 5.7 (continued)

SPECIES	White Shrimp
Week	***
Duncan's MR	14 15 13 12 16 11 17 10
Year	***
Duncan's MR	80 79 81
Week X Year	***
Station	***
Duncan's MR	05 01 07 06 04 08
Week X Station	***
Year X Station	***
Weeks analyzed	10-17
$\overline{Log}$	0.604
s^2	0.125
R^2	0.727

SPECIES	Blue Crab
Week	***
Duncan's MR	5 6 8 9 7 14 13 2 4 12 16 15 1 3 10 11 17
Year	***
Duncan's MR	79 80 81
Week X Year	***
Station	***
Duncan's MR	06 05 04 08 07 01
Week X Station	***
Year X Station	***
Weeks analyzed	1-17
$\overline{Log}$	0.727
s^2	0.083
R^2	0.633

NS $p>.05$
* $.01<p\leq.05$
** $.001<p\leq.01$
*** $p\leq.001$

'able 5.8 Results of ANOVA and Duncan's multiple range comparison for nekton CPUE - small trawl (by year).

cies	Total Organisms
	1979
eek	***
uncan's MR	7 8 5 6 9 10 4 11 3 1 16 17 13 15 14 12 2
tion	***
uncan's MR	5 1 6 7 4 8
eek X Station	***
ks analyzed	1-17
og	2.260
	0.105
	0.776
	1980
k	***
ncan's MR	10 12 2 5 8 4 9 6 3 11 1 18 14 7 17 15 13 16
tation	***
can's MR	5 1 11 6 12 4 7 8
eek X Station	***
ks analyzed	1-18
g	2.259
2	0.097
	0.733
	1981
	***
can's MR	4 5 10 9 6 16 8 3 11 12 13 15 2 7 17 14 1
ation	***
can's MR	5 13 12 10 4 1 6 7 11 8 2
ek X Station	***
eks analyzed	1-17
	2.269
	0.174
	0.752

p>.05
.01<p≤.05
.001<p≤.01
* p≤.001

Table 5.8 (continued)

Species	BAY ANCHOVY 1979 Young of Year
Week	***
Duncan's MR	11 17 10 12 15 16 14 9 13 8
Station	***
Duncan's MR	1 6 4 5 8 7
Week X St[illegible]	***
Weeks [illegible]	8-17
$\overline{\text{Log}}$	0.848
S^2	0.264
R^2	0.763

Species	BAY ANCHOVY 1979 Juveniles and Adults
Week	***
Duncan's MR	6 8 9 1 7 3 10 11 5 12 2 4
Station	***
Duncan's MR	5 4 1 8 6 7
Week X Station	***
Weeks analyzed	1-12
$\overline{\text{Log}}$	0.999
S^2	0.148
R^2	0.823

NS $p > .05$
* $.01 < p \leq .05$
** $.001 < p \leq .01$
*** $p \leq .001$

able 5.8 (continued)

ecies	**BAY ANCHOVY** 1980 Young of Year
eek	***
can's MR	12 17 18 13 15 14 11 16 10 9 8
tion	***
uncan's MR	11 1 5 6 4 7 8 12
k X Station	***
ks analyzed	8-18
	1.046
	0.308
2	0.785

cies	**BAY ANCHOVY** 1980 Juveniles and Adults
eek	***
can's MR	1 8 9 4 7 3 2 5 10 6 11 12
tion	***
uncan's MR	1 6 4 5 8 7
k X Station	***
ks analyzed	1-12
	0.928
	0.239
2	0.741

S p>.05
.01<p≤.05
.001<p≤.01
p≤.001

Table 5.8 (continued)

Species	BAY ANCHOVY 1981 Young of Year
Week	**
Duncan's MR	16 10 15 11 13 17 9 14 12 8
Station	***
Duncan's MR	1 13 5 4 11 2 8 7 10 12
Week X Station	**
Weeks analyzed	8-17
$\overline{Log}$	1.114
S^2	0.538
R^2	0.755

Species	BAY ANCHOVY 1981 Juveniles and Adults
Week	***
Duncan's MR	2 5 4 6 3 8 7 9 10 1 11 12
Station	***
Duncan's MR	13 4 1 5 6 10 8 2 11 7 12
Week X Station	**
Weeks analyzed	1-12
$\overline{Log}$	0.996
S^2	0.406
R^2	0.746

NS p>.05
* .01<p≤.05
** .001<p≤.01
*** p≤.001

able 5.8 (continued)

pecies	SPOT 1979 Young of Year
eek	***
ncan's MR	7 5 6 8 9 17 4 3 10 11 16 13 12 15 14 2 1
tion	***
uncan's MR	5 6 1 4 8 7
k X Station	***
eks analyzed	1-17
	0.956
	0.154
2	0.883

pecies	SPOT 1979 Juveniles and Adults
eek	***
can's MR	5 1 6 7 4 3 2 8 9 10 12 11 13 14 15 16 17
tion	***
uncan's MR	5 1 4 8 6 7
k X Station	***
ks analyzed	1-17
	0.298
	0.037
2	0.889

S p>.05
.01<p≤.05
.001<p≤.01
p≤.001

Table 5.8 (continued)

Species — SPOT 1980 Young of Year

Week ***

Duncan's MR 8 7 9 5 10 4 17 6 11 18 12 13 16 15 14 3 1 2

Station ***

Duncan's MR 5 6 1 12 4 7 8 11

Week X Station ***

Weeks analyzed 1-18

$\overline{Log}$ 0.658

S^2 0.130

R^2 0.839

Species — SPOT 1980 Juveniles and Adults

Week ***

Duncan's MR 1 2 5 6 4 3 7 8 9 18 16 15 11 10 17 12 13 14

Station ***

Duncan's MR 5 1 4 6 8 7 11 12

Week X Station ***

Weeks analyzed 1-18

$\overline{Log}$ 0.505

S^2 0.058

R^2 0.912

NS $p>.05$
* $.01<p\leq.05$
** $.001<p\leq.01$
*** $p\leq.001$

able 5.8 (continued)

ecies

SPOT
1981
Young of Year

eek ***

Duncan's MR 5 4 15 16 11 17 12 9 6 8 3 14 10 13 7 2 1

tion ***

uncan's MR 12 6 11 13 5 4 1 8 10 7 2

k X Station ***

ks analyzed 1-17

0.698

0.145

2 0.874

cies

SPOT
1981
Juveniles and Adults

eek ***

can's MR 4 6 3 5 7 8 9 2 11 10 1 12 13 14 15 16 17

tion ***

uncan's MR 13 5 6 4 1 7 10 11 2 8 12

k X Station ***

ks analyzed 1-17

0.668

0.089

2 0.934

p>.05
.01<p≤.05
.001<p≤.01
p≤.001

Table 5.8 (continued)

Species	CROAKER 1979 Young of Year
Week	***
Duncan's MR	7 8 9 11 10 6 17 16 5 4 15 3 2 1 12 14 13
Station	**
Duncan's MR	1 5 6 8 4 7
Week X Station	***
Weeks analyzed	1-17
$\overline{\text{Log}}$	0.945
S^2	0.094
R^2	0.897

Species	CROAKER 1979 Juveniles and Adults
Week	***
Duncan's MR	6 5 7 8 4 9 1 2 3 10
Station	***
Duncan's MR	1 7 8 5 4 6
Week X Station	***
Weeks analyzed	1-10
$\overline{\text{Log}}$	0.145
S^2	0.019
R^2	0.802

NS $p>.05$
* $.01<p\leq.05$
** $.001<p\leq.01$
*** $p\leq.001$

Table 5.8 (continued)

Species CROAKER 1980 Young of Year

Week	***
Duncan's MR	8 9 10 7 3 2 11 6 5 4 12 18 13 1 14 15 16 17
Station	***
Duncan's MR	1 5 4 11 16 12 8 7
Week X Station	***
Weeks analyzed	1-18
[illegible]	0.857
[illegible]	0.158
R^2	0.800

Species CROAKER 1980 Juveniles and Adults

Week	***
Duncan's MR	6 7 8 5 9 4 3 2 1 10
Station	***
Duncan's MR	5 8 1 4 7 6
Week X Station	***
Weeks analyzed	1-10
[illegible]	0.365
[illegible]	0.380
R^2	0.840

NS $p>.05$
* $.01<p\leq.05$
** $.001<p\leq.01$
*** $p\leq.001$

Table 5.8 (continued)

Species	CROAKER 1981 Young of Year
Week	***
Duncan's MR	9 8 12 10 11 14 15 7 6 13 16 17 1 4 3 5 2
Station	***
Duncan's MR	12 11 1 10 5 13 4 6 7 8 2
Week X Station	***
Weeks analyzed	1-17
$\overline{\text{Log}}$	0.608
S^2	0.110
R^2	0.876

Species	CROAKER 1981 Juveniles and Adults
Week	***
Duncan's MR	6 5 7 8 9 4 10 3 1 2
Station	***
Duncan's MR	5 13 10 1 11 6 4 8 2 7 12
Week X Station	***
Weeks analyzed	1-10
$\overline{\text{Log}}$	0.623
S^2	0.067
R^2	0.907

NS $p>.05$
* $.01<p\leq.05$
** $.001<p\leq.01$
*** $p\leq.001$

Table 5.8 (continued)

Species	MENHADEN
	1979 Juveniles and Adults
Week	***
Duncan's MR	3 4 1 2 5 7 6 8 9
Station	***
Duncan's MR	4 5 8 6 7 1
Week X Station	***
Weeks analyzed	1-9
	0.262
	0.088
	0.762
	1980 Juveniles and Adults
Week	***
Duncan's MR	4 3 5 2 1 8 7 6 9
Station	***
Duncan's MR	4 8 5 6 1 7
Week X Station	***
Weeks analyzed	1-9
	0.600
	0.136
	0.834
	1981 Juveniles and Adults
Week	***
Duncan's MR	2 3 1 4 6 8 5 9 7
Station	***
Duncan's MR	10 13 5 4 6 11 7 8 1 12 2
Week X Station	**
Weeks analyzed	1-9
	0.391
	0.112
	0.876

$p>.05$
$.01<p\leq.05$
$.001<p\leq.01$
$p\leq.001$

Table 5.8 (continued)

Species

WEAKFISH

1979

Young of Year

Week	***
Duncan's MR	10 11 9 15 12 14 13 8 16 17
Station	***
Duncan's MR	5 1 8 6 4 7
Week X Station	***
Weeks analyzed	8-17
$\overline{\text{Log}}$	0.570
S^2	0.074
R^2	0.882

1980

Young of Year

Week	***
Duncan's MR	10 9 12 11 14 13 8 15 16 17 18
Station	***
Duncan's MR	5 1 8 6 4 7 11 12
Week X Station	***
Weeks analyzed	8-18
$\overline{\text{Log}}$	0.523
S^2	0.067
R^2	0.911

1981

Young of Year

Week	***
Duncan's MR	9 8 12 10 13 11 14 15 16 17
Station	***
Duncan's MR	10 1 5 13 4 6 11 7 8 2 12
Week X Station	***
Weeks analyzed	8-17
$\overline{\text{Log}}$	0.542
S^2	0.114
R^2	0.890

NS $p>.05$
* $.01<p\leq.05$
** $.001<p\leq.01$
*** $p\leq.001$

able 5.8 (continued)

cies	BROWN SHRIMP
	1979
eek	***
can's MR	8 9 11 7 10 12 17 15 16 14 13
tation	***
can's MR	5 1 6 7 4 8
eek X Station	***
eks analyzed	7-17
	0.955
2	0.081
	0.922
	1980
k	***
can's MR	10 9 11 12 8 14 13 16 15 17 7 18
ation	***
can's MR	5 1 6 7 12 4 8 11
k X Station	***
eeks analyzed	7-18
	0.728
	0.068
	0.929
	1981
k	***
an's MR	9 8 11 10 12 13 16 7 14 15 17
ion	***
can's MR	11 10 7 5 4 1 13 6 12 8 2
X Station	***
ks analyzed	7-17
	0.330
	0.103
	0.892

p>.05
.01<p≤.05
.001<p≤.01
* p≤.001

Table 5.8 (continued)

Species	PINK SHRIMP
	1979
Week	***
Duncan's MR	13 15 14 17 16 1 2 11 12 7 4 5 6 3 8 9 10
Station	***
Duncan's MR	1 5 7 6 4 8
Week X Station	***
Weeks analyzed	1-17
$\overline{Log}$	0.578
S^2	0.071
R^2	0.891
	1980
Week	***
Duncan's MR	2 1 5 14 8 7 6 13 15 3 12 16 11 4 17 18 10 9
Station	***
Duncan's MR	1 5 12 7 4 11 6 8
Week X Station	***
Weeks analyzed	1-18
$\overline{Log}$	0.386
S^2	0.066
R^2	0.812
	1981
Week	***
Duncan's MR	12 13 14 11 15 16 8 17 10 3 7 6 9 5 2 1 4
Station	***
Duncan's MR	5 1 7 4 10 13 8 11 6 2 12
Week X Station	***
Weeks analyzed	1-17
$\overline{Log}$	0.368
S^2	0.060
R^2	0.898

NS $p>.05$
* $.01<p\leq.05$
** $.001<p\leq.01$
*** $p\leq.001$

able 5.8 (continued)

cies	WHITE SHRIMP
	1979
eek	***
can's MR	13 15 16 14 17 11 12 10
tation	***
can's MR	1 5 6 4 7 8
eek X Station	***
eks analyzed	10-17
	0.544
2	0.068
	0.827
	1980
	***
an's MR	14 12 13 15 11 18 16 17 10
tation	***
an's MR	5 11 12 1 7 6 4 8
X Station	***
eeks analyzed	10-18
	0.852
2	0.079
	0.502
	1981
[illegible]	***
an's MR	14 12 15 13 11 16 17 10
ion	***
an's MR	5 1 11 10 13 7 4 8 6 2 12
X Station	***
ek nalyzed	10-17
	0.343
	0.058
	0.881

p>.05
.01<p≤.05
.001<p≤.01
* p≤.001

Table 5.8 (continued)

Species BLUE CRAB

1979

Week	***
Duncan's MR	4 5 8 7 13 6 1 14 9 16 15 17 2 10 12 11 3
Station	***
Duncan's MR	6 5 4 8 7 1
Week X Station	***
Weeks analyzed	1-17
$\overline{Log}$	0.863
S^2	0.062
R^2	0.773

1980

Week	***
Duncan's MR	6 2 5 7 9 12 1 14 10 8 3 13 11 17 15 16 4 18
Station	***
Duncan's MR	12 3 6 4 8 7 11 1
Week X Station	***
Weeks analyzed	1-18
$\overline{Log}$	0.684
S^2	0.078
R^2	0.683

1981

Week	***
Duncan's MR	12 8 6 9 14 16 11 13 3 15 17 7 10 5 4 2 1
Station	***
Duncan's MR	11 12 10 13 4 8 6 7 5 1 2
Week X Station	***
Weeks analyzed	1-17
$\overline{Log}$	0.642
S^2	0.077
R^2	0.822

NS $p>.05$
* $.01<p\leq.05$
** $.001<p\leq.01$
*** $p\leq.001$

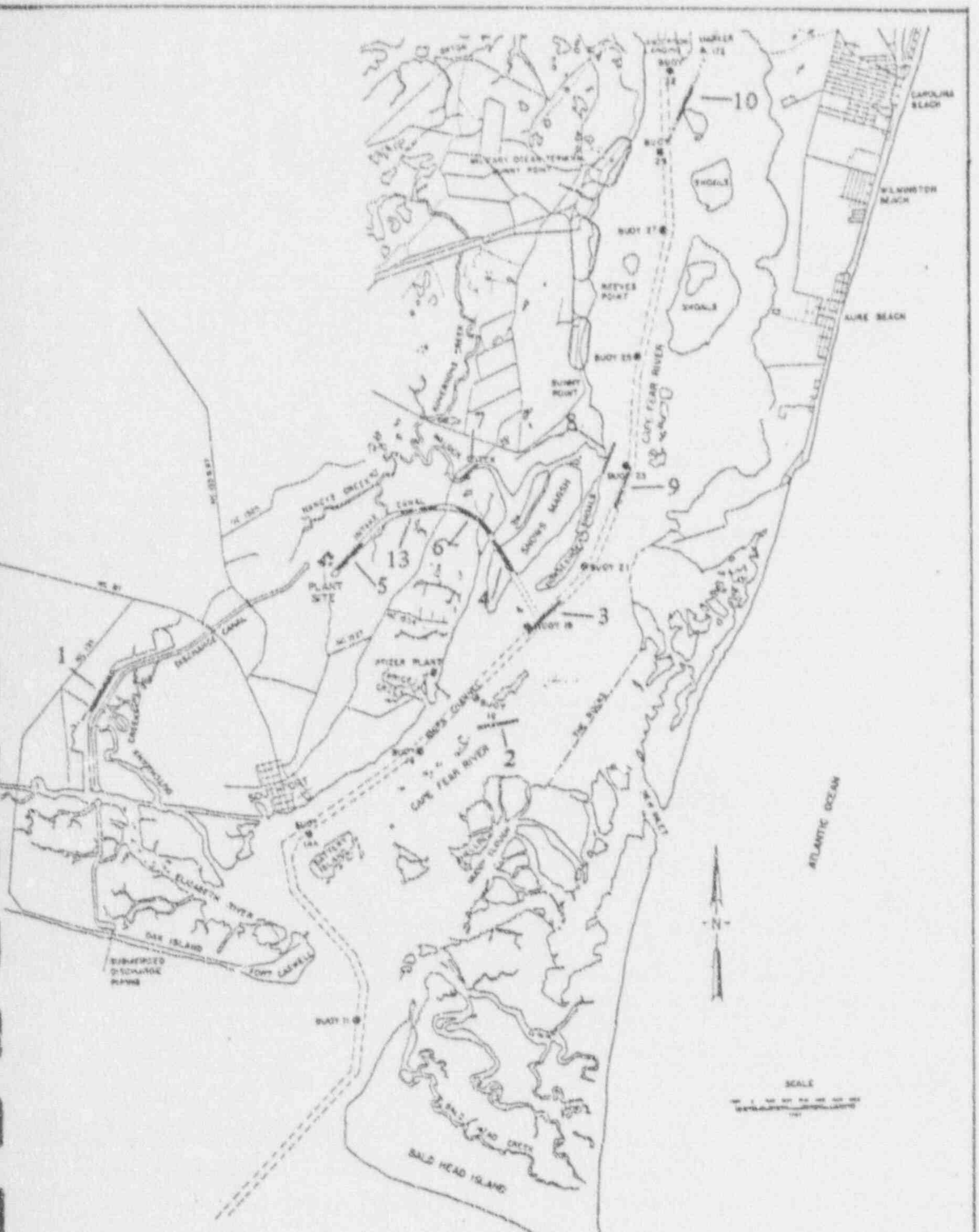


Figure 5.1 Nekton sampling stations

Figure 5.1 (continued)

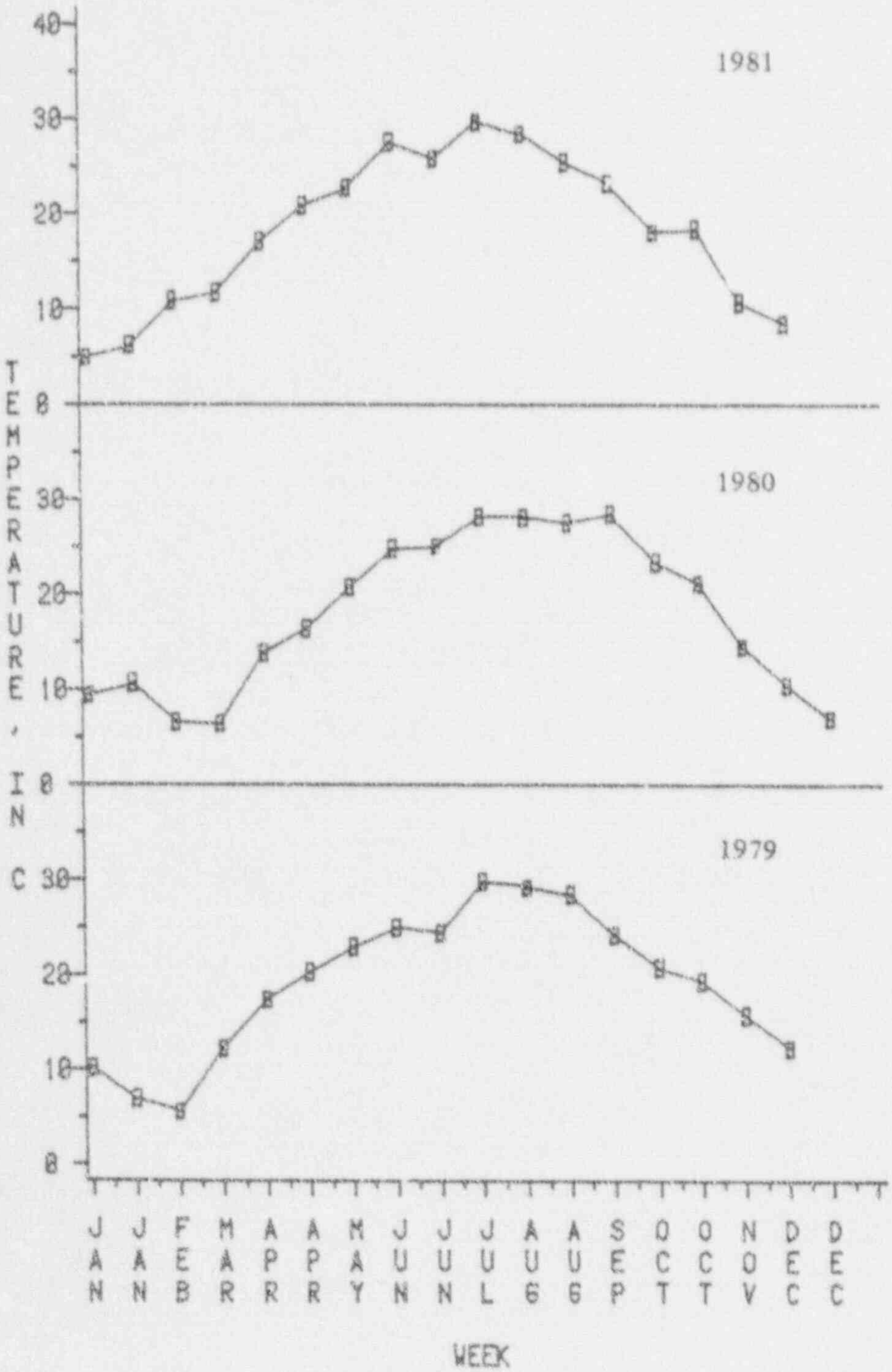


Figure 5.2 Mean temperature (all stations combined)

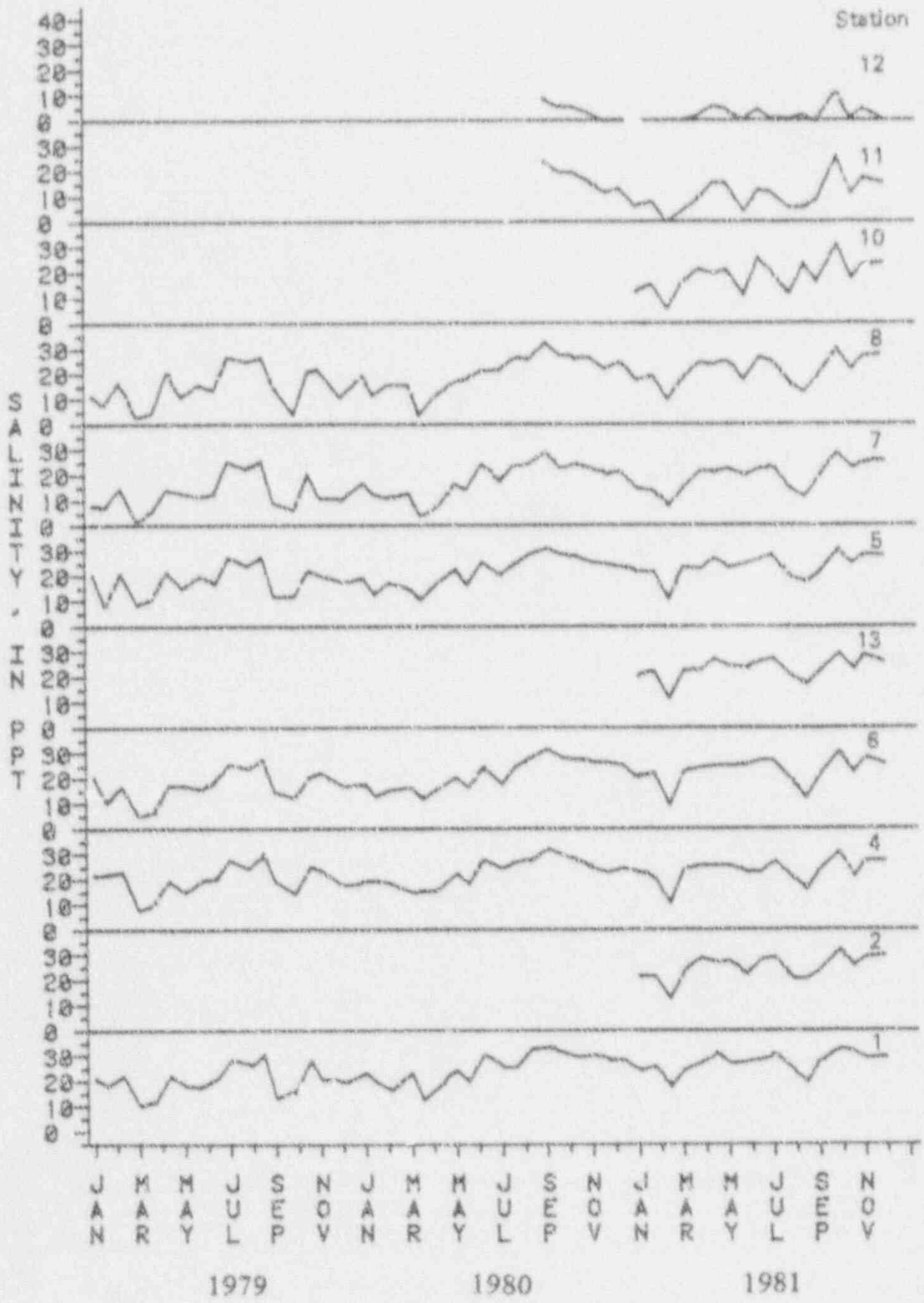


Figure 5.3 Mean salinity by station

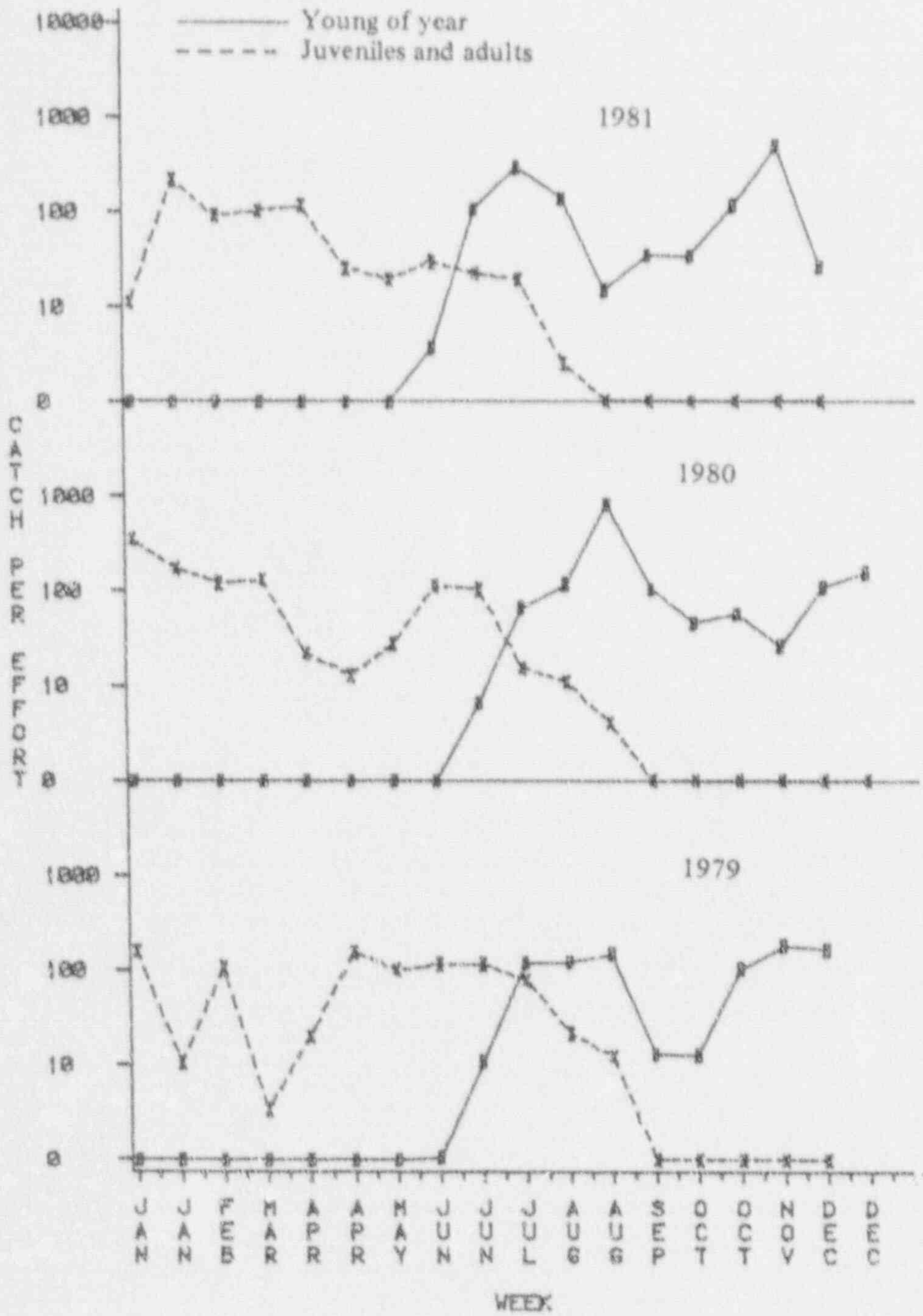


Figure 5.4 Bay anchovy CPUE (all stations combined)

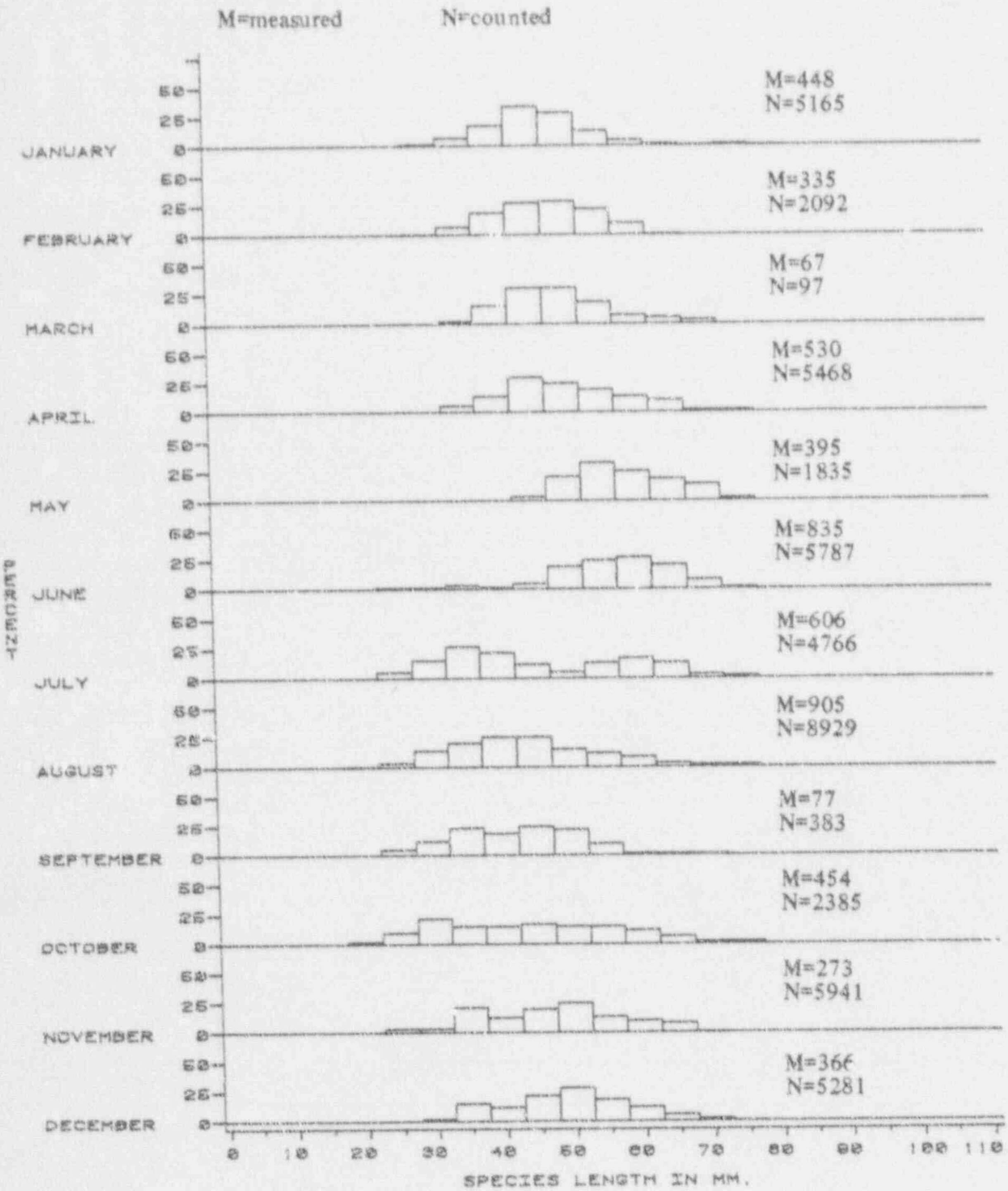


Figure 5.5 Length frequencies of bay anchovy for 1979

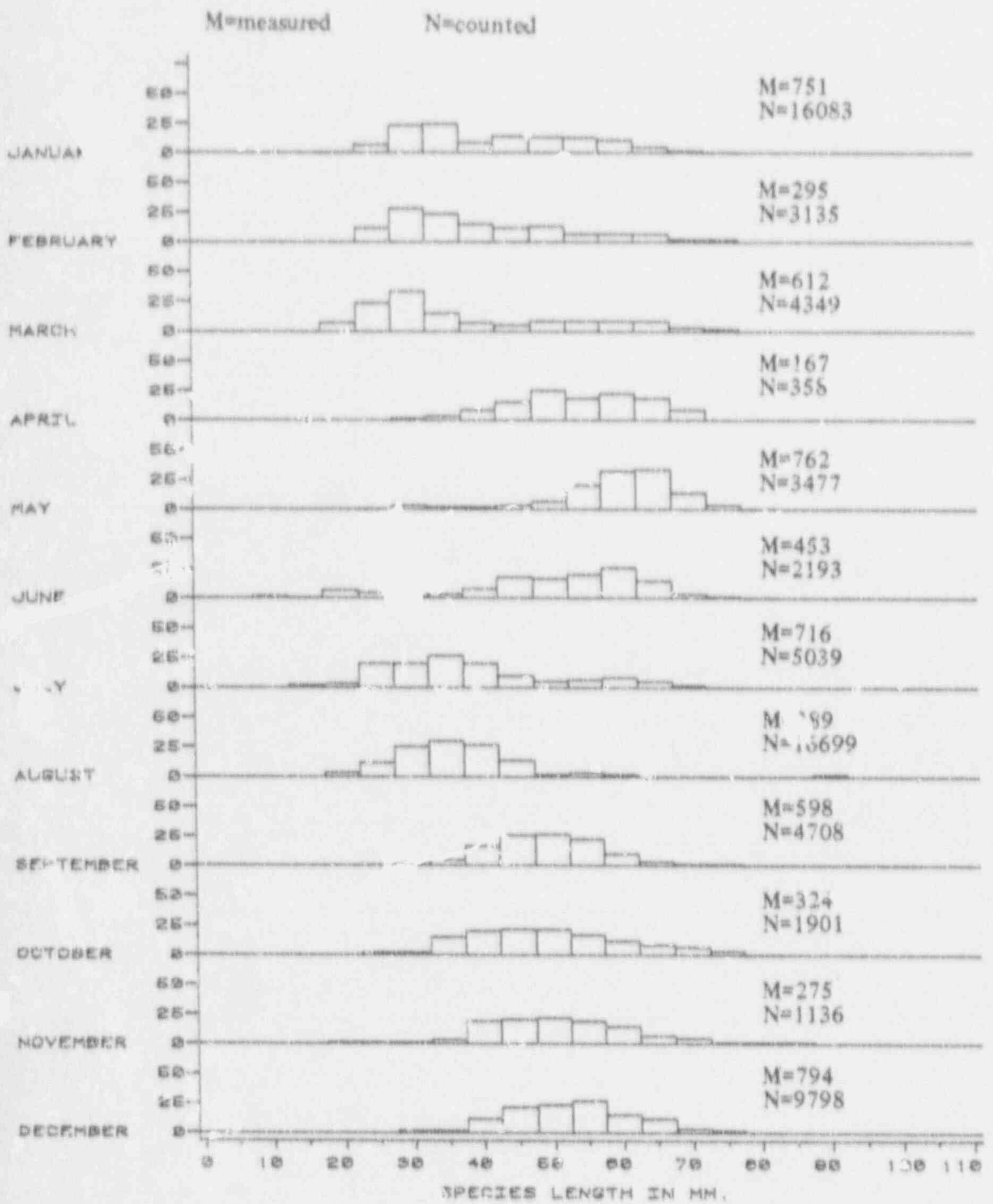


Figure 5.6 Length frequencies of bay anchovy for 1980

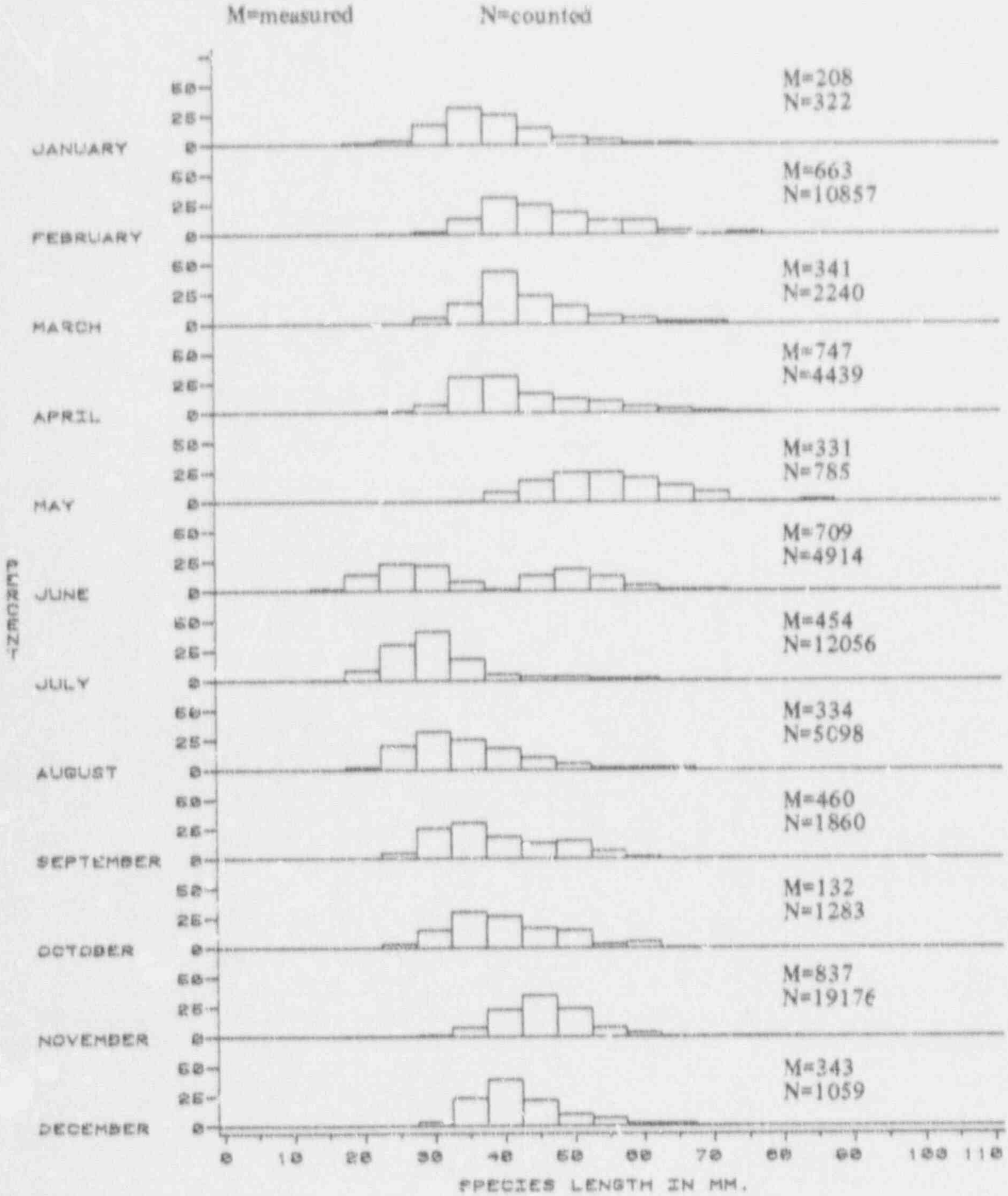


Figure 5.7 Length frequencies of bay anchovy for 1981

M=measured N=counted

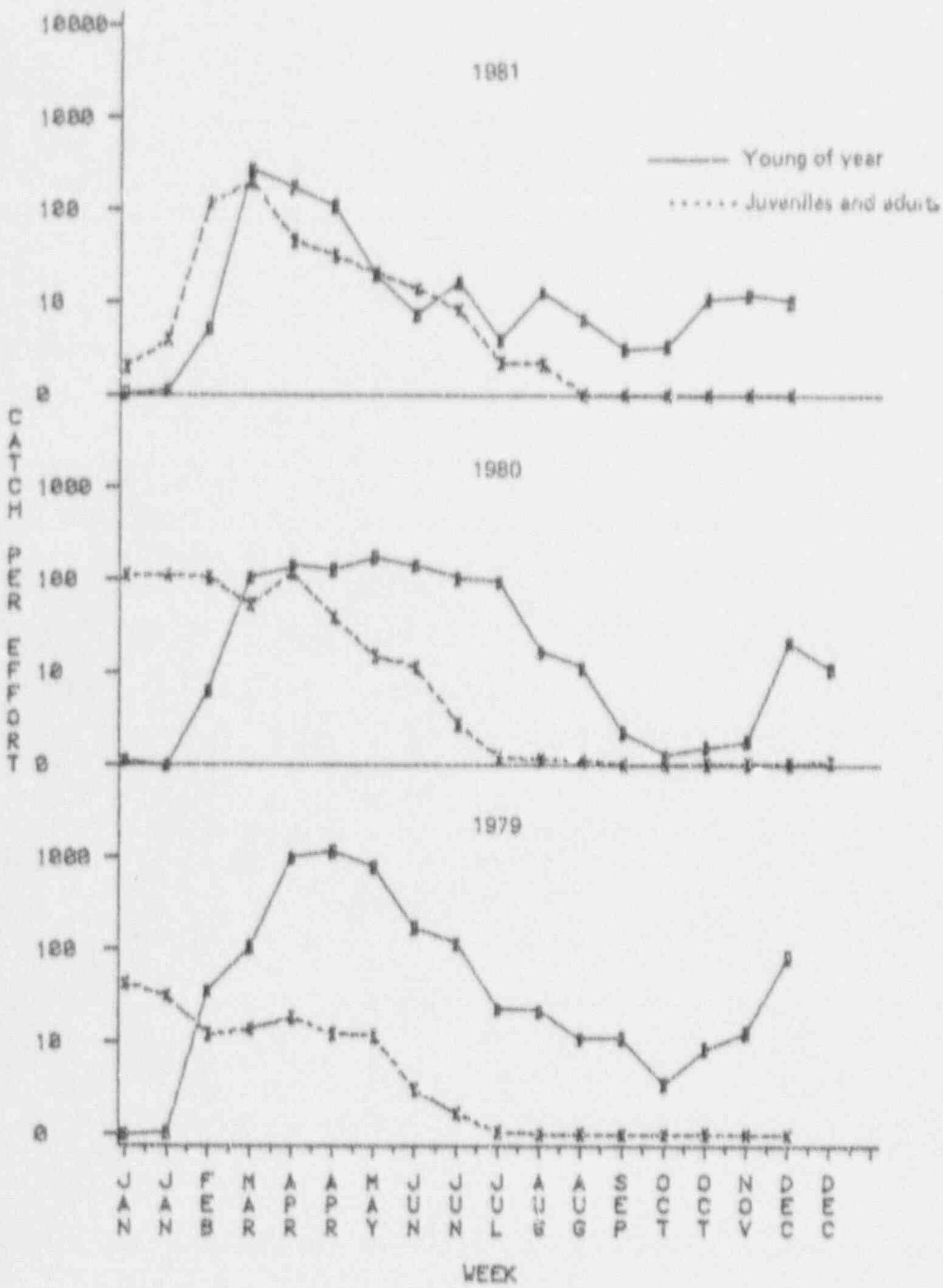


Figure 5.8 Spot CPUE (all stations combined)

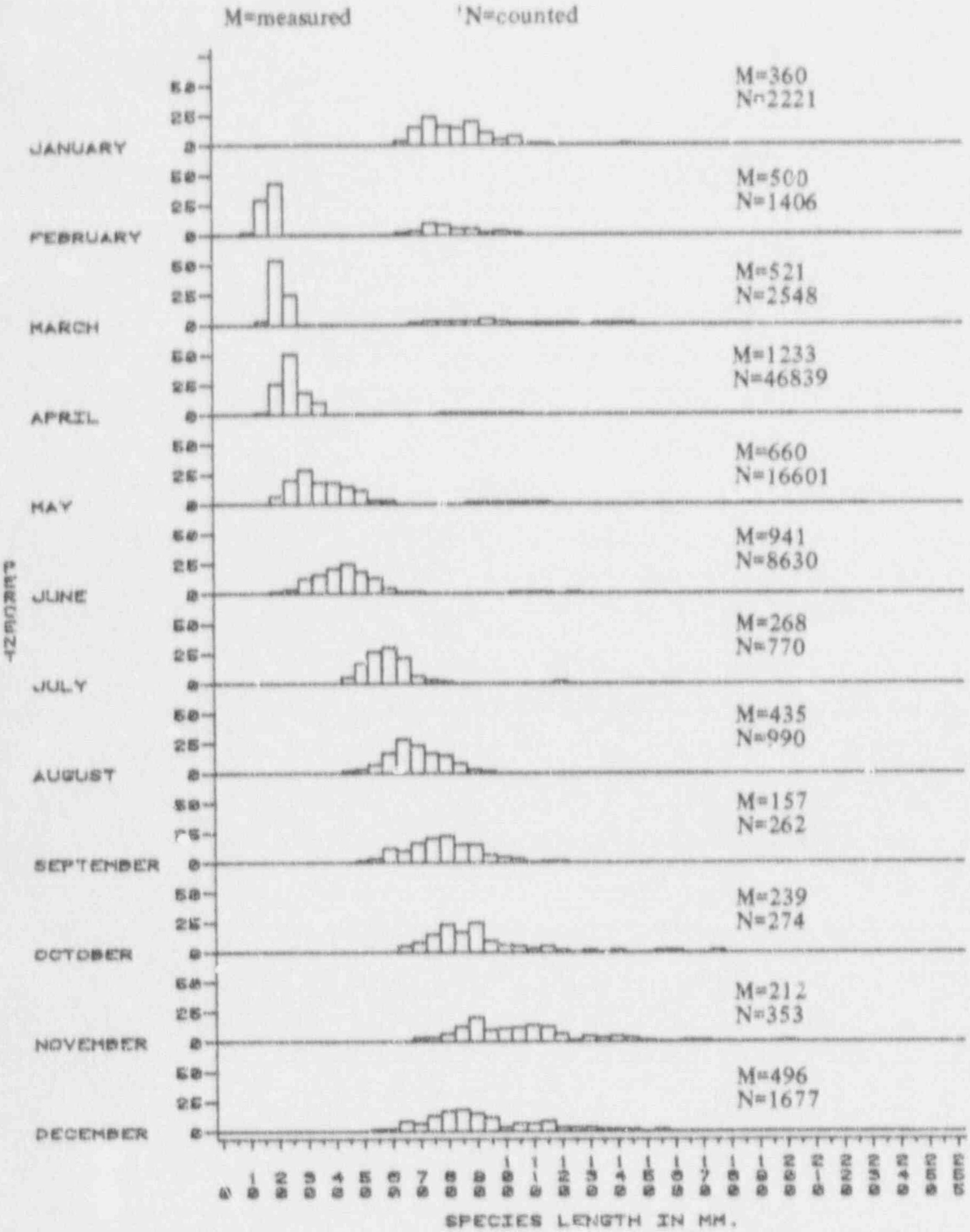


Figure 5.9 Length frequencies of spot for 1979

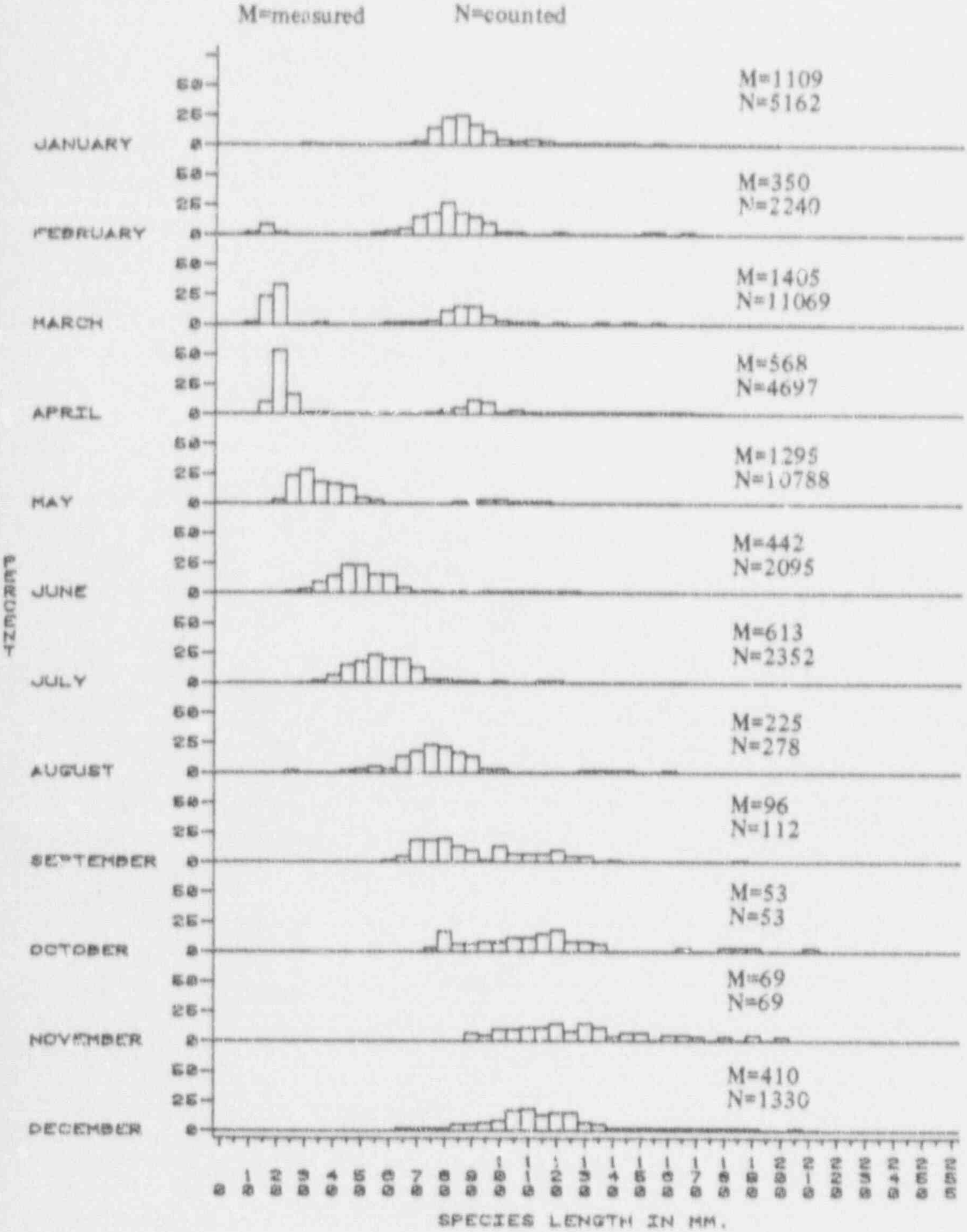


Figure 5.10 Length frequencies of spot for 1980

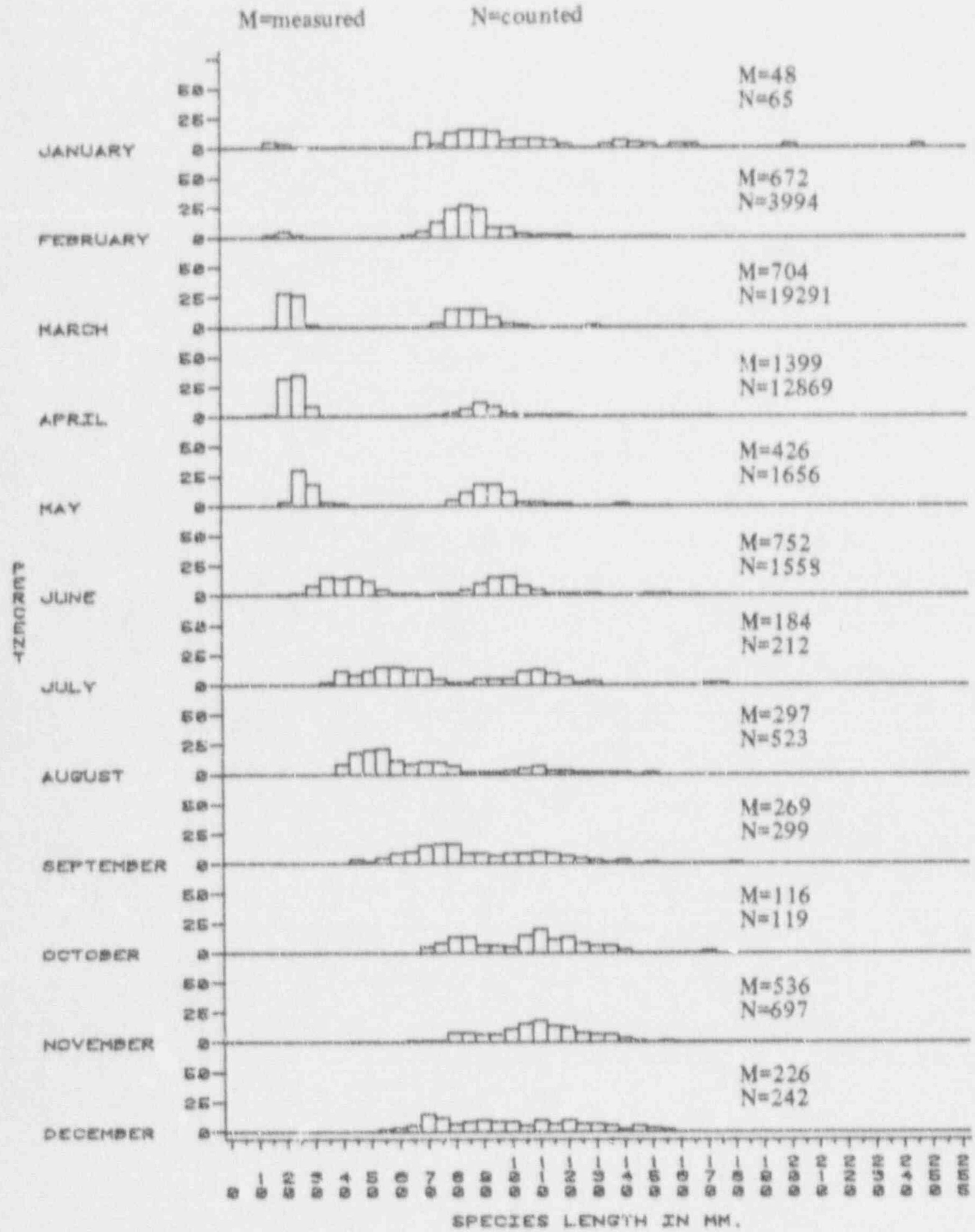


Figure 5.11 Length frequencies of spot for 1981

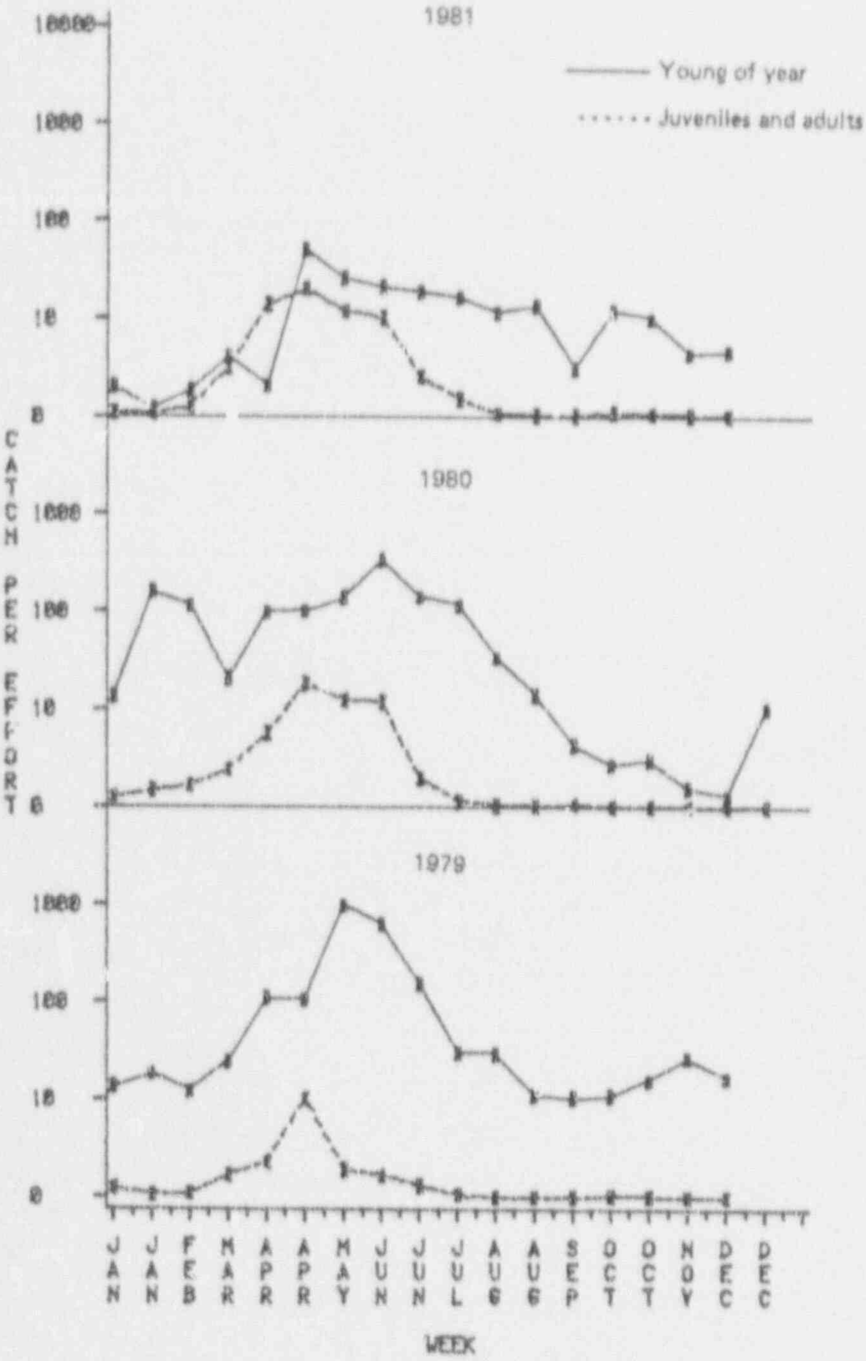


Figure 5.12 Atlantic croaker CPUE (all stations combined)

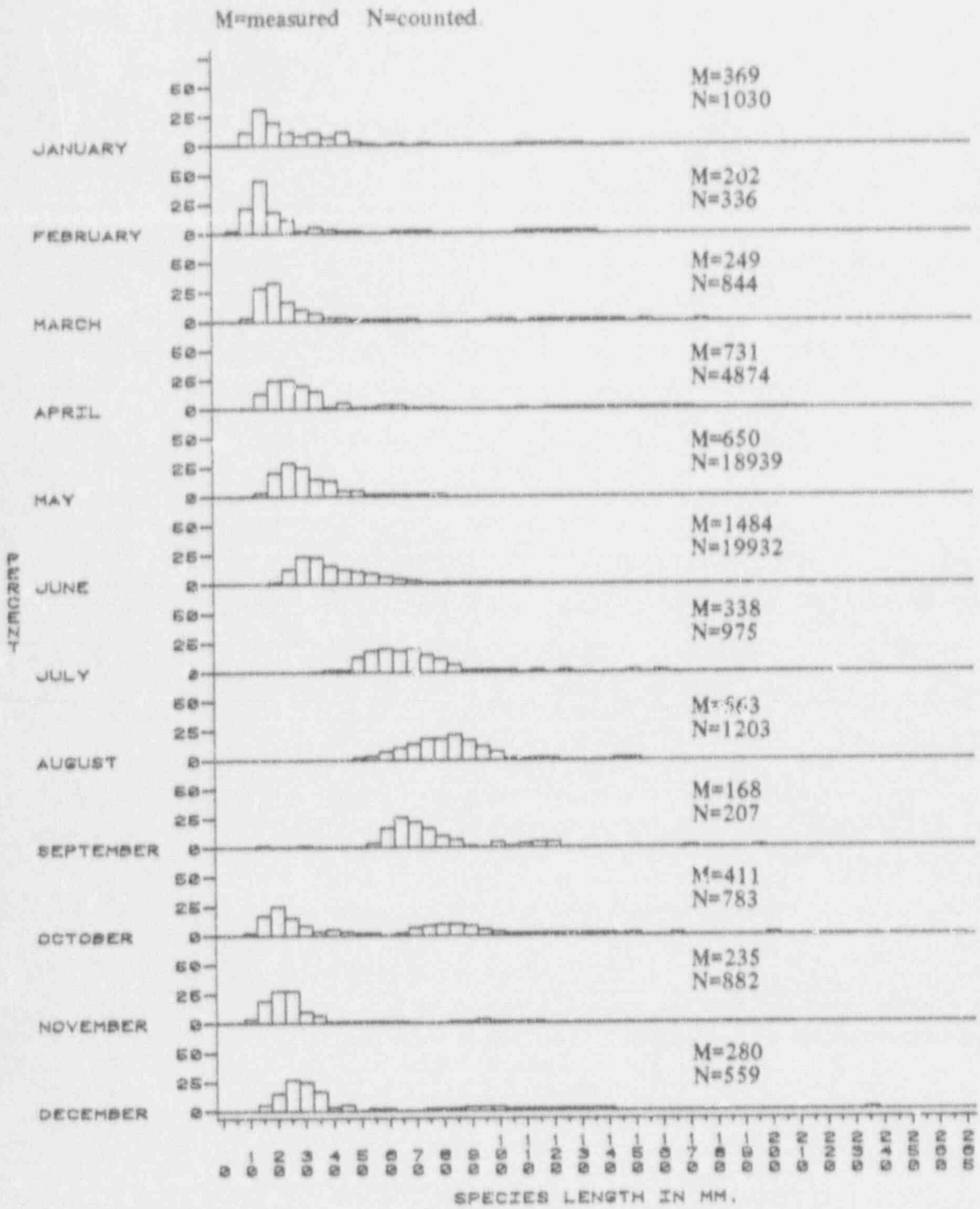


Figure 5.13 Length frequencies of Atlantic croaker for 1979

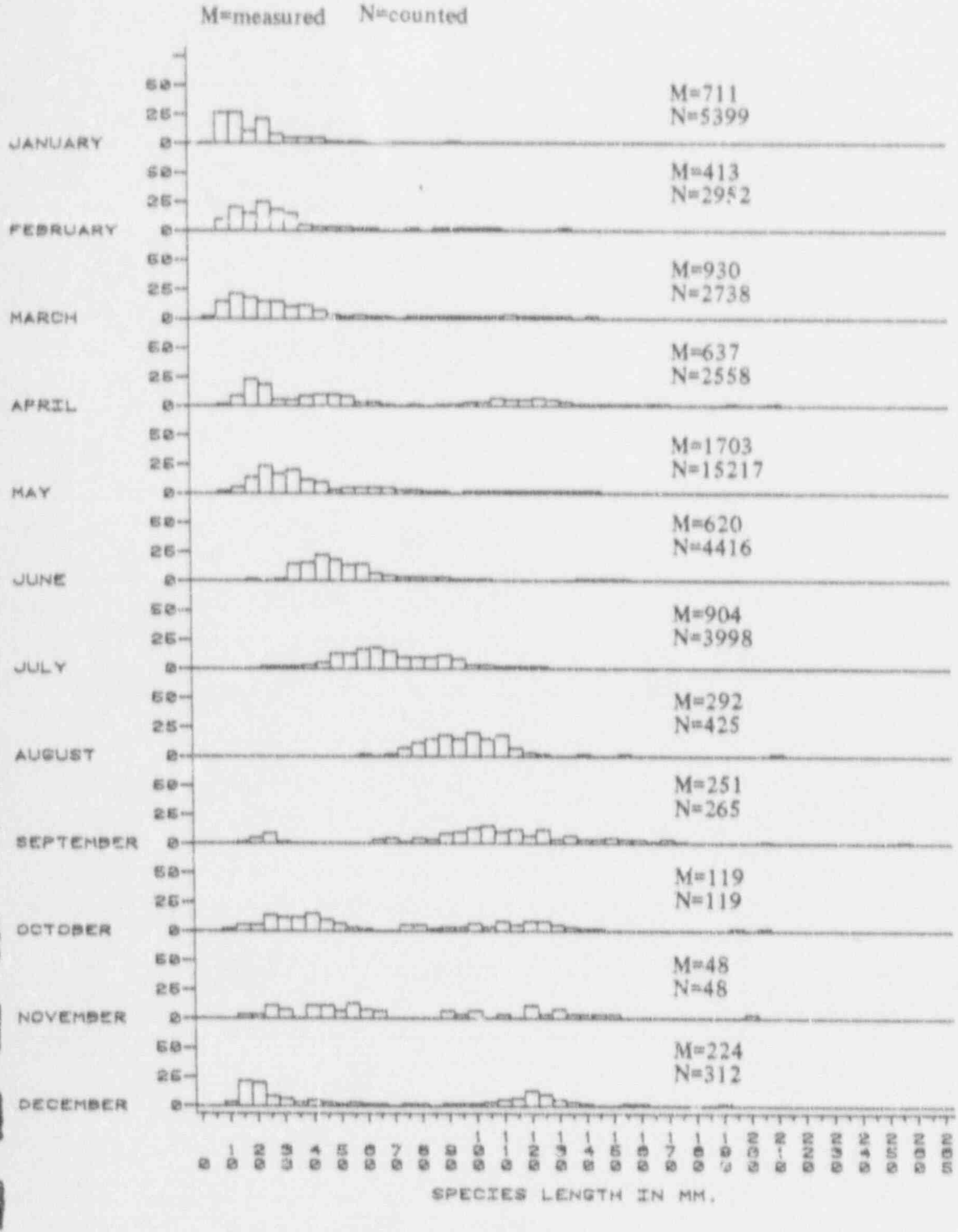


Figure 5.14 Length frequencies of Atlantic croaker for 1980

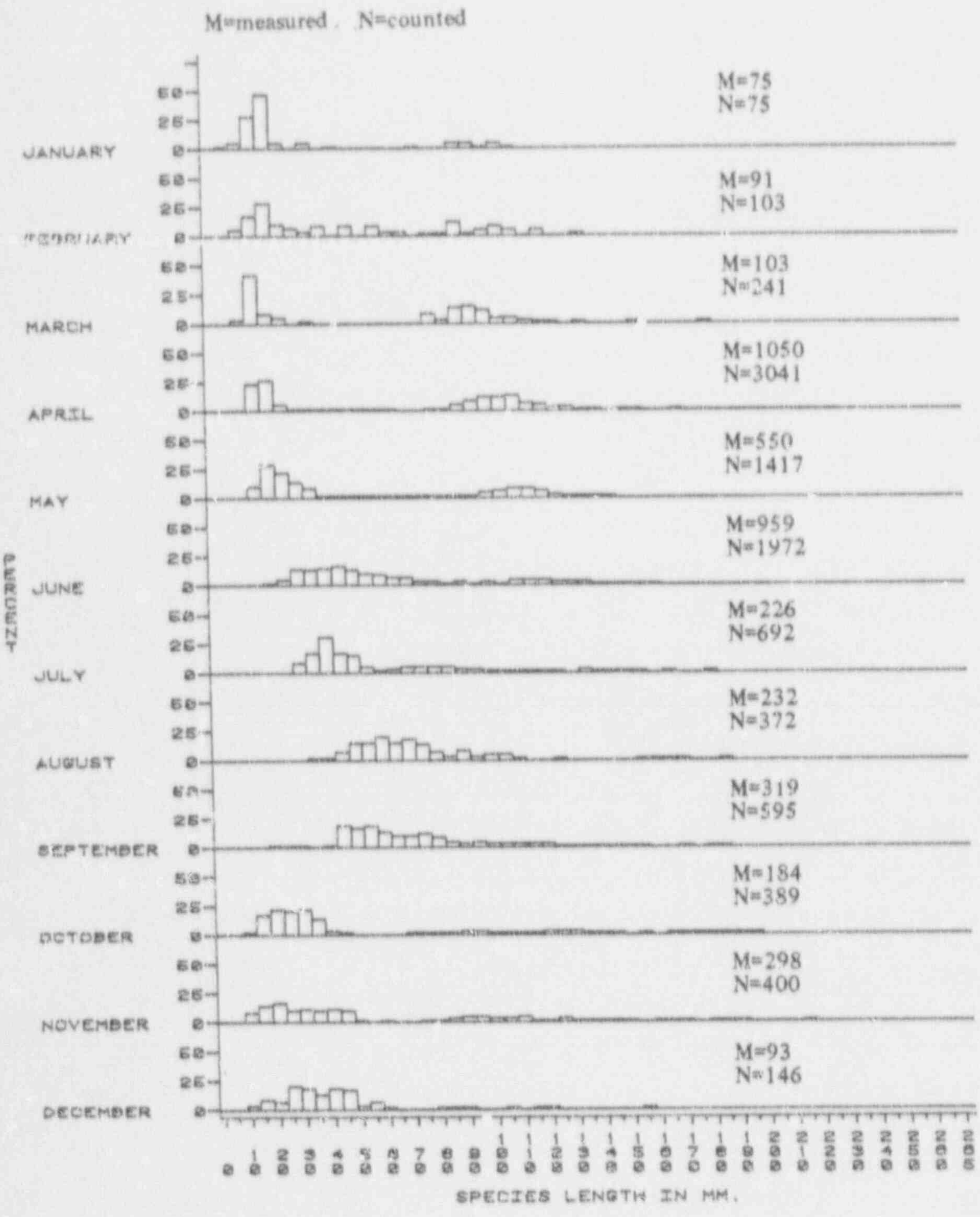


Figure 5.15 Length frequencies of Atlantic croaker for 1981

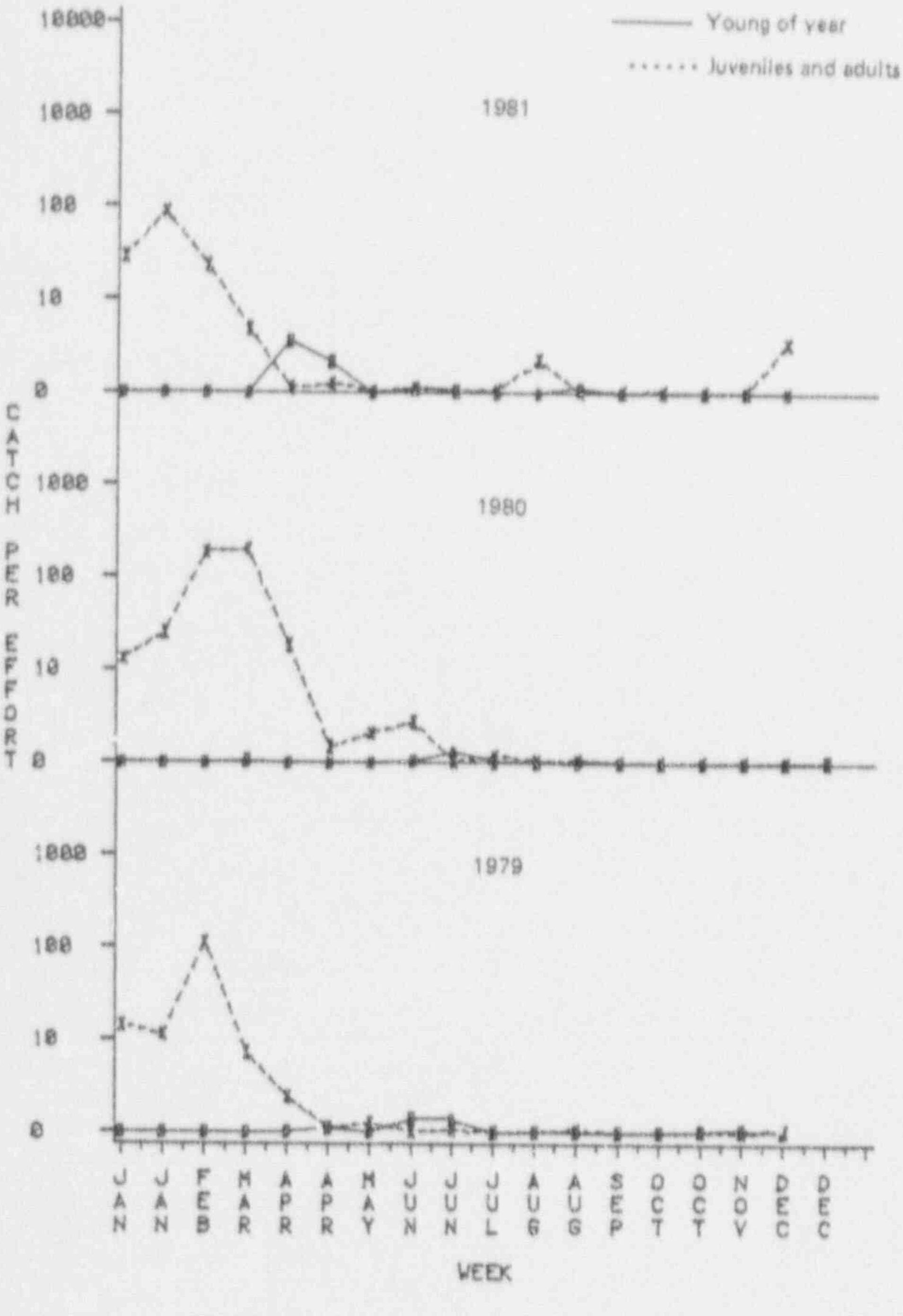


Figure 5.16 Atlantic menhaden CPUE (all stations combined)

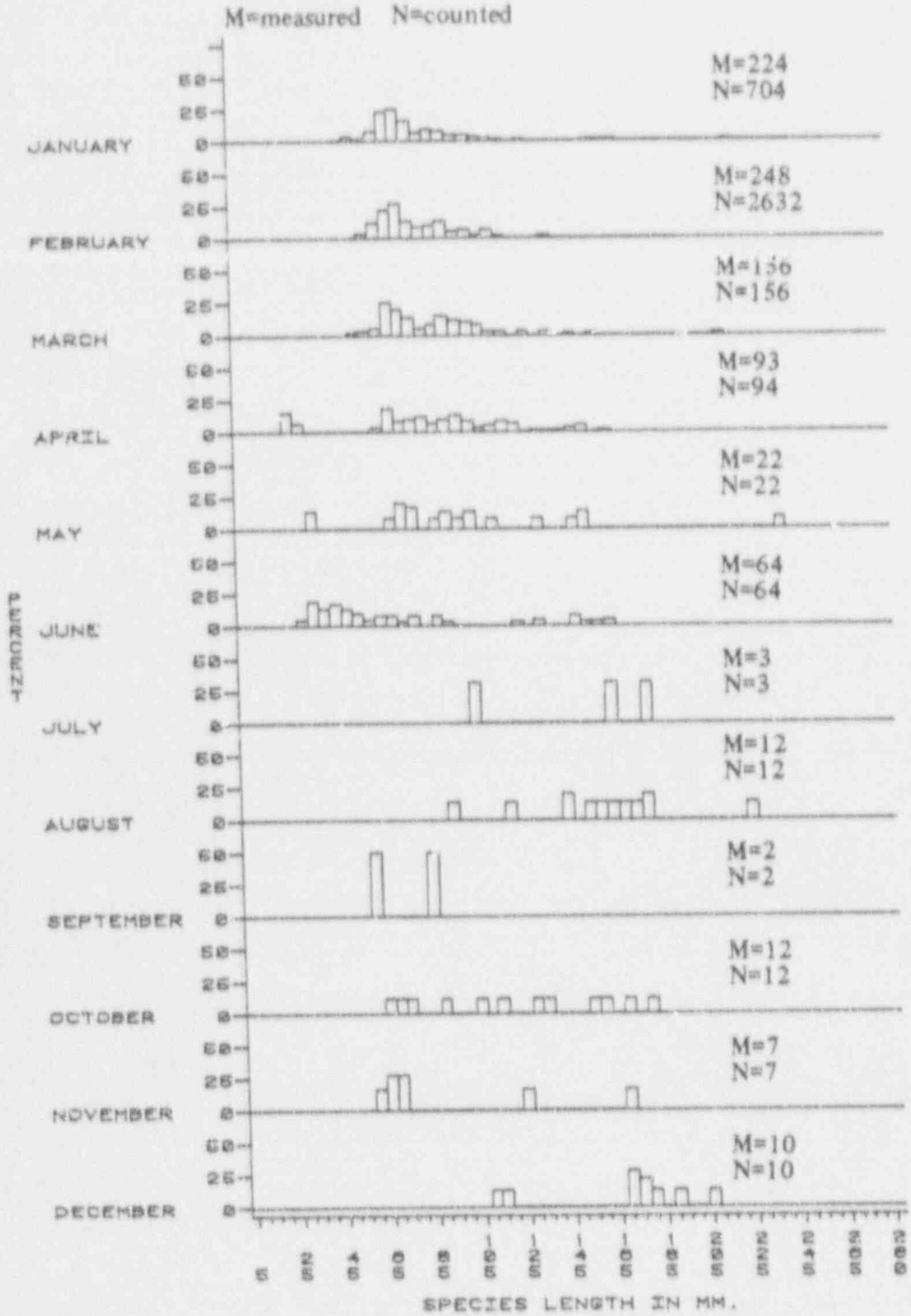


Figure 5.17 *Length frequencies of Atlantic menhaden for 1979*

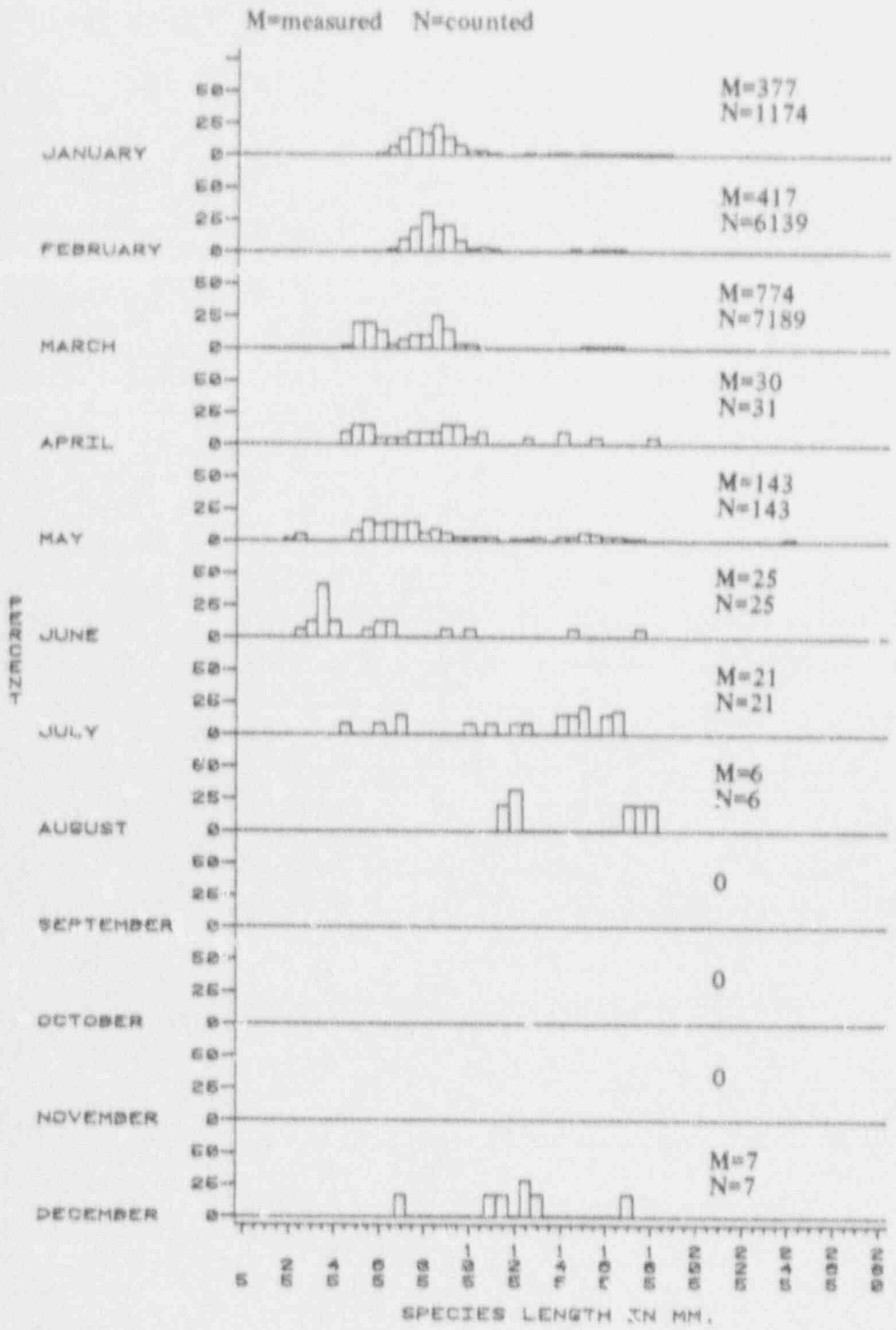


Figure 5.18 Length frequencies of Atlantic menhaden for 1980

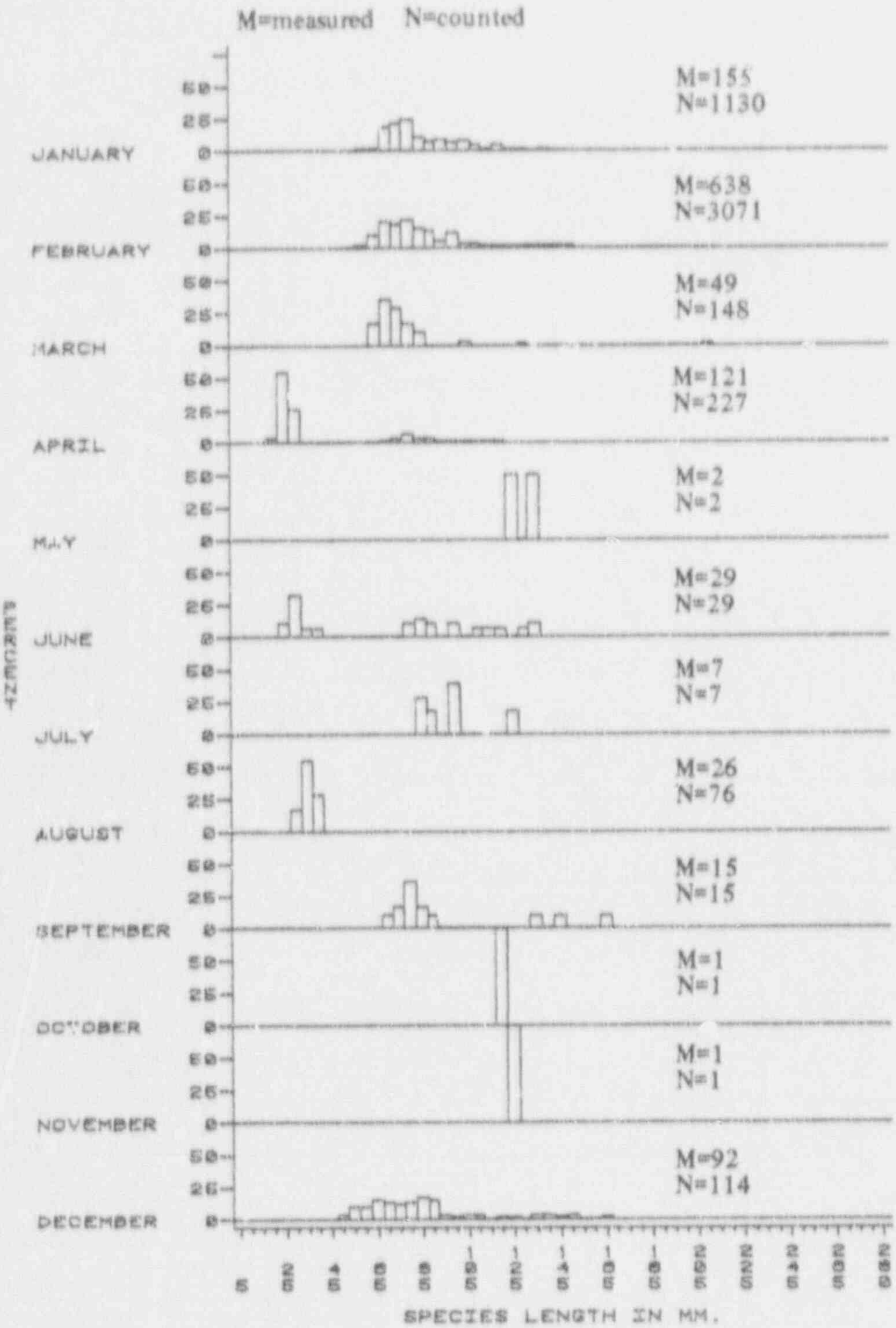


Figure 5.19 Length frequencies of Atlantic menhaden for 1981

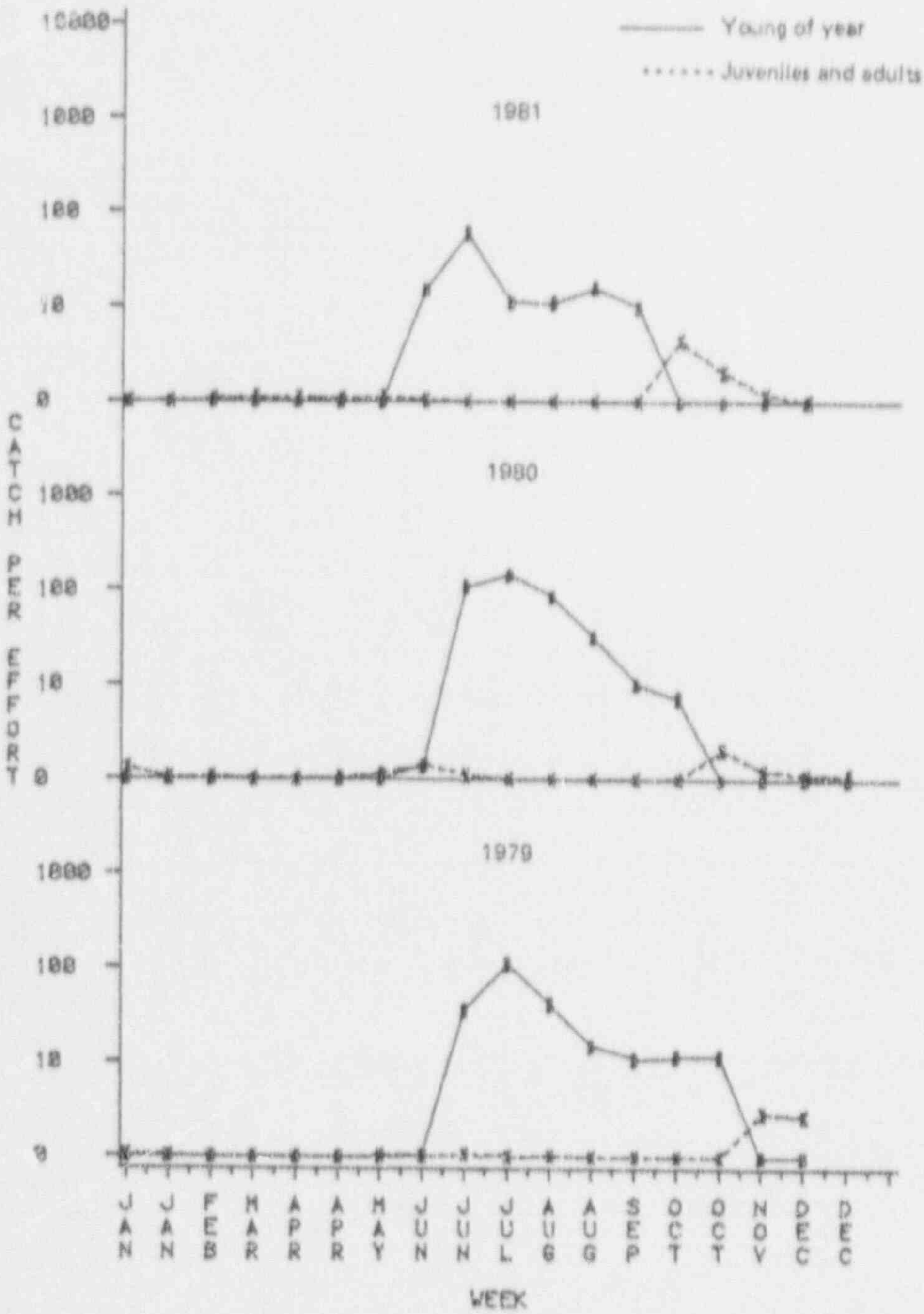


Figure 5.20 Weakfish CPUE (all stations combined)

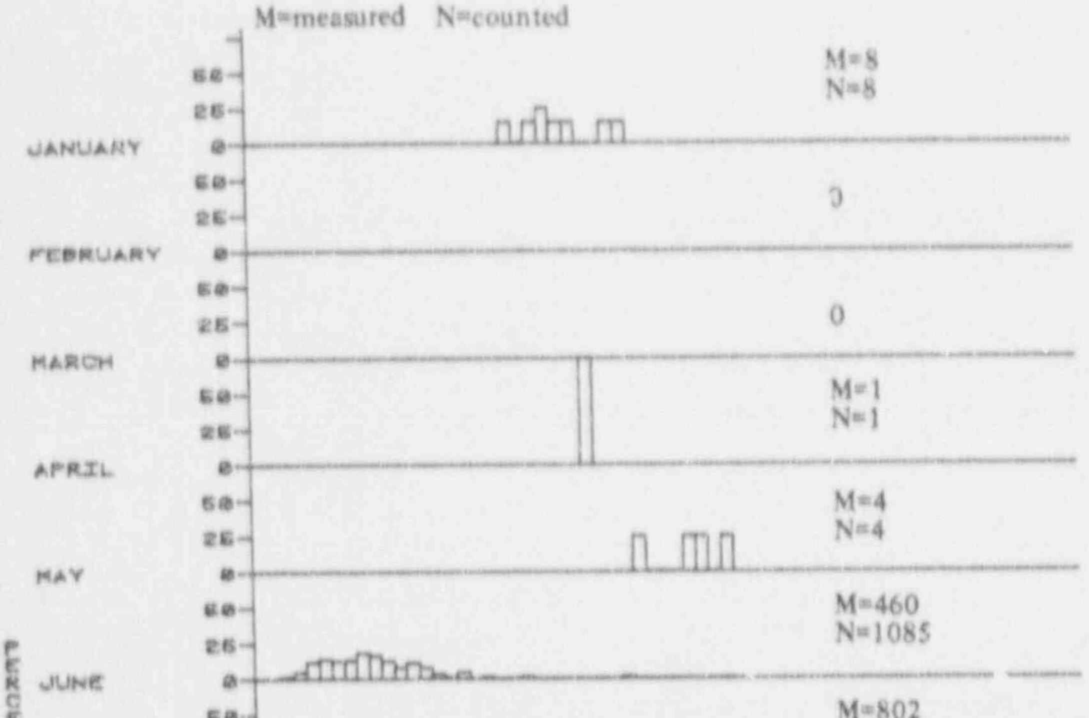


Figure 5.21 Length frequencies of weakfish for 1979

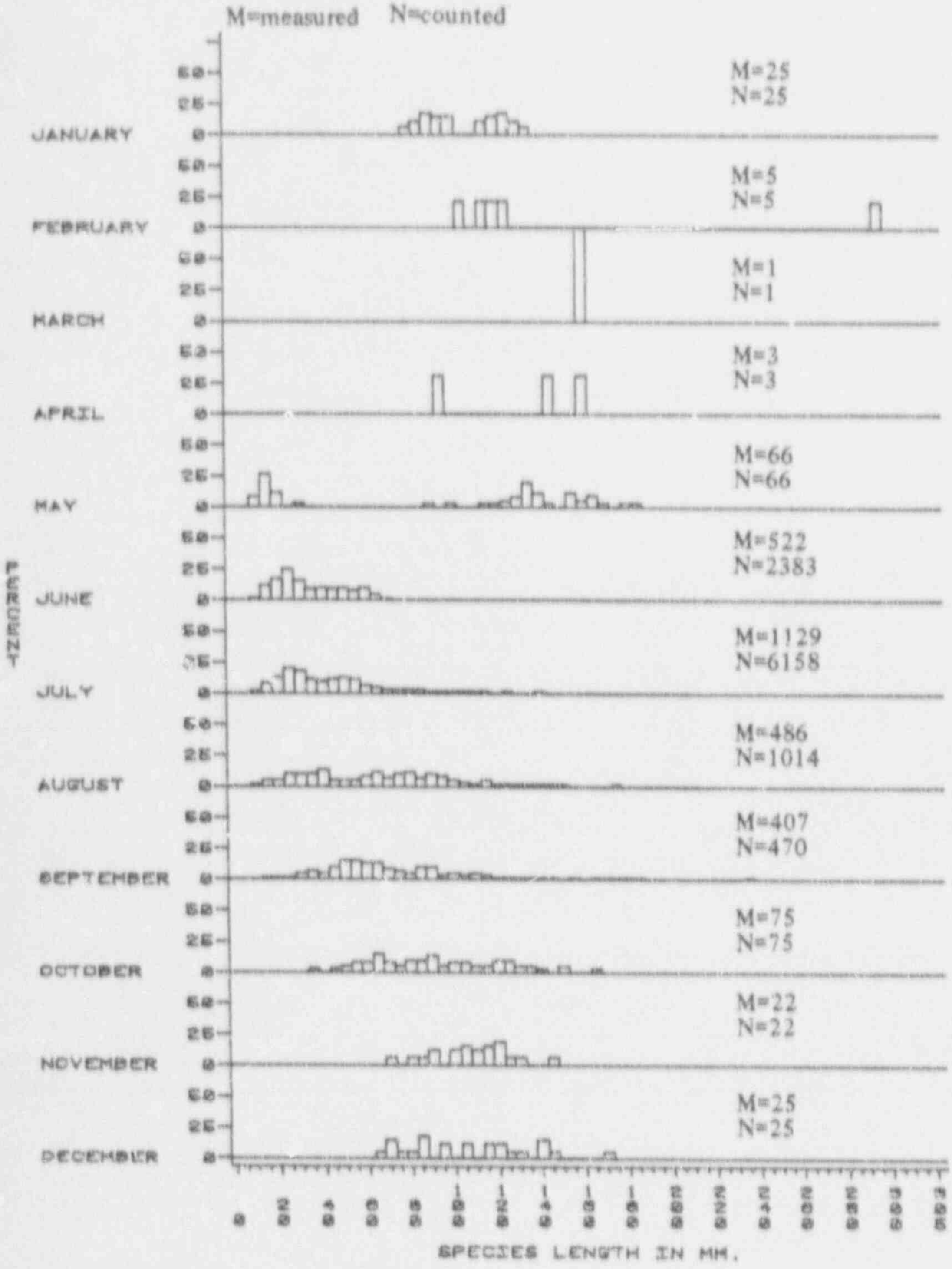


Figure 5.22 Length frequencies of weakfish for 1980

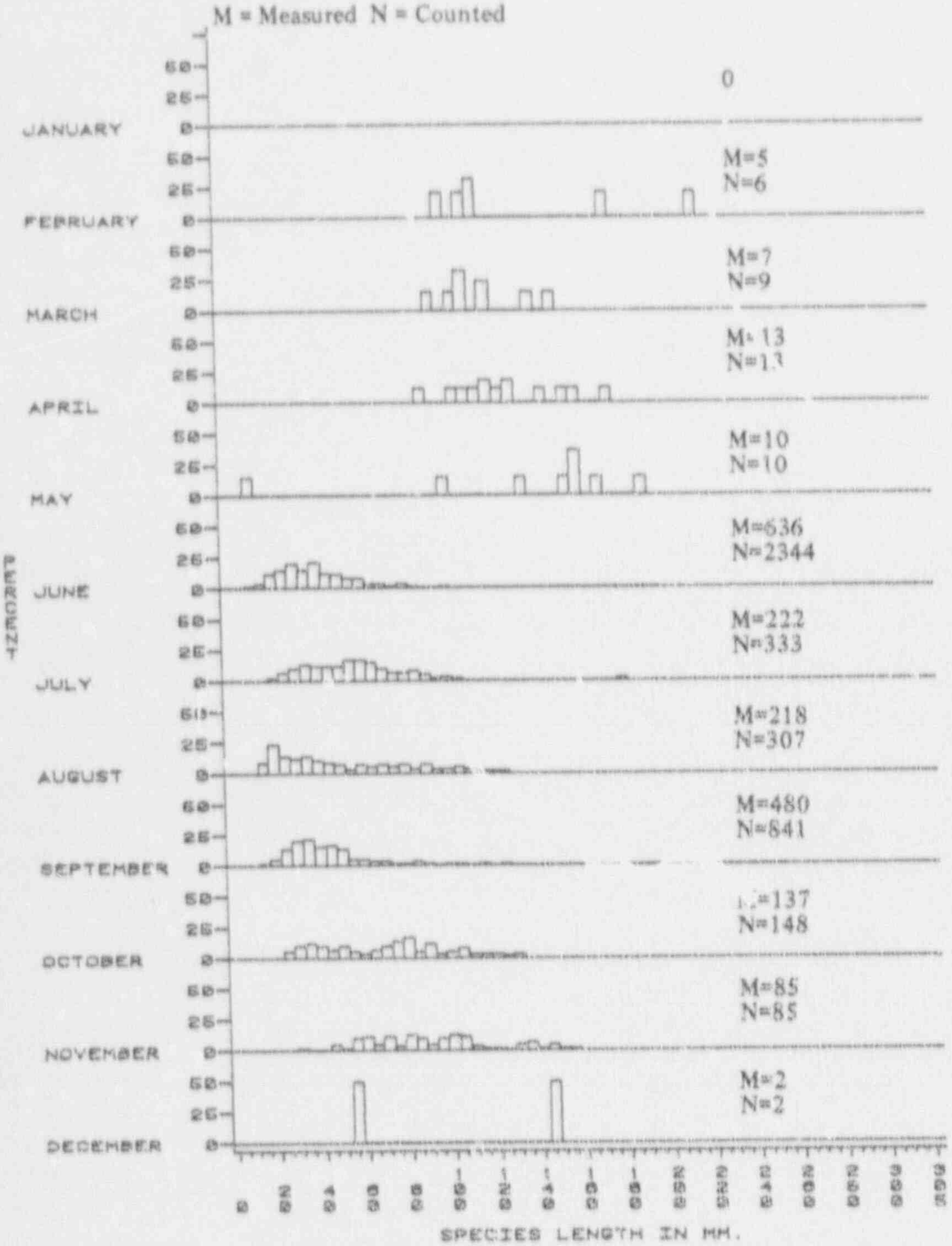


Figure 5.23 Length frequencies of weakfish for 1981

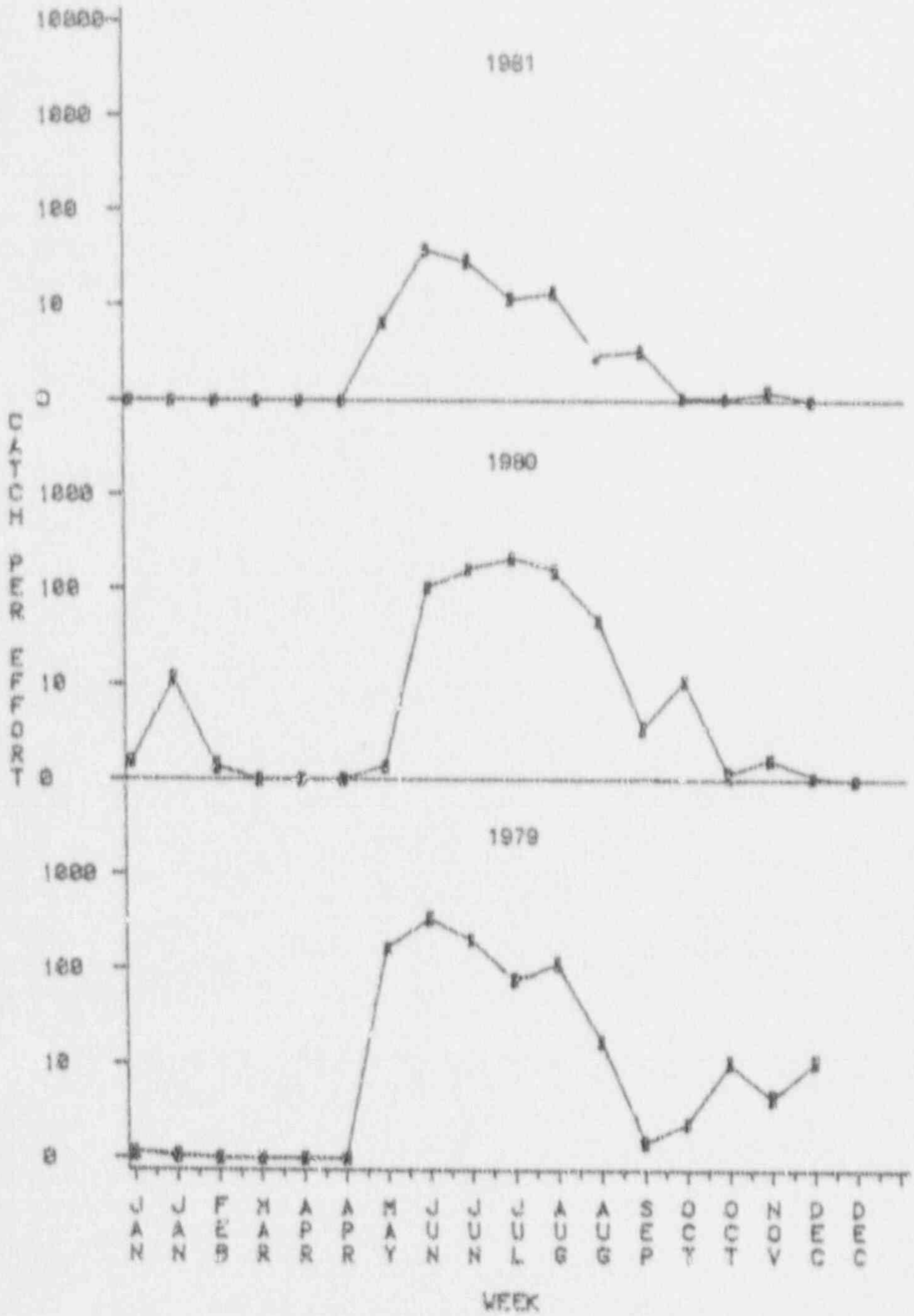


Figure 5.24 Brown shrimp CPUE (all stations combined)

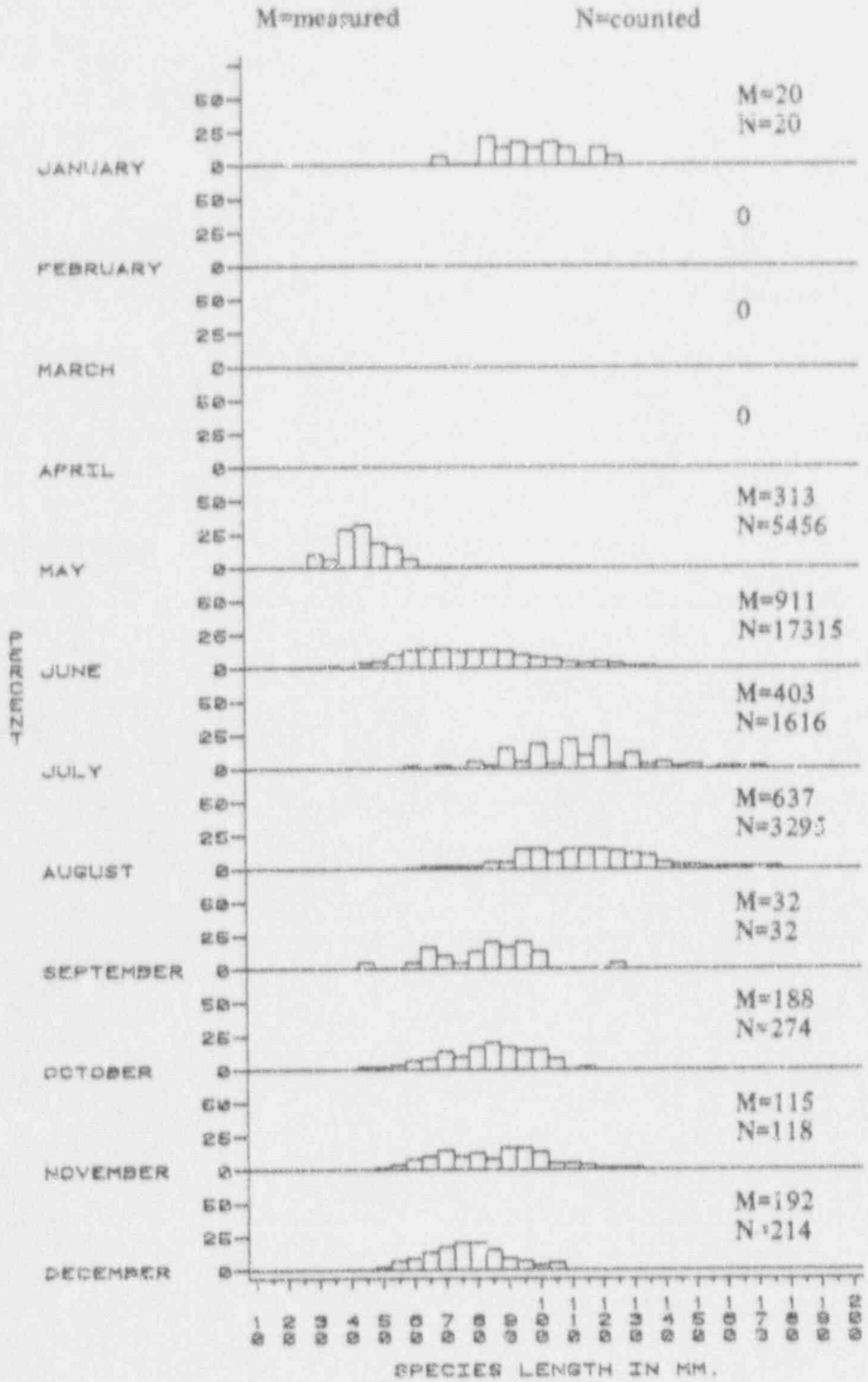


Figure 5.25 Length frequencies of brown shrimp for 1979

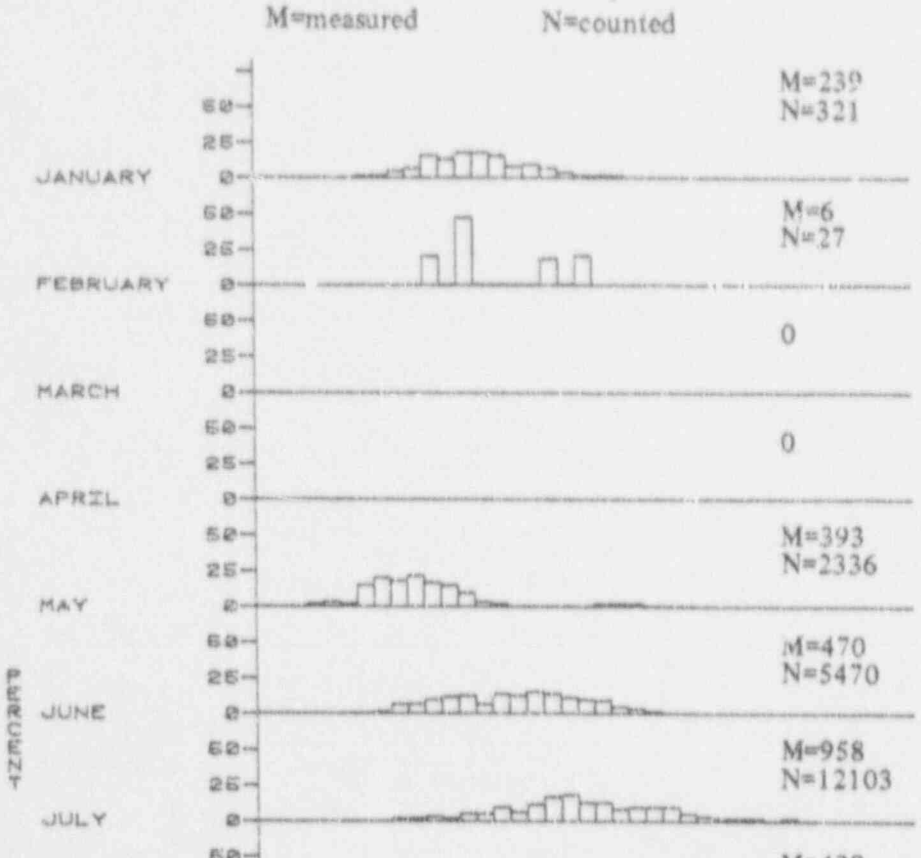


Figure 5.26 Length frequencies of brown shrimp for 1980

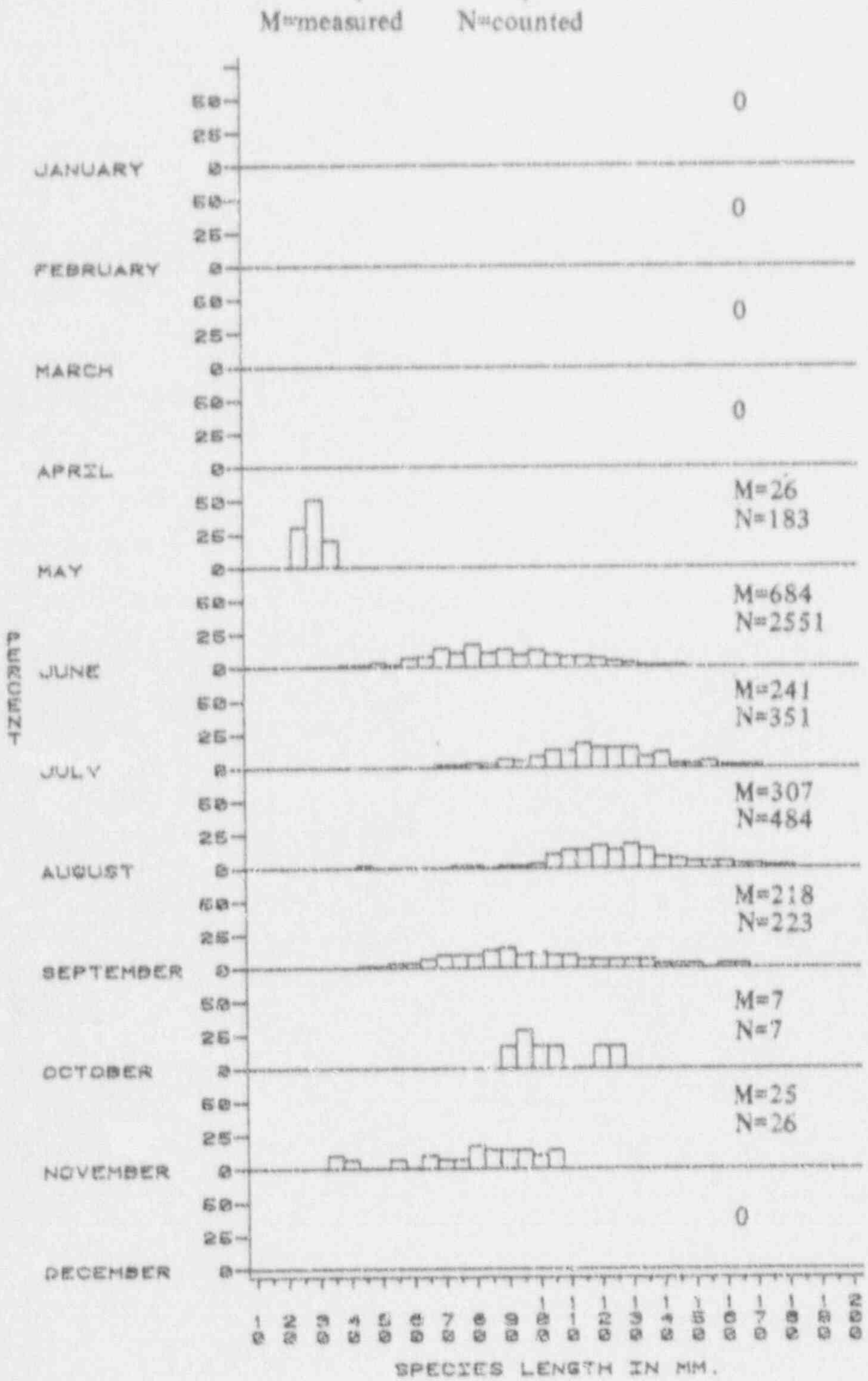


Figure 5.27 Length frequencies of brown shrimp for 1981

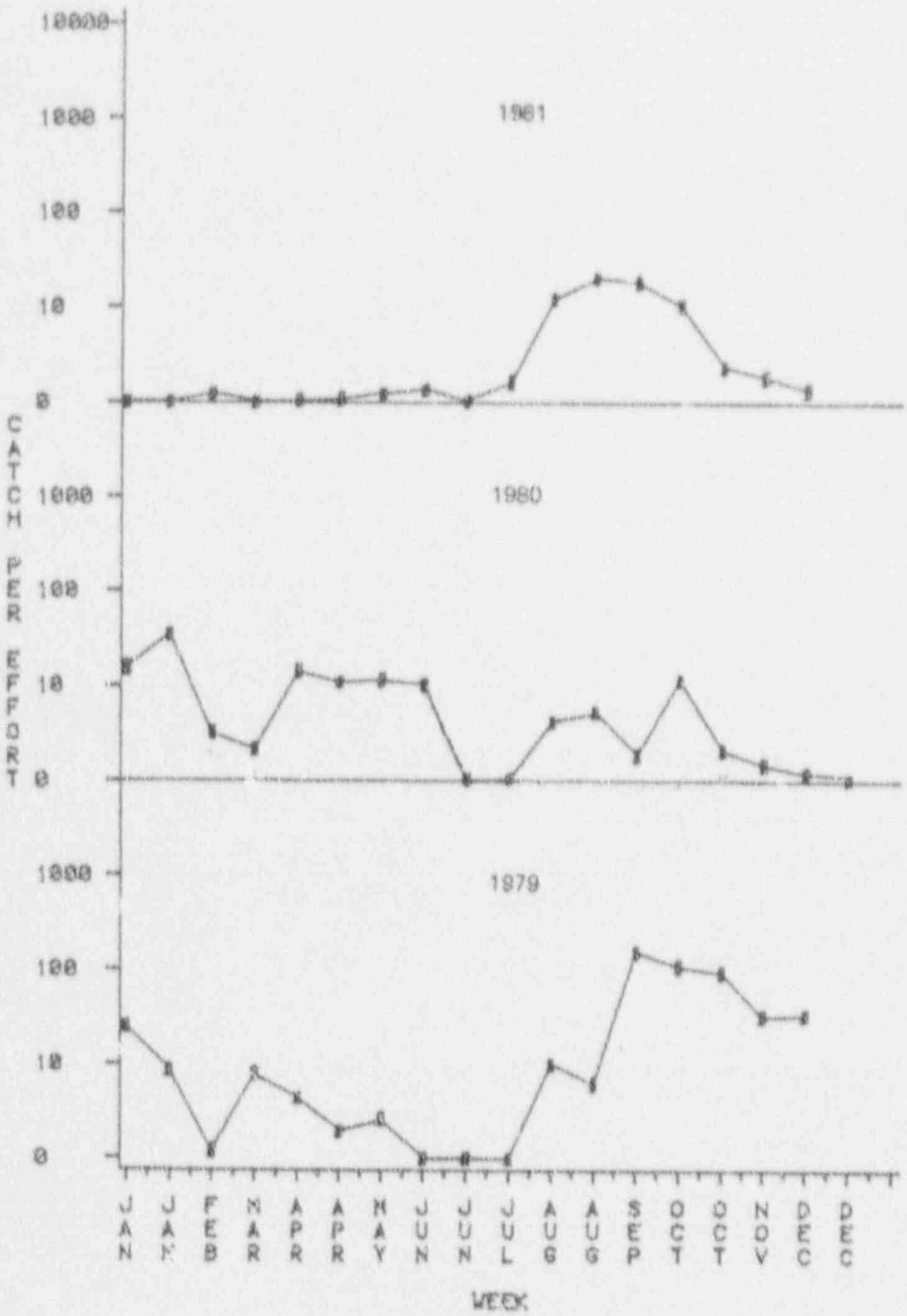


Figure 5.28 Pink shrimp CPUE (all stations combined)

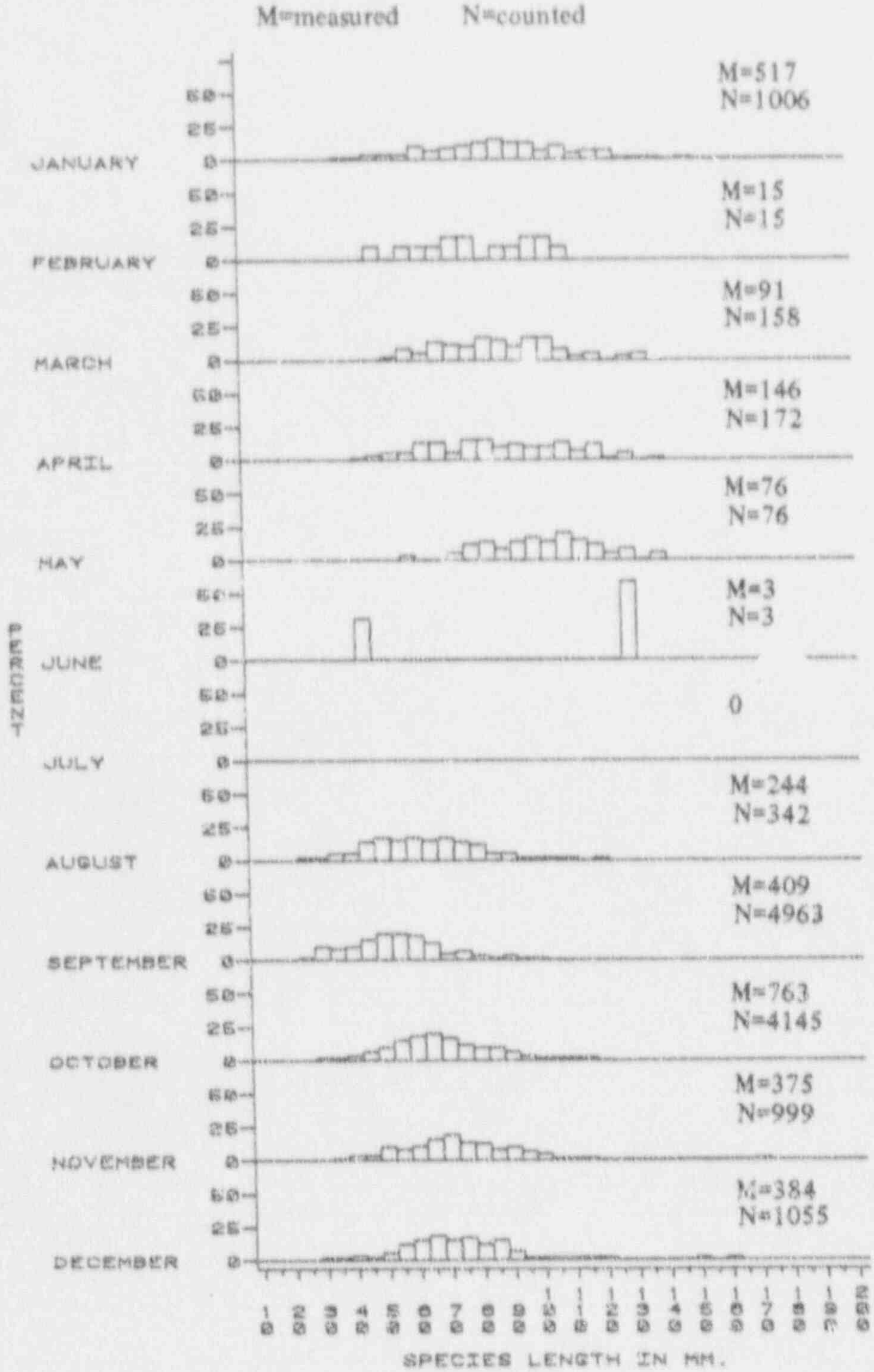


Figure 5.29 Length frequencies of pink shrimp for 1979

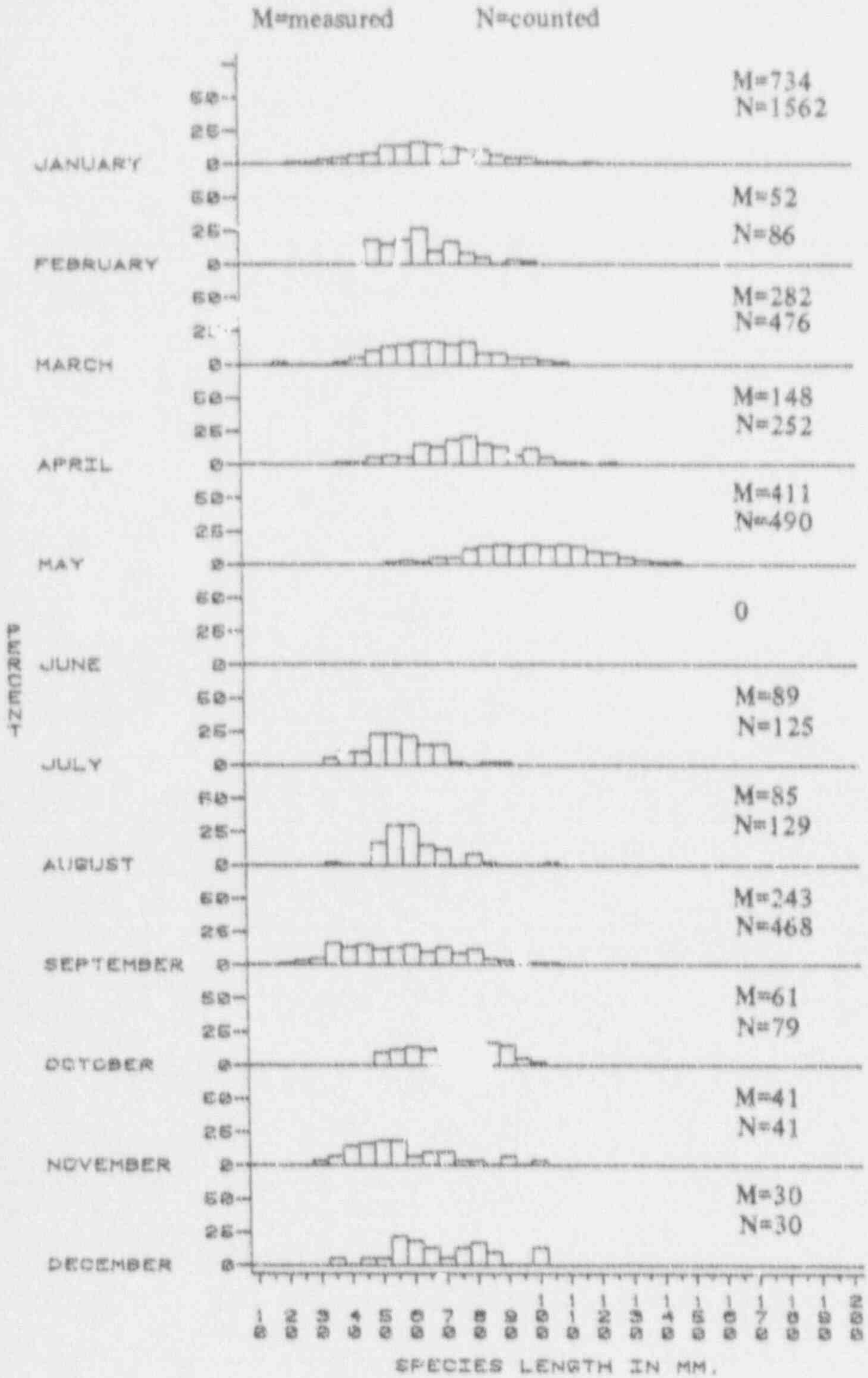


Figure 5.30 Length frequencies of pink shrimp for 1980

M=measured N=counted

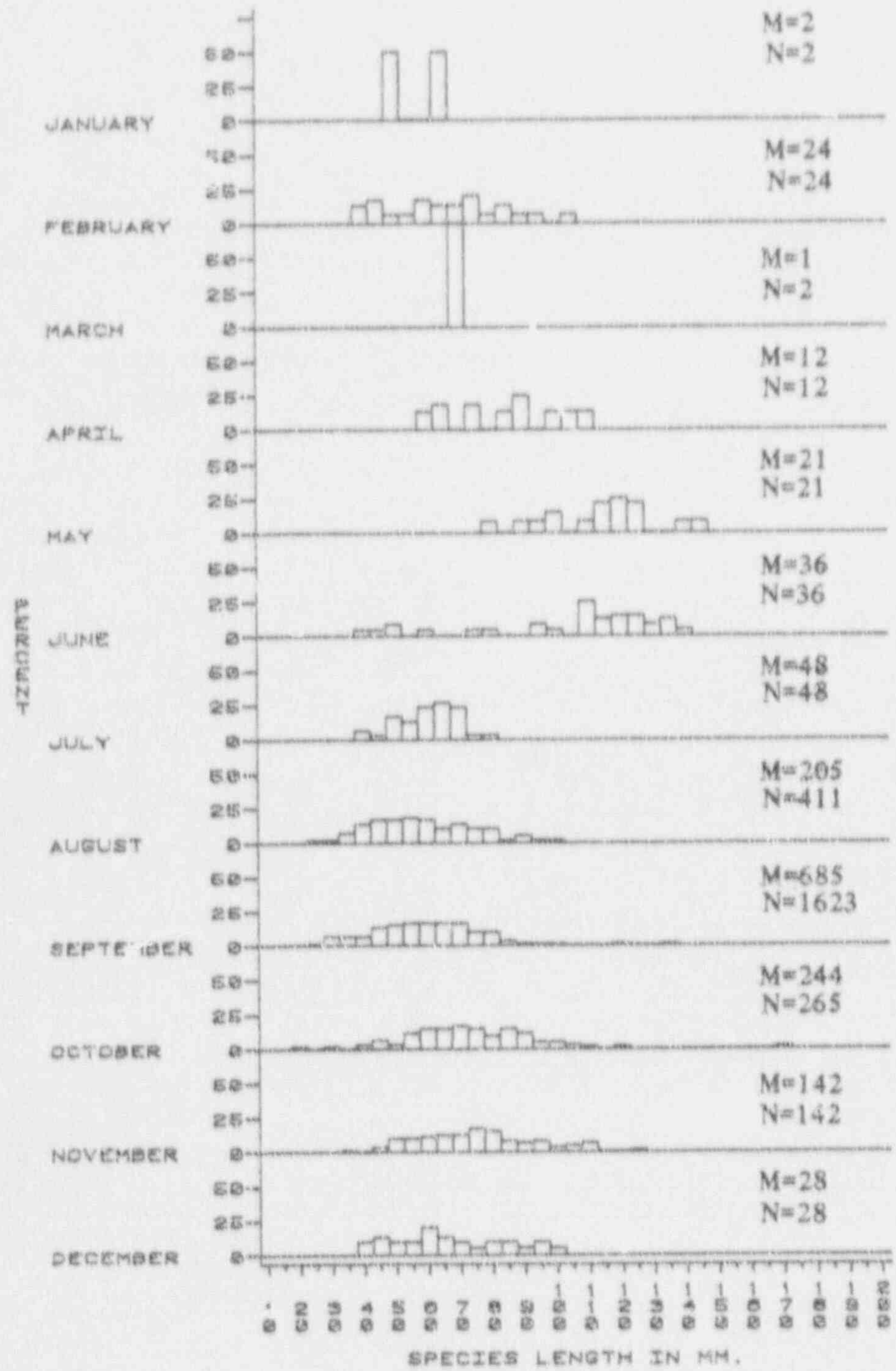


Figure 5.31 Length frequencies of pink shrimp for 1981

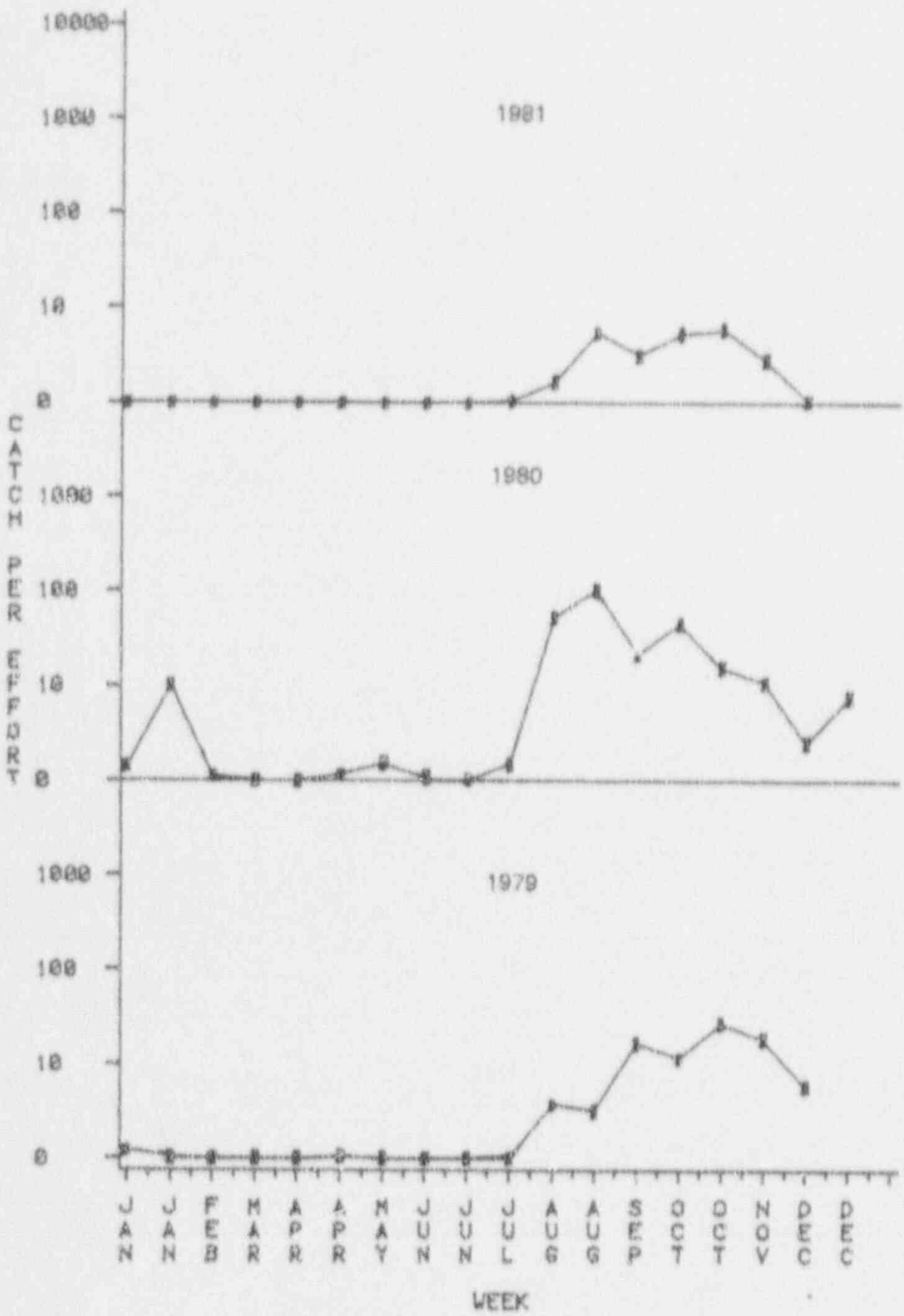


Figure 5.52 White shrimp CPUE (all stations combined)

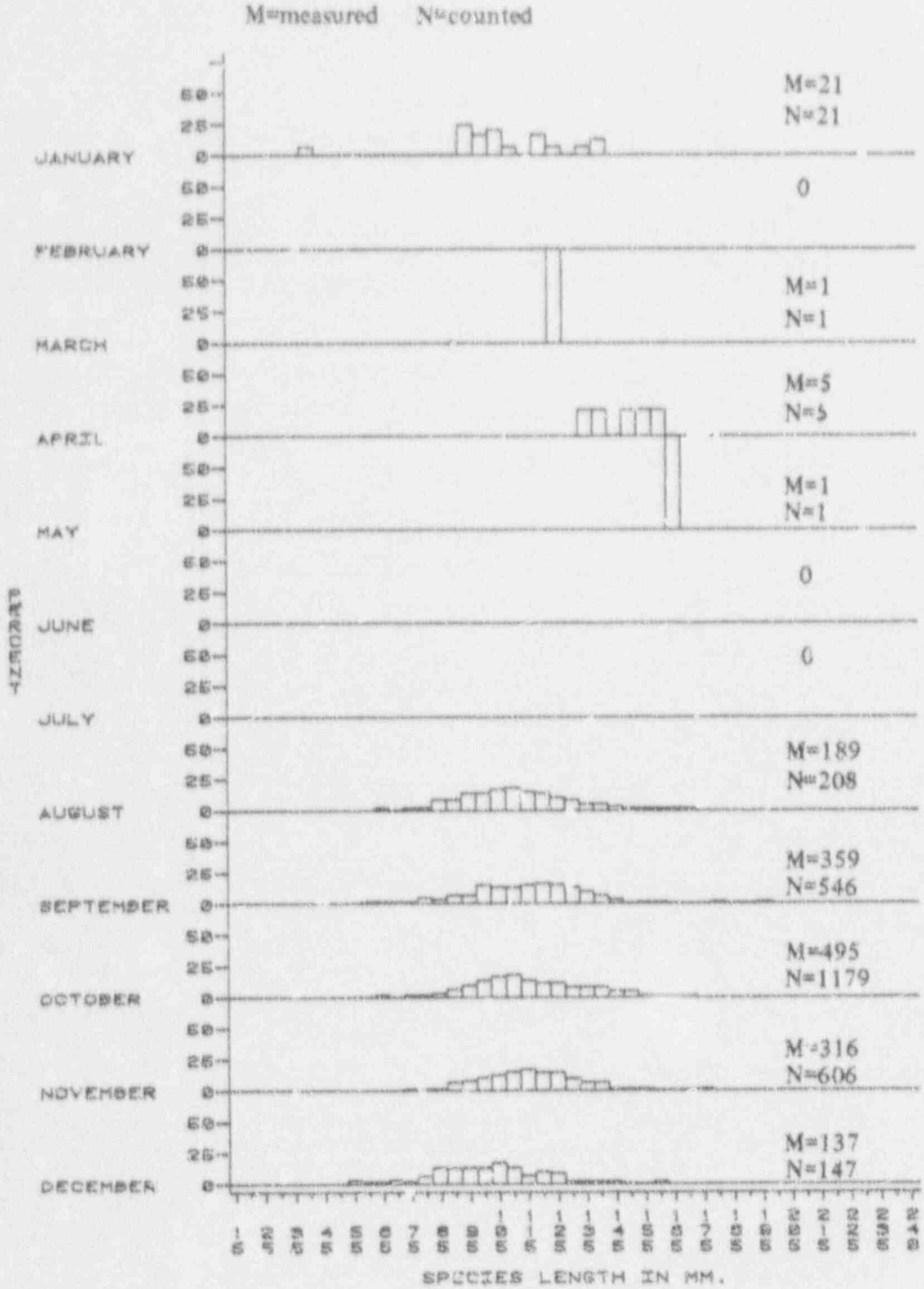


Figure 5.33 Length frequencies of white shrimp for 1979

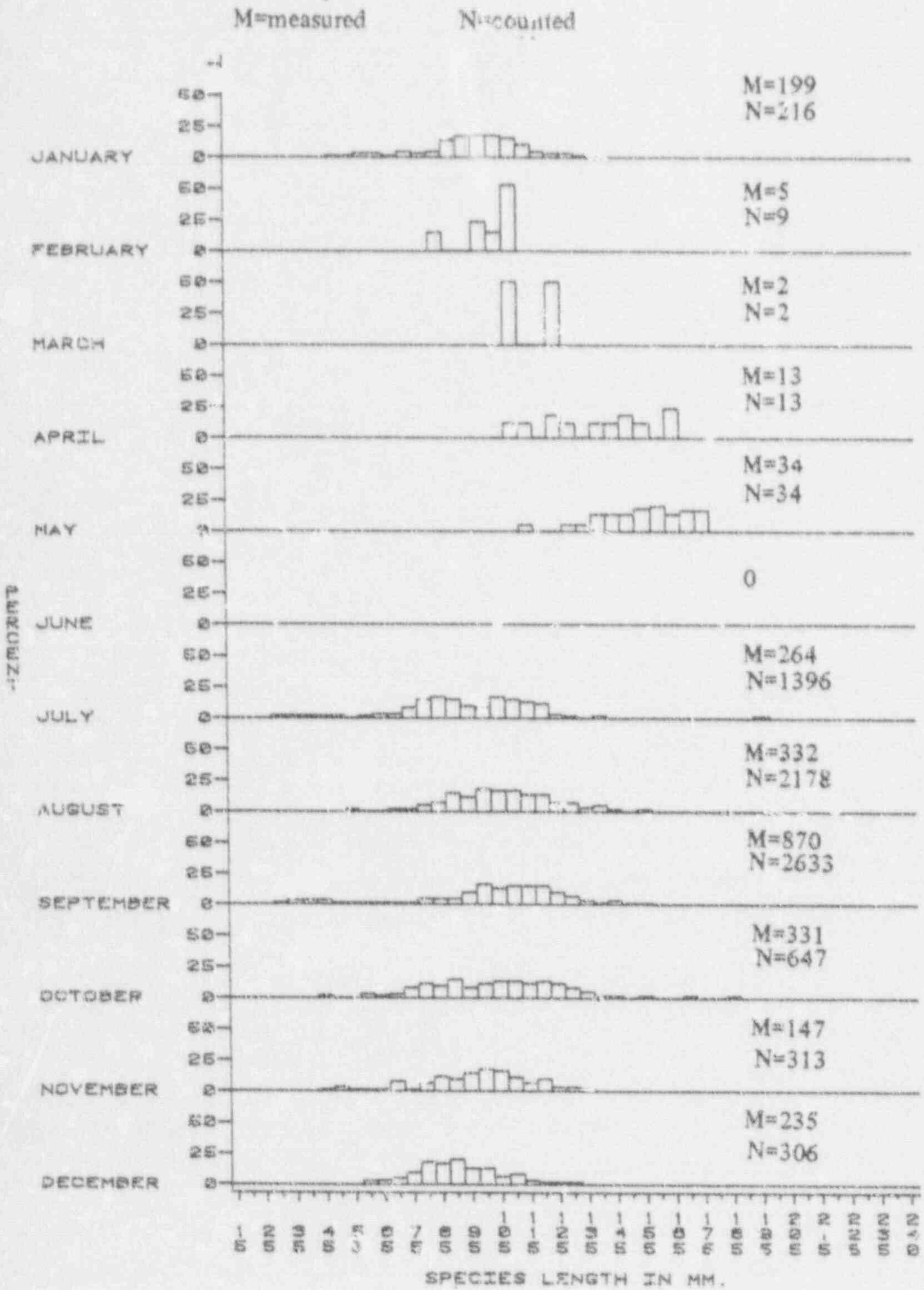


Figure 5.34 Length frequencies of white shrimp for 1980

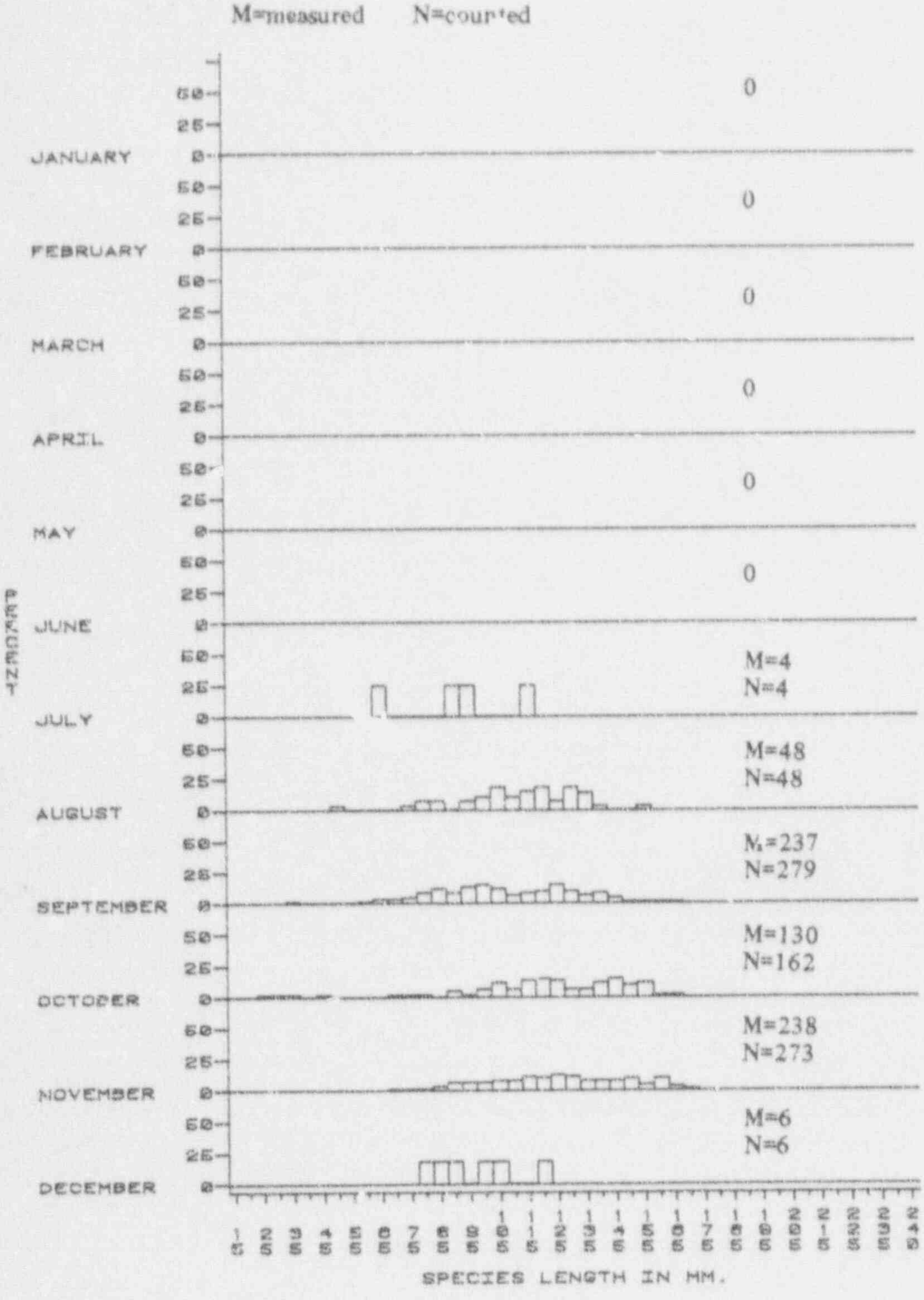


Figure 5.35 Length frequencies of white shrimp for 1981

6.0 ENTRAINMENT

6.1 Introduction

Entrainment studies were conducted by NCSU from May 1974 to August 1978 (Copeland et al. 1979). CP&L continued the entrainment studies starting in September 1978 as part of the long-term monitoring program. This section will cover data collected from September 1978 through August 1981. The data from September 1978 to May 1979 have previously been reported (CP&L 1980a) but are incorporated into this report to provide three complete years for comparison.

6.2 Methods

Sampling to monitor entrainment rates of larval and postlarval fishes, penaeid shrimp, and portunid crabs was conducted from one of the two discharge sluiceways. As presented by Hodson, Schneider, and Copeland (1977), the reason for sampling in the discharge instead of the intake was based on the assumption that the larvae and water are thoroughly mixed during passage through the plant resulting in a homogeneous distribution of larvae in the discharge sluiceway. This mixing eliminates the need for multilevel sampling to adequately describe the BSEP entrainment rates. Samples collected in this manner permit the determination of the seasonality, abundance, and species composition of the entrained larvae and postlarvae.

Entrainment samples were collected by fishing two round 0.5 m (19.7 in), 505 micron mesh plankton nets mounted side by side for five minutes just below the surface in the center of one of the discharge sluiceways. General Oceanics Model 2030 flowmeters were mounted in the mouth of each net (Figure 6.1). Samples were preserved immediately in approximately 10% formalin. Salinity and water temperature measurements were taken from water collected from the surface prior to each collection using an American Optical Model 10419 refractometer and a Yellow Springs Instrument Company Model 43TD telethermometer.

In the laboratory, the samples were washed to remove the formalin, sorted, and all larval and postlarval fish, shrimp postlarvae, and portunid crab megalops were retained. Larger individuals of these groups were also retained when they were encountered. All specimens were identified to the lowest practical taxon (Table 3.3), counted, and measured (up to 100 per species prior to January 1, 1980; up to 50 per species after January 1, 1980). These data were recorded on computer data forms with other information including sample number, date and time of collection, temperature, salinity, photoperiod and tide stage. A quality control program identical to the one described in Section 3.2 was conducted on entrainment samples.

All larval fish collected by NCSU during the years 1974-1978 were measured in standard length (SL). Larval fish collected by CP&L between September 1978 and August 1979 were measured in total length (TL). Larval fish collected after September 1, 1979, were measured in standard length. To compare these sets of data, a conversion program was used to convert total length to standard length (Table 3.4). All figures, tables, and analyses were done with these converted lengths.

Prior to January 1981, entrainment samples were collected on mid and slack tides over one 24-hour period each week. It has been shown that the greatest densities of organisms are entrained during nighttime hours (Copeland et al. 1979, CP&L 1980a). Therefore, the sampling scheme for entrainment was changed on January 1, 1981, to one daytime sample and three nighttime samples to be taken at 1200, 2100, 2400 and 0300 EST respectively (one hour later during EDT). This change provided for a reduction in the number of samples taken and allowed sampling to be conducted over all phases of the tide cycle.

Statistical analyses and trends in densities of the major species entrained presented in this chapter incorporate all data collected since September 1974.

6.3 Results & Discussion

A total of 2221 samples was collected over 156 sampling trips (weeks) between September 6, 1978, and August 24, 1981 (Table 6.1). *Gobiosoma* spp. dominated the entrainment catch, representing 23.13%, 21.15%, and 35.54% of the total density of organisms caught during 1979, 1980, and 1981 respectively. The combined summer species--anchovies, gobies, and seatrout--accounted for 53.13%, 42.43%, and 58.28% of the total entrainment during 1979, 1980, and 1981 respectively. The winter species--spot, croaker, menhaden, mullet, and flounder--accounted for approximately 21.99%, 19.30%, and 9.51% and postlarval penaeid shrimp represented 11.24%, 10.65%, and 7.81% of the total catch during 1979, 1980, and 1981 respectively. A list of the total density and percent of the total catch for each species by year is presented in Table 6.2.

6.3.1 Entrainment Densities

The mean daily flow through the BSEP from September 1978 to August 1981 ranged between 7.95 X 10^5 and 5.87 X 10^6 cubic meters of water. The flow rate varied independently of the number of organisms available or season of the year. However, because cooling water requirements depend in part on water temperature, maximum flows typically occur during the summer and early fall, while lower flows occur during the winter and early spring. Plant load and scheduled and unscheduled outages can alter this pattern.

The mean density of total larval and postlarval fish entrained during the sampling period ranged between 23.6/1000m^3 (November 7, 1978) and 1.97 X 10^4/1000m^3 (June 9, 1981) (Table 6.3). Two periods of abundance occurred encompassing the expected winter and summer recruitment periods (Figure 6.2). The December to April peaks were comprised primarily of species such as spot, croaker, flounder, menhaden, mullet, and brown shrimp. The May to August peaks were mostly comprised of anchovies, gobies, seatrout, and pink and white shrimp.

Spot were very consistent in their peak densities, between 1 X 10^3/$1000m^3$ (March 1979) and 1.8 X 10^3/$1000m^3$ (March 1980) during the sampling period (Table 6.4). Spot larvae and postlarvae appeared in the entrainment samples around the end of December each year and disappeared from the samples around the end of May each year (Figure 6.3).

Croaker occurred in the entrainment samples over a much longer period of time than did spot. The period of abundance for croaker was from September to late May (Figure 6.4). Density of croaker during the peak of their abundance ranged between 515/$1000m^3$ (March 1980) and 623/$1000m^3$ (February 1981) (Table 6.5).

The three species of flounder taken in the entrainment samples were combined to characterize the entrainment of flounder. The density of flounder larvae and postlarvae in entrainment was variable (Table 6.6) with peak abundance ranging from about 28/$1000m^3$ in March 1980 to 123/$1000m^3$ in February 1979. The season of occurrence in entrainment samples was about the same throughout the sampling period, i.e., from about the beginning of December through mid-April each year (Figure 6.5).

Atlantic menhaden occurred in entrainment samples from February through April of each year (Figure 6.6). Their peak densities ranged from 45.8/$1000m^3$ in April 1980 to 649.8/$1000m^3$ in April 1981 (Table 6.7).

Entrainment samples contained two species of mullet which were combined to characterize the entrainment of mullet. Mullet were variable in their period of occurrence, usually being January through March each year (Figure 6.7). Peak abundance was fairly consistent at approximately 120/$1000m^3$ for all three years (Table 6.8).

Three species of penaeid shrimp were taken in entrainment samples, but because of identification problems, were only identified to the generic level. However, those postlarvae that occurred during the

spring were primarily brown shrimp, and those that occurred in late summer or fall were a mixture of pink and white shrimp. Densities of brown shrimp during the spring peak ranged between 198/1000m^3 (April 1980) and 231/1000m^3 (March 1981). Densities of pink and white shrimp during the late summer peak ranged between 837/1000m^3 (September 1979) and 1.89 X 10^3/1000m^3 (September 1978) (Table 6.9). Shrimp were present in entrainment samples from March to January of each year (Figure 6.8). Shrimp were not measured until January 1975.

The period of abundance for anchovies, consisting of two species, usually began in April of each year and persisted through the fall months (Figure 6.9). Peak abundance ranged from 2.82 X 10^3/1000m^3 (July 1979) to 7.88 X 10^3/1000m^3 (June 1981) (Table 6.10).

Other fish caught in the summer samples were seatrout, consisting of two species. Their period of abundance in entrainment samples was from May through September in each year (Figure 6.10). Their peak abundance was relatively consistent, between 60/1000m^3 (May 1980) and 80/1000m^3 (June 1981) for all three years (Table 6.11).

Gobionellus spp. appeared to have two periods of abundance - one in the fall and one in the spring and early summer months (Figure 6.11). Peak densities for the fall recruitment ranged between 26/1000m^3 in October 1979 to 55/1000m^3 in October 1978. The spring peak densities ranged from 14.8/1000m^3 in April 1979 to 114/1000m^3 in April 1981 (Table 6.12).

Gobiosoma spp. appeared in entrainment samples beginning in May and persisted through late summer each year (Figure 6.12). Peak densities ranged from 1.77 X 10^3/1000m^3 in July 1979 to 1.33 X 10^4/1000m^3 in June 1981 (Table 6.13).

6.3.2 Number Entrained

The mean number of organisms entrained by the once-through cooling system was computed by multiplying the mean density per day by

the mean flow per day computed from operations records during the week of sampling.

Total organisms entrained per day, based on means, ranged from a low of 9.9 X 10^4/day in November 1978 to a high of 6.26 X 10^7/day in July 1981 (Table 6.3). The seasonal patterns of total entrainment were similar to the pattern seen in the density plots shown in Section 3, with obvious differences being related to the number of pumps operating in any particular week.

The pattern of entrainment numbers followed closely the pattern of larval density for each of the species. The maximum total entrainment of spot was 7.01 X 10^6/day in February 1980 (Table 6.4), and for croaker, the maximum of 4.25 X 10^6/day occurred in October 1979 (Table 6.5). Of the other winter species, flounder had a total entrainment maximum of 4.56 X 10^5/day in February 1981 (Table 6.6), menhaden of 1.75 X 10^6/day in April 1981 (Table 6.7), and mullet of 7.28 X 10^5/ day in February 1981 (Table 6.8). The maximum entrainment total for brown shrimp was 7.99 X 10^5/day in March 1979 (Table 6.9).

Of the summer species, anchovies had a maximum total entrainment of 2.13 X 10^7/day in June 1981 (Table 6.10) and seatrout of 4.02 X 10^5/ day in July 1979 (Table 6.11). The maximum entrainment total for pink and white shrimp was 7.31 X 10^6/day in September 1978 (Table 6.9). The maximum fall entrainment rate for *Gobionellus* spp. was 2.98 X 10^5/ day in October 1978 and the maximum spring rate was 3.08 X 10^5/day in April 1981. *Gobiosoma* spp. had a maximum entrainment rate of 5.48 X 10^7/ day in June 1981.

6.3.3 Diurnal Patterns

The densities of entrained organisms previously discussed in this chapter were based on means constructed from 24-hour periods. There was considerable variation around each mean owing to the difference in densities over a 24-hour period. The densities of organisms entrained

during the daytime were consistently lower than at nighttime (Figure 6.2). These differences were found to be significant for all species (Tables 6.14 and 6.15).

From late February through March, when spot reached their maximum densities, the mean daytime density averaged between 50/1000m^3 (1981) and 220/1000m^3 (1979), while mean nighttime densities averaged between 890/1000m^3 (1981) and 1540/1000m^3 (1980) (Figure 6.3).

When croaker reached their highest densities, the mean daytime densities averaged between 60/1000m^3 (1981) and 100/1000m^3 (1980) and mean nighttime densities averaged between 315/1000m^3 (1981) and 400/1000m^3 (1979) (Figure 6.4).

The difference in daytime and nighttime densities for flounder was pronounced. Typically, no flounder were entrained during the day, but at peak densities their mean nighttime densities averaged between 30/1000m^3 (1980) and 170/1000m^3 (1979) (Figure 6.5).

During their period of peak abundance, the mean daytime densities of menhaden averaged between 20/1000m^3 (1980) and 200/1000m^3 (1981), while mean nighttime densities averaged between 50/1000m^3 (1980) and 320/1000m^3 (1981) (Figure 6.6).

During peak recruitment, mullet exhibited mean daytime densities averaging between 20/1000m^3 (1981) and 50/1000m^3 (1979), while mean nighttime densities averaged between 50/1000m^3 (1981) and 100/1000m^3 (1979) (Figure 6.7).

Mean daytime densities for brown shrimp averaged between 30/1000m^3 (1981) and 80/1000m^3 (1979) during their period of peak abundance. At this same time, mean nighttime densities were averaging between 50/1000m^3 (1981) and 100/1000m^3 (1979) (Figure 6.8).

Anchovies achieved mean daytime densities averaging between 1.2 X 10^3/1000m^3 (1980) and 2.2 X 10^3/1000m^3 (1981) during peak

recruitment. Mean nighttime densities averaged between $1.8 \times 10^3/1000m^3$ (1979) and $3.8 \times 10^3/1000m^3$ (1981) during this same period (Figure 6.9).

When seatrout reached their peak densities, mean daytime densities averaged between $7/1000m^3$ (1980) and $26/1000m^3$ (1979) and mean nighttime densities averaged between $45/1000m^3$ (1980) and $60/1000m^3$ (1979) (Figure 6.10).

Gobionellus spp., like flounder, was rarely entrained during the day. Average mean nighttime densities were about the same for both periods of peak abundance ranging between $30/1000m^3$ (Spring 1979) and $50/1000m^3$ (Fall 1981).

Gobiosoma spp. exhibited mean daytime densities averaging between $1.0 \times 10^3/1000m^3$ (1979) and $3.7 \times 10^3/1000m^3$ (1981) and mean nighttime densities averaged between $900/1000m^3$ (1979) and $5.7 \times 10^3/1000m^3$ (1981).

Pink and white shrimp averaged mean daytime densities of $25/1000m^3$ during their period of peak recruitment in 1981. In 1980 their average mean daytime densities were $255/1000m^3$. Mean nighttime densities averaged between $550/1000m^3$ (1981) and $1.6 \times 10^3/1000m^3$ (1980) (Figure 6.8).

The 1981 larval fish year typically exhibited the lowest average mean daytime densities and often, especially for the summer species, the lowest average mean nighttime densities also. This can be accounted for by a combination of reasons. First, the analysis period for summer species spans the calendar year, i.e., from January to December (Table 6.1). Therefore, the final four months (September to December) of the 1981 summer analysis period are not included in this report. This could be especially critical to the pink and white shrimp densities since they often peak during September.

Another factor contributing to the apparently lower 1981 daytime densities is the change to the entrainment sampling program previously mentioned in Section 6.2. Prior to January 1981, sixteen efforts, or samples, were taken over a 24-hour period. This has been reduced to eight per 24-hour period with only two of these occuring during daylight hours. This reduction in sampling efforts greatly reduces the probability of accurately describing mean daytime densities. This should be kept in mind when attempting to make day vs. night density comparisons between years.

6.3.4 Entrainment Trend Analysis

The larval entrainment data from September 1974 to August 1981 was subjected to a linear trend analysis (Table 6.16). Differences among years were separated into a trend component proportional to the size of the linear increase or decrease and a deviation component proportional to the size of the year-to-year fluctuations around the trend line. The error component, used to judge the significance of the first two, was computed from the discrepancy between sampling periods within years. The percent change per year was calculated from the slope of the trend line and is an average over all years. The logarithm of the densities (density + 10) was analyzed throughout.

A nonsignificant trend component and deviation component implies a relatively constant level of abundance in the species (i.e., brown shrimp and menhaden). A significant trend component with no significant deviations (i.e., mullet) suggests a simple increase or decrease over the analysis period. Significant deviations, however, indicate that the year-to-year fluctuations cannot be described by the linear trends.

There is a long-term, almost cyclic, variability in larval abundances that arises from such factors as size of spawning population, the ocean currents which the larvae must use to migrate to the estuary, and the salinity and temperature conditions in the estuary during

recruitment. Because the trend analysis used is a linear trend analysis, it will attempt to fit a straight line to the data. Therefore, significant trends in entrainment abundances, either positive or negative, may be indicated by the analysis which in reality could be accounted for by natural perturbations in environmental conditions and not necessarily by cropping by BSEP.

Plots of mean Log_{10} density (density + 10) for the years analyzed are presented for all species in Figures 6.13 to 6.24. These plots show the observed density for each year and the predicted density trend line including 95% confidence intervals. The linear trend for total fish entrained (Figure 6.13) showed an overall increase during the past seven years. The mean densities during 1978 were significantly lower and the mean densities during 1980 were significantly higher than the predicted trend. This same situation is reflected in the trends for total fish in the Cape Fear River (Figure 3.36).

TABLE 6.1 TRIP NUMBER, DATE, EFFORTS AND ANALYSIS PERIODS FOR ENTRAINMENT PROJECT, 1974-1981.

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WINTER ANALYSIS WEEK	SUMMER ANALYSIS YEAR	SUMMER ANALYSIS WEEK
6	09SEP74	4	75	2	74	37
7	24SEP74	12	75	4	74	39
8	07OCT74	3	75	6	74	41
9	21OCT74	12	75	8	74	43
10	07NOV74	4	75	10	74	45
11	19NOV74	12	75	12	74	47
12	04DEC74	4	75	14	74	49
13	15DEC74	9	75	16	74	51
14	17JAN75	4	75	20	75	3
15	13FEB75	10	75	24	75	7
16	23FEB75	4	75	26	75	9
17	13MAR75	12	75	28	75	11
18	24MAR75	4	75	30	75	13
19	07APR75	12	75	32	75	15
20	25APR75	4	75	34	75	17
21	06MAY75	12	75	36	75	19
22	18MAY75	4	75	38	75	21
23	04JUN75	11	75	40	75	23
24	11JUN75	4	75	41	75	24
25	16JUN75	3	[illegible]	42	75	25
26	02JUL75	8	75	44	75	27
27	16JUL75	24	75	46	75	29
28	30JUL75	8	75	48	75	31
29	12AUG75	24	75	50	75	33
30	27AUG75	8	75	52	75	35

TABLE 6.1 (CONTINUED).

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WINTER ANALYSIS WEEK	SUMMER ANALYSIS YEAR	SUMMER ANALYSIS WEEK
31	09SEP75	24	76	2	75	37
32	24SEP75	8	76	4	75	39
33	06OCT75	24	76	6	75	41
34	22OCT75	8	76	8	75	43
35	04NOV75	24	76	10	75	45
36	13NOV75	12	76	11	75	46
37	19NOV75	8	76	12	75	47
38	24NOV75	12	76	13	75	48
39	03DEC75	24	76	14	75	49
40	11DEC75	24	76	15	75	50
41	16DEC75	8	76	16	75	51
42	06JAN76	24	76	19	76	2
43	12JAN76	24	76	20	76	3
44	26JAN76	8	76	22	76	5
45	03FEB76	24	76	23	76	6
46	11FEB76	24	76	24	76	7
47	17FEB76	8	76	25	76	8
48	03MAR76	24	76	27	76	10
49	10MAR76	24	76	28	76	11
50	16MAR76	8	76	29	76	12
51	30MAR76	24	76	31	76	14
52	13APR76	8	76	33	76	16
53	27APR76	24	76	35	76	18
54	04MAY76	24	76	36	76	19
55	11MAY76	8	76	37	76	20
56	25MAY76	24	76	39	76	22
57	08JUN76	8	76	41	76	24
58	22JUN76	24	76	43	76	26
59	20JUL76	24	76	47	76	30
60	17AUG76	24	76	51	76	34

TABLE 6.1 (CONTINUED).

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WINTER ANALYSIS WEEK	SUMMER ANALYSIS YEAR	SUMMER ANALYSIS WEEK
61	14SEP76	16	77	2	76	37
1	27OCT76	16	77	8	76	43
2	02NOV76	16	77	9	76	44
3	09NOV76	16	77	10	76	45
4	16NOV76	16	77	11	76	46
5	23NOV76	16	77	12	76	47
6	01DEC76	15	77	13	76	48
7	07DEC76	16	77	14	76	49
8	13DEC76	16	77	15	76	50
9	21DEC76	15	77	16	76	51
10	29DEC76	16	77	17	76	52
11	04JAN77	16	77	18	77	1
12	11JAN77	16	77	19	77	2
13	18JAN77	16	77	20	77	3
14	25JAN77	15	77	21	77	4
15	01FEB77	16	77	22	77	5
16	08FEB77	16	77	23	77	6
17	15FEB77	16	77	24	77	7
18	22FEB77	16	77	25	77	8
19	01MAR77	16	77	26	77	9
20	08MAR77	16	77	27	77	10
21	15MAR77	16	77	28	77	11
22	22MAR77	16	77	29	77	12
23	29MAR77	16	77	30	77	13
24	05APR77	16	77	31	77	14
25	13APR77	16	77	32	77	15
26	19APR77	16	77	33	77	16
27	26APR77	16	77	34	77	17
28	03MAY77	14	77	35	77	18
29	10MAY77	16	77	36	77	19
30	17MAY77	16	77	37	77	20
31	24MAY77	15	77	38	77	21
32	31MAY77	15	77	39	77	22
33	07JUN77	16	77	40	77	23
34	14JUN77	16	77	41	77	24
35	21JUN77	16	77	42	77	25
36	28JUN77	16	77	43	77	26
37	06JUL77	16	77	44	77	27
38	12JUL77	16	77	45	77	28
39	19JUL77	16	77	46	77	29
40	26JUL77	14	77	47	77	30
41	02AUG77	15	77	48	77	31
42	09AUG77	16	77	49	77	32
43	16AUG77	16	77	50	77	33
44	23AUG77	16	77	51	77	34
45	30AUG77	16	77	52	77	35

TABLE 6.1 (CONTINUED).

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WINTER ANALYSIS WEEK	SUMMER ANALYSIS YEAR	SUMMER ANALYSIS WEEK
46	07SEP77	16	78	1	77	36
47	13SEP77	16	78	2	77	37
48	20SEP77	16	78	3	77	38
49	27SEP77	16	78	4	77	39
50	04OCT77	16	78	5	77	40
51	11OCT77	16	78	6	77	41
52	18OCT77	16	78	7	77	42
53	25OCT77	16	78	8	77	43
54	01NOV77	16	78	9	77	44
55	08NOV77	16	78	10	77	45
56	15NOV77	16	78	11	77	46
57	21NOV77	16	78	12	77	47
58	29NOV77	16	78	13	77	48
59	6DEC77	16	78	14	77	49
60	13DEC77	16	78	15	77	50
61	20DEC77	15	78	16	77	51
62	29DEC77	15	78	17	77	52
63	03JAN78	16	78	18	78	1
64	10JAN78	16	78	19	78	2
65	17JAN78	16	78	20	78	3
66	24JAN78	16	78	21	78	4
67	31JAN78	16	78	22	78	5
68	07FEB78	16	78	23	78	6
69	14FEB78	16	78	24	78	7
70	21FEB78	16	78	25	78	8
71	28FEB78	16	78	26	78	9
72	07MAR78	16	78	27	78	10
73	14MAR78	16	78	28	78	11
74	21MAR78	16	78	29	78	12
75	29MAR78	16	78	30	78	13
76	04APR78	16	78	31	78	14
77	11APR78	15	78	32	78	15
78	18APR78	16	78	33	78	16
79	25APR78	15	78	34	78	17
80	02MAY78	16	78	35	78	18
81	10MAY78	16	78	36	78	19
82	16MAY78	15	78	37	78	20
83	23MAY78	8	78	38	78	21
84	30MAY78	16	78	39	78	22
85	06JUN78	16	78	40	78	23
86	13JUN78	15	78	41	78	24
87	20JUN78	16	78	42	78	25
88	27JUN78	16	78	43	78	26
89	05JUL78	16	78	44	78	27
90	11JUL78	16	78	45	78	28
91	18JUL78	16	78	46	78	29
92	25JUL78	16	78	47	78	30
93	03AUG78	15	78	48	78	31
94	08AUG78	16	78	49	78	32
95	15AUG78	16	78	50	78	33
96	22AUG78	16	78	51	78	34
97	29AUG78	16	78	52	78	35

TABLE 6.1 (CONTINUED).

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WINTER ANALYSIS WEEK	SUMMER ANALYSIS YEAR	SUMMER ANALYSIS WEEK
1	06SEP78	16	79	1	78	36
2	12SEP78	16	79	2	78	37
3	19SEP78	16	79	3	78	38
4	26SEP78	16	79	4	78	39
5	03OCT78	16	79	5	78	40
6	10OCT78	16	79	6	78	41
7	17OCT78	16	79	7	78	42
8	24OCT78	16	79	8	78	43
9	31OCT78	16	79	9	78	44
10	07NOV78	16	79	10	78	45
11	14NOV78	16	79	11	78	46
12	21NOV78	16	79	12	78	47
13	28NOV78	16	79	13	78	48
14	05DEC78	16	79	14	78	49
15	12DEC78	16	79	15	78	50
16	18DEC78	16	79	16	78	51
17	27DEC78	16	79	17	78	52
18	03JAN79	16	79	18	79	1
19	09JAN79	16	79	19	79	2
20	16JAN79	16	79	20	79	3
21	23JAN79	16	79	21	79	4
22	30JAN79	16	79	22	79	5
23	06FEB79	16	79	23	79	6
24	13FEB79	16	79	24	79	7
25	20FEB79	16	79	25	79	8
26	27FEB79	16	79	26	79	9
27	06MAR79	16	79	27	79	10
28	13MAR79	16	79	28	79	11
29	20MAR79	16	79	29	79	12
30	27MAR79	16	79	30	79	13
31	03APR79	16	79	31	79	14
32	10APR79	16	79	32	79	15
33	18APR79	16	79	33	79	16
34	24APR79	16	79	34	79	17
35	01MAY79	16	79	35	79	18
36	08MAY79	16	79	36	79	19
37	15MAY79	16	79	37	79	20
38	22MAY79	16	79	38	79	21
39	29MAY79	16	79	39	79	22
40	05JUN79	16	79	40	79	23
41	12JUN79	16	79	41	79	24
42	19JUN79	16	79	42	79	25
43	26JUN79	16	79	43	79	26
44	03JUL79	16	79	44	79	27
45	10JUL79	16	79	45	79	28
46	17JUL79	16	79	46	79	29
47	24JUL79	15	79	47	79	30
48	31JUL79	15	79	48	79	31
49	07AUG79	16	79	49	79	32
50	14AUG79	16	79	50	79	33
51	21AUG79	16	79	51	79	34
52	28AUG79	16	79	52	79	35

TABLE 6.1 (CONTINUED.)

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WINTER ANALYSIS WEEK	SUMMER ANALYSIS YEAR	SUMMER ANALYSIS WEEK
53	04SEP79	16	80	1	79	36
54	11SEP79	16	80	2	79	37
55	18SEP79	16	80	3	79	38
56	25SEP79	16	80	4	79	39
57	02OCT79	16	80	5	79	40
58	09OCT79	16	80	6	79	41
59	15OCT79	16	80	7	79	42
60	23OCT79	16	80	8	79	43
61	30OCT79	16	80	9	79	44
62	06NOV79	16	80	10	79	45
63	13NOV79	16	80	11	79	46
64	20NOV79	16	80	12	79	47
65	27NOV79	16	80	13	79	48
66	04DEC79	16	80	14	79	49
67	11DEC79	16	80	15	79	50
68	18DEC79	16	80	16	79	51
69	25DEC79	16	80	17	79	52
70	02JAN80	16	80	18	80	1
71	08JAN80	16	80	19	80	2
72	15JAN80	16	80	20	80	3
73	22JAN80	16	80	21	80	4
74	29JAN80	16	80	22	80	5
75	05FEB80	16	80	23	80	6
76	12FEB80	16	80	24	80	7
77	19FEB80	16	80	25	80	8
78	26FEB80	16	80	26	80	9
79	04MAR80	16	80	27	80	10
80	11MAR80	16	80	28	80	11
81	18MAR80	16	80	29	80	12
82	24MAR80	16	80	30	80	13
83	01APR80	16	80	31	80	14
84	08APR80	16	80	32	80	15
85	16APR80	16	80	33	80	16
86	22APR80	16	80	34	80	17
87	29APR80	16	80	35	80	18
88	05MAY80	16	80	36	80	19
89	13MAY80	16	80	37	80	20
90	20MAY80	16	80	38	80	21
91	27MAY80	16	80	39	80	22
92	03JUN80	16	80	40	80	23
93	10JUN80	16	80	41	80	24
94	17JUN80	16	80	42	80	25
95	24JUN80	16	80	43	80	26
96	01JUL80	16	80	44	80	27
97	08JUL80	16	80	45	80	28
98	15JUL80	16	80	46	80	29
99	22JUL80	16	80	47	80	30
100	29JUL80	16	80	48	80	31
101	05AUG80	16	80	49	80	32
102	12AUG80	16	80	50	80	33
103	19AUG80	16	80	51	80	34
104	26AUG80	16	80	52	80	35

TABLE 6.1 (CONTINUED).

TRIP	SAMPLE DATE	EFFORTS	WINTER ANALYSIS YEAR	WINTER ANALYSIS WEEK	SUMMER ANALYSIS YEAR	SUMMER ANALYSIS WEEK
105	02SEP80	16	81	1	80	36
106	09SEP80	15	81	2	80	37
107	16SEP80	16	81	3	80	38
108	23SEP80	16	81	4	80	39
109	30SEP80	16	81	5	80	40
110	07OCT80	16	81	6	80	41
111	14OCT80	16	81	7	80	42
112	21OCT80	15	81	8	80	43
113	28OCT80	16	81	9	80	44
114	04NOV80	16	81	10	80	45
115	11NOV80	16	81	11	80	46
116	18NOV80	16	81	12	80	47
117	25NOV80	16	81	13	80	48
118	02DEC80	16	81	14	80	49
119	09DEC80	16	81	15	80	50
120	16DEC80	16	81	16	80	51
121	23DEC80	16	81	17	80	52
122	30DEC80	16	81	18	81	1
123	06JAN81	8	81	19	81	2
124	13JAN81	8	81	20	81	3
125	20JAN81	8	81	21	81	4
126	27JAN81	8	81	22	81	5
127	03FEB81	8	81	23	81	6
128	10FEB81	8	81	24	81	7
129	17FEB81	8	81	25	81	8
130	24FEB81	8	81	26	81	9
131	03MAR81	8	81	27	81	10
132	10MAR81	8	81	28	81	11
133	17MAR81	8	81	29	81	12
134	24MAR81	8	81	30	81	13
135	31MAR81	8	81	31	81	14
136	07APR81	8	81	32	81	15
137	14APR81	8	81	33	81	16
138	21APR81	8	81	34	81	17
139	28APR81	8	81	35	81	18
140	05MAY81	8	81	36	81	19
141	12MAY81	8	81	37	81	20
142	19MAY81	8	81	38	81	21
143	26MAY81	8	81	39	81	22
144	03JUN81	8	81	40	81	23
145	09JUN81	8	81	41	81	24
146	16JUN81	8	81	42	81	25
147	23JUN81	8	81	43	81	26
148	30JUN81	8	81	44	81	27
149	07JUL81	8	81	45	81	28
150	14JUL81	8	81	46	81	29
151	21JUL81	8	81	47	81	30
152	28JUL81	8	81	48	81	31
153	04AUG81	8	81	49	81	32
154	11AUG81	8	81	50	81	33
155	18AUG81	8	81	51	81	34
156	25AUG81	8	81	52	81	35

TABLE 6.2 TOTAL DENSITY (NUMBER / 1000 CUBIC METERS) AND PERCENT TOTAL OF FISH, PENAEID SHRIMP AND CRABS ENTRAINED, SEPTEMBER 1978 TO AUGUST 1981.

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	SEP 78 - AUG 79 DENSITY	SEP 78 - AUG 79 %	SEP 79 - AUG 80 DENSITY	SEP 79 - AUG 80 %	SEP 80 - AUG 81 DENSITY	SEP 80 - AUG 81 %
ELOPIDAE	TARPONS	0.00	0.00	51.36	0.00	0.00	0.00
ELOPS SAURUS(LEPTOCEPHALUS)	LADYFISH(LEPTOCEPHALUS)	487.26	0.05	163.51	0.01	721.62	0.06
MEGALOPS ATLANTICUS(LEPTOCEPHA	TARPON(LEPTOCEPHALUS)	94.86	0.01	492.74	0.03	66.00	0.01
ANGUILLIDAE	FRESHWATER EELS	*	*	*	*	*	*
ANGUILLA ROSTRATA	AMERICAN EEL	1,244.87	0.12	922.78	0.06	1,155.96	0.09
OPHICHTHIDAE	SNAKE EELS	*	*	*	*	*	*
MYROPHIS PUNCTATUS	SPECKLED WORM EEL	119.57	0.01	1,329.64	0.09	771.23	0.06
MYROPHIS PUNCTATUS(LEPTOCEPHAL	SPECKLED WORM EEL(LEPTO.)	273.91	0.03	1,558.72	0.11	4,773.85	0.37
OPHICHTHUS GOMESI	SHRIMP EEL	56.75	0.01	167.94	0.01	60.10	0.00
CLUPEIDAE	HERRINGS	*	*	*	*	*	*
ALOSA AESTIVALIS	BLUEBACK HERRING	0.00	0.00	10.29	0.00	0.00	0.00
BREVOORTIA TYRANNUS	ATLANTIC MENHADEN	4,059.20	0.39	2,916.41	0.20	9,862.48	0.77
ENGRAULIDAE	ANCHOVIES	*	*	*	*	*	*
ANCHOA SP.	ANCHOVY UNID.(ANCHOA)	178,448.99	17.07	193,447.03	13.44	129,731.16	10.13
ANCHOA HEPSETUS	STRIPED ANCHOVY	7,199.22	0.69	16,327.93	1.13	4,646.10	0.36
ANCHOA MITCHILLI	BAY ANCHOVY	112,701.88	10.78	83,595.47	5.81	147,426.76	11.51
SYNODONTIDAE	LIZARDFISHES	*	*	*	*	*	*
SYNODUS FOETENS	INSHORE LIZARDFISH	62.74	0.01	30.44	0.00	21.23	0.00
CYPRINIDAE	CARPS AND MINNOWS	*	*	*	*	*	*
CYPRINUS CARPIO	COMMON CARP	0.00	0.00	16.18	0.00	0.00	0.00
BATRACHOIDIDAE	TOADFISHES	*	*	*	*	*	*
OPSANUS TAU	OYSTER TOADFISH	0.00	0.00	0.00	0.00	21.23	0.00
GOBIESOCIDAE	CLINGFISHES	*	*	*	*	*	*
GOBIESOX STRUMOSUS	SKILLETFISH	628.33	0.06	1,619.18	0.11	3,768.09	0.29
GADIDAE	CODFISHES	*	*	*	*	*	*
UROPHYCIS SP.	HAKE UNID.(UROPHYCIS)	0.00	0.00	14.81	0.00	22.68	0.00
UROPHYCIS FLORIDANA	SOUTHERN HAKE	0.00	0.00	0.00	0.00	0.00	0.00
UROPHYCIS REGIA	SPOTTED HAKE	0.00	0.00	0.00	0.00	0.00	0.00
OPHIDIIDAE	CUSK-EELS	13.44	0.00	20.70	0.00	0.00	0.00
OPHIDION WELSHI	CRESTED CUSK-EEL	0.00	0.00	0.00	0.00	0.00	0.00
EXOCOETIDAE	FLYINGFISHES	*	*	*	*	*	*
HEMIRAMPHUS BRASILIENSIS	BALLYHOO	0.00	0.00	0.00	0.00	16.18	0.00
HYPORHAMPHUS UNIFASCIATUS	HALFBEAK	72.72	0.01	310.48	0.02	58.78	0.00
BELONIDAE	NEEDLEFISHES	*	*	*	*	*	*
STRONGYLURA MARINA	ATLANTIC NEEDLEFISH	126.75	0.01	0.00	0.00	0.00	0.00
CYPRINODONTIDAE	KILLIFISHES	31.53	0.00	31.77	0.00	0.00	0.00
FUNDULUS HETEROCLITUS	MUMMICHOG	58.09	0.01	0.00	0.00	14.64	0.00
FUNDULUS MAJALIS	STRIPED KILLIFISH	14.12	0.00	0.00	0.00	0.00	0.00
ATHERINIDAE	SILVERSIDES	45,506.89	4.35	34,358.14	2.39	67,520.70	5.27
MEMBRAS MARTINICA	ROUGH SILVERSIDE	32.54	0.00	78.15	0.01	0.00	0.00
MENIDIA MENIDIA	ATLANTIC SILVERSIDE	13.35	0.00	18.73	0.00	0.00	0.00

TABLE 6.2 (CONTINUED).

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	SEP 78 - AUG 79 DENSITY	SEP 78 - AUG 79 %	SEP 79 - AUG 80 DENSITY	SEP 79 - AUG 80 %	SEP 80 - AUG 81 DENSITY	SEP 80 - AUG 81 %
SYNGNATHIDAE	PIPEFISHES	*	*	*	*	*	*
HIPPOCAMPUS ERECTUS	LINED SEAHORSE	0.00	0.00	0.00	0.00	17.76	0.00
SYNGNATHUS SP.	PIPEFISH UNID. (SYNGNATHUS)	13.74	0.00	33.43	0.00	0.00	0.00
SYNGNATHUS FUSCUS	NORTHERN PIPEFISH	371.74	0.04	118.41	0.01	222.45	0.02
SYNGNATHUS LOUISIANAE	CHAIN PIPEFISH	97.89	0.01	336.96	0.02	147.47	0.01
SERRANIDAE	SEA BASSES	31.14	0.00	0.00	0.00	21.28	0.00
CENTRARCHIDAE	SUNFISHES	*	*	*	*	*	*
MICROPTERUS SALMOIDES	LARGEMOUTH BASS	0.00	0.00	0.00	0.00	0.00	0.00
CARANGIDAE	JACKS	143.39	0.01	214.00	0.01	115.70	0.01
CARANX HIPPOS	CREVALLE JACK	0.08	0.00	0.00	0.00	0.00	0.00
CHLOROSCOMBRUS CHRYSURUS	ATLANTIC BUMPER	96.65	0.01	14.77	0.00	33.13	0.00
OLIGOPLITES SAURUS	LEATHERJACKET	14.97	0.00	0.00	0.00	0.00	0.00
SELENE VOMER	LOOKDOWN	0.00	0.00	0.00	0.00	0.00	0.00
TRACHINOTUS FALCATUS	PERMIT	0.00	0.00	0.00	0.00	17.89	0.00
LUTJANIDAE	SNAPPERS	18.21	0.00	0.00	0.00	0.00	0.00
LUTJANUS GRISEUS	GRAY SNAPPER	54.39	0.01	80.43	0.01	102.14	0.01
GERREIDAE	MOJARRAS	378.13	0.04	1,223.73	0.09	524.61	0.04
HAEMULIDAE	GRUNTS	*	*	*	*	*	*
ORTHOPRISTIS CHRYSOPTERA	PIGFISH	215.47	0.02	247.94	0.02	4,721.63	0.37
SPARIDAE	PORGIES	*	*	*	*	*	*
ARCHOSARGUS PROBATOCEPHALUS	SHEEPSHEAD	30.88	0.00	203.45	0.01	108.55	0.01
LAGODON RHOMBOIDES	PINFISH	5,530.37	0.53	456.37	0.03	2,697.89	0.21
SCIAENIDAE	DRUMS	117.23	0.01	118.88	0.01	110.28	0.01
BAIRDIELLA CHRYSOURA	SILVER PERCH	3,489.45	0.33	8,066.64	0.56	4,814.53	0.38
CYNOSCION NEBULOSUS	SPOTTED SEATROUT	2,173.23	0.21	1,411.47	0.10	667.47	0.05
CYNOSCION REGALIS	WEAKFISH	6,241.13	0.60	3,886.29	0.27	2,327.58	0.18
LEIOSTOMUS XANTHURUS	SPOT	122,750.41	11.74	138,539.73	9.62	61,979.76	4.84
MENTICIRRHUS SP.	KINGFISH UNID. (MENTICIRRHUS)	773.35	0.07	512.43	0.04	629.21	0.05
MICROPOGONIAS UNDULATUS	ATLANTIC CROAKER	85,124.35	8.14	128,513.39	8.93	41,371.85	3.23
POGONIAS CROMIS	BLACK DRUM	319.72	0.03	2,558.67	0.18	785.08	0.06
SCIAENOPS OCELLATUS	RED DRUM	289.22	0.03	339.61	0.02	673.41	0.05
STELLIFER LANCEOLATUS	STAR DRUM	167.87	0.02	289.71	0.02	47.14	0.00
EPHIPPIDAE	SPADEFISHES	*	*	*	*	*	*
CHAETODIPTERUS FABER	ATLANTIC SPADEFISH	94.39	0.01	17.92	0.00	15.02	0.00
LABRIDAE	WRASSES	*	*	*	*	*	*
TAUTOGA ONITIS	TAUTOG	17.12	0.00	0.00	0.00	0.00	0.00
MUGILIDAE	MULLETS	*	*	*	*	*	*
MUGIL SP.	MULLET UNID. (MUGIL)	0.00	0.00	61.54	0.00	0.00	0.00
MUGIL CEPHALUS	STRIPED MULLET	8,219.37	0.79	6,364.55	0.44	5,125.30	0.40
MUGIL CUREMA	WHITE MULLET	60.70	0.01	173.74	0.01	74.17	0.01
URANOSCOPIDAE	STARGAZERS	*	*	*	*	*	*
ASTROSCOPUS SP.	STARGAZER UNID. (ASTROSCOPUS)	0.00	0.00	23.87	0.00	0.00	0.00

TABLE 6.2 (CONTINUED).

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	SEP 78 - AUG 79 DENSITY	SEP 78 - AUG 79 %	SEP 79 - AUG 80 DENSITY	SEP 79 - AUG 80 %	SEP 80 - AUG 81 DENSITY	SEP 80 - AUG 81 %
ASTROSCOPUS GUTTATUS	NORTHERN STARGAZER	0.00	0.00	16.42	0.00	0.38	0.00
BLENNIIDAE	COMBTOOTH BLENNIES	9,179.01	0.88	9,198.52	0.64	9,702.48	0.76
ELEOTRIDAE	SLEEPERS	*	*	*	*	*	*
DORMITATOR MACULATUS	FAT SLEEPER	237.26	0.02	415.04	0.03	200.56	0.02
GOBIIDAE	GOBIES	*	*	*	*	*	*
GOBIONELLUS SP.	GOBY UNID.(GOBIONELLUS)	776.99	0.07	7,693.60	0.53	6,572.19	0.51
GOBIONELLUS BOLEOSOMA	DARTER GOBY	5,267.[illegible]	0.50	0.00	0.00	0.00	0.00
GOBIONELLUS HASTATUS	SHARPTAIL GOBY	457.95	0.04	0.00	0.00	0.00	0.00
GOBIONELLUS SHUFELDTI	FRESHWATER GOBY	448.24	0.04	0.00	0.00	0.00	0.00
GOBIOSOMA SP.	GOBY UNID.(GOBIOSOMA)	236,479.90	22.62	304,390.82	21.15	455,068.09	35.56
GOBIOSOMA BOSCI	NAKED GOBY	36.73	0.00	0.00	0.00	0.00	0.00
GOBIOSOMA GINSBURGI	SEABOARD GOBY	5,312.90	0.51	0.00	0.00	0.00	0.00
GOBIOSOMA ROBUSTUM	CODE GOBY	17.92	0.00	0.00	0.00	0.00	0.00
MICROGOBIUS SP.	GOBY UNID.(MICROGOBIUS)	18,529.89	1.77	12,956.82	0.90	14,685.87	1.15
STROMATEIDAE	BUTTERFISHES	*	*	*	*	*	*
PEPRILUS ALEPIDOTUS	HARVESTFISH	45.87	0.00	19.34	0.00	18.18	0.00
TRIGLIDAE	SEAROBINS	*	*	*	*	*	*
PRIONOTUS SP.	SEAROBIN UNID.(PRIONOTUS)	381.96	0.04	586.17	0.04	433.[illegible]	0.03
PRIONOTUS TRIBULUS	BIGHEAD SEAROBIN	0.00	0.00	0.00	0.00	0.00	0.06
BOTHIDAE	LEFTEYE FLOUNDERS	*	*	*	*	*	*
CITHARICHTHYS SP.	WHIFF UNID.(CITHARICHTHYS)	542.45	0.05	511.57	0.04	280.11	0.02
ETROPUS CROSSOTUS	FRINGED FLOUNDER	0.00	0.00	34.59	0.00	49.51	0.00
PARALICHTHYS SP.	FLOUNDER UNID.(PARALICHTHYS)	3,978.36	0.38	1,395.09	0.10	2,879.33	0.22
PARALICHTHYS ALBIGUTTA	GULF FLOUNDER	918.47	0.09	0.00	0.00	0.00	0.00
PARALICHTHYS DENTATUS	SUMMER FLOUNDER	125.16	0.01	0.00	0.00	0.00	0.00
PARALICHTHYS LETHOSTIGMA	SOUTHERN FLOUNDER	4,584.24	0.44	0.00	0.00	0.00	0.00
SCOPHTHALMUS AQUOSUS	WINDOWPANE	0.00	0.00	0.00	0.00	20.24	0.00
SOLEIDAE	SOLES	*	*	*	*	*	*
TRINECTES MACULATUS	HOGCHOKER	1,995.19	0.19	939.81	0.06	1,725.24	0.13
CYNOGLOSSIDAE	TONGUEFISHES	*	*	*	*	*	*
SYMPHURUS SP.	TONGUEFISH UNID.(SYMPHURUS)	15.82	0.00	19.57	0.00	0.00	0.00
SYMPHURUS CIVITATUS	OFFSHORE TONGUEFISH	68.18	0.01	213.69	0.01	79.78	0.01
SYMPHURUS PLAGIUSA	BLACKCHEEK TONGUEFISH	3,631.73	0.35	1,239.32	0.09	2,523.18	0.20
BALISTIDAE	LEATHERJACKETS	*	*	*	*	*	*
MONACANTHUS HISPIDUS	PLANEHEAD FILEFISH	0.00	0.00	43.89	0.00	73.07	0.01
TETRAODONTIDAE	PUFFERS	*	*	*	*	*	*
SPHOEROIDES MACULATUS	NORTHERN PUFFER	14.12	0.00	23.81	0.00	53.11	0.00
FISH UNID.	FISH UNID.	69.78	0.01	162.94	0.01	68.49	0.01
PENAEIDAE	PENAEID SHRIMP	0.00	0.00	0.00	0.00	16.29	0.00
PENAEUS SP.(POSTLARVAE)	PENAEUS (POSTLARVAE)	117,549.92	11.24	153,304.15	10.65	100,049.92	7.81
PENAEUS DUORARUM	PINK SHRIMP	0.00	0.00	0.00	0.00	0.00	0.00
PENAEUS SETIFERUS	WHITE SHRIMP	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 6.7 (CONTINUED).

SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	SEP 78 - AUG 79 DENSITY	%	SEP 79 - AUG 80 DENSITY	%	SEP 80 - AUG 81 DENSITY	%
TRACHYPENEUS CONSTRICTUS	T-CON OR HARDPACK SHRIMP	5,655.49	0.54	2,286.08	0.15	5,992.79	0.47
PORTUNIDAE	SWIMMING CRABS	2,205.21	0.21	10,049.58	0.70	5,586.80	0.44
PORTUNIDAE(MEGALOPS)	SWIMMING CRABS (MEGALOPS)	38,750.13	3.71	302,476.87	21.01	176,327.15	13.77
CALLINECTES SP.	BLUE CRABS	0.00	0.00	313.76	0.02	37.30	0.00
	TOTAL	1,045,[illegible].42	100.0	1,439,492.57	99.9	1,280,393.13	100.0
	EFFORTS	930		832		559	

TABLE 6.3 ENTRAINMENT RATES (PER DAY) FOR TOTAL FISH SEPTEMBER 1978 TO AUGUST 1981.

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
1	01SEP78	5,580,561	06SEP78	460.95	2,572,360
2	08SEP78	4,060,993	12SEP78	336.15	1,371,826
3	15SEP78	2,919,118	19SEP78	315.28	888,412
4	22SEP78	3,857,281	26SEP78	627.34	2,419,827
5	29SEP78	4,981,083	03OCT78	180.45	898,936
6	06OCT78	5,407,534	10OCT78	88.31	477,539
7	13OCT78	5,407,534	17OCT78	88.57	478,945
8	20OCT78	5,407,534	24OCT78	89.26	482,676
9	27OCT78	5,407,534	31OCT78	133.60	722,447
10	03NOV78	4,209,579	07NOV78	23.62	99,407
11	10NOV78	3,782,128	14NOV78	37.13	140,430
12	17NOV78	4,428,795	21NOV78	41.24	182,644
13	24NOV78	4,918,164	28NOV78	62.15	305,664
14	01DEC78	5,211,786	05DEC78	125.88	656,060
15	08DEC78	5,407,534	12DEC78	380.29	2,056,431
16	15DEC78	5,407,534	18DEC78	243.35	1,315,923
17	22DEC78	5,407,534	27DEC78	284.32	1,537,470
18	29DEC78	5,407,534	03JAN79	422.33	2,283,764
19	05JAN79	5,407,534	09JAN79	205.25	1,109,896
20	12JAN79	3,862,524	16JAN79	730.86	2,822,964
21	19JAN79	2,703,767	23JAN79	644.89	1,743,632
22	26JAN79	2,703,767	30JAN79	1,024.11	2,768,955
23	02FEB79	2,703,767	06FEB79	601.48	1,626,262
24	09FEB79	2,703,767	13FEB79	784.93	2,122,268
25	16FEB79	2,703,767	20FEB79	819.54	2,215,845
26	23FEB79	2,703,767	27FEB79	1,023.74	2,767,954
27	02MAR79	1,607,924	06MAR79	1,379.65	2,218,379
28	09MAR79	2,018,550	13MAR79	1,418.99	2,864,303
29	16MAR79	2,018,550	20MAR79	1,314.50	2,653,515
30	23MAR79	2,018,550	27MAR79	604.91	1,221,102
31	30MAR79	2,018,550	03APR79	1,141.52	2,304,329
32	06APR79	2,018,550	10APR79	1,108.23	2,237,128
33	13APR79	2,638,401	18APR79	485.33	1,280,495
34	20APR79	2,703,767	24APR79	608.84	1,646,162
35	27APR79	2,963,133	01MAY79	907.50	2,689,043
36	04MAY79	3,843,299	08MAY79	1,199.00	4,608,116
37	11MAY79	4,666,489	15MAY79	1,037.07	4,839,476
38	18MAY79	5,211,786	22MAY79	646.28	3,368,273
39	25MAY79	4,082,042	29MAY79	902.61	3,684,492
40	01JUN79	2,671,259	05JUN79	2,286.40	6,107,567
41	08JUN79	4,449,069	12JUN79	3,121.02	13,885,633
42	15JUN79	5,811,264	19JUN79	2,377.69	13,817,384
43	22JUN79	5,772,814	26JUN79	4,064.71	23,464,815
44	29JUN79	5,110,417	03JUL79	4,809.37	24,577,886
45	06JUL79	5,348,111	10JUL79	1,480.88	7,919,911
46	13JUL79	5,561,336	17JUL79	2,270.39	12,626,402
47	20JUL79	5,811,264	24JUL79	2,529.87	14,701,742
48	27JUL79	5,598,039	31JUL79	3,428.57	19,193,269
49	03AUG79	5,479,192	07AUG79	1,548.50	8,484,529
50	10AUG79	5,772,814	14AUG79	1,513.90	8,739,463
51	17AUG79	5,811,264	21AUG79	1,794.78	10,429,940
52	24AUG79	5,872,435	28AUG79	1,692.35	9,938,215

TABLE 6.3 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
53	01SEP79	3,199,254	04SEP79	452.94	1,449,070
54	08SEP79	2,202,163	11SEP79	150.26	330,897
55	15SEP79	4,905,930	18SEP79	118.03	579,047
56	22SEP79	4,905,930	25SEP79	455.14	2,232,985
57	29SEP79	5,799,030	02OCT79	295.12	1,711,410
58	06OCT79	5,799,030	09OCT79	432.70	2,509,240
59	13OCT79	5,860,201	15OCT79	963.64	5,647,124
60	20OCT79	5,083,327	23OCT79	937.39	4,765,060
61	27OCT79	5,456,471	30OCT79	505.09	2,756,009
62	03NOV79	4,801,939	06NOV79	198.06	951,072
63	10NOV79	5,250,936	13NOV79	505.11	2,652,300
64	17NOV79	4,891,249	20NOV79	525.39	2,569,913
65	24NOV79	3,749,795	27NOV79	203.46	762,933
66	01DEC79	4,877,791	04DEC79	307.25	1,498,701
67	08DEC79	4,766,460	11DEC79	168.90	805,055
68	15DEC79	4,235,494	18DEC79	357.03	1,512,198
69	22DEC79	4,881,462	25DEC79	336.47	1,642,466
70	29DEC79	4,104,588	02JAN80	79.77	327,423
71	05JAN80	4,624,543	08JAN80	360.40	1,666,685
72	12JAN80	5,162,849	15JAN80	421.68	2,177,070
73	19JAN80	4,808,056	22JAN80	485.62	2,334,888
74	26JAN80	5,658,336	29JAN80	402.01	2,274,708
75	02FEB80	5,554,345	05FEB80	577.64	3,208,412
76	09FEB80	5,438,120	12FEB80	549.05	2,985,854
77	16FEB80	5,737,859	19FEB80	1,162.62	6,670,950
78	23FEB80	5,658,336	26FEB80	1,477.16	8,358,268
79	02MAR80	2,589,989	04MAR80	2,355.98	6,101,962
80	09MAR80	2,703,767	11MAR80	540.35	1,460,980
81	16MAR80	2,476,210	18MAR80	743.77	1,841,731
82	23MAR80	2,338,937	24MAR80	952.19	2,227,017
83	30MAR80	2,221,388	01APR80	739.40	1,642,494
84	06APR80	2,217,893	08APR80	946.00	2,098,127
85	13APR80	2,462,578	16APR80	600.7[illegible]	1,479,418
86	20APR80	2,716,001	22APR80	596.84	1,621,018
87	27APR80	3,100,506	29APR80	1,050.21	3,256,182
88	04MAY80	2,862,812	06MAY80	1,098.35	3,144,370
89	11MAY80	2,359,461	13MAY80	2,221.47	5,241,472
90	18MAY80	1,761,731	20MAY80	2,907.03	5,121,405
91	25MAY80	924,559	27MAY80	7,905.94	7,309,508
92	01JUN80	795,226	03JUN80	4,993.43	3,970,905
93	08JUN80	1,293,334	10JUN80	3,251.39	4,205,120
94	15JUN80	2,027,388	17JUN80	3,110.17	6,305,521
95	22JUN80	1,459,370	24JUN80	1,285.71	1,876,327
96	29JUN80	1,240,901	01JUL80	1,780.88	2,209,896
97	06JUL80	1,284,595	08JUL80	2,491.68	3,200,900
98	13JUL80	2,202,163	15JUL80	909.64	2,003,176
99	20JUL80	2,848,930	22JUL80	2,463.09	7,016,925
100	27JUL80	2,674,055	29JUL80	904.27	2,418,068
101	03AUG80	2,307,028	05AUG80	979.59	2,259,942
102	10AUG80	2,079,821	12AUG80	1,420.87	2,955,155
103	17AUG80	2,392,668	19AUG80	894.85	2,141,079
104	24AUG80	4,509,847	26AUG80	1,124.60	5,071,774

TABLE 6.3 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
105	01SEP80	4,544,146	02SEP80	947.02	4,303,397
106	08SEP80	4,666,489	09SEP80	548.88	2,551,342
107	15SEP80	4,631,534	16SEP80	334.22	1,548,224
108	22SEP80	4,456,759	23SEP80	238.67	1,063,695
109	29SEP80	4,876,219	30SEP80	382.10	1,863,203
110	06OCT80	4,926,903	07OCT80	205.71	1,013,513
111	13OCT80	4,114,200	14OCT80	132.50	545,131
112	20OCT80	5,002,056	21OCT80	44.75	223,942
113	27OCT80	4,924,282	28OCT80	67.43	332,044
114	03NOV80	5,407,534	04NOV80	91.38	494,140
115	10NOV80	5,407,534	11NOV80	140.87	761,759
116	17NOV80	5,270,511	18NOV80	184.18	970,723
117	24NOV80	5,407,534	25NOV80	147.43	797,233
118	01DEC80	5,407,534	02DEC80	144.48	781,281
119	08DEC80	2,703,767	09DEC80	193.40	522,909
120	15DEC80	4,629,436	16DEC80	156.56	724,785
121	22DEC80	4,722,417	23DEC80	194.58	918,988
122	29DEC80	2,429,720	30DEC80	580.87	1,411,351
123	05JAN81	5,407,534	06JAN81	708.35	3,830,427
124	12JAN81	5,407,534	13JAN81	707.47	3,825,668
125	19JAN81	5,407,534	20JAN81	724.06	3,915,379
126	26JAN81	5,407,534	27JAN81	414.09	2,239,206
127	02FEB81	5,508,467	03FEB81	707.76	3,898,673
128	09FEB81	5,407,534	10FEB81	927.88	5,017,543
129	16FEB81	2,703,767	17FEB81	879.54	2,378,071
130	23FEB81	5,407,534	24FEB81	1,214.71	6,568,586
131	02MAR81	5,407,534	03MAR81	1,119.65	6,054,545
132	09MAR81	2,703,767	10MAR81	1,907.18	5,156,570
133	16MAR81	3,107,497	17MAR81	743.49	2,311,047
134	23MAR81	2,703,767	24MAR81	557.62	1,507,675
135	30MAR81	2,703,767	31MAR81	1,259.69	3,405,908
136	06APR81	3,107,497	07APR81	1,075.59	3,342,393
137	13APR81	2,703,767	14APR81	1,504.33	4,067,458
138	20APR81	2,018,650	21APR81	2,218.25	4,477,970
139	27APR81	2,703,767	28APR81	1,484.37	4,013,391
140	04MAY81	2,703,767	05MAY81	2,508.87	6,783,400
141	11MAY81	2,018,650	12MAY81	1,770.03	3,573,071
142	18MAY81	2,018,650	19MAY81	4,201.70	8,481,762
143	25MAY81	2,018,650	26MAY81	5,513.71	11,130,251
144	01JUN81	2,018,650	03JUN81	7,437.92	15,014,557
145	08JUN81	2,018,650	09JUN81	19,744.26	39,856,750
146	15JUN81	2,703,767	16JUN81	19,594.63	52,979,214
147	22JUN81	2,018,650	23JUN81	3,623.34	7,314,255
148	29JUN81	3,792,614	30JUN81	6,510.35	24,691,245
149	06JUL81	4,722,417	07JUL81	13,262.37	62,630,442
150	13JUL81	4,722,417	14JUL81	5,018.58	23,699,929
151	20JUL81	4,722,417	21JUL81	3,027.78	14,298,440
152	27JUL81	4,722,417	28JUL81	1,048.90	4,953,343
153	03AUG81	2,975,979	04AUG81	1,028.68	3,061,330
154	10AUG81	2,703,767	11AUG81	849.35	2,296,445
155	17AUG81	2,703,767	18AUG81	1,017.83	2,751,975
156	24AUG81	2,703,767	25AUG81	333.40	901,436

TABLE 6.[illegible] ENTRAINMENT RATES (PER DAY) FOR SPOT
SEPTEMBER 1978 TO AUGUST 1981.

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
1	01SEP78	5,580,561	06SEP78	0.00	0
2	08SEP78	4,080,993	12SEP78	0.00	0
3	15SEP78	2,819,116	19SEP78	0.00	0
4	22SEP78	3,857,281	26SEP78	0.00	0
5	29SEP78	4,961,083	03OCT78	0.00	0
6	06OCT78	5,407,534	10OCT78	0.00	0
7	13OCT78	5,407,534	17OCT78	0.00	0
8	20OCT78	5,407,534	24OCT78	0.00	0
9	27OCT78	5,407,534	31OCT78	0.00	0
10	03NOV78	4,208,579	07NOV78	0.00	0
11	10NOV78	3,782,128	14NOV78	0.00	0
12	17NOV78	4,428,795	21NOV78	0.00	0
13	24NOV78	4,918,164	28NOV78	1.03	5,066
14	01DEC78	5,211,786	05DEC78	0.00	0
15	08DEC78	5,407,534	12DEC78	0.98	5,299
16	15DEC78	5,407,534	18DEC78	1.03	5,570
17	22DEC78	5,407,534	27DEC78	26.60	143,940
18	29DEC78	5,407,534	03JAN79	3.34	18,061
19	05JAN79	5,407,534	09JAN79	57.81	312,610
20	12JAN79	3,862,524	16JAN79	166.33	642,454
21	19JAN79	2,703,767	23JAN79	189.53	512,445
22	26JAN79	2,703,767	30JAN79	558.89	1,511,108
23	02FEB79	2,703,767	06FEB79	333.87	902,707
24	09FEB79	2,703,767	13FEB79	422.29	1,141,774
25	16FEB79	2,703,767	20FEB79	389.47	1,053,036
26	23FEB79	2,703,767	27FEB79	543.77	1,470,227
27	02MAR79	1,607,929	06MAR79	1,044.01	1,678,694
28	09MAR79	2,018,650	13MAR79	1,070.10	2,160,157
29	16MAR79	2,018,650	20MAR79	947.59	1,912,953
30	23MAR79	2,018,650	27MAR79	344.62	695,667
31	30MAR79	2,018,650	03APR79	875.78	1,767,993
32	06APR79	2,018,650	10APR79	311.50	628,809
33	13APR79	2,638,401	18APR79	225.49	594,933
34	20APR79	2,703,767	24APR79	119.83	323,992
35	27APR79	2,963,133	01MAY79	25.64	76,123
36	04MAY79	3,843,299	08MAY79	4.84	18,602
37	11MAY79	4,666,489	15MAY79	1.74	8,120
38	18MAY79	5,211,786	22MAY79	0.82	4,274
39	25MAY79	4,082,042	29MAY79	1.77	7,225
40	01JUN79	2,671,259	05JUN79	0.00	0
41	08JUN79	4,449,069	12JUN79	1.58	7,030
42	15JUN79	5,811,264	19JUN79	0.00	0
43	22JUN79	5,772,814	26JUN79	0.77	4,445
44	29JUN79	5,110,417	03JUL79	0.84	4,293
45	06JUL79	5,348,111	10JUL79	0.00	0
46	13JUL79	5,561,336	17JUL79	0.00	0
47	20JUL79	5,811,264	24JUL79	0.00	0
48	27JUL79	5,598,039	31JUL79	0.00	0
49	03AUG79	5,479,192	07AUG79	0.00	0
50	10AUG79	5,772,814	14AUG79	0.00	0
51	17AUG79	5,811,264	21AUG79	0.00	0
52	24AUG79	5,872,435	28AUG79	0.00	0

TABLE 6.4 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
53	01SEP79	3,199,2[illegible]4	04SEP79	0.00	0
54	08SEP79	2,202,163	11SEP79	0.00	0
55	15SEP79	4,905,930	18SEP79	0.00	0
56	22SEP79	4,905,930	25SEP79	0.00	0
57	29SEP79	5,799,030	02OCT79	0.00	0
58	06OCT79	5,799,030	09OCT79	0.00	0
59	13OCT79	5,860,201	16OCT79	0.00	0
60	20OCT79	5,083,327	23OCT79	0.00	0
61	27OCT79	5,456,471	30OCT79	0.00	0
62	03NOV79	4,801,934	06NOV79	0.00	0
63	10NOV79	5,250,936	13NOV79	0.00	0
64	17NOV79	4,891,249	20NOV79	0.00	0
65	24NOV79	3,749,795	27NOV79	0.00	0
66	01DEC79	4,877,791	04DEC79	2.06	10,048
67	08DEC79	4,766,460	11DEC79	6.31	30,076
68	15DEC79	4,235,494	18DEC79	9.80	41,508
69	22DEC79	4,881,462	25DEC79	46.18	225,426
70	29DEC79	4,104,588	02JAN80	11.91	48,985
71	05JAN80	4,624,543	08JAN80	102.36	473,368
72	12JAN80	5,162,844	15JAN80	125.51	647,989
73	19JAN80	4,808,056	22JAN80	211.82	1,018,442
74	26JAN80	5,558,336	29JAN80	227.34	1,2[illegible]6,366
75	02FEB80	5,554,345	05FEB80	401.53	2,230,236
76	09FEB80	5,438,120	12FEB80	342.71	1,863,698
77	16FEB80	5,737,859	19FEB80	809.31	4,543,707
78	23FEB80	5,558,336	26FEB80	1,240.04	7,016,563
79	02MAR80	2,589,989	04MAR80	1,775.65	4,501,504
80	09MAR80	2,703,767	11MAR80	340.46	920,525
81	16MAR80	2,476,210	18MAR80	627.53	1,553,996
82	23MAR80	2,338,837	24MAR80	735.55	1,720,565
83	30MAR80	2,221,[illegible]8	01APR80	540.13	1,199,938
84	06APR80	2,217,893	08APR80	615.23	1,364,514
85	13APR80	2,462,578	16APR80	212.79	524,012
86	20APR80	2,716,001	22APR80	156.39	424,755
87	27APR80	3,100,506	29APR80	82.09	254,521
88	04MAY80	2,862,312	05MAY80	21.43	61,350
89	11MAY80	2,359,461	13MAY80	10.01	23,518
90	18MAY80	1,761,731	20MAY80	1.35	2,376
91	25MAY80	924,559	27MAY80	2.17	2,006
92	01JUN80	795,226	03JUN80	0.00	0
93	08JUN80	1,293,334	10JUN80	0.00	0
94	15JUN80	2,027,388	17JUN80	0.00	0
95	22JUN80	1,459,370	24JUN80	0.00	0
96	29JUN80	1,240,901	01JUL80	0.00	0
97	06JUL80	1,234,595	08JUL80	0.00	0
98	13JUL80	2,202,163	15JUL80	0.00	0
99	20JUL80	2,848,830	22JUL80	0.00	0
100	27JUL80	2,674,055	29JUL80	0.00	0
101	03AUG80	2,307,028	05AUG80	0.00	0
102	10AUG80	2,079,821	12AUG80	0.00	0
103	17AUG80	2,392,568	19AUG80	0.00	0
104	24AUG80	4,509,847	26AUG80	0.00	0

TABLE 6.4 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
105	01SEP80	4,544,146	02SEP80	0.00	0
106	08SEP80	4,566,469	09SEP80	0.00	0
107	15SEP80	4,531,534	16SEP80	0.00	0
108	22SEP80	4,456,759	23SEP80	0.00	0
109	29SEP80	4,974,219	30SEP80	0.00	0
110	06OCT80	4,[illegible],903	07OCT80	0.00	0
111	13OCT80	4,114,200	14OCT80	0.00	0
112	20OCT80	5,002,056	21OCT80	0.00	0
113	27OCT80	4,924,282	28OCT80	0.00	0
114	03NOV80	5,407,534	04NOV80	0.00	0
115	10NOV80	5,407,534	11NOV80	0.00	0
116	17NOV80	3,270,511	18NOV80	0.00	0
117	24NOV80	5,407,534	25NOV80	0.00	0
118	01DEC80	5,407,534	02DEC80	0.00	0
119	08DEC80	2,703,767	09DEC80	0.00	0
120	15DEC80	4,629,436	16DEC80	0.00	0
121	22DEC80	4,722,417	23DEC80	1.29	6,092
122	29DEC80	2,429,720	30DEC80	65.22	158,466
123	05JAN81	5,407,534	06JAN81	318.63	1,723,003
124	12JAN81	5,407,534	13JAN81	219.67	1,187,873
125	19JAN81	5,407,534	20JAN81	286.43	1,548,880
126	26JAN81	5,407,534	27JAN81	226.87	1,226,807
127	02FEB81	5,508,467	03FEB81	334.24	1,841,150
128	09FEB81	5,407,534	10FEB81	421.52	2,279,384
129	16FEB81	2,703,767	17FEB81	185.67	502,008
130	23FEB81	5,407,534	24FEB81	615.24	3,326,931
131	02MAR81	5,407,534	03MAR81	662.15	3,580,599
132	09MAR81	2,703,767	10MAR81	1,520.78	4,111,935
133	16MAR81	3,107,497	17MAR81	584.60	1,816,891
134	23MAR81	2,703,767	24MAR81	221.02	597,587
135	30MAR81	2,703,767	31MAR81	963.[illegible]	2,604,620
136	06APR81	3,107,497	07APR81	467.[illegible]	1,451,574
137	13APR81	2,703,767	14APR81	386.42	1,044,790
138	20APR81	2,018,650	21APR81	158.14	319,229
139	27APR81	2,703,767	28APR81	39.94	107,988
140	04MAY81	2,703,767	05MAY81	0.00	0
141	11MAY81	2,018,650	12MAY81	2.62	5,289
142	18MAY81	2,018,650	19MAY81	0.00	0
143	25MAY81	2,018,650	26MAY81	0.00	0
144	01JUN81	2,018,650	03JUN81	0.00	0
145	08JUN81	2,018,650	09JUN81	0.00	0
146	15JUN81	2,703,767	16JUN81	0.00	0
147	22JUN81	2,018,650	23JUN81	0.00	0
148	29JUN81	3,792,614	30JUN81	0.00	0
149	06JUL81	4,722,417	07JUL81	0.00	0
150	13JUL81	4,722,417	14JUL81	0.00	0
151	20JUL81	4,722,417	21JUL81	0.00	0
152	27JUL81	4,722,417	28JUL81	0.00	0
153	03AUG81	2,975,979	04AUG81	0.00	0
154	10AUG81	2,703,767	11AUG81	0.00	0
155	17AUG81	2,703,767	18AUG81	0.00	0
156	24AUG81	2,703,767	25AUG81	0.00	0

TABLE 6.8 ENTRAINMENT RATES (PER DAY) FOR CROAKER SEPTEMBER 1978 TO AUGUST 1981.

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
1	01SEP78	5,580,561	06SEP78	0.00	0
2	08SEP78	4,060,993	12SEP78	6.27	25,588
3	15SEP78	2,819,118	19SEP78	1.94	5,469
4	22SEP78	3,857,281	26SEP78	44.22	170,569
5	29SEP78	4,981,083	03OCT78	11.83	58,926
6	06OCT78	5,407,534	10OCT78	8.84	47,803
7	13OCT78	5,407,534	17OCT78	1.18	6,381
8	20OCT78	5,407,534	24OCT78	14.07	76,084
9	27OCT78	5,407,534	31OCT78	42.23	228,350
10	03NOV78	4,208,579	07NOV78	7.61	32,027
11	10NOV78	3,782,128	14NOV78	11.92	45,083
12	17NOV78	4,428,795	21NOV78	5.59	24,757
13	24NOV78	4,918,164	28NOV78	25.19	123,889
14	01DEC78	5,211,786	05DEC78	65.52	341,476
15	08DEC78	5,407,534	12DEC78	313.32	1,694,289
16	15DEC78	5,407,534	18DEC78	198.75	1,074,747
17	22DEC78	5,407,534	27DEC78	214.99	1,162,566
18	29DEC78	5,407,534	03JAN79	389.55	2,106,505
19	05JAN79	5,407,534	09JAN79	132.16	714,660
20	12JAN79	3,862,524	16JAN79	537.70	2,076,879
21	19JAN79	2,703,767	23JAN79	386.74	1,045,655
22	26JAN79	2,703,767	30JAN79	413.16	1,117,088
23	02FEB79	2,703,767	06FEB79	222.74	602,237
24	09FEB79	2,703,767	13FEB79	244.15	660,125
25	16FEB79	2,703,767	20FEB79	248.47	671,805
26	23FEB79	2,703,767	27FEB79	190.47	514,987
27	02MAR79	1,607,929	06MAR79	27.59	44,363
28	09MAR79	2,018,650	13MAR79	205.59	415,014
29	16MAR79	2,018,650	20MAR79	154.18	311,235
30	23MAR79	2,018,650	27MAR79	100.72	203,318
31	30MAR79	2,018,650	03APR79	124.83	251,988
32	06APR79	2,018,650	10APR79	627.66	1,267,026
33	13APR79	2,638,401	18APR79	167.59	442,170
34	20APR79	2,703,767	24APR79	38.06	102,905
35	27APR79	2,963,133	01MAY79	21.78	64,537
36	04MAY79	3,843,299	08MAY79	32.49	124,869
37	11MAY79	4,666,489	15MAY79	15.94	74,384
38	18MAY79	5,211,786	22MAY79	25.05	130,555
39	25MAY79	4,082,042	29MAY79	32.45	132,462
40	01JUN79	2,671,259	05JUN79	4.67	12,475
41	08JUN79	4,449,069	12JUN79	0.76	3,381
42	15JUN79	5,811,264	19JUN79	0.00	0
43	22JUN79	5,772,814	26JUN79	2.3	13,393
44	29JUN79	5,110,417	03JUL79	0.00	0
45	06JUL79	5,348,111	10JUL79	0.00	0
46	13JUL79	5,561,336	17JUL79	0.00	0
47	20JUL79	5,811,264	24JUL79	0.00	0
48	27JUL79	5,598,039	31JUL79	0.00	0
49	03AUG79	5,479,192	07AUG79	0.00	0
50	10AUG79	5,772,814	14AUG79	0.00	0
51	17AUG79	5,811,264	21AUG79	0.00	0
52	24AUG79	5,872,435	28AUG79	0.00	0

TABLE 6.5 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
53	01SEP79	3,199,264	04SEP79	1.78	5,695
54	08SEP79	2,202,163	11SEP79	1.45	4,294
55	15SEP79	4,905,930	18SEP79	7.37	36,157
56	22SEP79	4,905,930	25SEP79	292.62	1,435,573
57	29SEP79	5,799,030	02OCT79	204.51	1,185,960
58	06OCT79	5,799,030	09OCT79	332.67	1,929,163
59	13OCT79	5,860,201	15OCT79	609.35	3,570,913
60	20OCT79	5,083,327	23OCT79	837.14	4,255,456
61	27OCT79	5,456,471	30OCT79	335.34	1,829,773
62	03NOV79	4,801,939	06NOV79	122.00	585,837
63	10NOV79	5,250,936	13NOV79	440.06	2,310,727
64	17NOV79	4,891,249	20NOV79	458.73	2,243,763
65	24NOV79	3,749,795	27NOV79	165.57	620,854
66	01DEC79	4,877,791	04DEC79	219.53	1,070,821
67	08DEC79	4,766,460	11DEC79	145.96	695,713
68	15DEC79	4,235,494	18DEC79	229.41	971,665
69	22DEC79	4,881,462	25DEC79	109.50	534,520
70	29DEC79	4,104,588	02JAN80	22.47	92,230
71	05JAN80	4,624,543	08JAN80	197.31	912,469
72	12JAN80	5,162,849	15JAN80	181.67	937,935
73	19JAN80	4,808,056	22JAN80	177.15	851,747
74	26JAN80	5,658,336	29JAN80	131.12	741,921
75	02FEB80	5,554,345	05FEB80	125.61	697,681
76	09FEB80	5,438,120	12FEB80	173.21	941,937
77	16FEB80	5,737,859	19FEB80	323.45	1,855,910
78	23FEB80	5,658,336	26FEB80	180.14	1,019,293
79	02MAR80	2,589,989	04MAR80	515.39	1,334,824
80	09MAR80	2,703,767	11MAR80	167.45	452,746
81	16MAR80	2,476,210	18MAR80	79.74	197,453
82	23MAR80	2,338,837	24MAR80	181.37	424,195
83	30MAR80	2,221,388	01APR80	119.24	264,878
84	06APR80	2,217,893	08APR80	162.71	360,873
85	13APR80	2,462,578	16APR80	192.53	474,120
86	20APR80	2,716,001	22APR80	322.37	875,557
87	27APR80	3,100,506	29APR80	171.66	532,233
88	04MAY80	2,862,812	05MAY80	11.93	34,153
89	11MAY80	2,359,461	13MAY80	76.98	181,631
90	18MAY80	1,761,731	20MAY80	2.50	4,404
91	25MAY80	924,559	27MAY80	1.48	1,368
92	01JUN80	795,226	03JUN80	0.00	0
93	08JUN80	1,293,334	10JUN80	0.00	0
94	15JUN80	2,027,368	17JUN80	0.00	0
95	22JUN80	1,459,370	24JUN80	0.00	0
96	29JUN80	1,240,901	01JUL80	0.00	0
97	06JUL80	1,284,595	08JUL80	0.00	0
98	13JUL80	2,202,163	15JUL80	0.00	0
99	20JUL80	2,848,830	22JUL80	0.00	0
100	27JUL80	2,674,055	29JUL80	0.00	0
101	03AUG80	2,307,028	05AUG80	0.00	0
102	10AUG80	2,079,821	12AUG80	0.00	0
103	17AUG80	2,392,668	19AUG80	0.00	0
104	24AUG80	4,509,847	26AUG80	1.17	5,277

TABLE 6.- (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
105	01SEP80	4,544,146	02SEP80	0.00	0
106	08SEP80	4,666,449	09SEP80	0.00	0
107	15SEP80	4,631,534	16SEP80	0.00	0
108	22SEP80	4,456,759	23SEP80	3.08	13,727
109	29SEP80	4,876,219	30SEP80	26.83	130,829
110	06OCT80	4,926,903	07OCT80	20.10	99,031
111	13OCT80	4,114,200	14OCT80	10.82	44,516
112	20OCT80	5,002,056	21OCT80	15.77	78,882
113	27OCT80	4,924,282	28OCT80	22.44	110,501
114	03NOV80	5,407,534	04NOV80	32.30	174,663
115	10NOV80	5,407,534	11NOV80	116.13	627,977
116	17NOV80	5,270,511	18NOV80	167.23	881,388
117	24NOV80	5,407,534	25NOV80	64.25	347,434
118	01DEC80	5,407,534	02DEC80	51.71	279,624
119	08DEC80	2,703,767	09DEC80	25.38	68,622
120	15DEC80	4,629,436	16DEC80	54.89	254,110
121	22DEC80	4,722,417	23DEC80	87.79	414,581
122	29DEC80	2,429,720	30DEC80	220.91	536,749
123	05JAN81	5,407,534	06JAN81	215.50	1,165,324
124	12JAN81	5,407,534	13JAN81	349.58	1,890,366
125	19JAN81	5,407,534	20JAN81	364.02	1,968,451
126	26JAN81	5,407,534	27JAN81	85.18	460,614
127	02FEB81	5,508,467	03FEB81	231.29	1,274,053
128	09FEB81	5,407,534	10FEB81	256.28	1,385,843
129	16FEB81	2,703,767	17FEB81	623.05	1,684,609
130	23FEB81	5,407,534	24FEB81	396.44	2,143,763
131	02MAR81	5,407,534	03MAR81	2 1.98	1,416,666
132	09MAR81	2,703,767	10MAR81	165.64	447,852
133	16MAR81	3,107,497	17MAR81	81.80	254,193
134	23MAR81	2,703,767	24MAR81	133.14	359,980
135	30MAR81	2,703,767	31MAR81	102.15	276,190
136	06APR81	3,107,497	07APR81	21.71	67,464
137	13APR81	2,703,767	14APR81	15.46	41,800
138	20APR81	2,018,650	21APR81	12.90	26,041
139	27APR81	2,703,767	28APR81	14.13	38,204
140	04MAY81	2,703,767	05MAY81	1.99	5,380
141	11MAY81	2,018,650	12MAY81	0.00	0
142	18MAY81	2,018,650	19MAY81	0.00	0
143	25MAY81	2,018,650	26MAY81	0.00	0
144	01JUN81	2,018,650	03JUN81	0.00	0
145	08JUN81	2,018,650	09JUN81	0.00	0
146	15JUN81	2,703,767	16JUN81	0.00	0
147	22JUN81	2,018,650	23JUN81	0.00	0
148	29JUN81	3,792,614	30JUN81	0.00	0
149	06JUL81	4,722,417	07JUL81	0.00	0
150	13JUL81	4,722,417	14JUL81	0.00	0
151	20JUL81	4,722,417	21JUL81	0.00	0
152	27JUL81	4,722,417	28JUL81	0.00	0
153	03AUG81	2,975,979	04AUG81	0.00	0
154	10AUG81	2,703,767	11AUG81	0.00	0
155	17AUG81	2,703,767	18AUG81	0.00	0
156	24AUG81	2,703,767	25AUG81	0.00	0

TABLE 6.6 ENTRAINMENT RATES (PER DAY) FOR FLOUNDER SEPTEMBER 1978 TO AUGUST 1981.

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
1	01SEP78	5,580,561	06SEP78	0.00	0
2	08SEP78	4,080,993	12SEP78	0.00	0
3	15SEP78	2,819,118	19SEP78	0.00	0
4	22SEP78	3,857,281	26SEP78	0.00	0
5	29SEP78	4,981,083	03OCT78	0.00	0
6	06OCT78	5,407,534	10OCT78	0.00	0
7	13OCT78	5,407,534	17OCT78	0.00	0
8	20OCT78	5,407,534	24OCT78	0.00	0
9	27OCT78	5,407,534	31OCT78	0.00	0
10	03NOV78	4,208,579	07NOV78	0.00	0
11	10NOV78	3,782,128	14NOV78	0.00	0
12	17NOV78	4,428,795	21NOV78	0.00	0
13	24NOV78	4,918,164	28NOV78	0.96	4,721
14	01DEC78	5,211,786	05DEC78	7.15	37,264
15	08DEC78	5,407,534	12DEC78	3.24	17,520
16	15DEC78	5,407,534	18DEC78	27.15	146,815
17	22DEC78	5,407,534	27DEC78	10.48	56,671
18	29DEC78	5,407,534	03JAN79	10.93	59,104
19	05JAN79	5,407,534	09JAN79	4.69	25,361
20	12JAN79	3,862,524	16JAN79	2.80	10,815
21	19JAN79	2,703,767	23JAN79	23.49	63,511
22	26JAN79	2,703,767	30JAN79	11.56	31,256
23	02FEB79	2,703,767	06FEB79	18.45	49,885
24	09FEB79	2,703,767	13FEB79	31.14	84,195
25	16FEB79	2,703,767	20FEB79	87.44	236,417
26	23FEB79	2,703,767	27FEB79	123.11	332,861
27	02MAR79	1,607,929	06MAR79	94.40	151,788
28	09MAR79	2,018,650	13MAR79	56.71	114,478
29	16MAR79	2,018,650	20MAR79	27.08	54,665
30	23MAR79	2,018,650	27MAR79	39.44	79,616
31	30MAR79	2,018,650	03APR79	18.68	37,708
32	06APR79	2,018,650	10APR79	0.00	0
33	13APR79	2,638,401	18APR79	1.00	2,638
34	20APR79	2,703,767	24APR79	0.00	0
35	27APR79	2,963,133	01MAY79	0.00	0
36	04MAY79	3,843,299	08MAY79	0.00	0
37	11MAY79	4,666,489	15MAY79	0.00	0
38	18MAY79	5,211,786	22MAY79	0.00	0
39	25MAY79	4,082,042	29MAY79	0.00	0
40	01JUN79	2,671,259	05JUN79	0.00	0
41	08JUN79	4,449,069	12JUN79	0.00	0
42	15JUN79	5,811,264	19JUN79	0.00	0
43	22JUN79	5,772,814	26JUN79	0.00	0
44	29JUN79	5,110,417	03JUL79	0.00	0
45	06JUL79	5,348,111	10JUL79	0.00	0
46	13JUL79	5,561,336	17JUL79	0.00	0
47	20JUL79	5,811,264	24JUL79	0.00	0
48	27JUL79	5,598,039	31JUL79	0.00	0
49	03AUG79	5,479,192	07AUG79	0.00	0
50	10AUG79	5,772,814	14AUG79	0.00	0
51	17AUG79	5,811,264	21AUG79	0.00	0
52	24AUG79	5,872,435	28AUG79	0.00	0

TABLE 6.6 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
53	01SEP79	3,199,254	04SEP79	0.00	0
54	08SEP79	2,202,163	11SEP79	0.00	0
55	15SEP79	4,905,930	18SEP79	0.00	0
56	22SEP79	4,905,930	25SEP79	0.00	0
57	29SEP79	5,799,030	02OCT79	0.00	0
58	06OCT79	5,799,030	09OCT79	0.00	0
59	13OCT79	5,860,201	15OCT79	0.00	0
60	20OCT79	5,083,327	23OCT79	0.00	0
61	27OCT79	5,456,471	30OCT79	0.00	0
62	03NOV79	4,801,939	06NOV79	0.00	0
63	10NOV79	5,250,936	13NOV79	0.00	0
64	17NOV79	4,891,249	20NOV79	0.00	0
65	24NOV79	3,749,795	27NOV79	0.00	0
66	01DEC79	4,877,791	04DEC79	0.00	0
67	08DEC79	4,766,460	11DEC79	0.00	0
68	15DEC79	4,235,494	18DEC79	1.01	4,278
69	22DEC79	4,881,462	25DEC79	1.84	8,982
70	29DEC79	4,104,588	02JAN80	0.90	3,694
71	05JAN80	4,624,543	08JAN80	0.00	0
72	12JAN80	5,162,849	15JAN80	0.00	0
73	19JAN80	4,808,056	22JAN80	0.00	0
74	26JAN80	5,658,336	29JAN80	0.00	0
75	02FEB80	5,554,345	05FEB80	5.64	31,327
76	09FEB80	5,438,120	12FEB80	6.35	34,532
77	16FEB80	5,737,859	19[illegible]80	4.86	27,886
78	23FEB80	5,658,336	2[illegible]EB80	10.72	60,657
79	02MAR80	2,589,989	04MAR80	27.90	72,261
80	09MAR80	2,703,767	11MAR80	11.80	31,904
81	16MAR80	2,476,210	18MAR80	6.89	17,061
82	23MAR80	2,338,837	24MAR80	5.12	11,975
83	30MAR80	2,221,338	01APR80	0.00	0
84	06APR80	2,217,893	08APR80	3.00	6,654
85	13APR80	2,462,578	16APR80	0.00	0
86	20APR80	2,716,001	22APR80	0.00	0
87	27APR80	3,100,506	29APR80	0.00	0
88	04MAY80	2,862,812	05MAY80	0.00	0
89	11MAY80	2,359,461	13MAY80	0.00	0
90	18MAY80	1,761,731	20MAY80	0.00	0
91	25MAY80	924,559	27MAY80	0.00	0
92	01JUN80	795,226	03JUN80	0.00	0
93	08JUN80	1,293,334	10JUN80	0.00	0
94	15JUN80	2,027,388	17JUN80	0.00	0
95	22JUN80	1,459,370	24JUN80	0.00	0
96	29JUN80	1,240,901	01JUL80	0.00	0
97	06JUL80	1,284,595	08JUL80	0.00	0
98	13JUL80	2,202,153	15JUL80	0.00	0
99	20JUL80	2,848,830	22JUL80	0.00	0
100	27JUL80	2,674,055	29JUL80	0.00	0
101	03AUG80	2,307,028	05AUG80	0.00	0
102	10AUG80	2,079,821	12AUG80	0.00	0
103	17AUG80	2,392,668	19AUG80	0.00	0
104	24AUG80	4,509,847	26AUG80	1.18	5,322

TABLE 6.6 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
105	01SEP80	4,544,146	02SEP80	0.00	0
106	08SEP80	4,666,489	09SEP80	0.00	0
107	15SEP80	4,631,534	16SEP80	0.00	0
108	22SEP80	4,456,759	23SEP80	0.00	0
109	29SEP80	4,876,219	30SEP80	0.00	0
110	06OCT80	4,926,903	07OCT80	0.00	0
111	13OCT80	4,114,200	14OCT80	0.00	0
112	20OCT80	5,002,056	21OCT80	0.00	0
113	27OCT80	4,924,222	28OCT80	0.00	0
114	03NOV80	5,407,534	04NOV80	0.00	0
115	10NOV80	5,407,534	11NOV80	0.00	0
116	17NOV80	5,270,511	18NOV80	0.00	0
117	24NOV80	5,407,534	25NOV80	0.00	0
118	01DEC80	5,407,534	02DEC80	0.00	0
119	08DEC80	2,703,767	09DEC80	1.29	3,488
120	15DEC80	4,629,436	16DEC80	3.81	17,638
121	22DEC80	4,722,417	23DEC80	1.41	6,659
122	29DEC80	2,429,720	30DEC80	6.47	15,720
123	05JAN81	5,407,534	06JAN81	0.00	0
124	12JAN81	5,407,534	13JAN81	31.44	170,013
125	19JAN81	5,407,534	20JAN81	6.80	36,771
126	26JAN81	5,407,534	27JAN81	2.87	15,520
127	02FEB81	5,508,467	03FEB81	9.51	52,386
128	09FEB81	5,407,534	10FEB81	61.73	333,807
129	16FEB81	2,703,767	17FEB81	29.69	80,275
130	23FEB81	5,407,534	24FEB81	84.51	456,991
131	02MAR81	5,407,534	03MAR81	40.86	220,952
132	09MAR81	2,703,767	10MAR81	47.09	127,320
133	16MAR81	3,107,497	17MAR81	6.58	20,447
134	23MAR81	2,703,767	24MAR81	3.62	9,788
135	30MAR81	2,703,767	31MAR81	7.03	19,007
136	06APR81	3,107,497	07APR81	2.19	6,805
137	13APR81	2,703,767	14APR81	0.00	0
138	20APR81	2,018,650	21APR81	0.00	0
139	27APR81	2,703,767	28APR81	0.00	0
140	04MAY81	2,703,767	05MAY81	0.00	0
141	11MAY81	2,018,650	12MAY81	0.00	0
142	18MAY81	2,018,650	19MAY81	0.00	0
143	25MAY81	2,018,650	26MAY81	0.00	0
144	01JUN81	2,018,650	03JUN81	0.00	0
145	08JUN81	2,018,650	09JUN81	0.	0
146	15JUN81	2,703,767	16JUN81	0.	0
147	22JUN81	2,018,650	23JUN81	0.	0
148	29JUN81	3,792,614	30JUN81	0.	0
149	06JUL81	4,722,417	07JUL81	0.00	0
150	13JUL81	4,722,417	14JUL81	0.00	0
151	20JUL81	4,722,417	21JUL81	0.00	0
152	27JUL81	4,722,417	28JUL81	0.00	0
153	03AUG81	2,975,979	04AUG81	0.00	0
154	10AUG81	2,703,767	11AUG81	0.00	0
155	17AUG81	2,703,767	18AUG81	0.00	0
156	24AUG81	2,703,767	25AUG81	0.00	0

TABLE 6.7 ENTRAINMENT RATES (PER DAY) FOR MENHADEN
SEPTEMBER 1978 TO AUGUST 1981.

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
1	01SEP78	5,580,561	06SEP78	0.00	0
2	08SEP78	4,080,993	12SEP78	0.00	0
3	15SEP78	2,819,118	19SEP78	0.00	0
4	22SEP78	3,857,281	26SEP78	0.00	0
5	29SEP78	4,981,083	03OCT78	0.00	0
6	06OCT78	5,407,534	10OCT78	0.00	0
7	13OCT78	5,407,534	17OCT78	0.00	0
8	20OCT78	5,407,534	24OCT78	0.00	0
9	27OCT78	5,407,534	31OCT78	0.00	0
10	03NOV78	4,208,579	07NOV78	0.00	0
11	10NOV78	3,782,128	14NOV78	0.00	0
12	17NOV78	4,428,795	21NOV78	0.00	0
13	24NOV78	4,918,164	28NOV78	0.00	0
14	01DEC78	5,211,786	05DEC78	0.00	0
15	08DEC78	5,407,534	12DEC78	0.00	0
16	15DEC78	5,407,534	18DEC78	0.00	0
17	22DEC78	5,407,534	27DEC78	2.06	11,140
18	29DEC78	5,407,534	03JAN79	0.00	0
19	05JAN79	5,407,534	09JAN79	0.00	0
20	12JAN79	3,862,524	16JAN79	0.95	3,669
21	19JAN79	2,703,767	23JAN79	1.06	2,866
22	26JAN79	2,703,767	30JAN79	0.00	0
23	02FEB79	2,703,767	06FEB79	1.16	3,136
24	09FEB79	2,703,767	13FEB79	0.00	0
25	16FEB79	2,703,767	20FEB79	6.58	17,791
26	23FEB79	2,703,767	27FEB79	4.53	12,248
27	02MAR79	1,607,929	06MAR79	5.01	8,056
28	09MAR79	2,018,650	13MAR79	2.55	5,148
29	16MAR79	2,018,650	20MAR79	31.43	63,446
30	23MAR79	2,018,650	27MAR79	66.60	134,442
31	30MAR79	2,018,650	03APR79	51.38	103,718
32	06APR79	2,018,650	10APR79	70.23	141,770
33	13APR79	2,638,401	18APR79	7.96	21,002
34	20APR79	2,703,767	24APR79	2.82	7,625
35	27APR79	2,963,133	01MAY79	0.00	0
36	04MAY79	3,843,299	08MAY79	0.00	0
37	11MAY79	4,666,489	15MAY79	0.00	0
38	18MAY79	5,211,786	22MAY79	0.00	0
39	25MAY79	4,082,042	29MAY79	0.00	0
40	01JUN79	2,671,259	05JUN79	0.00	0
41	08JUN79	4,449,069	12JUN79	0.00	0
42	15JUN79	5,811,264	19JUN79	0.00	0
43	22JUN79	5,772,814	26JUN79	0.00	0
44	29JUN79	5,110,417	03JUL79	0.00	0
45	06JUL79	5,348,111	10JUL79	0.00	0
46	13JUL79	5,561,336	17JUL79	0.00	0
47	20JUL79	5,811,264	24JUL79	0.00	0
48	27JUL79	5,598,039	31JUL79	0.00	0
49	03AUG79	5,479,192	07AUG79	0.00	0
50	10AUG79	5,772,814	14AUG79	0.00	0
51	17AUG79	5,811,264	21AUG79	0.00	0
52	24AUG79	5,872,435	28AUG79	0.00	0

TABLE 6.7 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
53	01SEP79	3,199,254	04SEP79	0.00	0
54	08SEP79	2,202,163	11SEP79	0.00	0
55	15SEP79	4,905,930	18SEP79	0.00	0
56	22SEP79	4,905,930	25SEP79	0.00	0
57	29SEP79	5,799,030	02OCT79	0.00	0
58	06OCT79	5,799,030	09OCT79	0.00	0
59	13OCT79	5,860,201	15OCT79	0.00	0
60	20OCT79	5,083,327	23OCT79	0.00	0
61	27OCT79	5,456,471	30OCT79	0.00	0
62	03NOV79	4,801,939	06NOV79	0.00	0
63	10NOV79	5,230,936	13NOV79	0.00	0
64	17NOV79	4,891,249	20NOV79	0.00	0
65	24NOV79	3,749,795	27NOV79	0.00	0
66	01DEC79	4,877,791	04DEC79	0.00	0
67	08DEC79	4,766,460	11DEC79	0.00	0
68	15DEC79	4,235,494	18DEC79	0.00	0
69	22DEC79	4,881,462	25DEC79	0.00	0
70	29DEC79	4,104,588	02JAN80	0.00	0
71	05JAN80	4,624,543	08JAN80	0.00	0
72	12JAN80	5,162,849	15JAN80	0.00	0
73	19JAN80	4,808,056	22JAN80	0.00	0
74	26JAN80	5,658,336	29JAN80	0.00	0
75	02FEB80	5,554,345	05FEB80	0.00	0
76	09FEB80	5,438,120	12FEB80	4.71	25,614
77	16FEB80	5,737,859	19FEB80	0.00	0
78	23FEB80	5,658,336	26FEB80	4.10	23,708
79	02MAR80	2,589,989	04MAR80	5.36	13,882
80	09MAR80	2,703,767	11MAR80	1.91	5,164
81	16MAR80	2,476,210	18MAR80	0.99	2,451
82	23MAR80	2,338,837	24MAR80	5.05	11,811
83	30MAR80	2,221,388	01APR80	42.31	93,98[illegible]
84	06APR80	2,217,893	08APR80	45.81	101,602
85	13APR80	2,462,578	16APR80	22.94	56,492
86	20APR80	2,716,001	22APR80	30.37	82,485
87	27APR80	3,100,506	29APR80	16.94	52,523
88	04MAY80	2,862,812	05MAY80	1.71	4,[illegible]95
89	11MAY80	2,359,461	13MAY80	0.00	0
90	18MAY80	1,761,731	20MAY80	0.00	0
91	25MAY80	924,559	27MAY80	0.00	0
92	01JUN80	795,2[illegible]	03JUN80	0.00	0
93	08JUN80	1,293,334	10JUN80	0.00	0
94	15JUN80	2,027,388	17JUN80	0.00	0
95	22JUN80	1,459,370	24JUN80	0.00	0
96	29JUN80	1,240,901	01JUL80	0.00	0
97	06JUL80	1,284,595	08JUL80	0.00	0
98	13JUL80	2,202,163	15JUL80	0.00	0
99	20JUL80	2,848,830	22JUL80	0.00	0
100	27JUL80	2,574,055	29JUL80	0.00	0
101	03AUG80	2,307,028	05AUG80	0.00	0
102	10AUG80	2,079,821	12AUG80	0.00	0
103	17AUG80	2,3[illegible]2,668	19AUG80	0.00	0
104	24AUG80	4,509,847	26AUG80	0.00	0

TABLE 6.7 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
105	01SEP80	4,544,140	02SEP80	0.00	0
106	08SEP80	4,666,489	09SEP80	0.00	0
107	15SEP80	4,651,534	16SEP80	0.00	0
108	22SEP80	4,456,759	23SEP80	0.00	0
109	29SEP80	4,876,219	30SEP80	0.00	0
110	06OCT80	4,926,903	07OCT80	0.00	0
111	13OCT80	4,114,200	14OCT80	0.00	0
112	20OCT80	5,002,056	21OCT80	0.00	0
113	27OCT80	4,924,282	28OCT80	0.00	0
114	03NOV80	5,407,534	04NOV80	0.00	0
115	10NOV80	5,407,534	11NOV80	0.00	0
116	17NOV80	5,270,511	18NOV80	0.00	0
117	24NOV80	5,407,534	25NOV80	0.00	0
118	01DEC80	5,407,534	02DEC80	0.00	0
119	08DEC80	2,703,767	09DEC80	0.00	0
120	15DEC80	4,629,436	16DEC80	0.00	0
121	22DEC80	4,722,417	23DEC80	0.00	0
122	29DEC80	2,429,720	30DEC80	0.00	0
123	05JAN81	5,407,534	06JAN81	0.00	0
124	12JAN81	5,407,534	13JAN81	0.00	0
125	19JAN81	5,407,534	20JAN81	3.21	17,358
126	26JAN81	5,407,534	27JAN81	2.87	15,520
127	02FEB81	5,508,467	03FEB81	3.15	17,352
128	09FEB81	5,407,534	10FEB81	0.00	0
129	16FEB81	2,703,767	17FEB81	0.00	0
130	23FEB81	5,407,534	24FEB81	9.01	48,722
131	02MAR81	5,407,534	03MAR81	9.78	52,886
132	09MAR81	2,703,767	10MAR81	23.58	63,755
133	16MAR81	3,107,497	17MAR81	9.76	30,329
134	23MAR81	2,703,767	24MAR81	93.77	253,532
135	30MAR81	2,703,767	31MAR81	154.23	417,002
136	06APR81	3,107,497	07APR81	264.37	821,529
137	13APR81	2,703,767	14APR81	649.80	1,756,908
138	20APR81	2,018,650	21APR81	5.75	11,607
139	27APR81	2,703,767	28APR81	6.02	16,277
140	04MAY81	2,703,767	05MAY81	0.00	0
141	11MAY81	2,018,650	12MAY81	0.00	0
142	18MAY81	2,018,650	19MAY81	0.00	0
143	25MAY81	2,018,650	26MAY81	0.00	0
144	01JUN81	2,018,650	03JUN81	0.00	0
145	08JUN81	2,018,650	09JUN81	0.00	0
146	15JUN81	2,703,767	16JUN81	0.00	0
147	22JUN81	2,018,650	23JUN81	0.00	0
148	29JUN81	3,792,614	30JUN81	0.00	0
149	06JUL81	4,722,417	07JUL81	0.00	0
150	13JUL81	4,722,417	14JUL81	0.00	0
151	20JUL81	4,722,417	21JUL81	0.00	0
152	27JUL81	4,722,417	28JUL81	0.00	0
153	03AUG81	2,975,979	04AUG81	0.00	0
154	10AUG81	2,703,767	11AUG81	0.00	0
155	17AUG81	2,703,767	18AUG81	0.00	0
156	24AUG81	2,703,737	25AUG81	0.00	0

TABLE 6.8 ENTRAINMENT RATES (PER DAY) FOR MULLET
SEPTEMBER 1978 TO AUGUST 1981.

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
1	01SEP78	5,580,561	05SEP78	0.00	0
2	08SEP78	4,080,993	12SEP78	0.00	0
3	15SEP78	2,819,118	19SEP78	0.00	0
4	22SEP78	4,857,281	26SEP78	0.00	0
5	29SEP78	4,981,083	03OCT78	0.00	0
6	06OCT78	5,407,534	10OCT78	0.00	0
7	13OCT78	5,407,534	17OCT78	0.00	0
8	20OCT78	5,407,534	24OCT78	0.00	0
9	27OCT78	5,407,534	31OCT78	0.00	0
10	03NOV78	4,208,579	07NOV78	0.00	0
11	10NOV78	3,782,128	14NOV78	1.18	4,463
12	17NOV78	4,428,795	21NOV78	0.00	0
13	24NOV78	4,918,164	28NOV78	0.00	0
14	01DEC78	5,211,786	05DEC78	1.21	6,306
15	08DEC78	5,407,534	12DEC78	1.03	5,570
16	15DEC78	5,407,534	18DEC78	0.00	0
17	22DEC78	5,407,534	27DEC78	0.00	0
18	29DEC78	5,407,534	03JAN79	0.00	0
19	05JAN79	5,407,534	09JAN79	0.00	0
20	12JAN79	3,862,524	16JAN79	0.88	3,399
21	19JAN79	2,703,767	23JAN79	3.05	8,246
22	26JAN79	2,703,767	30JAN79	19.51	52,750
23	02FEB79	2,703,767	06FEB79	12.74	34,446
24	09FEB79	2,703,767	13FEB79	47.48	128,375
25	16FEB79	2,703,767	20FEB79	71.38	192,995
26	23FEB79	2,703,767	27FEB79	117.03	316,422
27	02MAR79	1,607,929	06MAR79	82.65	132,895
28	09MAR79	2,018,650	13MAR79	12.88	26,000
29	16MAR79	2,018,650	20MAR79	112.53	227,159
30	23MAR79	2,018,650	27MAR79	16.11	32,520
31	30MAR79	2,018,650	03APR79	8.03	16,210
32	06APR79	2,018,650	10APR79	4.18	8,438
33	13APR79	2,638,401	18APR79	0.96	2,533
34	20APR79	2,703,757	24APR79	0.91	2,460
35	27APR79	2,963,133	01MAY79	1.14	3,378
36	04MAY79	3,843,299	08MAY79	0.00	0
37	11MAY79	4,666,489	15MAY79	0.00	0
38	18MAY79	5,211,786	22MAY79	0.00	0
39	25MAY79	4,082,042	29MAY79	0.84	3,429
40	01JUN79	2,671,259	05JUN79	0.84	2,244
41	08JUN79	4,449,059	12JUN79	0.93	4,138
42	15JUN79	5,811,264	19JUN79	0.00	0
43	22JUN79	5,772,814	26JUN79	0.00	0
44	29JUN79	5,110,417	03JUL79	0.00	0
45	06JUL79	5,348,111	10JUL79	0.00	0
46	13JUL79	5,561,336	17JUL79	0.00	0
47	20JUL79	5,811,264	24JUL79	0.00	0
48	27JUL79	5,598,039	31JUL79	0.00	0
49	03AUG79	5,479,192	07AUG79	0.00	0
50	10AUG79	5,772,814	14AUG79	0.00	0
51	17AUG79	5,811,264	21AUG79	0.00	0
52	24AUG79	5,872,435	28AUG79	0.00	0

TABLE [illegible]. (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
53	01SEP79	3,199,254	04SEP79	0.00	0
54	08SEP79	2,202,163	11SEP79	0.00	0
55	15SEP79	4,905,[illegible]30	18SEP79	0.00	0
56	22SEP79	4,905,930	25SEP79	0.00	0
57	29SEP79	5,799,030	02OCT79	0.00	0
58	06OCT79	5,799,030	09OCT79	0.00	0
59	13OCT79	5,860,201	15OCT79	0.86	5,040
60	20OCT79	5,063,327	23OCT79	0.00	0
61	27OCT79	5,456,471	30OCT79	0.00	0
62	03NOV79	4,801,939	06NOV79	0.00	0
63	10NOV79	5,250,936	13NOV79	0.00	0
64	17NOV79	4,891,249	20NOV79	0.00	0
65	24NOV79	3,749,795	27NOV79	0.00	0
66	01DEC79	4,877,791	04DEC79	0.00	0
67	08DEC79	4,766,460	11DEC79	0.00	0
68	15DEC79	4,235,494	18DEC79	56.49	239,263
69	22DEC79	4,881,462	25DEC79	119.99	585,678
70	29DEC79	4,104,588	02JAN80	16.64	68,300
71	05JAN80	4,624,543	08JAN80	11.11	51,379
72	12JAN80	5,162,349	15JAN80	61.30	316,483
73	19JAN80	4,808,056	22JAN80	67.53	324,688
74	26JAN80	5,658,336	29JAN80	12.98	73,445
75	02FEB80	5,554,345	05FEB80	21.[illegible]	118,030
76	09FEB80	5,438,120	12FEB80	9.81	53,348
77	16FEB80	5,737,859	19FEB80	3.07	17,615
78	23FEB80	5,658,336	26FEB80	5.15	29,140
79	02MAR80	2,589,989	04MAR80	4.77	12,354
80	09MAR80	2,703,767	11MAR80	8.41	22,739
81	16MAR80	2,476,210	18MAR80	1.96	4,853
82	23MAR80	2,338,837	2[illegible]MAR80	3.11	7,274
83	30MAR80	2,221,388	01APR80	3.14	6,975
84	06APR80	2,217,893	08APR80	0.00	0
85	13APR80	2,462,578	16APR80	0.00	0
86	20APR80	2,716,001	22APR80	0.00	0
87	27APR80	3,100,506	29APR80	0.00	0
88	04MAY80	2,862,812	05MAY80	0.00	0
89	11MAY80	2,359,461	13MAY80	0.00	0
90	18MAY80	1,761,731	20MAY80	2.56	4,510
91	25MAY80	924,559	27MAY80	0.00	0
92	01JUN80	795,226	03JUN80	0.00	0
93	08JUN80	1,293,334	10JUN80	0.00	0
94	15JUN80	2,027,388	17JUN80	1.13	2,291
95	22JUN80	1,459,370	24JUN80	0.00	0
96	29JUN80	1,240,901	01JUL80	0.00	0
97	06JUL80	1,284,595	08JUL80	0.00	0
98	13JUL80	2,202,163	15JUL80	0.00	0
99	20JUL80	2,848,830	22JUL80	0.00	0
100	27JUL80	2,674,055	29JUL80	0.00	0
101	03AUG80	2,307,028	05AUG80	1.25	2,884
102	10AUG80	2,079,821	12AUG80	0.00	0
103	17AUG80	2,392,668	19AUG80	0.00	0
104	24AUG80	4,509,847	26AUG80	0.00	0

TABLE 6.8 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
105	01SEP80	4,544,146	02SEP80	0.00	0
106	08SEP80	4,666,449	09SEP80	0.00	0
107	15SEP80	4,631,534	16SEP80	0.00	0
108	22SEP80	4,456,759	23SEP80	0.00	0
109	29SEP80	4,876,219	30SEP80	0.00	0
110	06OCT80	4,925,903	07OCT80	0.00	0
111	13OCT80	4,114,200	14OCT80	0.00	0
112	20OCT80	5,002,056	21OCT80	0.00	0
113	27OCT80	4,924,282	28OCT80	0.00	0
114	03NOV80	5,407,534	04NOV80	0.00	0
115	10NOV80	5,407,534	11NOV80	1.21	6,543
116	17NOV80	5,270,511	18NOV80	0.00	0
117	24NOV80	5,407,534	25NOV80	0.00	0
118	01DEC80	5,407,534	02DEC80	0.00	0
119	08DEC80	2,703,767	04DEC80	0.00	0
120	15DEC80	4,629,436	16DEC80	0.00	0
121	22DEC80	4,722,417	23DEC80	15.85	74,850
122	29DEC80	2,429,720	30DEC80	87.70	213,086
123	05JAN81	5,407,534	06JAN81	11.97	64,728
124	12JAN81	5,407,534	13JAN81	25.60	138,433
125	19JAN81	5,407,534	20JAN81	18.90	102,202
126	26JAN81	5,407,534	27JAN81	64.11	346,677
127	02FEB81	5,508,467	03FEB81	9.35	51,504
128	09FEB81	5,407,534	10FEB81	134.73	728,557
129	16FEB81	2,703,767	17FEB81	3.10	8,382
130	23FEB81	5,407,534	24FEB81	64.02	346,190
131	02MAR81	5,407,534	03MAR81	63.35	342,567
132	09MAR81	2,703,767	10MAR81	38.62	104,419
133	16MAR81	3,107,497	17MAR81	0.00	0
134	23MAR81	2,703,767	24MAR81	0.00	0
135	30MAR81	2,703,767	31MAR81	0.00	0
136	06APR81	3,107,497	07APR81	0.00	0
137	13APR81	2,703,767	14APR81	0.00	0
138	20APR81	2,018,650	21APR81	0.00	0
139	27APR81	2,703,767	28APR81	0.00	0
140	04MAY81	2,703,767	05MAY81	0.00	0
141	11MAY81	2,018,650	12MAY81	2.62	5,289
142	18MAY81	2,018,650	19MAY81	0.00	0
143	25MAY81	2,018,650	26MAY81	0.00	0
144	01JUN81	2,018,650	03JUN81	0.00	0
145	08JUN81	2,018,650	09JUN81	0.00	0
146	15JUN81	2,703,767	16JUN81	0.00	0
147	22JUN81	2,018,650	23JUN81	0.00	0
148	29JUN81	3,792,614	30JUN81	0.00	0
149	06JUL81	4,722,417	07JUL81	2.04	9,634
150	13JUL81	4,722,417	14JUL81	0.00	0
151	20JUL81	4,722,417	21JUL81	0.00	0
152	27JUL81	4,722,417	28JUL81	0.00	0
153	03AUG81	2,975,979	04AUG81	2.02	6,011
154	10AUG81	2,703,767	11AUG81	0.00	0
155	17AUG81	2,703,767	18AUG81	0.00	0
156	24AUG81	2,703,767	25AUG81	0.00	0

TABLE 6.9 ENTRAINMENT RATES (PER DAY) FOR SHRIMP
SEPTEMBER 1978 TO AUGUST 1981.

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
1	01SEP78	5,580,561	06SEP78	300.14	1,674,950
2	08SEP78	4,080,993	12SEP78	337.06	1,375,540
3	15SEP78	2,819,118	19SEP78	244.25	688,570
4	22SEP78	3,857,281	26SEP78	1,896.66	7,312,093
5	29SEP78	4,981,083	03OCT78	241.66	1,198,747
6	06OCT78	5,407,534	10OCT78	142.95	773,007
7	13OCT78	5,407,534	17OCT78	193.97	1,048,899
8	20OCT78	5,407,534	24OCT78	30.08	162,659
9	27OCT78	5,407,534	31OCT78	20.56	111,179
10	03NOV78	4,208,579	07NOV78	10.99	46,252
11	10NOV78	3,782,128	14NOV78	7.71	29,160
12	17NOV78	4,428,795	21NOV78	8.71	38,575
13	24NOV78	4,918,164	28NOV78	2.67	13,131
14	01DEC78	5,211,786	05DEC78	9.62	50,137
15	08DEC78	5,407,534	12DEC78	4.23	22,874
16	15DEC78	5,407,534	18DEC78	1.98	10,707
17	22DEC78	5,407,534	27DEC78	2.18	11,788
18	29DEC78	5,407,534	03JAN79	1.04	5,624
19	05JAN79	5,407,534	09JAN79	0.00	0
20	12JAN79	3,862,524	16JAN79	0.00	0
21	19JAN79	2,703,767	23JAN79	0.00	0
22	26JAN79	2,703,767	30JAN79	0.00	0
23	02FEB79	2,703,767	06FEB79	0.00	0
24	09FEB79	2,703,767	13FEB79	0.00	0
25	16FEB79	2,703,767	20FEB79	0.00	0
26	23FEB79	2,703,767	27FEB79	0.00	0
27	02MAR79	1,607,929	06MAR79	0.00	0
28	09MAR79	2,018,650	13MAR79	0.00	0
29	16MAR79	2,018,650	20MAR79	24.54	49,538
30	23MAR79	2,018,650	27MAR79	395.81	799,002
31	30MAR79	2,018,650	03APR79	264.36	533,650
32	06APR79	2,018,650	10APR79	174.75	352,759
33	13APR79	2,638,401	18APR79	92.73	244,654
34	20APR79	2,703,767	24APR79	21.00	56,779
35	27APR79	2,963,133	01MAY79	52.57	156,068
36	04MAY79	3,843,299	08MAY79	60.16	231,213
37	11MAY79	4,666,489	15MAY79	10.32	48,158
38	18MAY79	5,211,786	22MAY79	7.64	39,918
39	25MAY79	4,082,042	29MAY79	36.47	148,872
40	01JUN79	2,671,259	05JUN79	9.16	24,469
41	08JUN79	4,449,069	12JUN79	49.31	219,384
42	15JUN79	5,811,264	19JUN79	98.78	574,037
43	22JUN79	5,772,814	26JUN79	94.95	548,186
44	29JUN79	5,110,417	03JUL79	26.25	134,148
45	06JUL79	5,348,111	10JUL79	144.09	770,609
46	13JUL79	5,561,336	17JUL79	81.56	453,583
47	20JUL79	5,811,264	24JUL79	250.35	1,454,950
48	27JUL79	5,598,039	31JUL79	361.81	2,025,426
49	03AUG79	5,479,192	07AUG79	286.31	1,568,747
50	10AUG79	5,772,814	14AUG79	666.93	3,850,063
51	17AUG79	5,811,264	21AUG79	529.58	3,077,524
52	24AUG79	5,872,435	28AUG79	191.13	1,122,399

TABLE -.? (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
53	01SEP79	3,199,254	04SEP79	372.67	1,192,266
54	08SEP79	2,202,163	11SEP79	837.34	1,844,[illegible]
55	15SEP79	4,905,930	18SEP79	220.34	1,080,973
56	22SEP79	4,905,930	25SEP79	410.55	2,014,130
57	29SEP79	5,799,030	02OCT79	109.77	636,560
58	06OCT79	5,799,030	09OCT79	115.92	672,224
59	13OCT79	5,860,201	15OCT79	43.85	256,970
60	20OCT79	5,083,327	23OCT79	240.50	1,222,540
61	27OCT79	5,456,471	30OCT79	181.09	988,112
62	03NOV79	4,801,939	06NOV79	277.31	1,331,626
63	10NOV79	5,250,936	13NOV79	73.19	384,316
64	17NOV79	4,891,249	20NOV79	48.11	235,318
65	24NOV79	3,749,795	27NOV79	58.94	221,013
66	01DEC79	4,877,791	04DEC79	45.50	221,939
67	08DEC79	4,766,460	11DEC79	23.10	110,105
68	15DEC79	4,235,494	18DEC79	20.00	84,710
69	22DEC79	4,881,462	25DEC79	33.81	165,042
70	29DEC79	4,104,588	02JAN80	10.14	41,621
71	05JAN80	4,624,543	08JAN80	43.33	200,381
72	12JAN80	5,162,949	15JAN80	11.01	56,843
73	19JAN80	4,808,056	22JAN80	42.42	203,958
74	26JAN80	5,658,336	29JAN80	5.80	32,918
75	02FEB80	5,554,345	05FEB80	0.00	0
76	09FEB80	5,438,120	12FEB80	0.00	0
77	16FEB80	5,737,859	19FEB80	0.00	0
78	23FEB80	5,658,336	26FEB80	1.02	5,772
79	02MAR80	2,589,989	04MAR80	0.00	0
80	09MAR80	2,703,767	11MAR80	0.00	0
81	16MAR80	2,476,210	18MAR80	0.00	0
82	23MAR80	2,338,837	24MAR80	0.00	0
83	30MAR80	2,221,388	01APR80	18.33	40,718
84	06APR80	2,217,893	08APR80	52.82	117,149
85	13APR80	2,462,578	16APR80	198.23	488,157
86	20APR80	2,716,001	22APR80	101.26	275,022
87	27APR80	3,100,506	29APR80	62.05	192,386
88	04MAY80	2,862,812	05MAY80	35.65	102,059
89	11MAY80	2,359,461	13MAY80	63.73	150,368
90	18MAY80	1,761,731	20MAY80	62.16	109,509
91	25MAY80	924,559	27MAY80	21.97	20,313
92	01JUN80	795,226	03JUN80	9.64	7,666
93	08JUN80	1,293,334	10JUN80	50.98	65,934
94	15JUN80	2,027,388	17JUN80	104.48	211,821
95	22JUN80	1,459,370	24JUN80	89.15	130,103
96	29JUN80	1,240,901	01JUL80	126.59	157,086
97	06JUL80	1,284,595	08JUL80	300.99	386,650
98	13JUL80	2,202,163	15JUL80	165.20	363,797
99	20JUL80	2,848,830	22JUL80	165.68	471,994
100	27JUL80	2,674,045	29JUL80	364.08	973,570
101	03AUG80	2,307,028	05AUG80	469.64	1,083,473
102	10AUG80	2,079,821	12AUG80	1,259.39	2,619,306
103	17AUG80	2,392,568	19AUG80	1,149.62	2,750,659
104	24AUG80	4,509,947	26AUG80	1,484.08	6,692,974

TABLE 6.9 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
105	01SEP80	4,544,146	02SEP80	402.60	1,829,473
106	08SEP80	4,666,469	09SEP80	659.70	3,078,483
107	15SEP80	4,631,534	16SEP80	1,466.21	6,790,801
108	22SEP80	4,456,759	23SEP80	227.38	1,013,378
109	29SEP80	4,876,219	30SEP80	664.79	3,241,662
110	06OCT80	4,926,903	07OCT80	259.37	1,277,891
111	13OCT80	4,114,200	14OCT80	133.14	547,765
112	20OCT80	5,002,056	21OCT80	102.42	512,311
113	27OCT80	4,924,282	28OCT80	33.37	164,323
114	03NOV80	5,407,534	04NOV80	12.26	66,296
115	10NOV80	5,407,534	11NOV80	3.53	19,089
116	17NOV80	5,270,511	18NOV80	1.04	5,481
117	24NOV80	5,407,534	25NOV80	13.58	73,434
118	01DEC80	5,407,534	02DEC80	2.46	13,303
119	08DEC80	2,703,767	09DEC80	0.00	0
120	15DEC80	4,629,436	16DEC80	2.47	11,435
121	22DEC80	4,722,417	23DEC80	1.37	6,470
122	29DEC80	2,429,720	30DEC80	0.00	0
123	05JAN81	5,407,534	06JAN81	0.00	0
124	12JAN81	5,407,534	13JAN81	0.00	0
125	19JAN81	5,407,534	20JAN81	0.00	0
126	26JAN81	5,407,534	27JAN81	0.00	0
127	02FEB81	5,509,467	03FEB81	0.00	0
128	09FEB81	5,407,534	10FEB81	0.00	0
129	16FEB81	2,703,767	17FEB81	0.00	0
130	23FEB81	5,407,534	24FEB81	0.00	0
131	02MAR81	5,407,534	03MAR81	20.60	111,395
132	09MAR81	2,703,767	10MAR81	132.69	358,763
133	16MAR81	3,107,497	17MAR81	168.60	523,924
134	23MAR81	2,703,767	24MAR81	231.91	627,031
135	30MAR81	2,703,767	31MAR81	63.53	171,770
136	06APR81	3,107,497	07APR81	73.79	229,302
137	13APR81	2,703,767	14APR81	8.33	22,522
138	20APR81	2,018,650	21APR81	56.62	114,296
139	27APR81	2,703,767	28APR81	16.10	43,531
140	04MAY81	2,703,767	05MAY81	21.40	57,861
141	11MAY81	2,018,650	12MAY81	70.90	143,122
142	18MAY81	2,018,650	19MAY81	48.21	97,319
143	25MAY81	2,018,650	26MAY81	167.51	338,144
144	01JUN81	2,018,650	03JUN81	231.97	468,266
145	08JUN81	2,018,650	09JUN81	51.82	104,606
146	15JUN81	2,703,767	16JUN81	10.18	27,524
147	22JUN81	2,018,650	23JUN81	80.31	162,118
148	29JUN81	3,792,614	30JUN81	52.22	198,050
149	06JUL81	4,722,417	07JUL81	399.67	1,887,408
150	13JUL81	4,722,417	14JUL81	94.59	446,693
151	20JUL81	4,722,417	21JUL81	216.09	1,020,467
152	27JUL81	4,722,417	28JUL81	550.77	2,600,966
153	03AUG81	2,975,979	04AUG81	889.21	2,646,270
154	10AUG81	2,703,767	11AUG81	351.00	949,022
155	17AUG81	2,703,767	18AUG81	419.73	1,134,852
156	24AUG81	2,703,767	25AUG81	189.57	512,553

TABLE 6.10 ENTRAINMENT RATES (PER DAY) FOR ANCHOVIES
SEPTEMBER 1978 TO AUGUST 1981.

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
1	01SEP78	5,580,561	06SEP78	172.12	960,[illegible]26
2	08SEP78	4,080,993	12SEP78	165.69	676,180
3	15SEP78	2,819,118	19SEP78	113.15	318,983
4	22SEP78	3,857,281	26SEP78	231.74	893,886
5	29SEP78	4,981,083	03OCT78	15.33	76,360
6	06OCT78	5,407,534	10OCT78	35.14	190,021
7	13OCT78	5,407,534	17OCT78	33.53	181,315
8	20OCT78	5,407,534	24OCT78	23.42	126,644
9	27OCT78	5,407,534	31OCT78	6.4[illegible]	34,087
10	03NOV78	4,208,579	07NOV78	1.02	4,293
11	10NOV78	3,782,128	14NOV78	2.42	9,153
12	17NOV78	4,428,795	21NOV78	0.00	0
13	24NOV78	4,918,164	28NOV78	2.86	14,066
14	01DEC78	5,211,786	05DEC78	3.32	17,303
15	08DEC78	5,407,534	12DEC78	16.93	91,550
16	15DEC78	5,407,534	18DEC78	3.00	16,223
17	22DEC78	5,407,534	27DEC78	2.14	11,572
18	29DEC78	5,407,534	03JAN79	4.18	22,603
19	05JAN79	5,407,534	09JAN79	2.39	12,924
20	12JAN79	3,862,524	16JAN79	3.16	12,206
21	19JAN79	2,703,767	23JAN79	6.85	18,521
22	26JAN79	2,703,767	30JAN79	2.38	6,435
23	02FEB79	2,703,767	06FEB79	5.54	14,979
24	09FEB79	2,703,767	13FEB79	6.60	17,845
25	16FEB79	2,703,767	20FEB79	2.31	6,246
26	23FEB79	2,703,767	27FEB79	2.21	5,975
27	02MAR79	1,607,929	06MAR79	0.00	0
28	09MAR79	2,018,650	13MAR79	1.34	2,705
29	16MAR79	2,018,650	20MAR79	2.93	5,915
30	23MAR79	2,018,650	27MAR79	3.68	7,429
31	30MAR79	2,018,650	03APR79	0.00	0
32	06APR79	2,018,650	10APR79	0.00	0
33	13APR79	2,638,401	18APR79	1.89	4,987
34	20APR79	2,703,767	24APR79	3.62	9,788
35	27APR79	2,963,133	01MAY79	69.29	205,315
36	04MAY79	3,843,299	08MAY79	132.68	509,929
37	11MAY79	4,666,489	15MAY79	381.53	1,780,406
38	18MAY79	5,211,786	22MAY79	127.21	662,991
39	25MAY79	4,082,042	29MAY79	220.10	898,457
40	01JUN79	2,671,259	05JUN79	933.83	2,494,502
41	08JUN79	4,449,069	12JUN79	1,640.78	7,299,943
42	15JUN79	5,811,264	19JUN79	1,687.14	9,804,416
43	22JUN79	5,772,814	26JUN79	2,468.44	14,249,845
44	29JUN79	5,110,417	03JUL79	2,825.15	14,437,695
45	06JUL79	5,348,111	10JUL79	828.35	4,430,108
46	13JUL79	5,561,336	17JUL79	1,232.20	6,852,678
47	20JUL79	5,811,264	24JUL79	626.59	3,641,280
48	27JUL79	5,598,039	31JUL79	2,174.86	12,174,951
49	03AUG79	5,479,192	07AUG79	905.03	4,958,833
50	10AUG79	5,772,814	14AUG79	771.83	4,455,631
51	17AUG79	5,811,264	21AUG79	579.06	3,365,071
52	24AUG79	5,872,435	28AUG79	340.52	1,999,682

TABLE 6.10 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
53	01SEP79	3,199,254	04SEP79	177.89	569,115
54	08SEP79	2,202,163	11SEP79	73.02	160,802
55	15SEP79	4,905,930	18SEP79	62.64	307,307
56	22SEP79	4,905,930	25SEP79	107.82	528,957
57	29SE[illegible]	5,799,030	02OCT79	76.40	443,046
58	06O[illegible]9	5,799,030	09OCT79	62.50	362,439
59	13[illegible]79	5,860,201	15OCT79	333.85	1,956,428
60	20OCT79	5,083,327	23OCT79	75.30	382,775
61	27OCT79	5,456,471	30OCT79	145.05	791,461
62	03NOV79	4,801,939	06NOV79	37.08	178,056
63	10NOV79	5,250,936	13NOV79	38.18	200,481
64	17NOV79	4,891,249	20NOV79	35.21	172,221
65	24NOV79	3,749,795	27NOV79	29.47	110,506
66	01DEC79	4,877,791	04DEC79	69.67	339,836
67	08DEC79	4,766,460	11DEC79	9.20	43,851
68	15DEC79	4,235,494	18DEC79	26.95	114,147
69	22DEC79	4,881,462	25DEC79	17.46	85,230
70	29DEC79	4,104,588	02JAN80	5.27	21,631
71	05JAN80	4,624,543	08JAN80	19.17	88,652
72	12JAN80	5,162,849	15JAN80	11.59	59,837
73	19JAN80	4,808,056	22JAN80	2.00	9,616
74	26JAN80	5,658,336	29JAN80	10.36	58,620
75	02FEB80	5,554,345	05FEB80	18.79	104,366
76	09FEB80	5,438,120	12FEB80	4.45	24,200
77	16FEB80	5,737,859	19FEB80	8.19	46,993
78	23FEB80	5,658,336	26FEB80	11.63	65,806
79	02MAR80	2,589,989	04MAR80	9.28	24,035
80	09MAR80	2,703,767	11MAR80	4.68	12,654
81	16MAR80	2,476,210	18MAR80	8.99	22,261
82	23MAR80	2,338,837	24MAR80	7.44	17,401
83	30MAR80	2,221,388	01APR80	2.11	4,687
84	06APR80	2,217,893	08APR80	3.08	6,831
85	13APR80	2,452,578	16APR80	10.00	24,526
86	20APR80	2,716,001	22APR80	3.08	8,365
87	27APR80	3,100,506	29APR80	23.67	73,389
88	04MAY80	2,862,812	05MAY80	470.86	1,347,984
89	11MAY80	2,359,461	13MAY80	1,442.89	3,404,443
90	18MAY80	1,761,731	20MAY80	2,028.56	3,573,777
91	25MAY80	924,559	27MAY80	3,569.51	3,300,223
92	01JUN80	795,226	03JUN80	2,101.16	1,670,897
93	08JUN80	1,293,334	10JUN80	1,408.41	1,821,545
94	15JUN80	2,027,388	17JUN80	1,067.74	2,164,723
95	22JUN80	1,459,370	24JUN80	249.35	363,894
96	29JUN80	1,240,901	01JUL80	302.16	374,951
97	06JUL80	1,284,595	08JUL80	731.66	939,887
98	13JUL80	2,202,163	15JUL80	429.49	945,807
99	20JUL80	2,848,830	22JUL80	1,509.12	4,299,226
100	27JUL80	2,674,055	29JUL80	297.47	795,451
101	03AUG80	2,307,028	05AUG80	320.87	740,256
102	10AUG80	2,079,821	12AUG80	363.90	756,847
103	17AUG80	2,392,668	19AUG80	188.43	450,850
104	24AUG80	4,509,847	26AUG80	312.61	1,409,823

TABLE 6.10 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
105	01SEP80	4,544,146	02SEP80	275.45	1,251,685
106	08SEP80	4,666,489	09SEP80	136.59	637,396
107	15SEP80	4,631,534	16SEP80	18.47	85,544
108	22SEP80	4,456,759	23SEP80	72.81	324,497
109	29SEP80	4,876,219	30SEP80	151.40	738,260
110	06OCT80	4,926,903	07OCT80	142.88	703,956
111	13OCT80	4,114,200	14OCT80	77.59	319,221
112	20OCT80	5,002,056	21OCT80	18.36	91,838
113	27OCT80	4,924,282	28OCT80	28.64	141,031
114	03NOV80	5,407,534	04NOV80	45.88	248,098
115	10NOV80	5,407,534	11NOV80	13.19	71,325
116	17NOV80	5,270,511	18NOV80	11.10	58,503
117	24NOV80	5,407,534	25NOV80	19.11	103,338
118	01DEC80	5,407,534	02DEC80	25.47	137,730
119	08DEC80	2,703,767	09DEC80	37.40	101,121
120	15DEC80	4,629,436	16DEC80	34.69	160,595
121	22DEC80	4,722,417	23DEC80	58.20	274,845
122	29DEC80	2,429,720	30DEC80	177.18	430,498
123	05JAN81	5,407,534	06JAN81	147.35	796,800
124	12JAN81	5,407,534	13JAN81	67.48	364,900
125	19JAN81	5,407,534	20JAN81	10.72	57,969
126	26JAN81	5,407,534	27JAN81	3.01	16,277
127	02FEB81	5,508,467	03FEB81	101.28	557,898
128	09FEB81	5,407,534	10FEB81	8.48	45,856
129	16FEB81	2,703,767	17FEB81	6.27	16,953
130	23FEB81	5,407,534	24FEB81	0.00	0
131	02MAR81	5,407,534	03MAR81	9.78	52,886
132	09MAR81	2,703,767	10MAR81	6.04	16,331
133	16MAR81	3,107,497	17MAR81	0.00	0
134	23MAR81	2,703,767	24MAR81	0.00	0
135	30MAR81	2,703,767	31MAR81	7.10	19,197
136	06APR81	3,107,497	07APR81	2.10	6,526
137	13APR81	2,703,767	14APR81	4.63	12,518
138	20APR81	2,018,650	21APR81	14.35	28,968
139	27APR81	2,703,767	28APR81	209.57	566,624
140	04MAY81	2,703,767	05MAY81	600.93	1,624,775
141	11MAY81	2,018,650	12MAY81	491.32	991,803
142	18MAY81	2,018,650	19MAY81	785.65	1,585,952
143	25MAY81	2,018,650	26MAY81	1,173.58	2,369,047
144	01JUN81	2,018,650	03JUN81	3,013.01	6,082,213
145	08JUN81	2,018,650	09JUN81	5,982.39	12,076,352
146	15JUN81	2,703,767	16JUN81	7,882.06	21,311,254
147	22JUN81	2,018,650	23JUN81	1,188.89	2,399,953
148	29JUN81	3,792,614	30JUN81	5,186.47	19,670,279
149	06JUL81	4,722,417	07JUL81	1,196.72	5,651,411
150	13JUL81	4,722,417	14JUL81	1,897.79	8,962,156
151	20JUL81	4,722,417	21JUL81	760.87	3,593,145
152	27JUL81	4,722,417	28JUL81	240.48	1,135,647
153	03AUG81	2,975,979	04AUG81	317.19	943,951
154	10AUG81	2,703,767	11AUG81	241.79	653,744
155	17AUG81	2,703,767	18AUG81	726.19	1,963,449
156	24AUG81	2,703,767	25AUG81	270.22	730,612

TABLE 6.11 ENTRAINMENT RATES (PER DAY) FOR SEATROUT SEPTEMBER 1978 TO AUGUST 1981.

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
1	01SEP78	5,580,561	06SEP78	14.64	81,699
2	08SEP78	4,080,993	12SEP78	7.06	28,812
3	15SEP78	2,819,118	19SEP78	0.82	2,312
4	22SEP78	3,857,281	26SEP78	0.00	0
5	29SEP78	4,981,083	03OCT78	0.00	0
6	06OCT78	5,407,534	10OCT78	0.00	0
7	13OCT78	5,407,534	17OCT78	0.00	0
8	20OCT78	5,407,534	24OCT78	0.00	0
9	27OCT78	5,407,534	31OCT78	0.00	0
10	03NOV78	4,208,579	07NOV78	0.00	0
11	10NOV78	3,782,128	14NOV78	0.00	0
12	17NOV78	4,428,795	21NOV78	0.00	0
13	24NOV78	4,918,164	28NOV78	0.00	0
14	01DEC78	5,211,786	05DEC78	0.00	0
15	08DEC78	5,407,534	12DEC78	0.00	0
16	15DEC78	5,407,534	18DEC78	0.00	0
17	22DEC78	5,407,534	27DEC78	0.00	0
18	29DEC78	5,407,534	03JAN79	0.00	0
19	05JAN79	5,407,534	09JAN79	0.00	0
20	12JAN79	3,862,524	16JAN79	0.00	0
21	19JAN79	2,703,767	23JAN79	0.00	0
22	26JAN79	2,703,767	30JAN79	0.00	0
23	02FEB79	2,703,767	06FEB79	0.00	0
24	09FEB79	2,703,767	13FEB79	0.00	0
25	16FEB79	2,703,767	20FEB79	0.00	0
26	23FEB79	2,703,767	27FEB79	0.00	0
27	02MAR79	1,607,929	06MAR79	0.00	0
28	09MAR79	2,018,650	13MAR79	0.00	0
29	16MAR79	2,018,650	20MAR79	0.00	0
30	23MAR79	2,018,650	27MAR79	0.00	0
31	30MAR79	2,018,650	03APR79	0.00	0
32	06APR79	2,018,650	10APR79	0.00	0
33	13APR79	2,638,401	18APR79	0.00	0
34	20APR79	2,703,767	24APR79	0.00	0
35	27APR79	2,963,133	01MAY79	0.00	0
36	04MAY79	3,843,299	08MAY79	1.85	7,110
37	11MAY79	4,666,489	15MAY79	6.28	29,306
38	18MAY79	5,211,786	22MAY79	16.37	85,317
39	25MAY79	4,082,042	29MAY79	3.57	14,573
40	01JUN79	2,671,259	05JUN79	26.38	70,468
41	08JUN79	4,449,069	12JUN79	21.93	97,568
42	15JUN79	5,811,264	19JUN79	59.67	346,758
43	22JUN79	5,772,914	26JUN79	57.88	334,130
44	29JUN79	5,110,417	03JUL79	78.81	402,752
45	06JUL79	5,348,111	10JUL79	20.54	109,850
46	13JUL79	5,561,336	17JUL79	16.94	94,209
47	20JUL79	5,811,264	24JUL79	61.45	357,102
48	27JUL79	5,598,039	31JUL79	62.00	347,078
49	03AUG79	5,479,192	07AUG79	8.22	45,039
50	10AUG79	5,772,914	14AUG79	41.80	241,304
51	17AUG79	5,811,264	21AUG79	19.75	114,772
52	24AUG79	5,872,435	28AUG79	7.64	44,865

TABLE 6.11 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
53	01SEP79	3,199,254	04SEP79	4.67	14,941
54	08SEP79	2,202,163	11SEP79	16.22	35,719
55	15SEP79	4,905,930	18SEP79	2.84	13,933
56	22SEP79	4,905,930	25SEP79	4.94	24,235
57	29SEP79	5,799,030	02OCT79	0.91	5,277
58	06OCT79	5,799,030	09OCT79	0.91	5,277
59	13OCT79	5,860,201	15OCT79	0.74	4,337
60	20OCT79	5,083,327	23OCT79	0.00	0
61	27OCT79	5,456,471	30OCT79	0.00	0
62	03NOV79	4,801,939	06NOV79	0.00	0
63	10NOV79	5,250,936	13NOV79	0.00	0
64	17NOV79	4,891,249	20NOV79	0.00	0
65	24NOV79	3,749,795	27NOV79	0.00	0
66	01DEC79	4,877,791	04DEC79	0.00	0
67	08DEC79	4,766,460	11DEC79	0.00	0
68	15DEC79	4,235,494	18DEC79	0.00	0
69	22DEC79	4,881,462	25DEC79	0.00	0
70	29DEC79	4,104,588	02JAN80	0.00	0
71	05JAN80	4,624,543	08JAN80	0.00	0
72	12JAN80	5,162,849	15JAN80	0.00	0
73	19JAN80	4,809,056	22JAN80	0.00	0
74	26JAN80	5,658,336	29JAN80	0.00	0
75	02FEB80	5,554,345	05FEB80	0.00	0
76	09FEB80	5,438,120	12FEB80	0.00	0
77	16FEB80	5,737,859	19FEB80	0.00	0
78	23FEB80	5,658,336	26FEB80	0.00	0
79	02MAR80	2,589,989	04MAR80	0.00	0
80	09MAR80	2,703,767	11MAR80	0.00	0
81	16MAR80	2,476,210	18MAR80	0.00	0
82	23MAR80	2,338,837	24MAR80	0.00	0
83	30MAR80	2,221,388	01APR80	0.00	0
84	06APR80	2,217,893	08APR80	0.00	0
85	13APR80	2,462,578	16APR80	0.00	0
86	20APR80	2,716,001	22APR80	0.00	0
87	27APR80	3,100,506	29APR80	0.00	0
88	04MAY80	2,862,812	05MAY80	0.00	0
89	11MAY80	2,359,461	13MAY80	11.05	26,072
90	18MAY80	1,761,731	20MAY80	5.55	9,778
91	25MAY80	924,559	27MAY80	63.61	58,811
92	01JUN80	795,226	03JUN80	14.82	11,785
93	08JUN80	1,293,334	10JUN80	26.57	34,364
94	15JUN80	2,027,388	17JUN80	16.27	32,986
95	22JUN80	1,459,370	24JUN80	1.46	2,131
96	29JUN80	1,240,901	01JUL80	0.00	0
97	06JUL80	1,284,595	08JUL80	28.46	36,560
98	13JUL80	2,202,163	15JUL80	24.42	53,777
99	20JUL80	2,848,830	22JUL80	14.13	40,254
100	27JUL80	2,674,055	29JUL80	22.37	59,819
101	03AUG80	2,307,028	05AUG80	12.74	29,392
102	10AUG80	2,079,821	12AUG80	40.09	83,380
103	17AUG80	2,392,568	19AUG80	11.22	26,845
104	24AUG80	4,509,847	26AUG80	7.10	32,020

TABLE 6.11 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
105	01SEP80	4,544,146	02SEP80	0.00	0
106	08SEP80	4,666,489	09SEP80	0.00	0
107	15SEP80	4,531,534	16SEP80	2.37	10,977
108	22SEP80	4,456,759	23SEP80	4.13	18,406
109	29SEP80	4,876,219	30SEP80	3.30	16,092
110	06OCT80	4,926,903	07OCT80	0.00	0
111	13OCT80	4,114,200	14OCT80	0.00	0
112	20OCT80	5,002,056	21OCT80	0.00	0
113	27OCT80	4,924,282	28OCT80	0.00	0
114	03NOV80	5,407,534	04NOV80	0.00	0
115	10NOV80	5,407,534	11NOV80	0.00	0
116	17NOV80	5,270,511	18NOV80	0.00	0
117	24NOV80	5,407,534	25NOV80	0.00	0
118	01DEC80	5,407,534	02DEC80	0.00	0
119	08DEC80	2,703,767	09DEC80	0.00	0
120	15DEC80	4,629,436	16DEC80	0.00	0
121	22DEC80	4,722,417	23DEC80	0.00	0
122	29DEC80	2,429,720	30DEC80	0.00	0
123	05JAN81	5,407,534	06JAN81	0.00	0
124	12JAN81	5,407,534	13JAN81	0.00	0
125	19JAN81	5,407,534	20JAN81	0.00	0
126	26JAN81	5,407,534	27JAN81	0.00	0
127	02FEB81	5,508,467	03FEB81	0.00	0
128	09FEB81	5,407,534	10FEB81	0.00	0
129	16FEB81	2,703,767	17FEB81	0.00	0
130	23FEB81	5,407,534	24FEB81	0.00	0
131	02MAR81	5,407,534	03MAR81	0.00	0
132	09MAR81	2,703,767	10MAR81	0.00	0
133	16MAR81	3,107,497	17MAR81	0.00	0
134	23MAR81	2,703,767	24MAR81	0.00	0
135	30MAR81	2,703,767	31MAR81	0.00	0
136	06APR81	3,107,497	07APR81	0.00	0
137	13APR81	2,703,767	14APR81	0.00	0
138	20APR81	2,018,650	21APR81	0.00	0
139	27APR81	2,703,767	28APR81	0.00	0
140	04MAY81	2,703,767	05MAY81	6.34	17,142
141	11MAY81	2,018,650	12MAY81	10.42	21,034
142	18MAY81	2,018,650	19MAY81	12.87	25,980
143	25MAY81	2,018,650	26MAY81	24.38	49,215
144	01JUN81	2,018,650	03JUN81	28.88	58,299
145	08JUN81	2,018,650	09JUN81	71.50	144,333
146	15JUN81	2,703,767	16JUN81	79.52	215,004
147	22JUN81	2,018,650	23JUN81	10.89	21,983
148	29JUN81	3,792,614	30JUN81	25.73	97,584
149	06JUL81	4,722,417	07JUL81	12.72	60,069
150	13JUL81	4,722,417	14JUL81	10.46	49,396
151	20JUL81	4,722,417	21JUL81	15.35	72,489
152	27JUL81	4,722,417	28JUL81	5.22	24,651
153	03AUG81	2,975,979	04AUG81	18.26	54,741
154	10AUG81	2,703,767	11AUG81	10.02	27,092
155	17AUG81	2,703,767	18AUG81	6.31	17,061
156	24AUG81	2,703,767	25AUG81	5.91	15,979

TABLE 6.12 ENTRAINMENT RATES (PER DAY) FOR GOBIONELL[illegible]S
SEPTEMBER 1978 TO AUGUST [illegible]1.

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
1	01SEP78	5,580,561	06SEP78	0.00	0
2	08SEP78	4,080,993	12SEP78	0.00	0
3	15SEP78	2,819,118	19SEP78	1.98	5,582
4	22SEP78	3,857,281	26SEP78	1[illegible].49	59,749
5	29SEP78	4,981,083	03OCT78	1.01	5,031
6	06OCT78	5,4[illegible]7,534	10OCT78	6.59	35,636
7	13OCT78	5,407,534	17OCT78	39.02	[illegible]1,002
8	20OCT78	5,407,534	24OCT78	38.88	[illegible]0,245
9	27OCT78	5,407,534	31OCT78	55.11	298,009
10	03NOV78	4,208,579	07NOV78	11.79	49,619
11	10NOV78	3,782,128	14NOV78	20.22	76,475
12	17NOV78	4,428,795	21NOV78	26.52	117,452
13	24NOV78	4,918,164	28NOV78	15.36	75,543
14	01DEC78	5,211,786	05DEC78	27.30	142,282
15	08DEC78	5,407,534	12DEC78	34.52	186,668
16	15DEC78	5,407,534	18DEC78	7.53	40,719
17	22DEC78	5,407,534	27DEC78	9.76	52,778
18	29DEC78	5,407,534	03JAN79	3.32	17,953
19	05JAN79	5,407,534	09JAN79	1.14	6,165
20	12JAN79	3,862,524	16JAN79	4.33	16,725
21	19JAN79	2,703,767	23JAN79	4.52	12,221
22	26JAN79	2,703,767	30JAN79	0.00	0
23	02FEB79	2,703,767	06FEB79	0.00	0
24	09FEB79	2,703,767	13FEB79	0.00	0
25	16FEB79	2,703,767	20FEB79	0.00	0
26	23FEB79	2,703,767	27FEB79	1.10	2,974
27	02MAR79	1,607,929	06MAR79	2.54	4,084
28	09MAR79	2,018,650	13MAR79	13.77	27,797
29	16MAR79	2,018,650	20MAR79	13.97	28,201
30	23MAR79	2,018,650	27MAR79	13.36	26,969
31	30MAR79	2,018,650	03APR79	6.89	13,908
32	06APR79	2,018,650	10APR79	10.41	21,014
33	13APR79	2,638,401	18APR79	14.82	39,101
34	20APR79	2,703,767	24APR79	2.87	7,760
35	27APR79	2,963,133	01MAY79	5.52	16,356
36	04MAY79	3,843,299	08MAY79	0.81	3,113
37	11MAY79	4,666,489	15MAY79	0.89	4,153
38	18MAY79	5,211,786	22MAY79	2.08	10,841
39	25MAY79	4,082,042	29MAY79	1.76	7,184
40	01JUN79	2,671,259	05JUN79	0.98	2,618
41	08JUN79	4,449,069	12JUN79	2.37	10,544
42	15JUN79	5,811,264	19JUN79	7.39	42,945
43	22JUN79	5,772,814	26JUN79	1.76	10,160
44	29JUN79	5,110,417	03JUL79	0.00	0
45	06JUL79	5,348,111	10JUL79	0.00	0
46	13JUL79	5,561,336	17JUL79	0.00	0
47	20JUL79	5,811,264	24JUL79	2.31	13,424
48	27JUL79	5,598,039	31JUL79	0.84	4,702
49	03AUG79	5,479,192	07AUG79	0.87	4,767
50	10AUG79	5,772,814	14AUG79	2.06	11,892
51	17AUG79	5,811,264	21AUG79	0.00	0
52	24AUG79	5,872,435	28AUG79	0.85	4,992

TABLE 6.12 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
53	01SEP79	3,199,294	04SEP79	0.00	0
54	08SEP79	2,202,163	11SEP79	0.98	2,158
55	15SEP79	4,905,930	18SEP79	8.34	40,915
56	22SEP79	4,905,930	25SEP79	11.63	57,056
57	29SEP79	5,799,030	02OCT79	2.73	15,831
58	06OCT79	5,799,030	09OCT79	26.27	152,341
59	13OCT79	5,860,201	15OCT79	9.88	57,899
60	20OCT79	5,083,327	23OCT79	14.70	74,725
61	27OCT79	5,455,471	30OCT79	11.74	64,059
62	03NOV79	4,801,939	06NOV79	18.90	90,757
63	10NOV79	5,250,936	13NOV79	16.72	87,796
64	17NOV79	4,891,249	20NOV79	21.25	103,939
65	24NOV79	3,749,795	27NOV79	2.46	9,224
66	01DEC79	4,877,791	04DEC79	6.58	32,096
67	08DEC79	4,765,460	11DEC79	2.17	10,343
68	15DEC79	4,235,494	18DEC79	9.72	41,169
69	22DEC79	4,881,462	25DEC79	7.00	34,170
70	29DEC79	4,104,589	02JAN80	4.88	20,030
71	05JAN80	4,624,543	08JAN80	2.21	10,220
72	12JAN80	5,162,849	15JAN80	4.21	21,736
73	19JAN80	4,808,056	22JAN80	5.28	25,387
74	26JAN80	5,658,336	29JAN80	1.88	10,638
75	02FEB80	5,554,345	05FEB80	1.89	10,498
76	09FEB80	5,438,120	12FEB80	0.79	4,296
77	16FEB80	5,737,859	19FEB80	0.00	0
78	23FEB80	5,658,336	26FEB80	0.00	0
79	02MAR80	2,589,989	04MAR80	1.11	2,875
80	09MAR80	2,703,767	11MAR80	1.01	2,731
81	16MAR80	2,476,210	18MAR80	0.99	2,451
82	23MAR80	2,338,837	24MAR80	6.25	14,618
83	30MAR80	2,221,388	01APR80	21.80	48,426
84	06APR80	2,217,893	08APR80	7.03	15,592
85	13APR80	2,462,578	16APR80	11.77	28,985
86	20APR80	2,716,001	22APR80	6.06	16,459
87	27APR80	3,100,506	29APR80	6.71	20,804
88	04MAY80	2,862,812	05MAY80	8.38	23,990
89	11MAY80	2,359,461	13MAY80	7.47	17,625
90	18MAY80	1,761,731	20MAY80	19.88	35,023
91	25MAY80	924,559	27MAY80	10.88	10,059
92	01JUN80	795,226	03JUN80	3.82	3,038
93	08JUN80	1,293,334	10JUN80	19.52	25,246
94	15JUN80	2,027,388	17JUN80	95.02	192,642
95	22JUN80	1,459,370	24JUN80	1.41	2,058
96	29JUN80	1,240,901	01JUL80	12.71	15,772
97	06JUL80	1,284,595	08JUL80	14.74	18,935
98	13JUL80	2,202,163	15JUL80	3.21	7,069
99	20JUL80	2,848,830	22JUL80	0.00	0
100	27JUL80	2,674,055	29JUL80	6.65	17,782
101	03AUG80	2,307,028	05AUG80	2.68	6,183
102	10AUG80	2,079,821	12AUG80	1.04	2,163
103	17AUG80	2,392,668	19AUG80	7.75	18,543
104	24AUG80	4,509,847	26AUG80	10.76	48,526

TABLE 6.12 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
105	01SEP80	4,544,146	02SEP80	2.91	13,223
106	08SEP80	4,666,489	09SEP80	3.46	16,146
107	15SEP80	4,631,534	16SEP80	22.82	105,692
108	22SEP80	4,456,759	23SEP80	14.70	65,514
109	29SEP80	4,876,219	30SEP80	50.41	245,810
110	06OCT80	4,926,903	07OCT80	20.12	99,129
111	13OCT80	4,114,200	14OCT80	17.80	73,233
112	20OCT80	5,032,056	21OCT80	2.07	10,[illegible]54
113	27OCT80	4,924,282	28OCT80	3.49	17,[illegible]
114	03NOV80	5,407,534	04NOV80	8.39	45,369
115	10NOV80	5,407,534	11NOV80	5.77	31,201
116	17NOV80	5,270,811	18NOV80	0.00	0
117	24NOV80	5,407,534	25NOV80	19.87	107,448
118	01DEC80	5,407,534	02DEC80	6.35	34,338
119	08DEC80	2,703,767	09DEC80	7.91	21,387
120	15DEC80	4,629,436	16DEC80	7.53	34,860
121	22DEC80	4,722,417	23DEC80	2.75	12,987
122	29DEC80	2,429,720	30DEC80	2.28	5,540
123	05JAN81	5,407,534	06JAN81	0.00	0
124	12JAN81	5,407,534	13JAN81	2.83	03
125	19JAN81	5,407,534	20JAN81	0.00	0
126	26JAN81	5,407,534	27JAN81	0.00	0
127	02FEB81	5,508,467	03FEB81	0.00	0
128	09FEB81	5,407,534	10FEB81	0.00	0
129	16FEB81	2,703,767	17FEB81	0.00	0
130	23FEB81	5,407,534	24FEB81	0.00	0
131	02MAR81	5,407,534	03MAR81	5.49	29,687
132	09MAR81	2,703,767	10MAR81	6.04	16,331
133	16MAR81	3,107,497	17MAR81	3.29	10,224
134	23MAR81	2,703,767	24MAR81	7.25	19,602
135	30MAR81	2,703,767	31MAR81	3.00	8,111
136	06APR81	3,107,497	07APR81	13.13	40,801
137	13APR81	2,703,767	14APR81	11.22	30,336
138	20APR81	2,018,650	21APR81	77.87	157,192
139	27APR81	2,703,767	28APR81	114.10	308,500
140	04MAY81	2,703,767	05MAY81	21.25	57,455
141	11MAY81	2,018,650	12MAY81	10.25	20,691
142	18MAY81	2,018,650	19MAY81	10.16	20,509
143	25MAY81	2,018,650	26MAY81	38.43	77,577
144	01JUN81	2,018,650	03JUN81	7.81	15,766
145	08JUN81	2,018,650	09JUN81	14.19	28,645
146	15JUN81	2,703,767	16JUN81	0.00	0
147	22JUN81	2,018,650	23JUN81	6.39	12, 99
148	29JUN81	3,792,614	30JUN81	4.64	17,598
149	06JUL81	4,722,417	07JUL81	47.63	224,929
150	13JUL81	4,722,417	14JUL81	4.12	19,456
151	20JUL81	4,722,417	21JUL81	10.36	48,924
152	27JUL81	4,722,417	28JUL81	5.26	24,840
153	03AUG81	2,975,979	04AUG81	0.00	0
154	10AUG81	2,703,767	11AUG81	0.00	0
155	17AUG81	2,703,767	18AUG81	0.00	0
156	24AUG81	2,703,767	25AUG81	0.00	0

TABLE 6.13 ENTRAINMENT RATES (PER DAY) FOR GOBIOSOMA
SEPTEMBER 1978 TO AUGUST 1981.

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
1	01SEP78	5,580,561	06SEP78	156.75	874,753
2	08SEP78	4,080,993	12SEP78	77.49	316,236
3	15SEP78	2,819,118	19SEP78	123.91	349,317
4	22SEP78	3,857,281	26SEP78	216.53	835,217
5	29SEP78	4,981,083	03OCT78	97.28	484,560
6	06OCT78	5,407,534	10OCT78	28.56	154,439
7	13OCT78	5,407,534	17OCT78	12.80	69,216
8	20OCT78	5,407,534	24OCT78	9.67	52,291
9	27OCT78	5,407,534	31OCT78	24.27	131,241
10	03NOV78	4,208,579	07NOV78	1.02	4,293
11	10NOV78	3,782,128	14NOV78	0.00	0
12	17NOV78	4,428,795	21NOV78	0.00	0
13	24NOV78	4,918,164	28NOV78	0.00	0
14	01DEC78	5,211,786	05DEC78	1.00	5,212
15	08DEC78	5,407,534	12DEC78	0.00	0
16	15DEC78	5,407,534	18DEC78	0.00	0
17	22DEC78	5,407,534	27DEC78	0.00	0
18	29DEC78	5,407,534	03JAN79	1.07	5,786
19	05JAN79	5,407,534	09JAN79	0.00	0
20	12JAN79	3,862,524	16JAN79	0.00	0
21	19JAN79	2,703,767	23JAN79	0.00	0
22	26JAN79	2,703,767	30JAN79	0.00	0
23	02FEB79	2,703,767	06FEB79	0.00	0
24	09FEB79	2,703,767	13FEB79	0.00	0
25	16FEB79	2,703,767	20FEB79	0.00	0
26	23FEB79	2,703,767	27FEB79	0.00	0
27	02MAR79	1,607,929	06MAR79	0.00	0
28	09MAR79	2,018,650	13MAR79	0.00	0
29	16MAR79	2,018,650	20MAR79	0.00	0
30	23MAR79	2,018,650	27MAR79	0.00	0
31	30MAR79	2,018,650	03APR79	0.00	0
32	06APR79	2,018,650	10APR79	0.00	0
33	13APR79	2,638,401	18APR79	0.00	0
34	20APR79	2,703,767	24APR79	0.00	0
35	27APR79	2,963,133	01MAY79	7.38	21,868
36	04MAY79	3,843,299	08MAY79	53.91	207,192
37	11MAY79	4,666,489	15MAY79	303.12	1,414,506
38	18MAY79	5,211,786	22MAY79	199.90	1,041,836
39	25MAY79	4,082,042	29MAY79	565.87	2,309,905
40	01JUN79	2,671,259	05JUN79	1,228.90	3,282,710
41	08JUN79	4,449,069	12JUN79	1,375.18	6,118,271
42	15JUN79	5,811,264	19JUN79	549.18	3,191,430
43	22JUN79	5,772,814	26JUN79	1,408.99	8,133,837
44	29JUN79	5,110,417	03JUL79	1,773.48	9,063,222
45	06JUL79	5,348,111	10JUL79	500.80	2,678,334
46	13JUL79	5,561,336	17JUL79	891.38	4,957,264
47	20JUL79	5,811,264	24JUL79	1,605.48	9,329,868
48	27JUL79	5,598,039	31JUL79	1,093.21	6,119,932
49	03AUG79	5,479,192	07AUG79	547.79	3,001,447
50	10AUG79	5,772,814	14AUG79	508.65	2,936,342
51	17AUG79	5,811,264	21AUG79	880.01	5,113,970
52	24AUG79	5,872,435	28AUG79	1,040.56	6,110,621

TABLE 6.13 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
53	01SEP79	3,199,254	04SEP79	99.52	318,390
54	08SEP79	2,202,163	11SEP79	12.87	28,342
55	15SEP79	4,905,930	18SEP79	10.66	52,297
56	22SEP79	4,905,930	25SEP79	18.83	92,379
57	29SEP79	5,799,030	02OCT79	1.69	9,800
58	06OCT79	5,799,030	09OCT79	4.73	27,429
59	13OCT79	5,860,201	15OCT79	4.18	24,496
60	20OCT79	5,083,327	23OCT79	2.22	11,285
61	27OCT79	5,456,471	30OCT79	1.84	10,040
62	03NOV79	4,801,939	06NOV79	1.87	8,980
63	10NOV79	5,250,936	13NOV79	1.05	5,513
64	17NOV79	4,891,249	20NOV79	0.00	0
65	24NOV79	3,749,795	27NOV79	0.00	0
66	01DEC79	4,877,791	04DEC79	0.00	0
67	08DEC79	4,766,460	11DEC79	0.00	0
68	15DEC79	4,235,494	18DEC79	0.00	0
69	22DEC79	4,881,462	25DEC79	0.00	0
70	29DEC79	4,104,588	02JAN80	0.00	0
71	05JAN80	4,624,543	08JAN80	0.00	0
72	12JAN80	5,162,849	15JAN80	1.07	5,524
73	19JAN80	4,808,056	22JAN80	0.00	0
74	26JAN80	5,658,336	29JAN80	0.00	0
75	02FEB80	5,554,345	05FEB80	0.00	0
76	09FEB80	5,438,120	12FEB80	0.00	0
77	16FEB80	5,737,859	19FEB80	0.00	0
78	23FEB80	5,658,336	26FEB80	0.00	0
79	02MAR80	2,589,989	04MAR80	0.00	0
80	09MAR80	2,703,767	11MAR80	0.00	0
81	16MAR80	2,476,210	18MAR80	0.00	0
82	23MAR80	2,338,837	24MAR80	0.00	0
83	30MAR80	2,221,388	01APR80	1.07	2,377
84	06APR80	2,217,893	08APR80	0.00	0
85	13APR80	2,462,578	16APR80	0.00	0
86	20APR80	2,716,001	22APR80	0.00	0
87	27APR80	3,100,506	29APR80	0.00	0
88	04MAY80	2,862,812	05MAY80	2.46	7,043
89	11MAY80	2,359,461	13MAY80	207.30	489,116
90	19MAY80	1,761,731	20MAY80	586.10	1,032,551
91	25MAY80	924,559	27MAY80	3,842.90	3,552,988
92	01JUN80	795,226	03JUN80	2,638.46	2,098,172
93	08JUN80	1,293,334	10JUN80	1,617.40	2,091,838
94	15JUN80	2,027,388	17JUN80	1,674.78	3,395,429
95	22JUN80	1,459,370	24JUN80	944.11	1,377,806
96	29JUN80	1,240,901	01JUL80	1,423.80	1,766,795
97	06JUL80	1,284,595	08JUL80	1,631.70	2,096,074
98	13JUL80	2,202,163	15JUL80	418.08	920,680
99	20JUL80	2,848,830	22JUL80	851.98	2,427,146
100	27JUL80	2,674,055	29JUL80	519.32	1,388,690
101	03AUG80	2,307,028	05AUG80	554.47	1,279,178
102	10AUG80	2,079,821	12AUG80	852.27	1,772,569
103	17AUG80	2,392,668	19AUG80	528.20	1,263,807
104	24AUG80	4,509,847	26AUG80	569.48	2,568,268

TABLE 6.13 (CONTINUED).

TRIP	FLOW FROM WEEK OF	MEAN FLOW	SAMPLE DATE	MEAN DENSITY	MEAN NUMBER
105	01SEP80	4,544,146	02SEP80	431.94	1,962,798
106	08SEP80	4,666,439	09SEP80	186.49	870,254
107	15SEP80	4,631,534	16SEP80	147.78	684,448
108	22SEP80	4,456,759	23SEP80	78.08	347,984
109	29SEP80	4,876,219	30SEP80	99.97	487,476
110	06OCT80	4,926,903	07OCT80	9.52	46,904
111	13OCT80	4,114,200	14OCT80	15.43	63,482
112	20OCT80	5,002,056	21OCT80	2.45	12,255
113	27OCT80	4,924,282	28OCT80	7.14	35,159
114	03NOV80	5,407,534	04NOV80	0.00	0
115	10NOV80	5,407,534	11NOV80	0.00	0
116	17NOV80	5,270,511	18NOV80	1.11	5,850
117	24NOV80	5,407,534	25NOV80	0.00	0
118	01DEC80	5,407,534	02DEC80	0.00	0
119	08DEC80	2,703,767	09DEC80	0.00	0
120	15DEC80	4,629,436	16DEC80	0.00	0
121	22DEC80	4,722,417	23DEC80	0.00	0
122	29DEC80	2,429,720	30DEC80	1.09	2,648
123	05JAN81	5,407,534	06JAN81	0.00	0
124	12JAN81	5,407,534	13JAN81	0.00	0
125	19JAN81	5,407,534	20JAN81	0.00	0
126	26JAN81	5,407,534	27JAN81	0.00	0
127	02FEB81	5,508,467	03FEB81	0.00	0
128	09FEB81	5,407,534	10FEB81	0.00	0
129	16FEB81	2,703,767	17FEB81	0.00	0
130	23FEB81	5,407,534	24FEB81	0.00	0
131	02MAR81	5,407,534	03MAR81	0.00	0
132	09MAR81	2,703,767	10MAR81	0.00	0
133	16MAR81	3,107,497	17MAR81	0.00	0
134	23MAR81	2,703,767	24MAR81	0.00	0
135	30MAR81	2,703,767	31MAR81	0.00	0
136	06APR81	3,107,497	07APR81	0.00	0
137	13APR81	2,703,767	14APR81	0.00	0
138	20APR81	2,018,650	21APR81	0.00	0
139	27APR81	2,703,767	28APR81	0.00	0
140	04MAY81	2,703,767	05MAY81	136.66	369,497
141	11MAY81	2,018,650	12MAY81	246.60	497,799
142	18MAY81	2,018,650	19MAY81	1,236.60	2,496,263
143	25MAY81	2,018,650	26MAY81	3,004.72	6,065,478
144	01JUN81	2,018,650	03JUN81	3,995.30	8,065,112
145	08JUN81	2,018,650	09JUN81	13,304.79	26,857,714
146	15JUN81	2,703,767	16JUN81	11,355.25	30,701,950
147	22JUN81	2,018,650	23JUN81	2,209.73	4,460,671
148	29JUN81	3,792,614	30JUN81	993.56	3,762,190
149	06JUL81	4,722,417	07JUL81	11,610.58	54,830,000
150	13JUL81	4,722,417	14JUL81	2,939.86	13,883,245
151	20JUL81	4,722,417	21JUL81	1,962.15	9,266,091
152	27JUL81	4,722,417	28JUL81	728.23	3,439,006
153	03AUG81	2,975,979	04AUG81	527.66	1,570,305
154	10AUG81	2,703,767	11AUG81	504.41	1,363,807
155	17AUG81	2,703,767	18AUG81	180.77	488,760
156	24AUG81	2,703,767	25AUG81	7.96	21,522

Table 6.14 Results of analysis of variance for entrainment - September 1974 to August 1981 (Log_{10} density [density + 10] - winter species only)

SOURCE	BROWN SHRIMP	CROAKER	FLOUNDER
Week	***	***	***
Year	***	***	***
Duncan's Test	76 75 77 81 79 80 78	80 75 78 79 76 81 77	79 81 78 77 76 80 75
Week X Year	***	***	***
Day/Night	***	***	***
Duncan's Test	N>D	N>D	N>D
Week X Day/Night	***	***	***
Year X Day/Night	***	***	***
$\overline{\text{Log}}$	1.468	1.772	1.213
Std. Dev.	0.299	0.380	0.238
R^2	0.745	0.667	0.589
Analysis Week	24-38	4-35	16-31

	MENHADEN	MULLET	SPOT
Week	***	***	***
Year	***	***	***
Duncan's Test	76 81 77 75 78 79 80	81 79 80 [illegible] 76 [illegible] 75	80 79 81 77 75 78 76
Week X Year	***	***	***
Day/Night	***	***	***
Duncan's Test	N>D	N>D	N>D
Week X Day/Night	***	*	***
Year X Day/Night	***	NS	***
$\overline{\text{Log}}$	1.383	1.228	1.846
Std. Dev.	0.330	0.311	0.369
R^2	0.633	0.391	0.790
Analysis week	26-36	16-30	16-37

---

*$.01 < p \leq 0.05$

**$.001 < p \leq 0.01$

***$p \leq .001$

Table 6.14 (continued)

TOTAL FISH

Week	***
Year	***
Duncan's Test	80 81 79 77 78 76 75
Week X Year	***
Day/Night	***
Duncan/s Test	N>D
Week X Day/Night	***
Year X Day/Night	NS
$\overline{\text{Log}}$	2.572
Std. Dev.	0.337
R^2	0.805
Analysis week	1-52

---

*.01<p≤0.05

**.001<p≤0.01

***p≤.001

able 6.15 Results of analysis of variance for entrainment - September 1974 to August 1981 (Log_{10} density [density + 10] - summer species only)

ource	ANCHOVIES	SEATROUT	GOBIONELLUS spp.
eek	***	***	***
ear	***	***	***
an's Test	81 77 76 79 80 78 75	76 81 79 77 75 78 80	81 76 75 80 78 77 79
eek X Year	***	***	***
/Night	***	***	***
an's Test	N>D	N>D	N>D
ek X Day/Night	***	***	***
ar X Day/Night	*	***	***
g	2.373	1.283	1.154
d. Dev.	0.332	0.292	0.243
	0.838	0.568	0.406
alysis Week	17-44	20-42	10-50

	GOBIOSOMA spp.	PINK & WHITE SHRIMP
e	***	***
a	***	***
an's Test	81 80 79 76 77 78 75	81 80 79 78 77 75 76
ek X Year	***	***
Night	***	***
ean's Test	N>D	N>D
ek X Day/Night	***	***
X Day/Night	***	***
	2.211	1.928
Dev.	0.345	0.418
	0.836	0.666
alysis Week	19-44	23-39

0 $p \le 0.05$

.001< $p \le .01$

* $\le .001$

Table 6.16 Entrainment trend analysis September 1974 to August 1981

Species	MEAN SQUARES			
	Linear Trend	Deviation From Linear Trend	Error	% Change Per Year
Anchovies	0.05574*	0.05250**	0.00721	+10.8
Croaker	0.00002^{NS}	0.04808**	0.00558	- 0.2
Flounder	0.01243*	0.01057**	0.00204	+ 5.0
Gobionellus spp.	0.00001^{NS}	0.00190*	0.00060	- 0.1
Gobiosoma spp.	0.62799**	0.04732**	0.00955	+41.2
Menhaden	0.00352^{NS}	0.01961^{NS}	0.01059	- 2.5
Mullet	0.04222*	0.00110^{NS}	0.00521	+ 9.4
Seatrout	0.01552*	0.02194**	0.00265	- 5.3
Spot	0.04992**	0.01610*	0.00471	+10.2
Total Fish	0.03175**	0.00298	0.00232	+ 8.1
Brown Shrimp	0.04523^{NS}	0.02631^{NS}	0.01194	- 8.8
Pink & White Shrimp	0.23213**	0.03651*	0.01031	+25.3

* Significance Level = 0.05

** Significance Level = 0.01

NS Not Significant

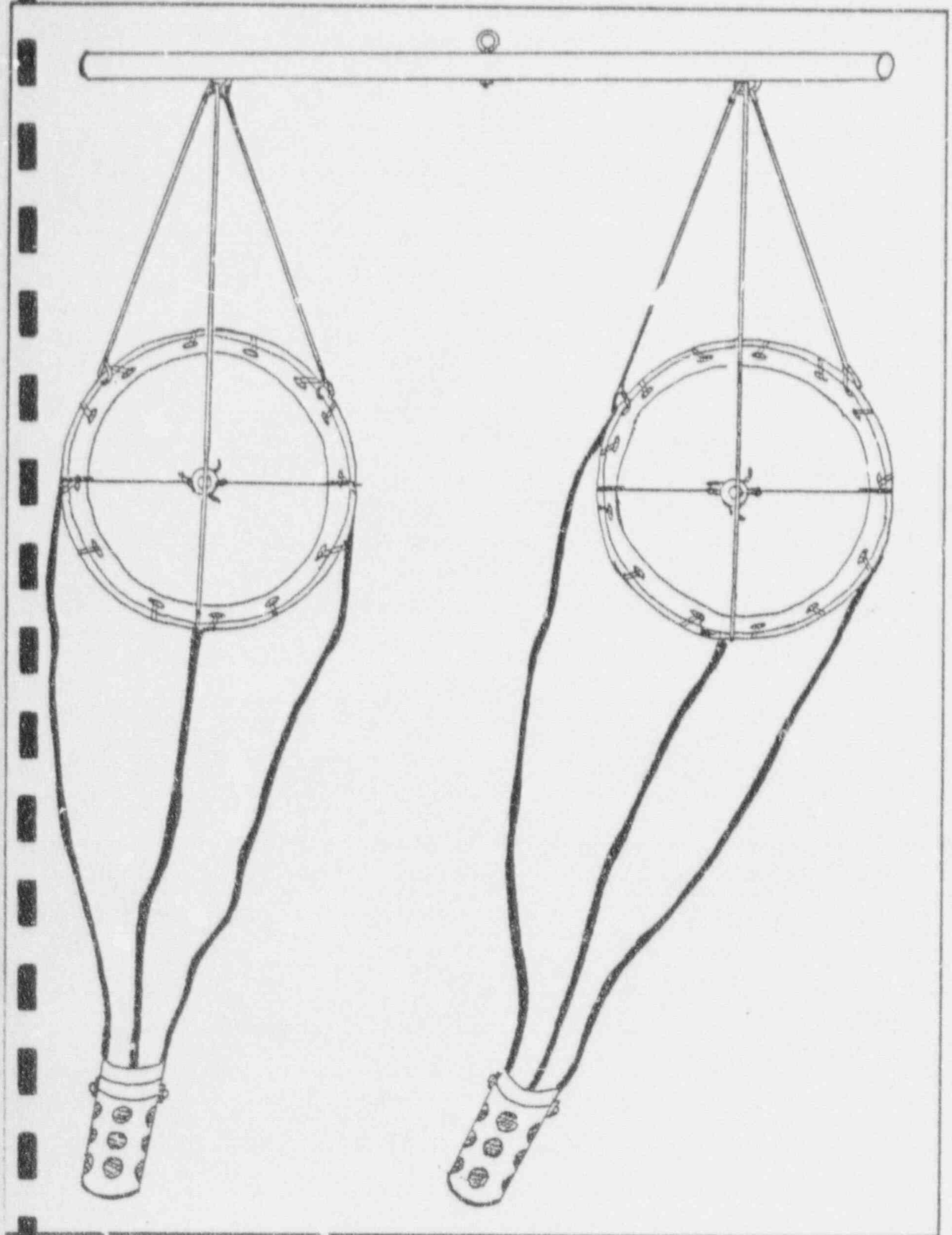


Figure 6.1 Entrainment sampling nets

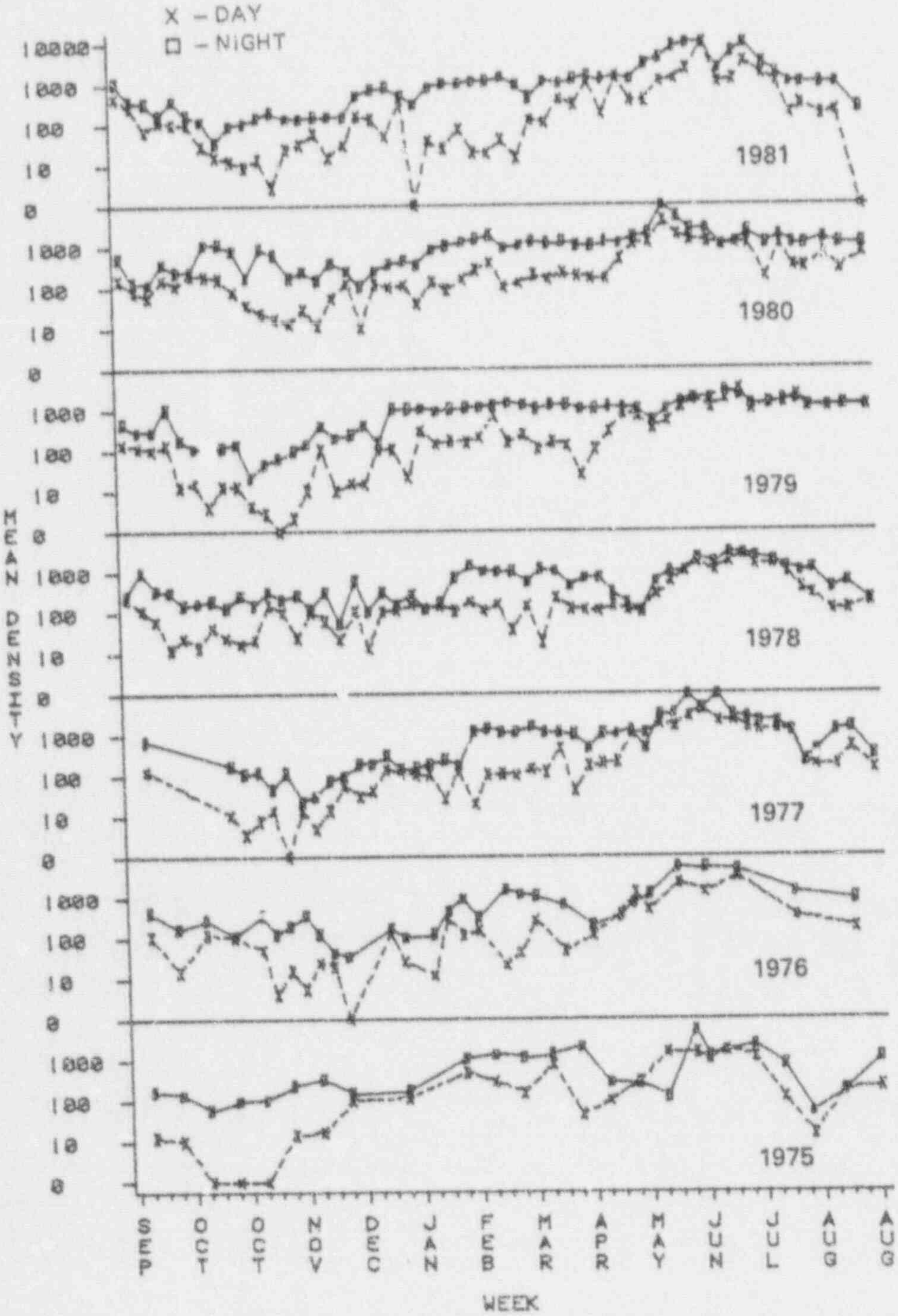


Figure 6.2 Day/night mean density of total fish entrained September 1974-August 1981.

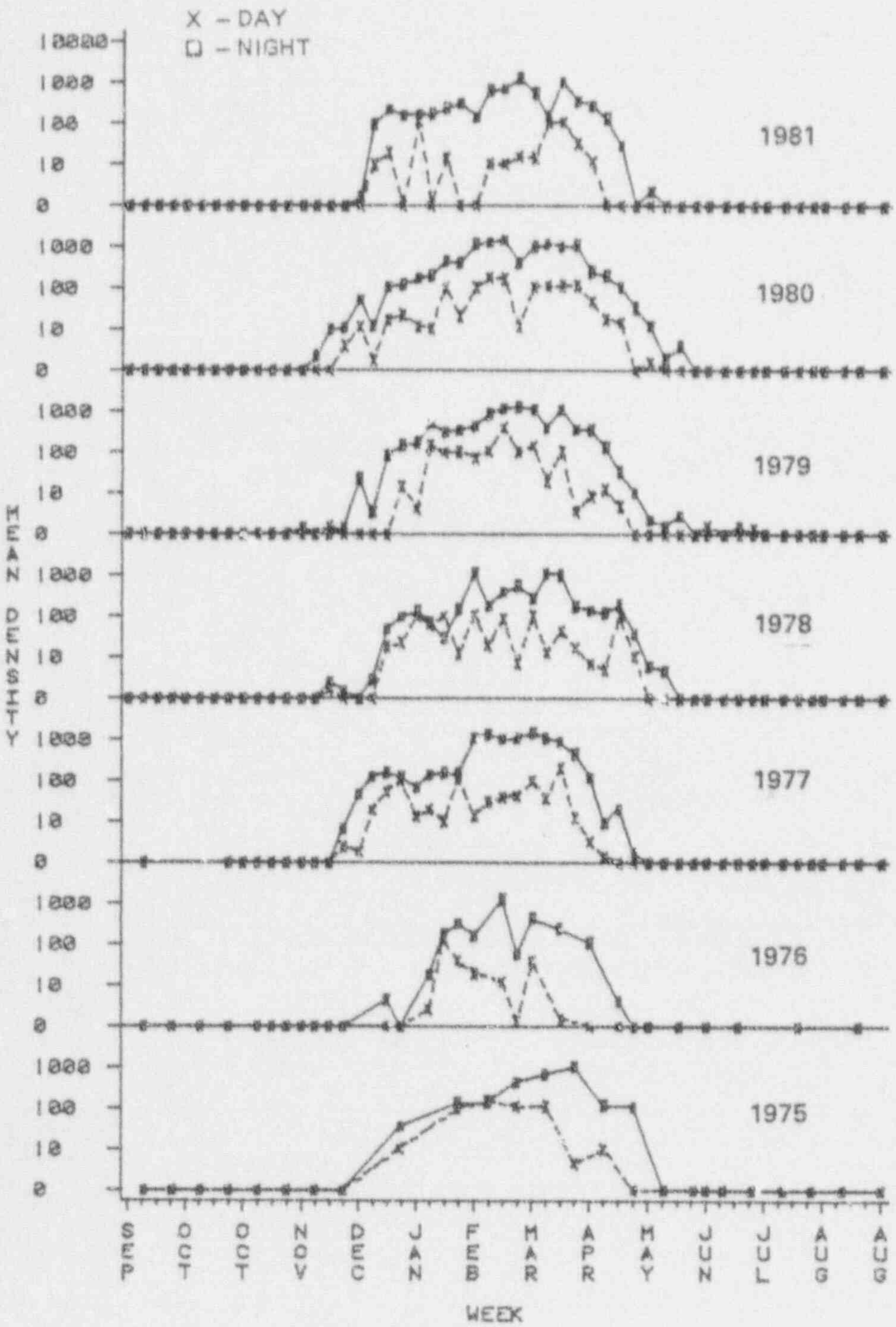


Figure 6.3 Day/night mean density of spot entrained September 1974-August 1981.

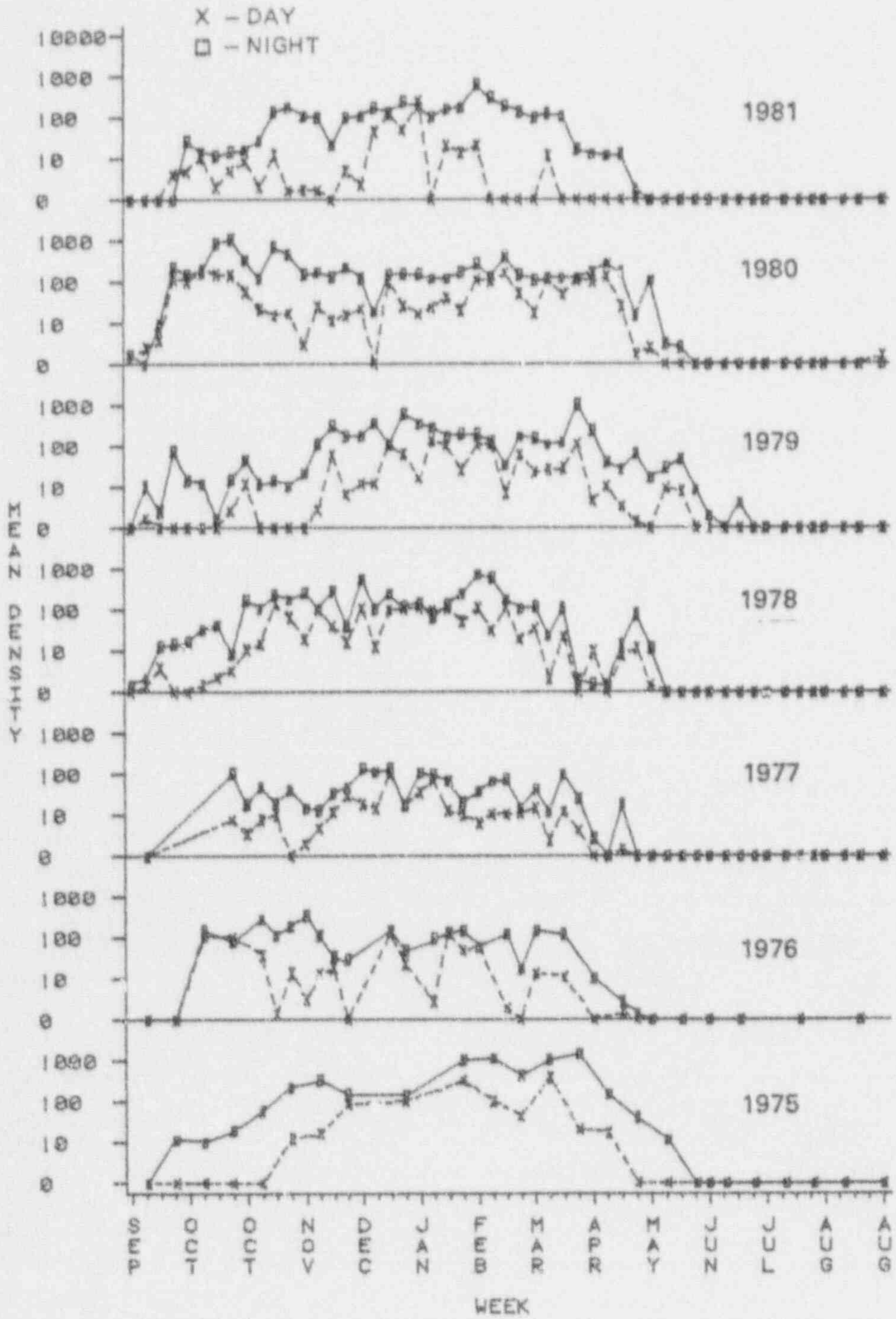


Figure 6.4 Day/night mean density of croaker entrained September 1974-August 1981.

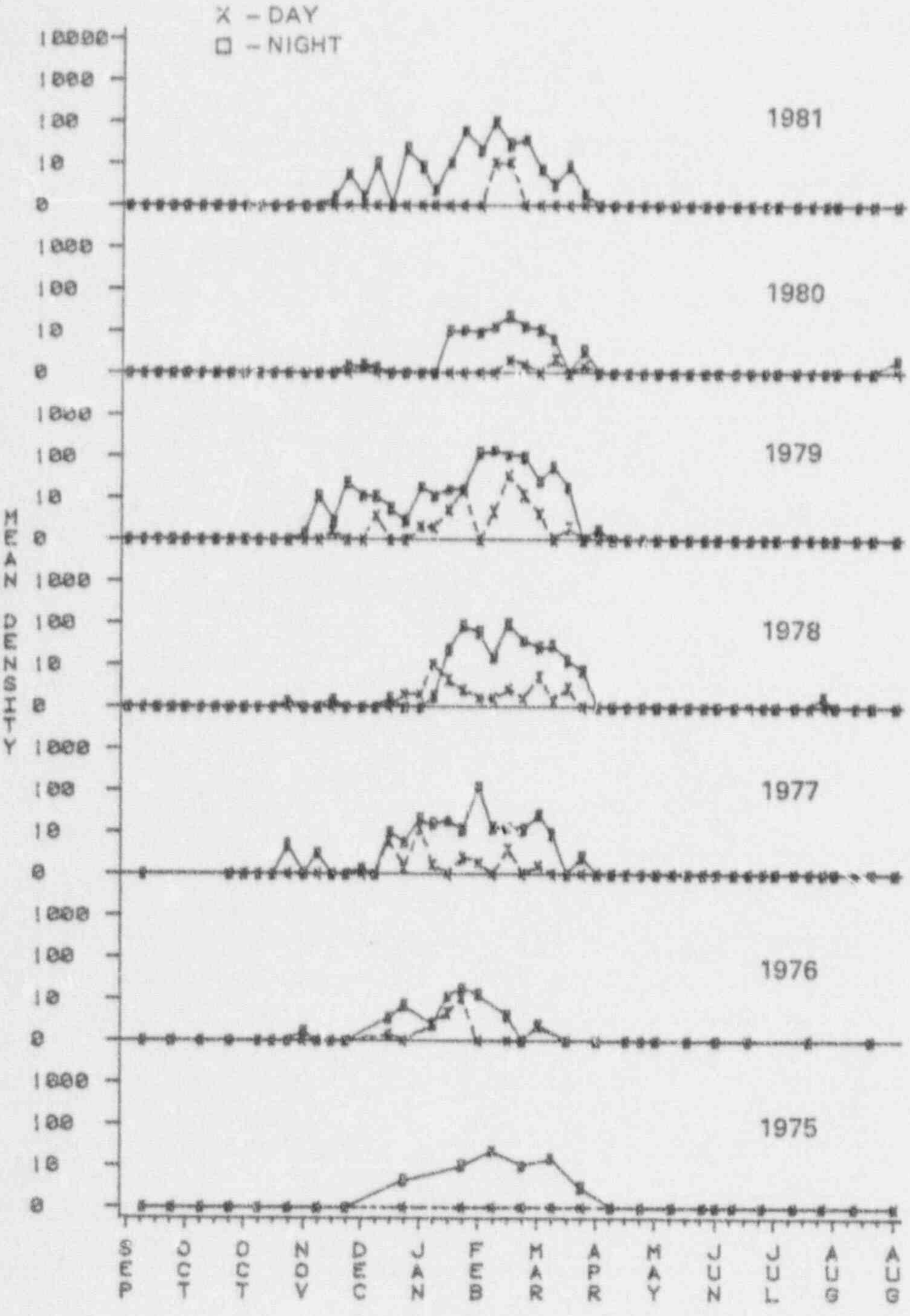


Figure 6.5 Day/r.ight mean density of flounder entrained September 1974-August 1981.

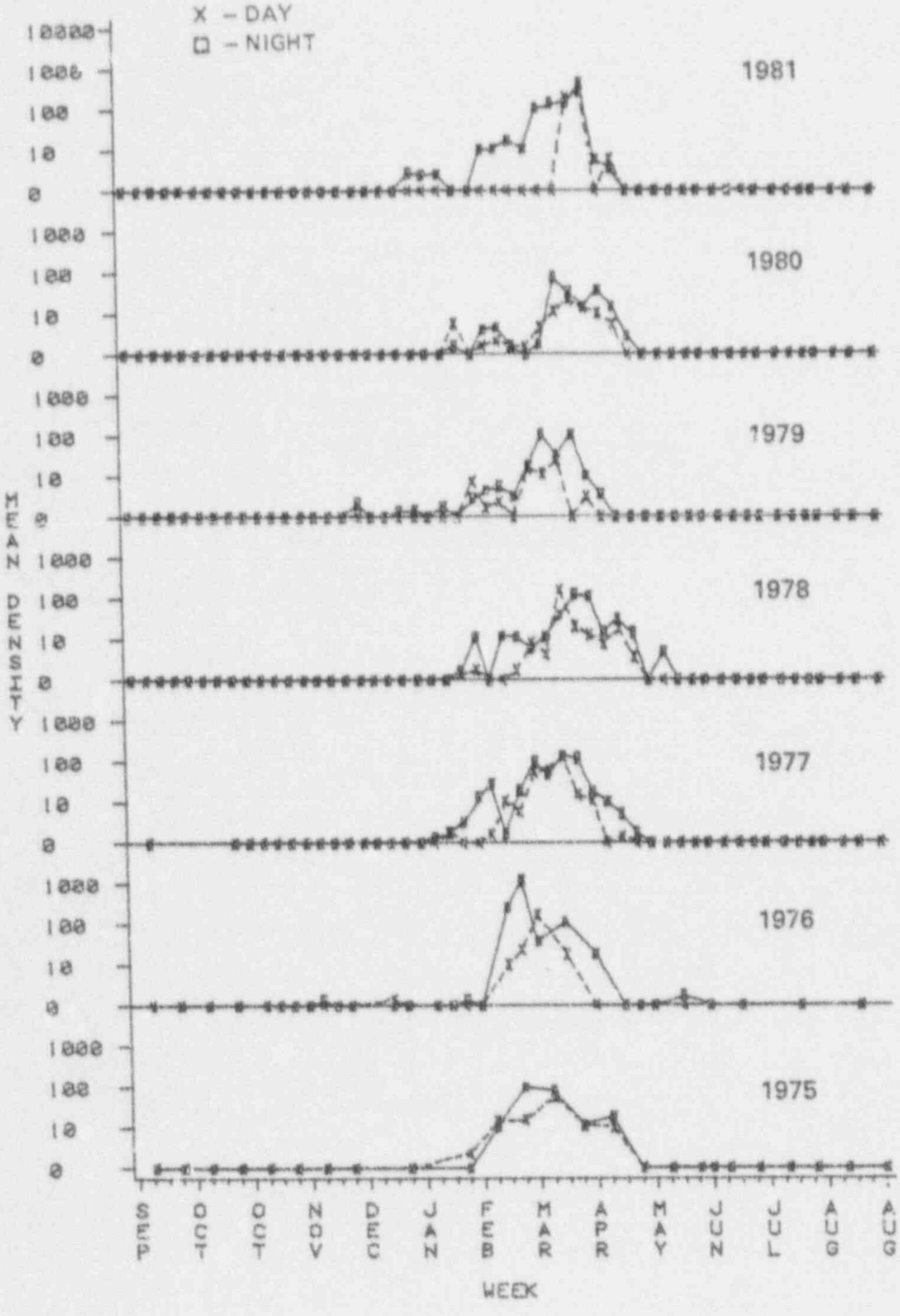


Figure 6.6 Day/night mean density of menhaden entrained September 1974-August 1981.

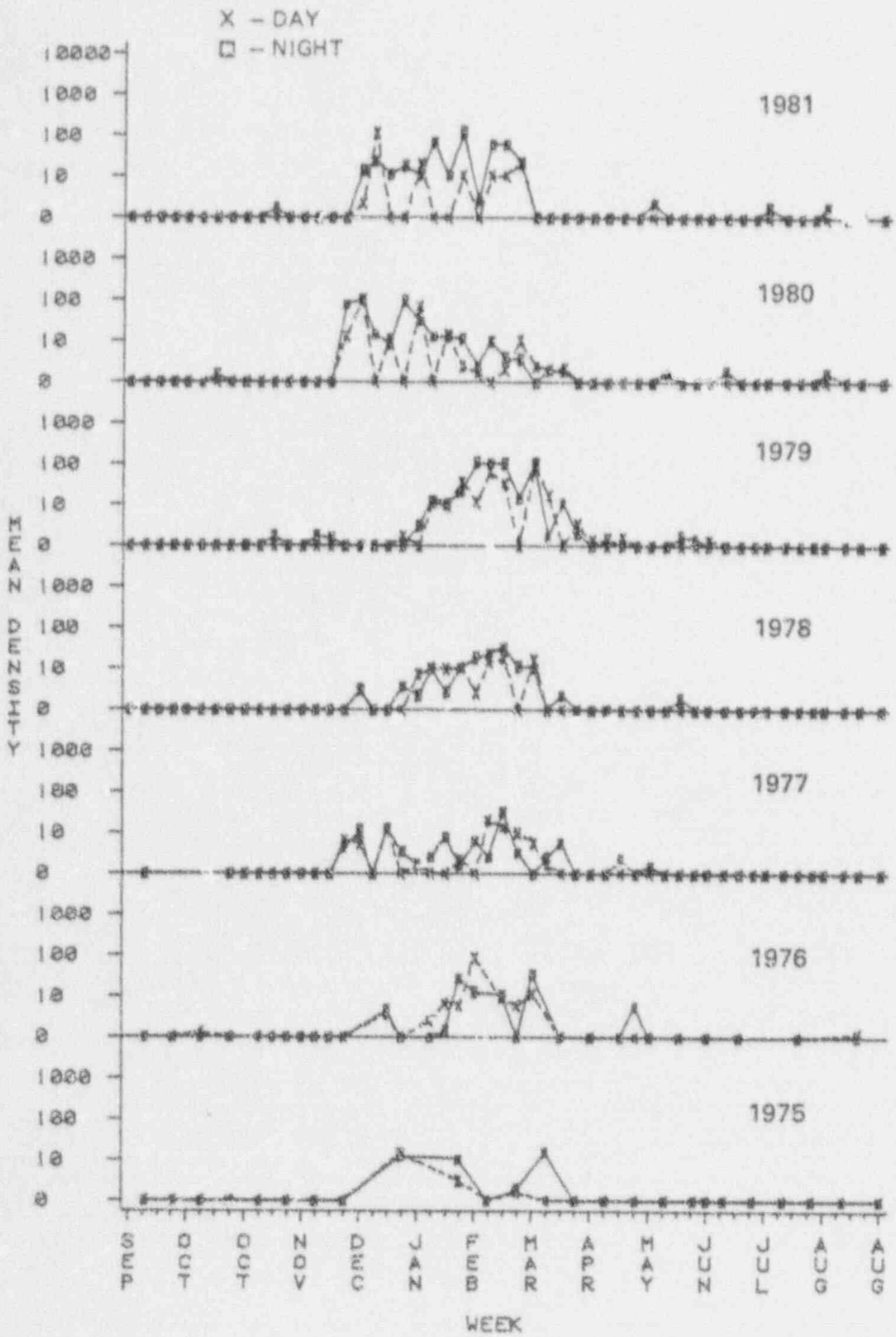


Figure 6.7 Day/night mean density of mullet entrained September 1974-August 1981.

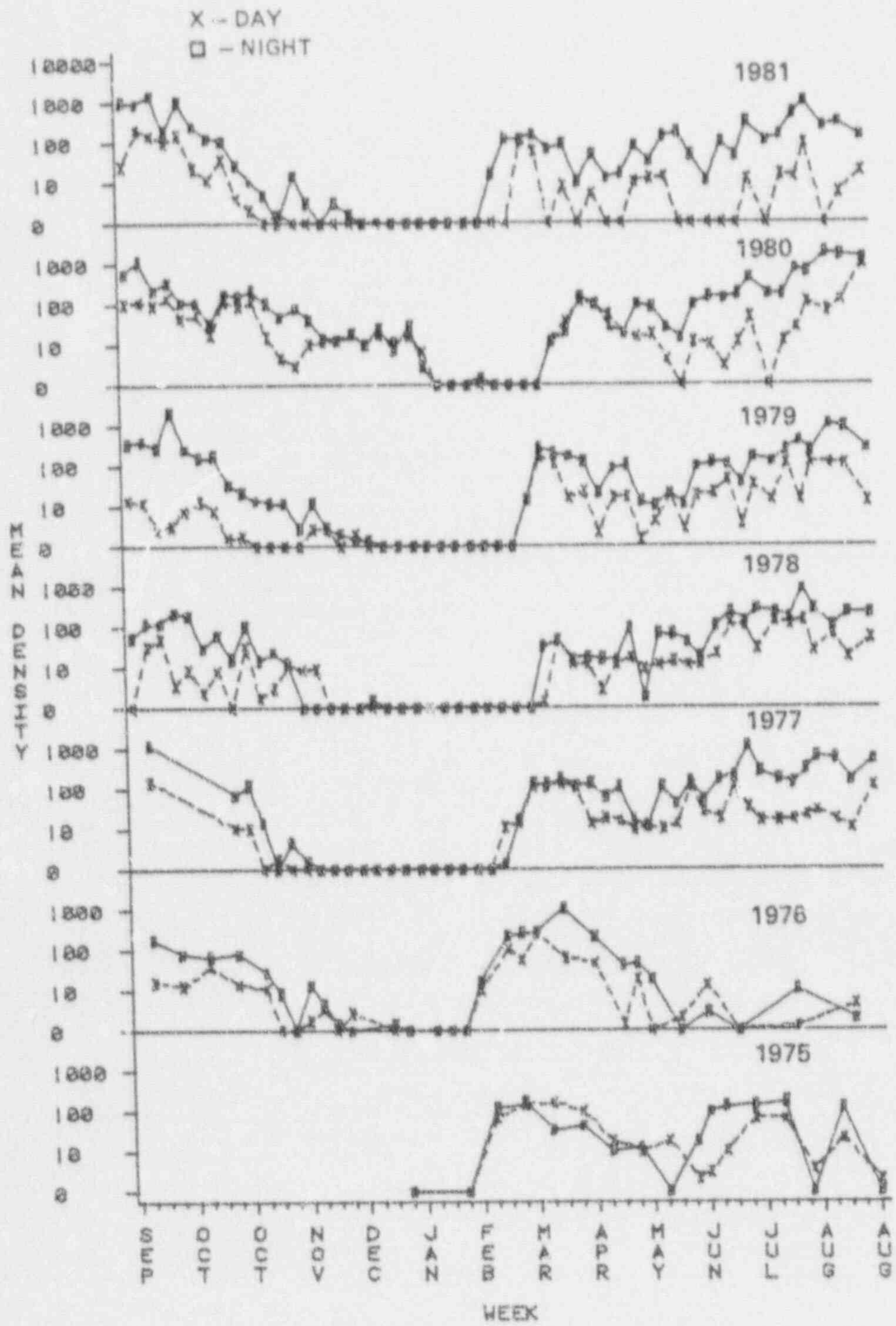


Figure 6.8 Day/night mean density of shrimp ... ained September 1974-August 1981.

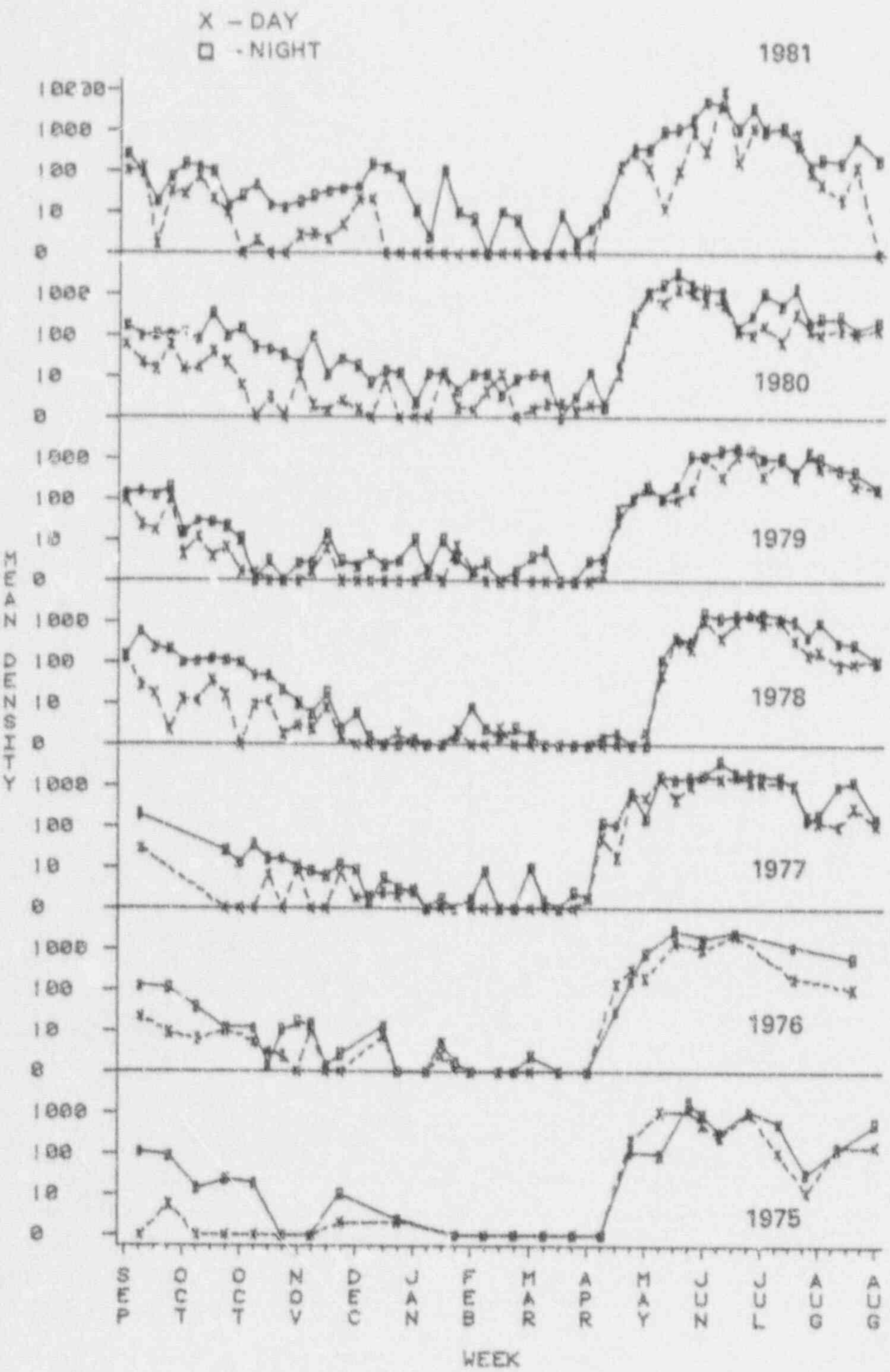


Figure 6.9 Day/night mean density of anchovies entrained September 1974-August 1981.

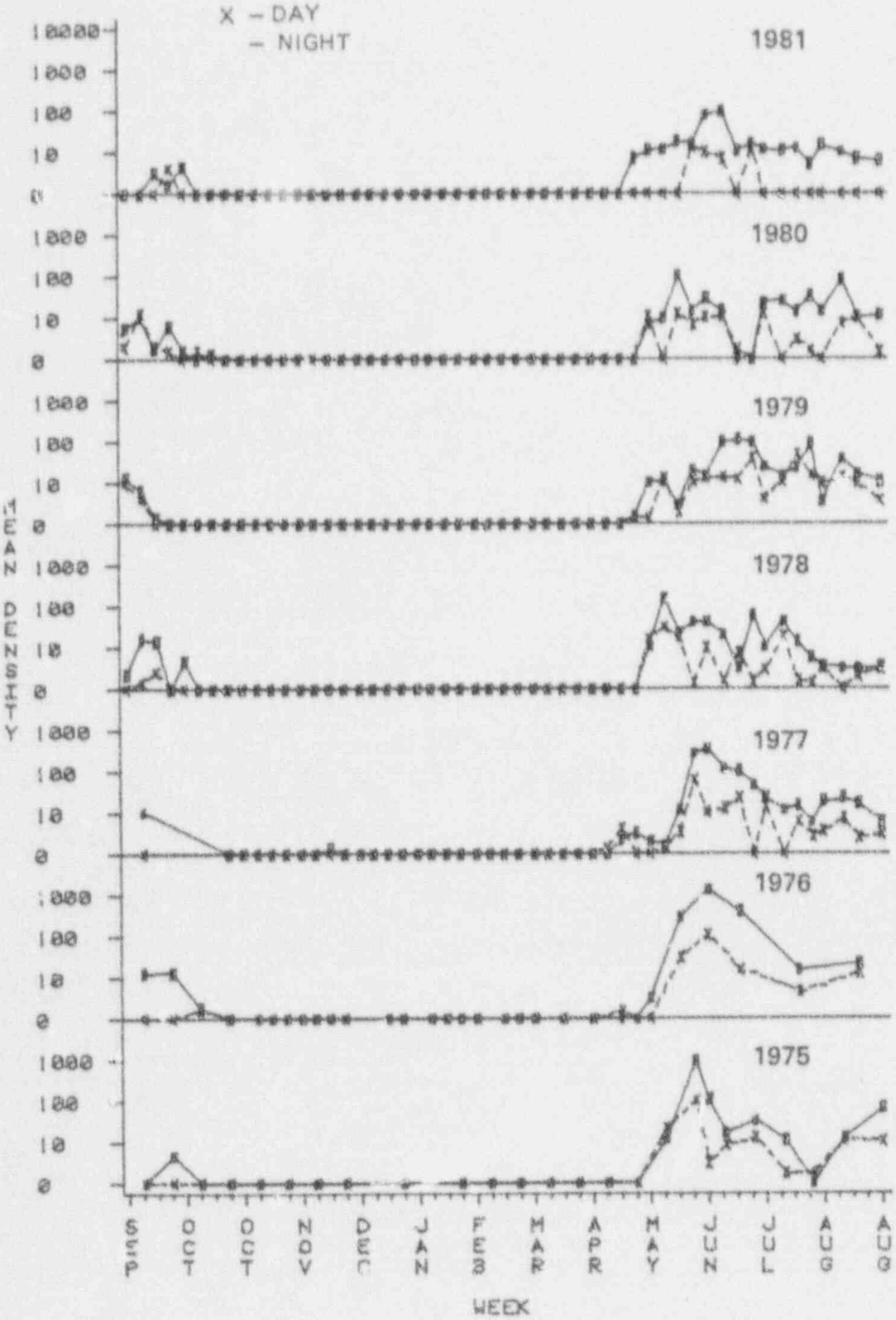


Figure 6.10 Day/night mean density of seatrout entrained September 1974-August 1981.

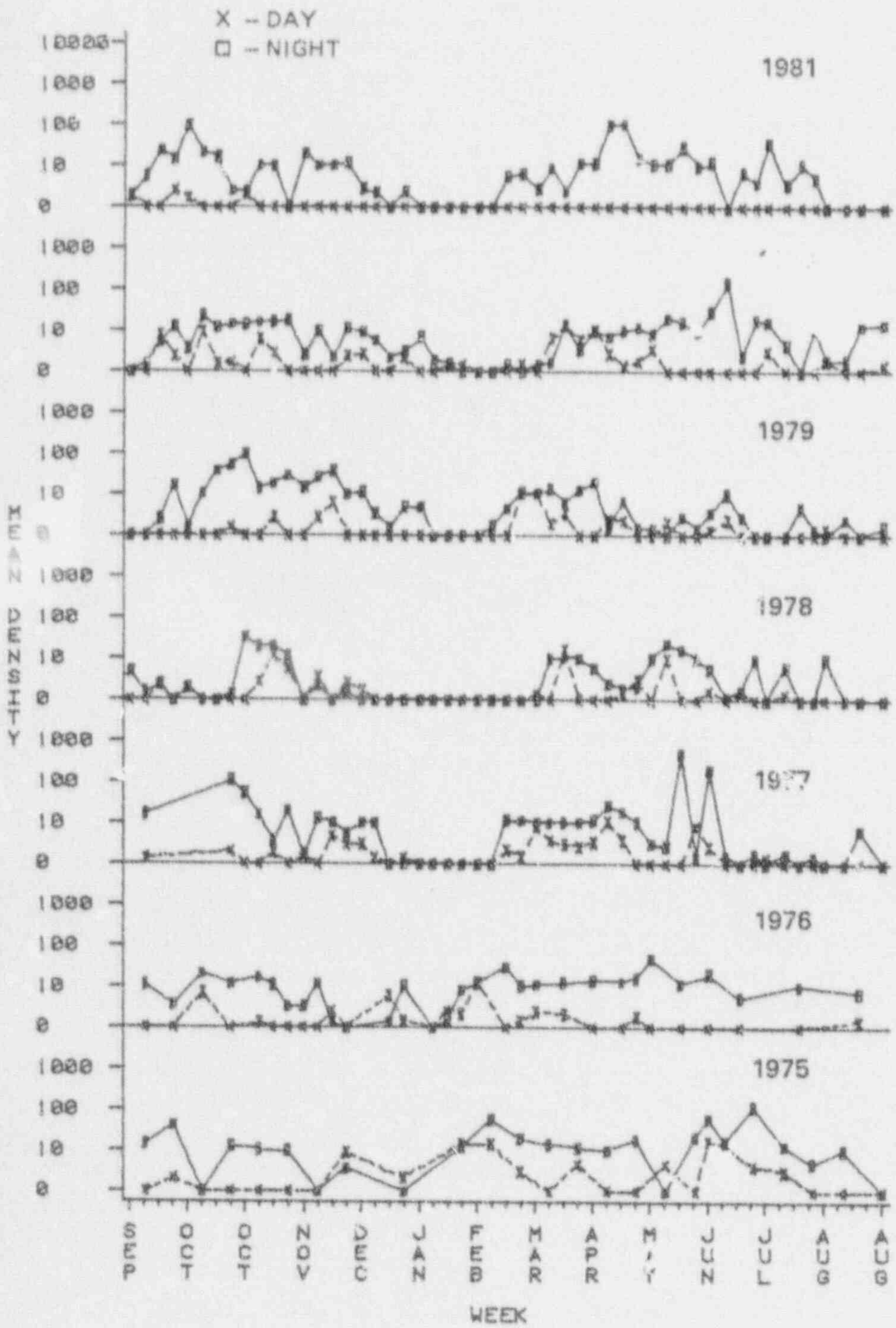


Figure 6.11 Day/night mean density of Gobionellus spp. entrained September 1974-August 1981.

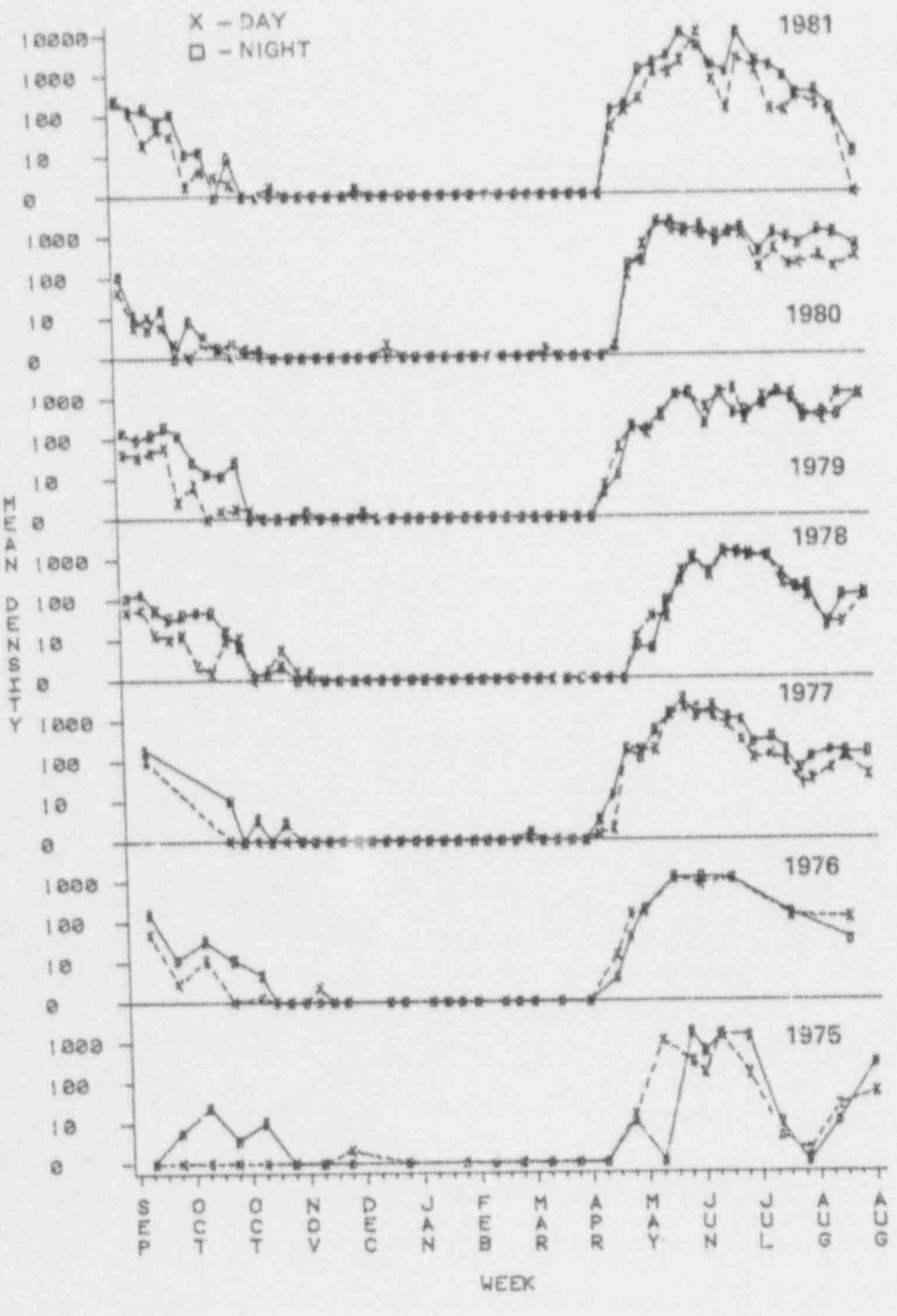
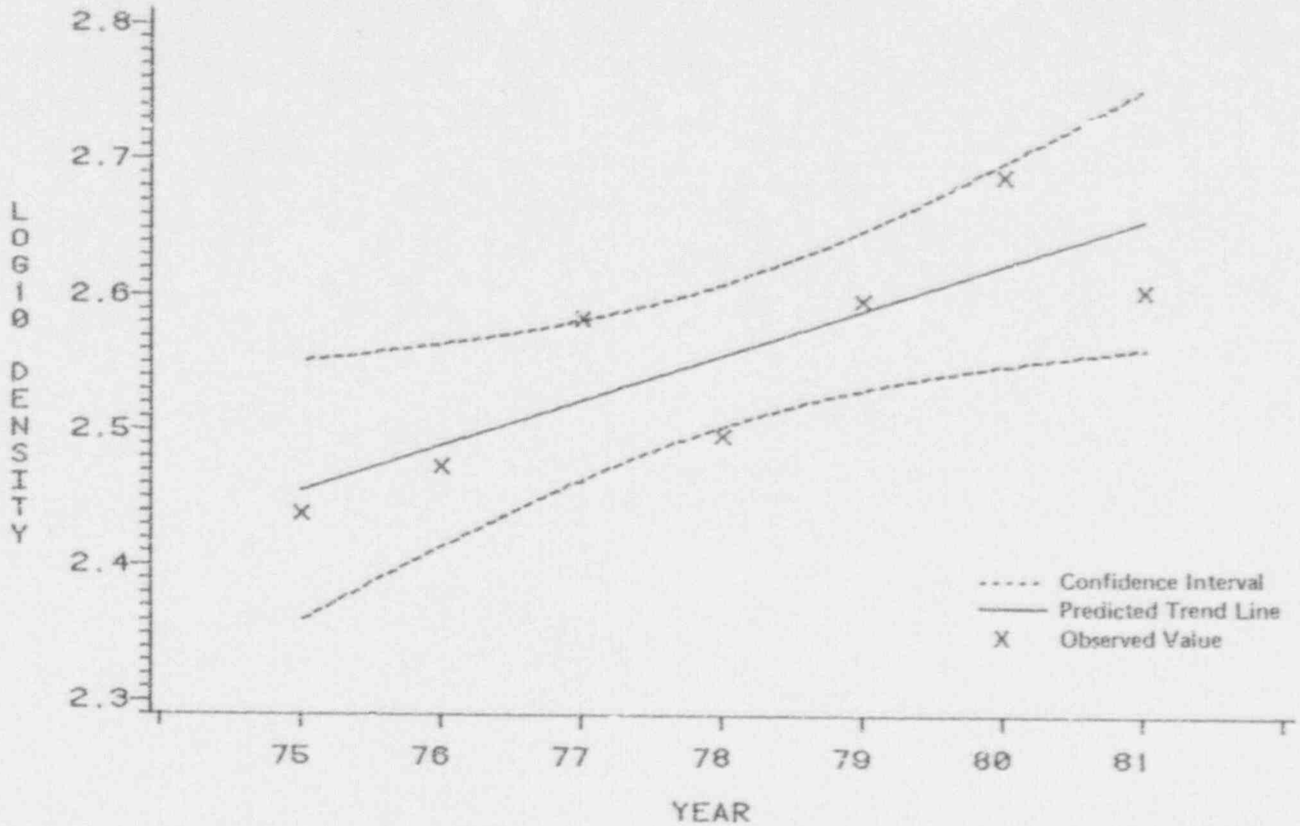


Figure 6.12 Day/night mean density of Gobiosoma spp. entrained September 1974-August 1981.



gure 6.13 Linear trend analysis for total fish entrained September 1974 to August 1981.

Figure 6.14 Linear trend analysis for spot entrained September 1974 to August 1981.

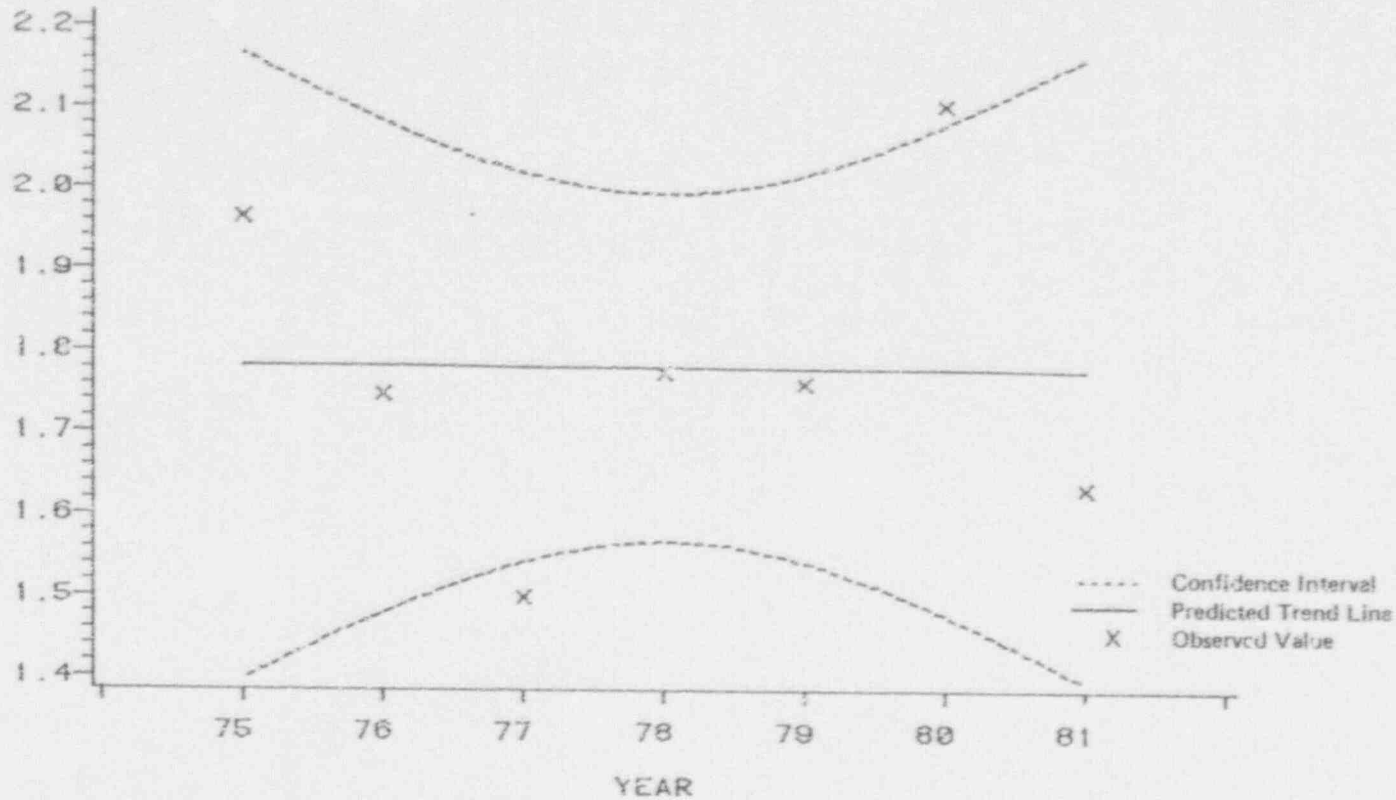


Figure 6.15 Linear trend analysis for croaker entrained September 1974 to August 1981.

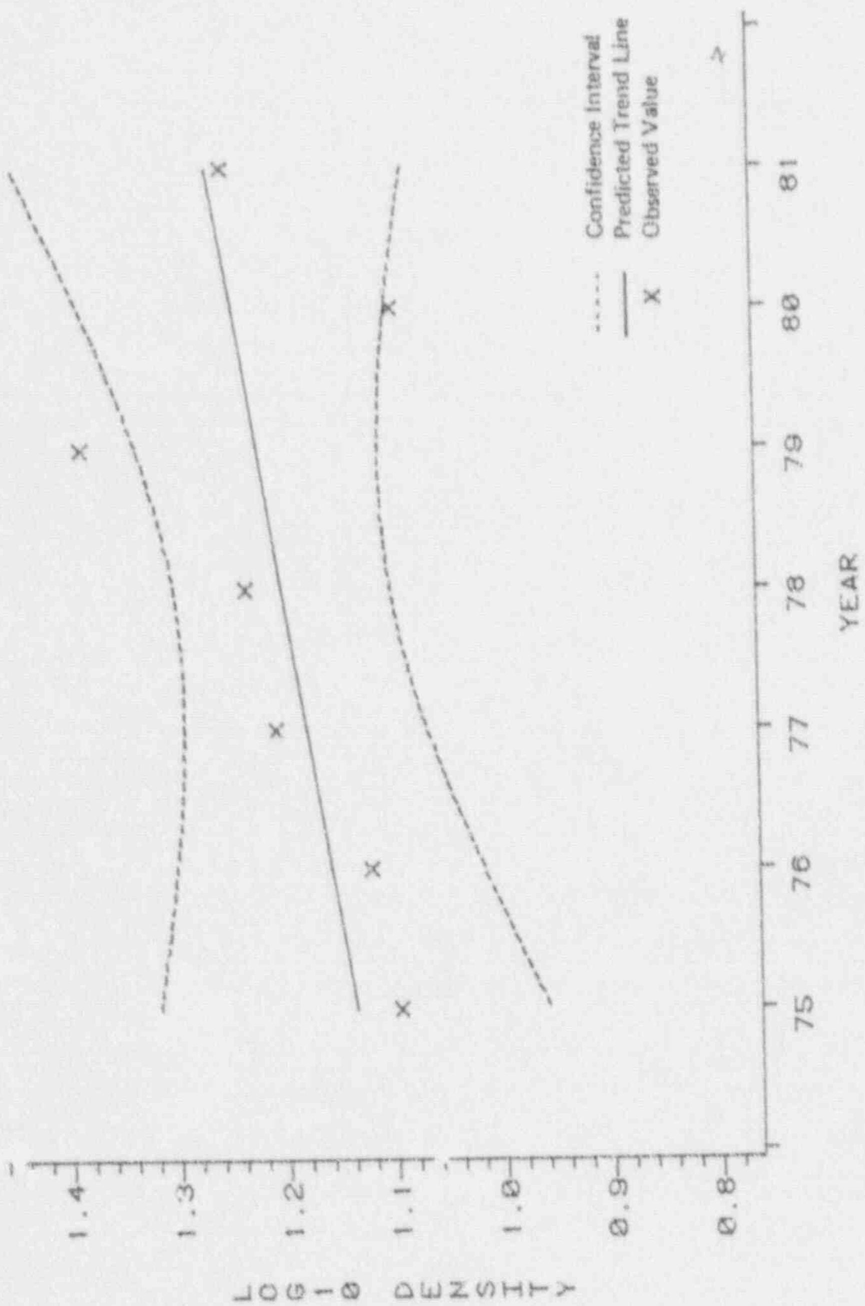
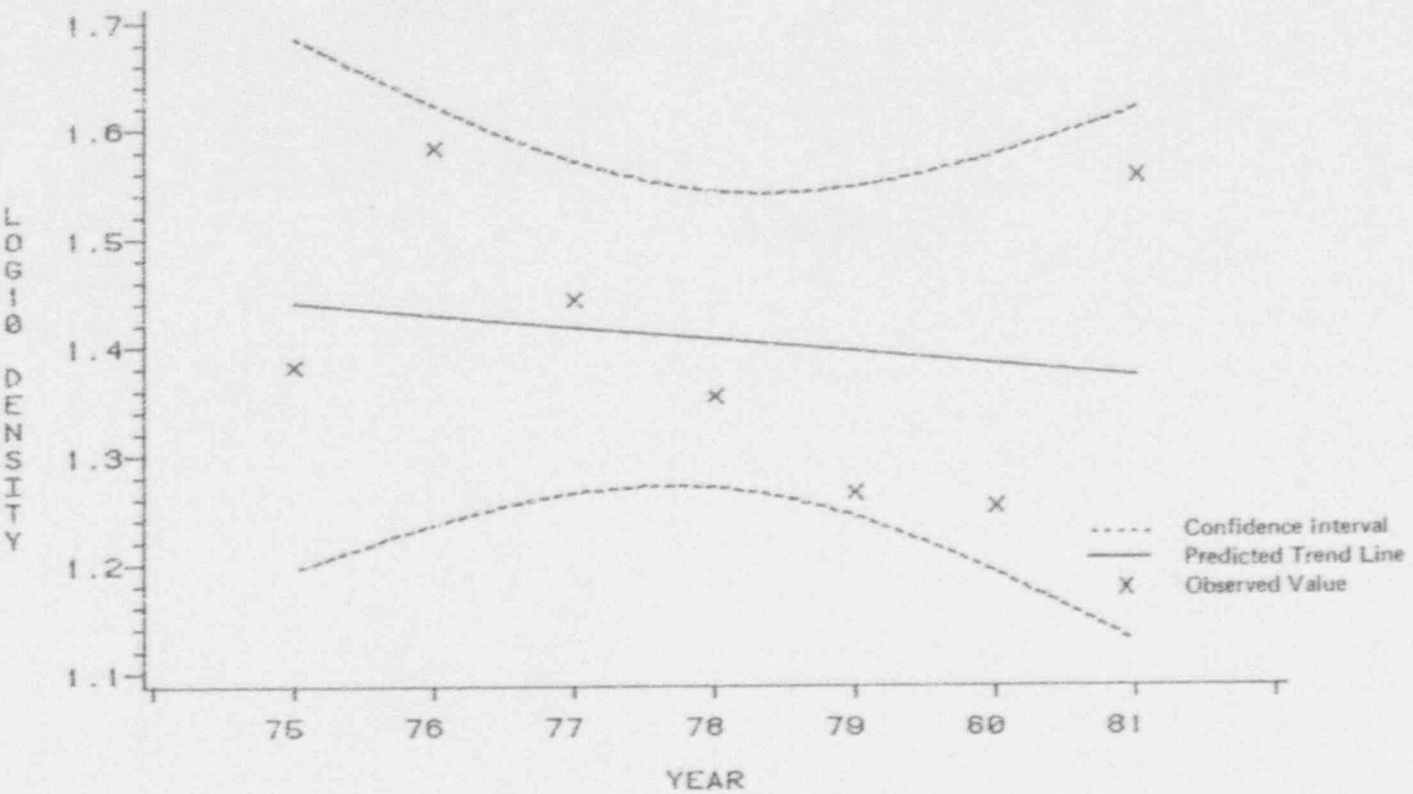


Figure 6.16 Linear trend analysis for flounder entrained September 1974 to August 1981.



gure 6.17 Linear trend analysis for menhaden entrained September 1974 to August 1981.

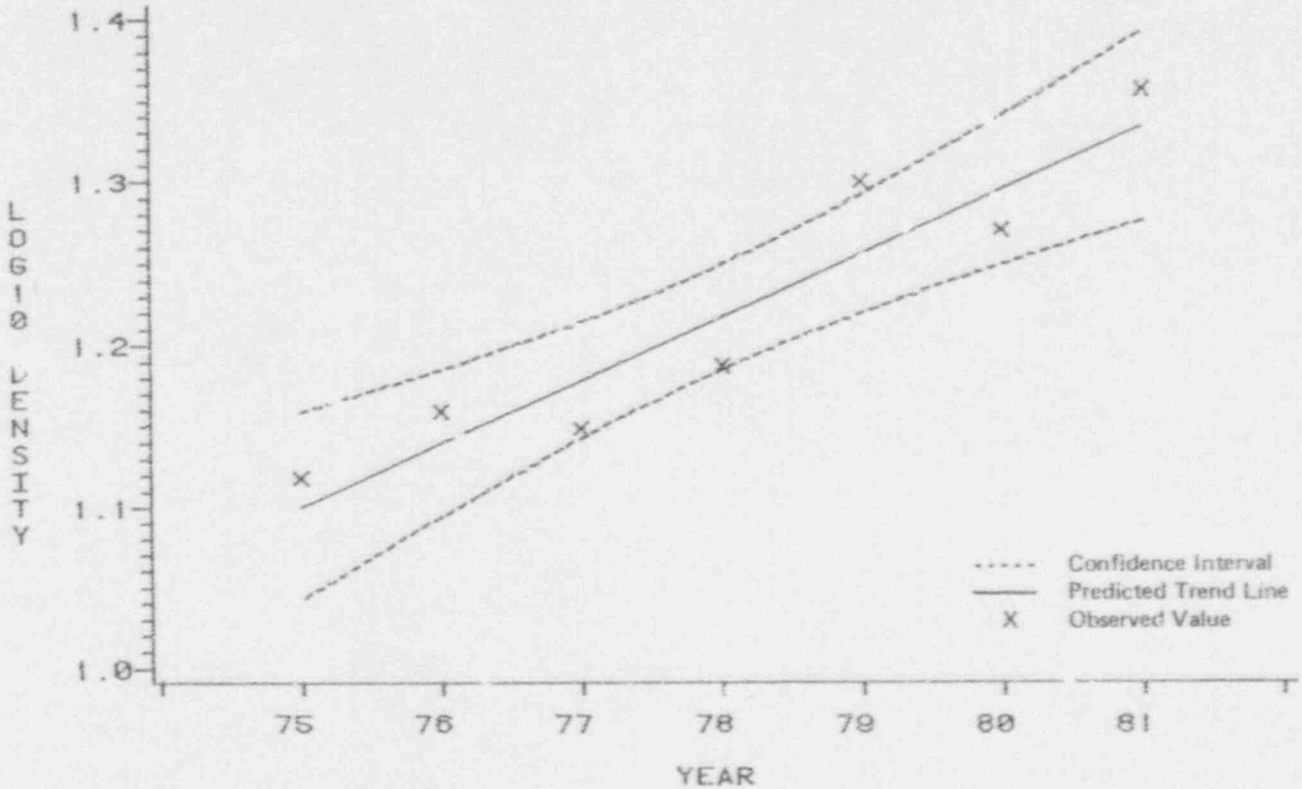


Figure 6.18 Linear trend analysis for mullet entrained September 1974 to August 1981.

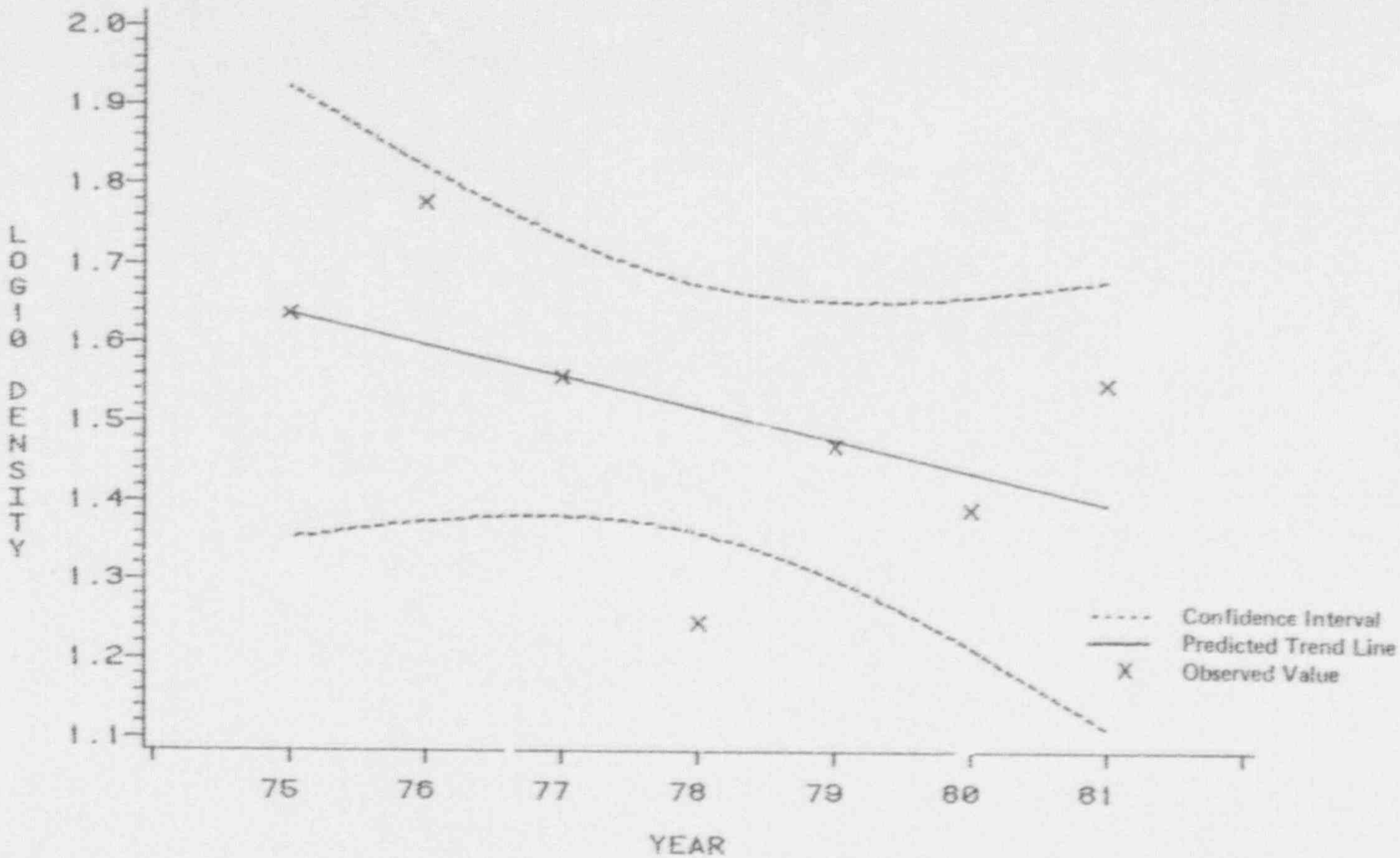


Figure 6.19 Linear trend analysis for brown shrimp entrained September 1974 to August 1981.

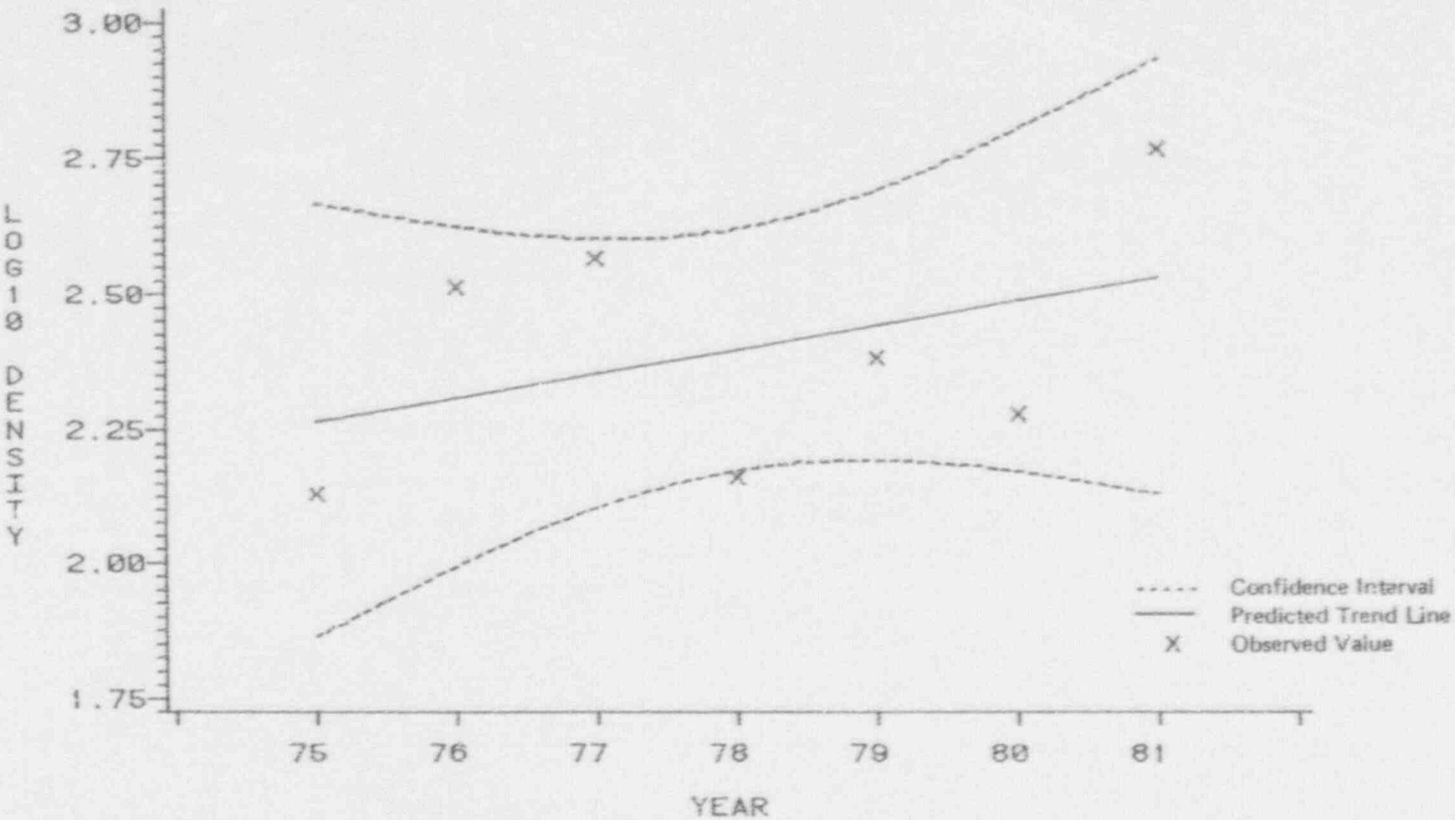
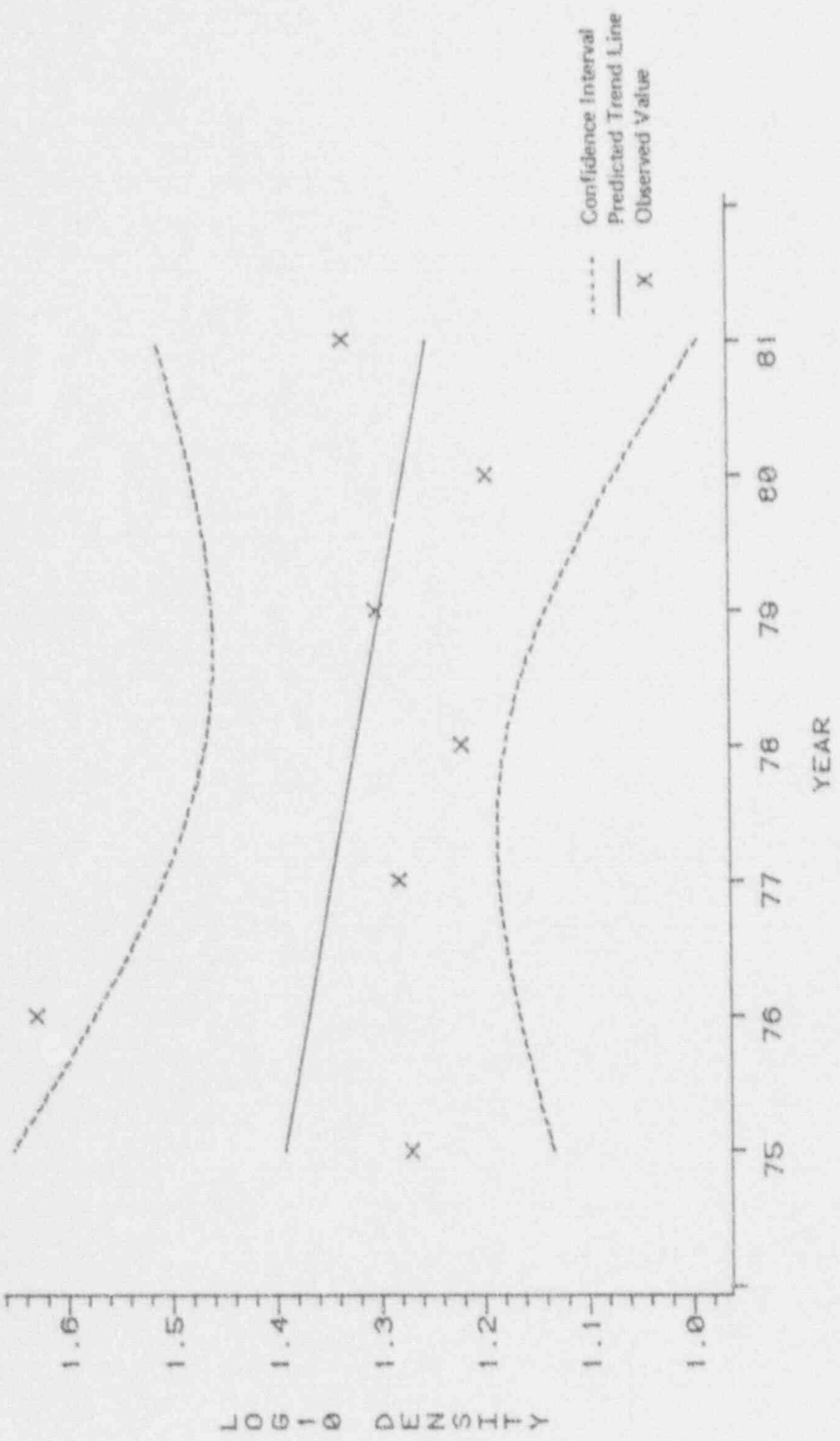


Figure 6.20 Linear trend analysis for anchovies entrained September 1974 to August 1981.



'igure 6.21 Linear trend analysis for seatrout entrained September 1974 to August 1981.

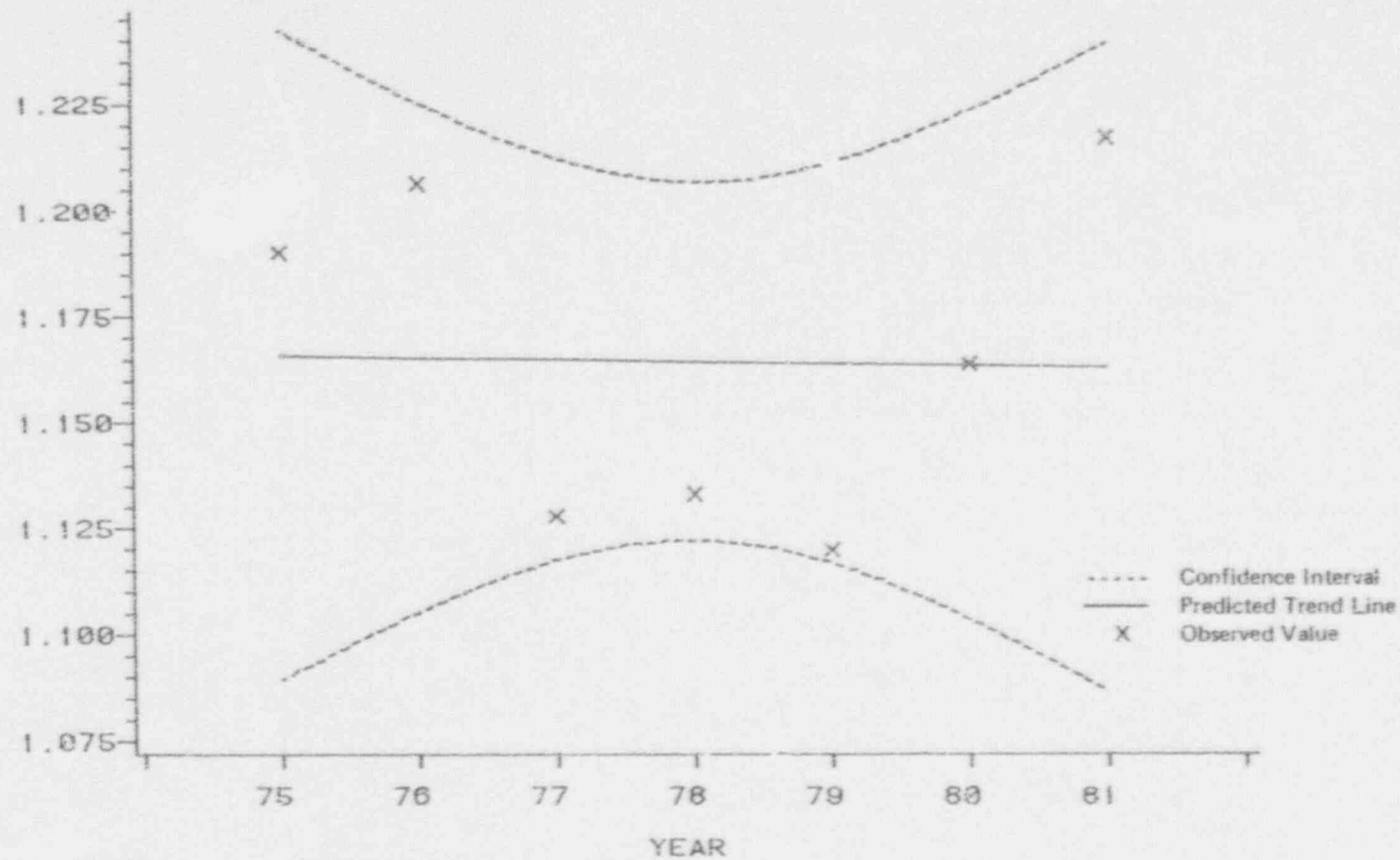


Figure 6.22 Linear trend analysis for Gobionellus spp. entrained September 1974 to August 1981.

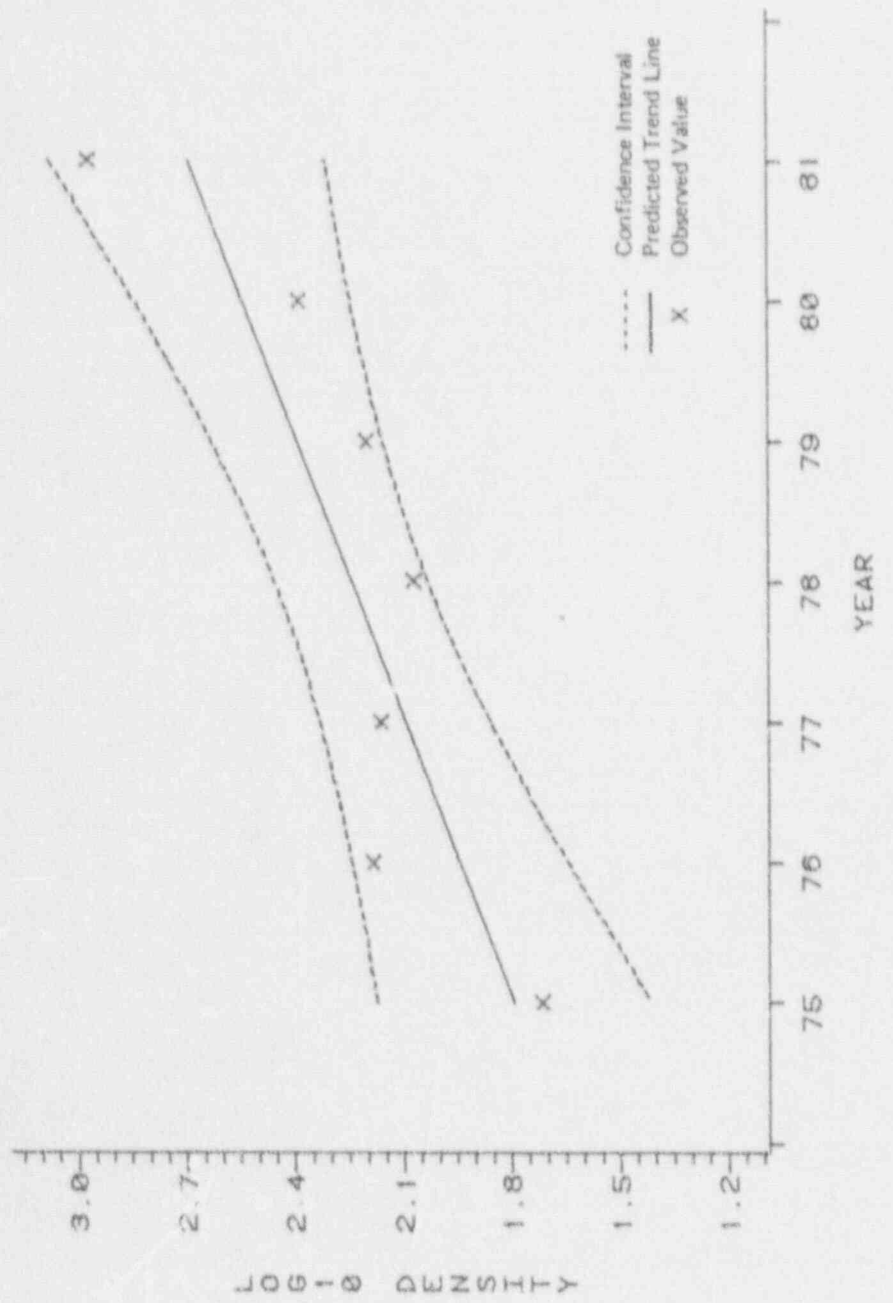


Figure 6.23 Linear trend analysis for Gobiosoma spp. entrained September 1974 to August 1981.

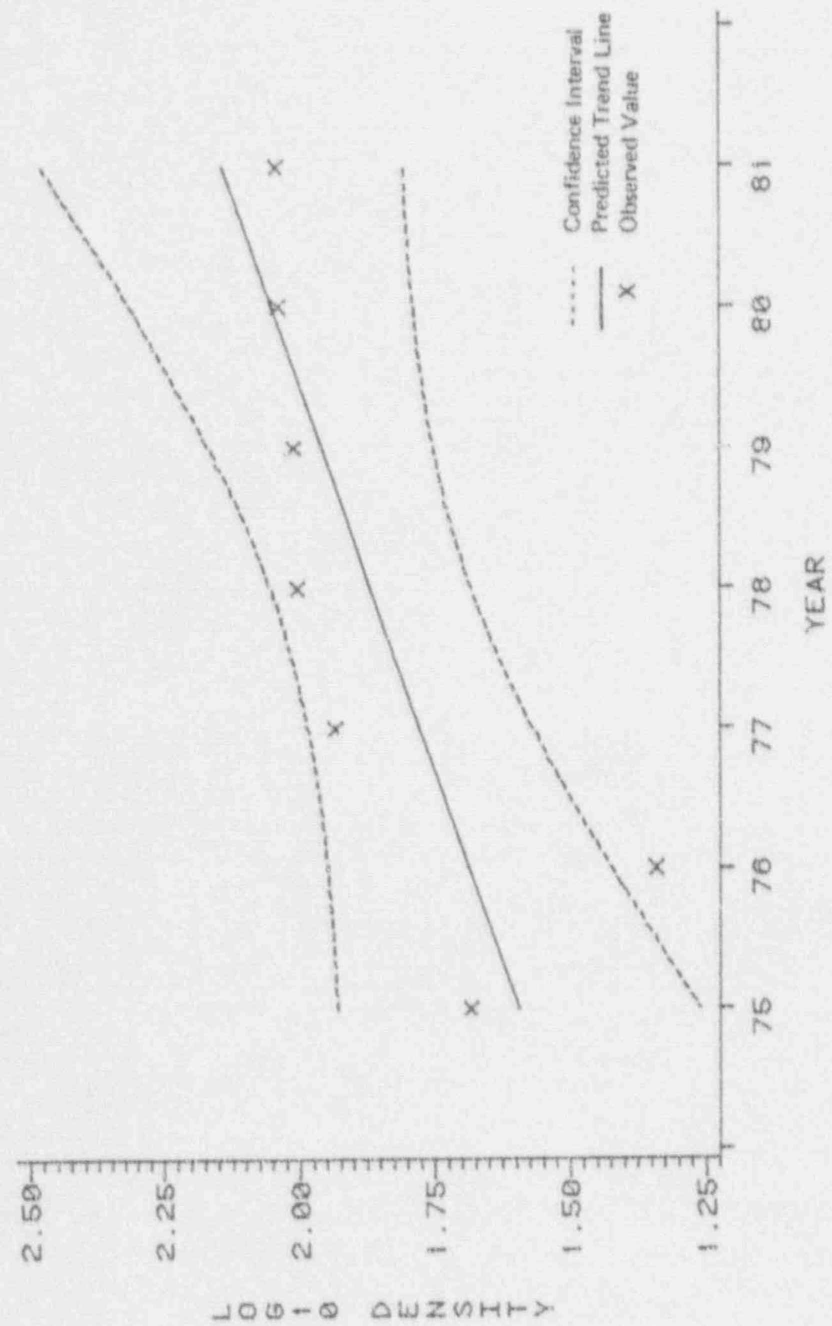


Figure 6.24 Linear trend analysis for pink & white shrimp entrained September 1974 to August 1981.

7.0 IMPINGEMENT

7.1 Introduction

Impingement studies have been undertaken at the BSEP since January 19, 1974. Samples were collected every day the first year (January 19, 1974 to January 18, 1975) and weekly thereafter. Objectives of this study were to determine the numbers, lengths, weights, and species composition of organisms impinged at BSEP.

In January 1979, a temporary diversion device was installed (CP&L 1979). After an initial period of effectiveness (75-90% reduction in impingement) (January - May 1979), problems developed with the diversion device. Biofouling was the major problem, resulting in severe underwashing of the panels and causing some panels to break away from their supports. Because of this and other problems (corrosion, damage by floating debris), the diversion device was not considered to be as effective after May 1979. There were intermittent periods when these problems were overcome, but because of reduced intake water flow, the effectiveness of the diversion device could not be determined. At present, a reliable, permanent diversion device using copper-nickel screening to prevent biofouling and sheet pilings to prevent underwashing is under construction.

7.2 Methods

With the present nekton return system, the traveling screens are rotated at regular intervals throughout the day, and the organisms and debris are washed off with high pressure spray nozzles located behind the screens. The water, debris, and organisms flow down a concrete trough into a 55.2 cm (22 in) diameter pipe which empties into a 3.3 m^3 (866 gal) circular fiberglass tank on top of a platform built in the intake canal. Excess water flows through screening around the tank while the organisms and debris remain in the tank. A top was constructed on the screening around this tank to prevent seagulls and

brown pelicans from being trapped in the tank as they attempted to feed on fish. The tank is then emptied into the nekton return boat MS LUICE by means of a gate valve in the bottom of the tank, which releases the water, organisms, and debris into another 55.2 cm pipe leading to the holding tank in the boat. Water, organisms, and debris are then transported to the ship channel and emptied away from the influence of the intake canal.

The impingement catch was sampled weekly. Under normal operations, one to eight examinations were made in a 24-hour period; the number of examinations varied as the number of organisms being impinged varied. Occasionally, a screen malfunction or other plant problems resulted in no sample being taken. Beginning in 1981, the 24-hour period was divided into day and night sampling periods to aid in analysis of the data.

The impingement catch in the fiberglass tank was emptied into a stainless steel basket on the dock prior to sampling to allow water to drain from the sample. Subsampling was required if the catch for a particular sample period was too large to be examined totally. In such cases, the entire catch was weighed but only a portion examined. This technique was used in the majority of samples taken after February 1975. To refine the estimate of the catch, obviously large or one-of-a-kind items (terrapins, gar, sturgeons) were counted separately and not included in the subsample. The weight of the entire catch divided by the weight of the examined portion gave an expansion factor that was used to obtain an estimate of the composition of the entire catch. The date, collection time, the number of hours fished (sample duration), and the number of intake pumps (one to four) operating on each of the two units were recorded. A water sample was collected just above the bottom of the intake canal with a Kemmerer or Van Dorn water sampler at the time of the sample collection. Water temperature was measured to the nearest degree centigrade with a bucket thermometer or YSI Model 43 telethermometer and salinity was measured to the nearest part per thousand (ppt) with an American Optical Model 10419 handheld refractometer. Appendix A contains daily temperature and salinity measurements from January 1975 through December 1981.

Analysis of an impingement sample consisted of separating the organisms from the debris, identifying, counting, recording length, and weighing as a total each species. Species such as mantis shrimp, squid, and crabs were not measured but only counted and weighed. All weights were recorded to the nearest gram. Total length to the nearest millimeter was recorded for fish and shrimp prior to January 1981 and standard lengths (SL) for fish after this time. Carapace length was taken on terrapins, estimated total length on live eels, and wing tip to wing tip length on skates and rays.

Starting in the spring of 1976, up to 100 specimens of 13 selected species (Table 7.1) were measured from each 24-hour study period for length frequency estimations. These species were chosen because of their dominance in the estuary and/or because they are commercially or recreationally important. Whenever several obvious size groups of one species were present in the catch, they were segregated and up to 100 specimens of each size group were measured. In this manner selection bias was largely avoided. Data sheets were coded and submitted directly for keypunching.

To obtain monthly estimates of impingement, the total number of hours in a month was divided by the number of hours sampled during that month. This expansion factor was then multiplied by the number and weight of all the organisms collected during that month. In this manner, a month's catch was treated as a whole. The 12 monthly totals were then combined to obtain the annual estimate.

The study period was from January 1979 through December 1981, except for statistical analyses which were over all years sampled excluding 1974. This is a change from previous reports which analyzed data from September through August. In forthcoming years, data from January through December of one year will be analyzed. Therefore, all data previously recorded have been regrouped into January-December periods and included in this report as a reference for future reports and for ease of future analysis.

To make analysis easier, the 128 taxa were grouped into the following 12 categories:

Group	Includes
bay anchovy	bay anchovy *Anchoa mitchilli*
blue crab	crabs *Callinectes sapidus, C. similus*, and *C. ornatus*
croaker	Atlantic croaker *Micropogonias undulatus*
flounder	summer flounder *Paralichthys dentatus* southern flounder *P. lethostigma* gulf flounder *P. albigutta*
menhaden	Atlantic menhaden *Brevoortia tyrannus*
miscellaneous species	all organisms not included in another species group (jellyfish, frogs, turtles, squid, etc.)
mullet	striped mullet *Mugil cephalus* white mullet *M. curema*
other finfish	all finfish not included in another
other shellfish	crustaceans such as grass shrimp, mantis shrimp, and crabs other than blue crabs
shrimp	brown shrimp *Peneaus aztecus* pink shrimp *P. duorarum* white shrimp *P. setiferus*
spot	spot *Leiostomus xanthurus*
trout	weakfish *Cynoscion regalis* spotted seatrout *C. nebulosus*

7.3 Results and Discussion

Total numbers of organisms impinged are important, but must be compared to estuarine populations to give the proper perspective to

impingement. Further, because impingement is largely a function of cooling water flow rate (Figure 7.1), year-to-year comparisons can only be made after adjusting tot l numbers by the flow rates. All statistical analyses were done after adjusting totals to numbers per million cubic meters of cooling water.

Total numbers and weights of organisms impinged are presented in Table 7.2, the major group annual summary; Table 7.3, the total numbers and weights of each species impinged annually; Table 7.4, the relative impingement (percentage) of the ten most abundant species; and Table 7.5, the monthly impingement for the 12 major species groups. Generally, these tables show overall impingement (both numbers and weights) was highest in 1978 and 1977, intermediate in 1979, 1980, and 1981, and lowest in 1976 and 1975. These rankings are directly comparable to the flow rates for the same period which ranked in decreasing order as follows: 1978, 1977, 1979, 1981, 1980, 1976, 1975 (Table 7.6). Salinity and temperature, which also influence impingement rates, are shown in Figures 7.2 and 7.3. Periods of low salinities and temperatures cause large increases in impingement rates.

Length frequencies for the thirteen species in Table 7.1 are shown in Figures 7.4a-f through Figures 7.16a-f for the years 1976-1981. These comparisons show only expected year-to-year variation except for 1979. During early 1979, when the diversion device was in place, the mean lengths of impinged spot and croaker were smaller, indicating that larger fish were being kept out of the intake canal.

Even though overall impingement is a function of flow rate and trend analysis for 1974-1981 showed no significant trend for most major groups (anchovy, crab, flounder, menhaden, and spot), other trends were noted. Mullet showed a slight increasing trend, but this trend is based on small numbers and is probably of no biological significance. Three species showed trends of decreasing impingement: croaker (19%), shrimp (29.3%), and trout (17.5%) (Tables 7.7 through 7.16; Figures 7.17 through 7.25).

Croaker are impinged in highest rates in May and June (Tables 7.7 and 7.10); the large decreasing trend results from low 1980-1981 catches, especially during these peak months. Croaker were one of the ten most abundant species impinged (1.6%-10%) during all years except 1981.

Shrimp are impinged in highest rates in the second half of the year (Tables 7.7 and 7.14). While 1977-1980 impingement rates are similar for this part of the year, 1981 rates were much lower and 1975-1976 were much higher. Shrimp populations in 1981 were low throughout the southeast. Populations in 1975 and 1976 were high. The sharp downward trend is largely controlled by these extremes; impingement rates in the middle years (1977-1980) did not show this sharp trend. Shrimp ranked as one of the ten most abundant species impinged (1.7%-24.4%) from all years except 1981.

Trout are impinged in highest rates in June-August (Tables 7.7 and 7.16). There is an apparent decrease over the period of impingement monitoring. Trout were one of the ten most abundant species impinged (1.0%-4.1%) for only 3 of the 7 years sampled.

Menhaden have been one of the most impinged species (6.0%-57.9%) during all 7 years sampled. The peak impingement occurred during the winter months when water temperatures dropped to near lethal temperatures for the species. The diversion structure will reduce impingement of menhaden.

Spot have ranged from 2.0%-12.0% of the total impingement catch and have been one of the ten most abundant species impinged for all 7 years sampled.

Bay anchovy have ranked first or second (12.9%-32.1%) in all 7 years sampled.

The comparison of impingement numbers to flow rates supports the necessity of converting total numbers to rates for annual comparisons.

The impingement rates, although variable, generally reflect the density of organisms in the estuary. More importantly, changes in annual density patterns for individual species illustrate the effectiveness of the temporary diversion structure. The structure was installed in December 1978 and effectively reduced impingement until fouling and underwashing reduced its effectiveness in May 1979. The rate of menhaden impingement typically increases in winter; however, as shown in Table 7.12, menhaden impingement was generally lower in early 1979 (March-April) than in similar periods for other years. This decrease was a direct result of the diversion device. Similar decreases were seen for bay anchovies in March-April 1979. Croaker were impinged in much lower rates in early 1979 than other years, in relation to the spring impingement peaks. Shrimp and trout followed a similar pattern of lowered impingement rates during the period of effectiveness of the diversion structure (February-April 1979). Spot were impinged in greatest rates in 1979, but except for March, the diversion structure appeared relatively effective (Tables 7.7 and 7.15). The overall comparison of major groups shows that the diversion device was effective in reducing impingement rates, even if only [illegible] short period until fouling and undercutting reduced its effectiveness in May 1979.

7.4 Summary

Impingement was directly related to cooling water flow rates and to estuarine population densities. Substantial reductions in impingement rates were seen in early 1979 as a result of the temporary diversion structure. Installation of the permanent diversion structure by late 1982 should maintain similar reductions throughout the year, and installation of fine mesh screening on the traveling screens should increase survival of these organisms which are impinged.

Table 7.1 List of species used in length frequency analysis

Scientific Name	Common Name
Anchoa mitchilli	Bay Anchovy
Brevoortia tyrannus	Atlantic Menhaden
Cynoscion nebulosus	Spotted Seatrout
C. regalis	Weakfish
Leiostomus xanthurus	Spot
Micropogonias undulatus	Atlantic Croaker
Mugil cephalus	Striped Mullet
M. curema	White Mullet
Paralichthys dentatus	Summer Flounder
P. lethostigma	Southern Flounder
Penaeus aztecus	Brown Shrimp
P. duorarum	Pink Shrimp
P. setiferus	White Shrimp

TABLE 7.2 A comparison of impingement rates, January 1975 to December 1981.

	Jan - Dec 1975	Jan - Dec 1976	Jan - Dec 1977	Jan - Dec 1978	Jan - Dec 1979	Jan - Dec 1980	Jan - Dec 1981
Number of Organisms	3,296,697	6,019,291	16,355,569	18,859,331	11,147,099	9,736,795	9,697,879
Weight (kg)	26,919	39,103	98,729	131,569	61,374	67,701	65,269
Number of Shellfish	1,407,109	1,578,464	1,198,013	2,210,602	2,765,909	1,128,726	588,945
Weight of Shellfish	15,033	10,020	8,511	17,940	27,938	8,149	5,463
Number of Finfish	1,859,051	4,389,298	15,110,769	16,471,230	8,302,769	8,512,553	9,049,495
Weight of Finfish	11,592	27,724	89,447	105,699	32,921	59,184	59,488
Number of Misc. Species	30,537	51,529	46,787	177,499	78,421	95,516	59,439
Weight of Misc. Species	294	1,359	771	7,931	515	368	318
Total Number of Taxa	129	138	132	134	146	125	131
Total Taxa of Finfish	112	119	116	118	129	112	117
Species with Less Than 100 Specimens	42	38	28	29	32	26	32
Species with Less Than 1000 Specimens	74	79	65	59	78	63	71
Species Representing More Than 2% of Total Catch	9	10	5	4	10	7	4

TABLE 7.3. TOTAL NUMBER AND WEIGHT OF SPECIES IMPINGED AT BSEP, JANUARY 1975 - DECEMBER 1981.

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
CARCHARHINIDAE	*	*	*	*	*	*	*
REQUIEM SHARKS	*	*	*	*	*	*	*
RHIZOPRIONODON TERRAENOVAE	0	26	83	163	306	0	379
ATLANTIC SHARPNOSE SHARK	0.0	4.0	10.8	16.5	28.6	0.0	81.7
RAJIDAE	*	*	*	*	*	*	*
SKATES	*	*	*	*	*	*	*
RAJA EGLANTERIA	0	0	14	19	0	0	0
CLEARNOSE SKATE	0.0	0.0	14.9	11.8	0.0	0.0	0.0
DASYATIDAE	*	*	*	*	*	*	*
STINGRAYS	*	*	*	*	*	*	*
DASYATIS AMERICANA	2	16	0	8	0	0	0
SOUTHERN STINGRAY	0.4	4.6	0.0	2.6	0.0	0.0	0.0
DASYATIS SABINA	87	235	441	304	159	178	89
ATLANTIC STINGRAY	16.1	28.0	136.2	218.3	52.6	75.6	30.0
DASYATIS SAYI	0	0	0	16	8	0	21
BLUNTNOSE STINGRAY	0.0	0.0	0.0	6.9	2.9	0.0	13.0
GYMNURA MICRURA	0	18	44	65	12	45	0
SMOOTH BUTTERFLY RAY	0.0	3.7	9.3	10.7	1.6	7.9	0.0
MYLIOBATIDAE	*	*	*	*	*	*	*
EAGLE RAYS	*	*	*	*	*	*	*
RHINOPTERA BONASUS	0	0	0	8	0	0	0
COWNOSE RAY	0.0	0.0	0.0	10.8	0.0	0.0	0.0
ACIPENSERIDAE	*	*	*	*	*	*	*
STURGEONS	*	*	*	*	*	*	*

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
ACIPENSER OXYRHYNCHUS	18	12	27	194	27	89	15
ATLANTIC STURGEON	4.2	5.6	19.6	72.6	14.5	27.9	6.2
LEPISOSTEIDAE	*	*	*	*	*	*	*
GARS	*	*	*	*	*	*	*
LEPISOSTEUS OSSEUS	6	8	10	8	56	6	0
LONGNOSE GAR	2.5	2.6	3.1	3.4	4.1	1.7	0.0
ELOPIDAE	*	*	*	*	*	*	*
TARPONS	*	*	*	*	*	*	*
ELOPS SAURUS	49	146	176	181	328	44	272
LADYFISH	3.7	5.7	10.4	14.5	32.4	4.8	30.3
ELOPS SAURUS(LEPTOCEPHALUS)	0	0	0	0	0	196	0
LADYFISH(LEPTOCEPHALUS)	0.0	0.0	0.0	0.0	0.0	0.2	0.0
MEGALOPS ATLANTICUS	0	0	63	0	0	0	0
TARPON	0.0	0.0	4.1	0.0	0.0	0.0	0.0
MEGALOPS ATLANTICUS(LEPTOCEPHALUS)	0	0	0	0	139	0	0
TARPON(LEPTOCEPHALUS)	0.0	0.0	0.0	0.0	0.1	0.0	0.0
ANGUILLIDAE	*	*	*	*	*	*	*
FRESHWATER EELS	*	*	*	*	*	*	*
ANGUILLA ROSTRATA	216	137	242	485	457	308	215
AMERICAN EEL	20.0	12.3	8.7	47.9	33.9	20.9	28.5
CONGRIDAE	*	*	*	*	*	*	*
CONGER EELS	*	*	*	*	*	*	*
CONGER OCEANICUS	0	0	8	519	7	19	0
CONGER EEL	0.0	0.0	0.6	54.8	0.2	4.7	0.0

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
OPHICHTHIDAE	*	*	*	*	*	*	*
SNAKE EELS	*	*	*	*	*	*	*
MYROPHIS PUNCTATUS	26	166	842	3774	3224	1087	1555
SPECKLED WORM EEL	1.3	4.0	23.9	127.1	101.5	24.1	64.8
MYROPHIS PUNCTATUS(LEPTOCEPHALUS)	0	0	0	0	7	847	6
SPECKLED WORM EEL(LEPTO.)	0.0	0.0	0.0	0.0	0.0	0.1	0.0
OPHICHTHUS GOMESI	821	1951	607	4783	14868	7654	6049
SHRIMP EEL	46.9	87.6	16.7	171.6	467.9	253.6	294.8
OPHICHTHUS OCELLATUS	0	0	0	0	10	6	0
PALESPOTTED EEL	0.0	0.0	0.0	0.0	1.0	0.4	0.0
CLUPEIDAE	0	0	23	0	0	0	0
HERRINGS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALOSA AESTIVALIS	100100	94654	118729	97309	593770	76069	134976
BLUEBACK HERRING	233.0	307.0	636.3	742.7	706.0	455.2	701.7
ALOSA MEDIOCRIS	0	0	8	399	1486	0	0
HICKORY SHAD	0.0	0.0	1.9	4.9	8.0	0.0	0.0
ALOSA PSEUDOHARENGUS	2183	2197	1542	0	0	0	158
ALEWIFE	6.5	8.4	16.8	0.0	0.0	0.0	2.5
ALOSA SAPIDISSIMA	3521	6944	7704	6788	2268	512	2460
AMERICAN SHAD	15.4	35.0	51.4	61.7	15.7	6.0	17.4
BREVOORTIA TYRANNUS	197625	541632	8618170	10915895	764153	4275953	4250608
ATLANTIC MENHADEN	4843.1	13061.4	59763.6	74764.0	13876.5	46036.8	40639.5
DOROSOMA CEPEDIANUM	16489	366380	26738	3202	54068	414	642
GIZZARD SHAD	116.2	1023.8	189.2	153.9	332.3	4.5	8.1

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
DOROSOMA PETENENSE THREADFIN SHAD	35146 125.4	42620 271.3	2354 9.9	4549 24.4	728 4.7	182 2.8	242 4.3
OPISTHONEMA OGLINUM ATLANTIC THREAD HERRING	26261 99.1	123 1.2	283 1.9	326 1.7	2292 19.9	595 8.1	298 2.7
ENGRAULIDAE ANCHOVIES	* *	* *	* *	* *	* *	* *	* *
ANCHOA HEPSETUS STRIPED ANCHOVY	3481 28.7	23313 93.9	17469 97.1	41854 210.3	43448 162.8	38679 180.6	66515 524.9
ANCHOA MITCHILLI BAY ANCHOVY	638404 944.1	1821682 2745.6	3626130 5574.6	2430339 4515.5	3034617 5600.4	2569516 3297.7	3113466 3411.5
UMBRIDAE MUDMINNOWS	* *	* *	* *	* *	* *	* *	* *
UMBRA PYGMAEA EASTERN MUDMINNOW	0 0.0	0 0.0	0 [illegible]	0 0.0	0 0.0	31 0.1	0 0.0
ESOCIDAE PIKES	* *	* *	* *	* *	* *	* *	* *
ESOX AMERICANUS AMERICANUS REDFIN PICKEREL	0 0.0	0 0.0	0 0.0	0 0.0	36 0.2	33 0.4	0 0.0
SYNODONTIDAE LIZARDFISHES	* *	* *	* *	* *	* *	* *	* *
SYNODUS FOETENS INSHORE LIZARDFISH	1004 15.7	612 15.1	2837 97.7	2884 104.9	549 9.6	1300 62.7	1182 28.0
CYPRINIDAE CARPS AND MINNOWS	* *	* *	* *	* *	* *	* *	* *

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
NOTEMIGONUS CRYSOLEUCAS	50	37	3280	190	35	0	0
GOLDEN SHINER	0.1	0.1	19.3	1.1	0.4	0.0	0.0
CATOSTOMIDAE	*	*	*	*	*	*	*
SUCKERS	*	*	*	*	*	*	*
ERIMYZON OBLONGUS	0	0	0	0	0	0	7
CREEK CHUBSUCKER	0.0	0.0	0.0	0.0	0.0	0.0	0.2
ICTALURIDAE	*	*	*	*	*	*	*
BULLHEAD CATFISHES	*	*	*	*	*	*	*
ICTALURUS CATUS	0	0	32	157	14	0	6
WHITE CATFISH	0.0	0.0	18.3	29.9	1.9	0.0	1.7
ICTALURUS NATALIS	0	0	0	0	7	0	0
YELLOW BULLHEAD	0.0	0.0	0.0	0.0	0.2	0.0	0.0
ICTALURUS NEBULOSUS	0	6	0	0	0	0	0
BROWN BULLHEAD	0.0	1.2	0.0	0.0	0.0	0.0	0.0
ARIIDAE	*	*	*	*	*	*	*
SEA CATFISHES	*	*	*	*	*	*	*
ARIUS FELIS	6	39	0	0	0	0	23
HARDHEAD CATFISH	0.5	2.9	0.0	0.0	0.0	0.0	2.5
BAGRE MARINUS	6	0	0	0	0	0	0
GAFFTOPSAIL CATFISH	0.0	0.0	0.0	0.	0.0	0.0	0.0
APHREDODERIDAE	*	*	*	*	*	*	*
PIRATE PERCHES	*	*	*	*	*	*	*
APHREDODERUS SAYANUS	0	14	0	0	0	0	0
PIRATE PERCH	0.0	0.1	0.0	0.0	0.0	0.0	0.0

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
BATRACHOIDIDAE	*	*	*	*	*	*	*
TOADFISHES	*	*	*	*	*	*	*
OPSANUS TAU	4506	5837	13429	15865	24509	10216	7538
OYSTER TOADFISH	75.1	110.7	264.1	327.2	283.3	136.9	84.8
PORICHTHYS PLECTRODON	0	18	0	0	185	0	0
ATLANTIC MIDSHIPMAN	0.0	1.5	0.0	0.0	5.4	0.0	0.0
GOBIESOCIDAE	*	*	*	*	*	*	*
CLINGFISHES	*	*	*	*	*	*	*
GOBIESOX STRUMOSUS	1094	2777	5570	4853	7164	6018	3085
SKILLETFISH	3.0	4.8	10.4	12.8	15.2	14.8	8.2
ANTENNARIIDAE	*	*	*	*	*	*	*
FROGFISHES	*	*	*	*	*	*	*
ANTENNARIUS OCELLATUS	[illegible]	0	0	0	0	0	0
OCELLATED FROGFISH	[illegible]	0.0	0.0	0.0	0.0	0.0	0.0
HISTRIO HISTRIO	0	68	0	0	9	0	0
SARGASSUMFISH	0.0	1.1	0.0	0.0	0.0	0.0	0.0
GADIDAE	0	0	0	0	1141	0	0
CODFISHES	0.0	0.0	0.0	0.0	3.6	0.0	0.0
UROPHYCIS SP.	101669	508	353	0	194	0	191
HAKE UNID.(UROPHYCIS)	828.0	1.4	0.6	0.0	0.4	0.0	0.2
UROPHYCIS FLORIDANA	0	343	2116	174	5620	25652	2055
SOUTHERN HAKE	0.0	1.4	19.1	3.4	30.6	94.3	11.0
UROPHYCIS REGIA	620	15075	278338	355898	25490	91998	98977
SPOTTED HAKE	5.6	73.9	3230.5	3810.0	385.9	490.3	684.9

TABLE [illegible] (CONTINUED)

SPECIES	[illegible]	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
OPHIDIIDAE	0	0	0	2093	11857	4621	484
CUSK-EELS	0.0	0.0	0.0	23.9	127.1	55.6	7.4
OPHIDION WELSHI	4111	5582	12618	10506	10384	4993	6115
CRESTED CUSK-EEL	67.3	75.1	148.1	160.9	124.1	60.3	95.3
EXOCOETIDAE	*	*	*	*	*	*	*
FLYINGFISHES	*	*	*	*	*	*	*
CYPSELURUS SP.	0	16	0	0	0	0	0
FLYINGFISH UNID.(CYPSELURUS)	0.0	2.8	0.0	0.0	0.0	0.0	0.0
HEMIRAMPHUS BRASILIENSIS	0	0	0	0	534	37	0
BALLYHOO	0.0	0.0	0.0	0.0	0.2	0.0	0.0
HYPORHAMPHUS UNIFASCIATUS	0	316	1508	2095	1475	1130	460
HALFBEAK	0.0	0.8	1.7	1.1	0.8	0.6	0.4
BELONIDAE	*	*	*	*	*	*	*
NEEDLEFISHES	*	*	*	*	*	*	*
STRONGYLURA MARINA	439	1239	1104	2302	1582	294	200
ATLANTIC NEEDLEFISH	5.1	2.8	17.5	10.8	5.9	1.5	0.6
CYPRINODONTIDAE	*	*	*	*	*	*	*
KILLIFISHES	*	*	*	*	*	*	*
CYPRINODON VARIEGATUS	80	0	30	0	0	29	15
SHEEPSHEAD MINNOW	0.1	0.0	0.0	0.0	0.0	0.0	0.0
FUNDULUS HETEROCLITUS	3393	2217	4032	1827	6228	1098	513
MUMMICHOG	10.6	4.9	12.5	5.9	17.3	3.8	1.9
FUNDULUS MAJALIS	0	0	31	0	14	106	43
STRIPED KILLIFISH	0.0	0.0	0.1	0.0	0.0	0.3	0.1

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
POECILIIDAE	*	*	*	*	*	*	*
LIVEBEARERS	*	*	*	*	*	*	*
POECILIA LATIPINNA	0	6	0	0	0	0	0
SAILFIN MOLLY	0.0	0.0	0.0	0.0	0.0	0.9	0.0
ATHERINIDAE	0	0	0	0	0	0	16
SILVERSIDES	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEMBRAS MARTINICA	5001	43851	39258	202782	97436	94254	127269
ROUGH SILVERSIDE	17.8	104.7	128.1	573.8	210.3	135.3	430.7
MENIDIA BERYLLINA	33	126	0	0	15	0	0
INLAND SILVERSIDE	0.1	0.4	0.0	0.0	0.0	0.0	0.0
MENIDIA MENIDIA	1631	20421	89355	297453	38832	58301	91700
ATLANTIC SILVERSIDE	7.2	61.2	261.1	1136.6	143.3	236.5	294.7
GASTEROSTEIDAE	*	*	*	*	*	*	*
STICKLEBACKS	*	*	*	*	*	*	*
GASTEROSTEUS ACULEATUS	0	0	0	0	7	0	0
THREESPINE STICKLEBACK	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SYNGNATHIDAE	*	*	*	*	*	*	*
PIPEFISHES	*	*	*	*	*	*	*
HIPPOCAMPUS ERECTUS	11	0	34	2047	40	0	143
LINED SEAHORSE	0.0	0.0	0.1	7.4	0.0	0.0	0.1
OOSTETHUS BRACHYURUS	0	15	0	70	0	0	0
OPOSSUM PIPEFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SYNGNATHUS SP.	0	0	0	32	0	0	31
PIPEFISH UNID.(SYNGNATHUS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
SYNGNATHUS FUSCUS NORTHERN PIPEFISH	202 0.3	516 1.1	1279 1.8	838 2.6	828 1.6	1296 2.0	2204 3.0
SYNGNATHUS LOUISIANAE CHAIN PIPEFISH	742 2.4	1060 2.5	1365 4.3	2688 16.9	1166 3.4	2750 4.3	2570 5.1
PERCICHTHYIDAE TEMPERATE BASSES	* *	* *	* *	* *	* *	* *	* *
MORONE SAXATILIS STRIPED BASS	7 0.1	0 0.0	0 0.0	0 0.0	0 0.0	193 1.4	0 0.0
SERRANIDAE SEA BASSES	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
CENTROPRISTIS PHILADELPHICA ROCK SEA BASS	39 0.3	37 1.9	272 8.7	0 0.0	7 0.1	242 7.1	61 0.7
CENTROPRISTIS STRIATA BLACK SEA BASS	62 0.5	52 2.5	74 1.3	0 0.0	50 1.4	0 0.0	0 0.0
DIPLECTRUM FORMOSUM SAND PERCH	18 0.2	6 0.0	23 0.2	64 2.6	0 0.0	0 0.0	31 0.3
EPINEPHELUS SP. GROUPER UNID.(EPINEPHELUS)	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	31 0.6	0 0.0
EPINEPHELUS MORIO RED GROUPER	0 0.0	0 0.0	63 5.2	0 0.0	0 0.0	0 0.0	0 0.0
EPINEPHELUS STRIATUS NASSAU GROUPER	6 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
MYCTEROPERCA SP. GROUPER UNID.(MYCTEROPERCA)	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	8 0.2

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
MYCTEROPERCA BONACI	18	16	120	0	0	56	34
BLACK GROUPER	1.9	1.5	1.9	0.0	0.0	2.2	4.5
MYCTEROPERCA MICROLEPIS	1097	103	539	31	0	103	1202
GAG	11.3	4.1	20.4	1.8	0.0	5.6	37.8
CENTRARCHIDAE	*	*	*	*	*	*	*
SUNFISHES	*	*	*	*	*	*	*
ACANTHARCHUS POMOTIS	0	0	0	0	0	6	7
MUD SUNFISH	0.0	0.0	0.0	0.0	0.0	0.2	0.3
CENTRARCHUS MACROPTERUS	0	0	29	280	0	0	0
FLIER	0.0	0.0	0.1	6.0	0.0	0.0	0.0
ENNEACANTHUS GLORIOSUS	0	0	0	48	56	0	0
BLUESPOTTED SUNFISH	0.0	0.0	0.0	0.1	0.1	0.0	0.0
LEPOMIS GIBBOSUS	31	0	5655	199	38	0	3
PUMPKINSEED	0.4	0.0	61.0	7.0	0.0	0.0	0.0
LEPOMIS GULOSUS	0	55	143	48	284	137	256
WARMOUTH	0.0	0.3	0.7	0.2	0.8	0.5	0.5
LEPOMIS MACROCHIRUS	1140	757	1557	6053	927	7	911
BLUEGILL	4.5	6.1	28.2	51.3	3.9	0.0	2.3
LEPOMIS MICROLOPHUS	0	0	0	178	0	0	0
REDEAR SUNFISH	0.0	0.0	0.0	0.1	0.0	0.0	0.0
MICROPTERUS SALMOIDES	12	37	211	899	23	0	31
LARGEMOUTH BASS	0.1	1.5	1.4	1.3	0.0	0.0	0.1
PRIACANTHIDAE	*	*	*	*	*	*	*
BIGEYES	*	*	*	*	*	*	*

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
PRIACANTHUS ARENATUS	6	0	0	0	8	0	0
BIGEYE	0.0	0.0	0.0	0.0	0.2	0.0	0.0
PRISTIGENYS ALTA	8	0	0	0	0	0	0
SHORT BIGEYE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POMATOMIDAE	*	*	*	*	*	*	*
BLUEFISHES	*	*	*	*	*	*	*
POMATOMUS SALTATRIX	3415	3140	12352	18939	6585	4058	6984
BLUEFISH	83.3	34.4	177.2	269.1	66.5	84.5	156.4
RACHYCENTRIDAE	*	*	*	*	*	*	*
COBIAS	*	*	*	*	*	*	*
RACHYCENTRON CANADUM	49	297	356	426	156	398	177
COBIA	2.6	0.2	0.4	0.9	0.2	6.3	1.5
ECHENEIDAE	*	*	*	*	*	*	*
REMORAS	*	*	*	*	*	*	*
ECHENEIS NAUCRATES	0	6	8	0	0	0	6
SHARKSUCKER	0.0	0.6	0.2	0.0	0.0	0.0	0.0
REMORA REMORA	0	0	0	0	30	0	0
REMORA	0.0	0.0	0.0	0.0	2.3	0.0	0.0
CARANGIDAE	0	0	0	62	6	0	0
JACKS	0.0	0.0	0.0	2.5	0.0	0.0	0.0
CARANX CRYSOS	0	0	57	0	0	0	0
BLUE RUNNER	0.0	0.0	1.6	0.0	0.0	0.0	0.0
CARANX HIPPOS	3456	24810	8387	4436	18099	13441	4161
CREVALLE JACK	7.4	29.5	19.0	11.9	26.7	18.1	9.8

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
CARANX LATUS	0	0	86	0	0	0	0
HORSE-EYE JACK	0.0	0.0	3.5	0.0	0.0	0.0	0.0
CHLOROSCOMBRUS CHRYSURUS	2710	48604	23097	46000	4182	10442	2536
ATLANTIC BUMPER	37.9	195.4	135.7	189.7	13.9	21.1	11.5
OLIGOPLITES SAURUS	6	0	0	0	23	36	0
LEATHERJACKET	0.0	0.0	0.0	0.0	0.0	0.1	0.0
SELENE SETAPINNIS	84	106	139	209	238	0	0
ATLANTIC MOONFISH	0.1	0.1	0.2	0.3	0.3	0.0	0.0
SELENE VOMER	1914	16331	4440	22325	32305	2515	3557
LOOKDOWN	11.3	51.2	20.1	124.6	98.3	14.4	23.5
TRACHINOTUS CAROLINUS	0	810	0	6	49	0	0
FLORIDA POMPANO	0.0	4.0	0.0	1.4	0.0	0.0	0.0
TRACHINOTUS FALCATUS	0	35	6	70	360	355	139
PERMIT	0.0	0.0	0.8	0.0	0.8	0.3	0.2
LUTJANIDAE	*	*	*	*	*	*	*
SNAPPERS	*	*	*	*	*	*	*
LUTJANUS GRISEUS	1199	855	5280	1905	12306	3682	1527
GRAY SNAPPER	10.5	3.8	27.2	10.8	71.3	17.9	16.4
LUTJANUS SYNAGRIS	0	31	143	0	0	0	0
LANE SNAPPER	0.0	0.1	0.9	0.0	0.0	0.0	0.0
LOBOTIDAE	*	*	*	*	*	*	*
TRIPLETAILS	*	*	*	*	*	*	*
LOBOTES SURINAMENSIS	0	70	0	16	0	15	0
TRIPLETAIL	0.0	0.8	0.0	0.7	0.0	5.8	0.0

TABLE 7.[illegible] (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
GERREIDAE	0	0	0	0	466	0	0
MOJARRAS	0.0	0.0	0.0	0.0	1.3	0.0	0.0
DIAPTERUS AURATUS	680	979	279	815	1405	551	38
IRISH POMPANO	5.4	2.7	1.0	8.5	13.2	3.4	0.2
EUCINOSTOMUS SP.	2491	975	0	233	0	0	0
MOJARRA UNID.(EUCINOSTOMUS)	10.1	2.7	0.0	5.5	0.0	0.0	0.0
EUCINOSTOMUS ARGENTEUS	0	1411	6983	1628	3337	3493	3664
SPOTFIN MOJARRA	0.0	7.8	57.4	13.5	10.2	10.8	28.5
EUCINOSTOMUS GULA	0	54	667	969	346	0	136
SILVER JENNY	0.0	0.3	5.3	11.7	0.9	0.0	1.9
HAEMULIDAE	*	*	*	*	*	*	*
GRUNTS	*	*	*	*	*	*	*
ANISOTREMUS SURINAMENSIS	0	0	0	0	[illegible]	0	0
BLACK MARGATE	0.0	0.0	0.0	0.0	[illegible]	0.0	0.0
ORTHOPRISTIS CHRYSOPTERA	828	3554	1841	3135	299	240	581
PIGFISH	6.2	11.1	5.3	12.8	1.9	2.5	5.0
SPARIDAE	*	*	*	*	*	*	*
PORGIES	*	*	*	*	*	*	*
ARCHOSARGUS PROBATOCEPHALUS	143	220	114	1076	180	860	7205
SHEEPSHEAD	7.5	7.1	1.8	14.3	5.7	21.9	290.7
LAGODON RHOMBOIDES	4987	52745	82220	96136	13539	16817	21784
PINFISH	46.6	396.3	686.1	723.6	172.3	142.1	227.6
STENOTOMUS CAPRINUS	8	0	0	0	0	0	0
LONGSPINE PORGY	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
SCIAENIDAE	*	*	*	*	*	*	*
DRUMS	*	*	*	*	*	*	*
BAIRDIELLA CHRYSOURA	5420	24288	30709	28515	13252	14912	29024
SILVER PERCH	108.4	204.5	600.3	313.0	112.9	112.9	519.6
CYNOSCION NEBULOSUS	3216	12423	7139	5252	5538	4849	3435
SPOTTED SEATROUT	91.1	171.1	165.6	155.7	113.2	133.8	170.6
CYNOSCION NOTHUS	12	0	6	0	0	0	0
SILVER SEATROUT	0.1	0.0	0.0	0.0	0.0	0.0	0.0
CYNOSCION REGALIS	128372	245535	166460	252162	273185	14288	45569
WEAKFISH	257.1	579.5	1345.4	3030.3	706.9	51.6	129.4
LARIMUS FASCIATUS	560	1289	405	53	476	185	978
BANDED DRUM	7.4	18.4	0.8	0.2	2.2	0.4	3.6
LEIOSTOMUS XANTHURUS	64904	318923	814731	568945	1339765	308502	613450
SPOT	685.3	3652.9	7606.2	7112.0	3623.9	3564.9	7054.4
MENTICIRRHUS SP.	0	0	0	0	789	218	103
KINGFISH UNID.(MENTICIRRHUS)	0.0	0.0	0.0	0.0	2.3	0.6	0.2
MENTICIRRHUS AMERICANUS	457	478	1846	1429	450	331	714
SOUTHERN KINGFISH	0.8	1.2	19.4	6.9	5.2	1.3	4.9
MENTICIRRHUS SAXATILIS	2	0	0	0	411	0	0
NORTHERN KINGFISH	0.0	0.0	0.0	0.0	1.1	0.0	0.0
MICROPOGONIAS UNDULATUS	232446	209740	405985	296422	1110051	295940	51469
ATLANTIC CROAKER	1022.1	2216.9	3837.8	1345.3	1622.5	727.6	646.5
POGONIAS CROMIS	86	0	0	98	272	13	298
BLACK DRUM	7.4	0.0	0.0	25.9	21.3	2.5	59.3

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
SCIAENOPS OCELLATUS RED DRUM	110 7.3	222 11.8	1331 37.2	4506 14.6	539 1.3	204 18.5	3073 18.8
STELLIFER LANCEOLATUS STAR DRUM	44799 189.5	231832 516.9	167126 585.1	37564 166.0	91626 298.0	239611 858.5	81201 225.6
EPHIPPIDAE SPADEFISHES	* *	* *	* *	* *	* *	* *	* *
CHAETODIPTERUS FABER ATLANTIC SPADEFISH	1128 1.2	240 8.5	748 4.5	4210 13.8	3898 8.1	5380 20.8	3803 17.3
LABRIDAE WRASSES	* *	* *	* *	* *	* *	* *	* *
TAUTOGA ONITIS TAUTOG	0 0.0	16 8.6	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0
MUGILIDAE MULLETS	* *	* *	* *	* *	* *	* *	* *
MUGIL SP. MULLET UNID.(MUGIL)	3926 15.8	244 8.1	0 0.0	8 0.0	60 0.0	0 0.0	15 0.0
MUGIL CEPHALUS STRIPED MULLET	7810 473.2	4555 260.1	21871 395.8	24319 607.9	24862 76.8	21774 313.0	31568 998.4
MUGIL CUREMA WHITE MULLET	1215 22.4	4817 22.6	22740 214.0	3762 30.8	2103 27.4	7577 35.7	9924 63.1
SPHYRAENIDAE BARRACUDAS	* *	* *	* *	* *	* *	* *	* *
SPHYRAENA BARRACUDA GREAT BARRACUDA	0 0.0	15 0.0	0 0.9	0 0.0	0 0.0	0 0.0	0 0.0

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
SPHYRAENA BOREALIS	0	226	0	0	231	0	134
NORTHERN SENNET	0.0	0.1	0.0	0.0	9.2	0.0	0.1
SPHYRAENA GUACHANCHO	164	23	247	32	176	0	38
GUAGUANCHE	0.3	0.0	0.3	0.0	0.2	0.0	0.1
URANOSCOPIDAE	0	0	0	0	648	1061	38
STARGAZERS	0.0	0.0	0.0	0.0	1.2	1.7	0.0
ASTROSCOPUS SP.	0	0	0	0	93	3393	270
STARGAZER UNID.(ASTROSCOPUS)	0.0	0.0	0.0	0.0	0.1	6.2	0.7
ASTROSCOPUS GUTTATUS	28	498	482	0	276	416	74
NORTHERN STARGAZER	0.0	0.9	1.1	0.0	0.9	1.6	0.3
ASTROSCOPUS Y-GRAECUM	341	305	385	1558	1276	199	172
SOUTHERN STARGAZER	2.8	5.9	1.5	5.0	9.9	7.1	0.4
BLENNIIDAE	*	*	*	*	*	*	*
COMBTOOTH BLENNIES	*	*	*	*	*	*	*
CHASMODES BOSQUIANUS	214	154	926	1878	979	761	326
STRIPED BLENNY	0.4	0.6	2.8	5.0	3.2	2.1	0.7
HYPLEUROCHILUS GEMINATUS	0	0	0	15	0	18	0
CRESTED BLENNY	0.0	0.0	0.0	0.1	0.0	0.0	0.0
HYPSOBLENNIUS HENTZI	715	1430	1754	1346	3061	2157	3633
FEATHER BLENNY	2.2	4.9	7.5	5.8	17.6	7.7	31.4
HYPSOBLENNIUS IONTHAS	603	3386	2375	2809	1849	612	673
FRECKLED BLENNY	1.6	9.2	7.8	8.1	6.5	2.2	2.6
ELEOTRIDAE	*	*	*	*	*	*	*
SLEEPERS	*	*	*	*	*	*	*

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
DORMITATOR MACULATUS	233	0	140	47	23	0	78
FAT SLEEPER	1.7	0.0	2.1	0.1	0.2	0.0	0.7
ELEOTRIS PISONIS	78	0	0	299	108	90	78
SPINYCHEEK SLEEPER	1.3	0.0	0.0	2.5	0.5	1.1	0.7
GOBIIDAE	*	*	*	*	*	*	*
GOBIES	*	*	*	*	*	*	*
GOBIONELLUS BOLEOSOMA	6	43	0	0	810	103	0
DARTER GOBY	0.0	0.0	0.0	0.0	1.4	0.0	0.0
GOBIONELLUS HASTATUS	391	502	247	1143	2011	1772	422
SHARPTAIL GOBY	2.1	2.4	0.9	4.2	11.1	4.6	1.0
GOBIONELLUS SHUFELDTI	200	54	113	0	6	18	0
FRESHWATER GOBY	0.1	0.1	0.3	0.0	0.0	0.0	0.0
GOBIOSOMA SP.	0	0	0	0	0	48	0
GOBY UNID.(GOBIOSOMA)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GOBIOSOMA BOSCI	6	64	236	476	362	494	90
NAKED GOBY	0.0	0.0	0.5	0.7	0.8	0.5	0.1
MICROGOBIUS SP.	0	0	0	0	74	0	81
GOBY UNID.(MICROGOBIUS)	0.0	0.0	0.0	0.0	0.1	0.0	0.1
MICROGOBIUS GULOSUS	0	0	0	0	6	89	0
CLOWN GOBY	0.0	0.0	0.0	0.0	0.0	0.1	0.0
MICROGOBIUS THALASSINUS	0	31	0	0	0	0	0
GREEN GOBY	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MICRODESMIDAE	*	*	*	*	*	*	*
WORMFISHES	*	*	*	*	*	*	*

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
MICRODESMUS LONGIPINNIS	0	0	7	0	0	0	0
PINK WORMFISH	0.0	0.0	0.1	0.0	0.0	0.0	0.0
TRICHIURIDAE	*	*	*	*	*	*	*
CUTLASSFISHES	*	*	*	*	*	*	*
TRICHIURUS LEPTURUS	1347	1516	271	271	777	2926	3535
ATLANTIC CUTLASSFISH	15.9	20.2	5.4	1.4	7.3	72.2	37.2
SCOMBRIDAE	0	0	0	0	0	23	0
MACKERELS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCOMBEROMORUS CAVALLA	0	0	0	30	128	6	12
KING MACKEREL	0.0	0.0	0.0	0.1	0.1	0.0	0.0
SCOMBEROMORUS MACULATUS	202	100	8	644	285	278	359
SPANISH MACKEREL	2.2	2.3	0.0	3.5	3.8	3.8	7.5
STROMATEIDAE	*	*	*	*	*	*	*
BUTTERFISHES	*	*	*	*	*	*	*
PEPRILUS ALEPIDOTUS	1156	584	356	6642	7542	1400	1640
HARVESTFISH	8.4	4.5	3.9	46.7	103.5	24.2	32.0
PEPRILUS TRIACANTHUS	808	1801	38703	1320	1093	3009	4509
BUTTERFISH	1.4	3.2	124.3	7.3	3.7	3.4	10.9
TRIGLIDAE	*	*	*	*	*	*	*
SEAROBINS	*	*	*	*	*	*	*
PRIONOTUS SP.	0	0	0	0	29	0	0
SEAROBIN UNID.(PRIONOTUS)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PRIONOTUS CAROLINUS	401	117	323	132	169	0	463
NORTHERN SEAROBIN	0.5	0.3	0.7	0.4	0.5	0.0	0.8

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
PRIONOTUS EVOLANS	6	226	0	0	0	0	8
STRIPED SEAROBIN	0.1	2.7	0.0	0.0	0.0	0.0	1.2
PRIONOTUS SCITULUS	809	328	464	2135	916	142	392
LEOPARD SEAROBIN	0.7	1.0	2.1	11.3	2.4	0.5	3.8
PRIONOTUS TRIBULUS	59591	53639	137678	126713	222765	100029	75015
BIGHEAD SEAROBIN	86.5	100.6	370.3	310.0	355.3	152.7	166.4
BOTHIDAE	*	*	*	*	*	*	*
LEFTEYE FLOUNDERS	*	*	*	*	*	*	*
ANCYLOPSETTA QUADROCELLATA	516	1165	2547	3144	1999	5790	3258
OCELLATED FLOUNDER	3.9	5.3	20.7	11.7	12.6	15.3	18.3
CITHARICHTHYS SPILOPTERUS	1806	3348	2011	4893	17387	14681	4024
BAY WHIFF	27.0	42.4	20.1	51.1	105.4	109.5	35.5
ETROPUS CROSSOTUS	6293	8662	13226	71242	74012	12344	25047
FRINGED FLOUNDER	32.5	42.5	73.0	319.9	182.7	97.1	74.5
PARALICHTHYS SP.	0	0	246	1261	0	0	0
FLOUNDER UNID.(PARALICHTHYS)	0.0	0.0	1.0	10.2	0.0	0.0	0.0
PARALICHTHYS ALBIGUTTA	0	15	0	8	0	0	54
GULF FLOUNDER	0.0	0.4	0.0	0.1	0.0	0.0	0.0
PARALICHTHYS DENTATUS	2242	1253	4710	8443	10226	2004	1656
SUMMER FLOUNDER	20.4	45.6	220.0	384.3	117.0	22.5	76.8
PARALICHTHYS LETHOSTIGMA	5792	6795	10110	19292	30188	3926	4073
SOUTHERN FLOUNDER	302.7	423.8	695.8	818.3	1129.0	228.9	372.8
SCOPHTHALMUS AQUOSUS	932	1064	21071	15664	4986	2247	19886
WINDOWPANE	9.9	27.7	162.3	102.8	71.0	44.8	67.4

TABLE 7.3. (C[illegible]TINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT([illegible])	[illegible] W[illegible]	[illegible]9 NU[illegible] WT[illegible]	[illegible]	[illegible]
SOLE,DAE	.	.	.	.	[illegible]	[illegible]	[illegible]
SO[illegible]ES	.	.	.	.	.	[illegible]	.
TRINECTES MACULATUS	20899	[illegible]3616	21073	6[illegible]238	1[illegible]	[illegible]	[illegible]
HOGCHOKER	117.1	[illegible]7.1	125.6	361.1	[illegible]	29.[illegible]	[illegible]
CYNOGLOSSIDAE	.	.	.	.	.	.	.
TONGUEFISHES	.	.	.	.	.	.	.
SYMPHURUS P[illegible]AGIUSA	85171	67924	136794	281525	177157	89540	413[illegible]4
BL[illegible]CKCHEEK TONGUEFISH	344.1	272.8	634.8	1198.8	700.3	385.2	251.0
BALIST[illegible]DAE	.	.	.	.	.	[illegible]	.
LEATHERJACKETS	.	.	.	.	.	[illegible]	.
ALUTERUS SCHOEPFI	[illegible]4	396	[illegible]	39	533	[illegible]	149
ORANGE FILEFISH	0.1	0.5	0.2	0.0	0.5	[illegible]	0.5
MONACANTHUS HISPIDUS	7708	5039	39424	6186	2041[illegible]	14585	374[illegible]
PLANEHEA[illegible] FILEFISH	7.2	6.9	23.2	10.0	15.[illegible]	12.6	7.0
OSTRACIIDAE	.	.	.	.	.	.	.
BOXFISHES	.	.	.	.	.	.	.
LACTOPHRYS BICAUDALIS	0	0	29	0	0	7	0
SPOTTED TRUNKFISH	0.3	0.0	0.2	[illegible].0	[illegible].0	0.[illegible]	0.0
TETRAODONTIDAE	.	.	.	.	.	.	.
PUFFERS	.	.	.	.	.	.	.
LAGOCEPHAL[illegible] [illegible]VIGATUS	2	38	76	0	0	115	39
SMOOTH [illegible]	0.0	0.2	0.1	0.0	0.0	0.2	0.0
SPHOEROID[illegible] [illegible]ATUS	215	[illegible]15	1452	530	702	55	27[illegible]
NORTHERN PUFFER	0.2	0.3	2.5	4.2	[illegible].2	0.2	1.4

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
DIODONTIDAE PORCUPINEFISHES	* *	* *	* *	* *	* *	* *	* *
CHILOMYCTERUS SCHOEPFI STRIPED BURRFISH	129 3.6	74[illegible] 12.6	529 14.4	375 4.1	1792 12.5	922 22.1	789 29.2
SQUILLA EMPUSA MANTIS SHRIMP	31433 254.5	23509 229.9	26858 307.8	46[illegible] 745.[illegible]	51806 749.6	18326 328.5	11237 168.7
PENAEUS SP.(ADULT) PENAEUS (ADULT)	4[illegible]9 21.9	0 0.0	0 0.0	0 0.0	0 0.0	0 0.0	0 [illegible]
PENAEUS AZTECUS BROWN SHRIMP	51652 272.7	443379 1925.6	264015 1479.9	323805 1888.2	[illegible]045 2816.0	30845 289.3	337[illegible] 673.[illegible]
PENAEUS DUORARUM PINK SHRIMP	39633 79.4	44573 116.4	178028 778.1	206754 993.4	423715 1395.8	94802 254.9	55301 220.0
PENAEUS SETIFERUS WHITE SHRIMP	803100 3759.9	684828 3280.3	21228 210.1	20859 180.1	221383 2043.2	250104 2310.8	13182 163.2
TRACHYPENEUS CONSTRICTUS T-CON OR HARDBACK SHRIMP	25459 20.4	[illegible]0870 47.0	99472 65.7	357388 241.4	129345 83.9	151215 86.5	167093 102.5
SICYONIA SP. ROCK SHRIMP	0 0.0	12 0.0	312 0.5	224 0.5	143 0.1	0 0.0	[illegible] 0.0
MACROBRACHIUM SP. FRESHWATER PRAWNS	82 0.7	0 0.0	34 0.[illegible]	41 0.1	469 2.8	0 0.0	0 0.0
PALAEMONETES SP. GRASS SHRIMP	[illegible]0725 6.0	53668 22.1	162147 66.3	255491 106.2	257419 111.4	109838 45.9	50896 23.7
ALPHEUS SP. SNAPPING SHRIMP	468 0.5	4476 4.[illegible]	1032[illegible] 12.2	15288 17.0	22830 24.2	8009 7.8	30591 34.2

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
ALPHEUS HETEROCHAELIS	0	0	0	0	0	0	31
SNAPPING SHRIMP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CRANGON SEPTEMSPINOSA	0	0	0	47	145	0	0
SAND SHRIMP	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PROCAMBARUS SP.	0	0	0	0	0	0	8
CRAYFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.1
UPOGEBIA SP. AND CALLIANASSA SP.	0	183	732	1630	2031	748	336
MUD SHRIMPS	0.0	0.4	1.2	3.6	3.2	1.3	0.2
PORTUNIDAE	0	0	0	0	0	8	0
SWIMMING CRABS	0.0	0.0	0.0	0.0	0.0	0.9	0.0
OVALIPES SP.	37	0	20	605	476	490	3886
CALICO CRABS	0.1	0.0	0.2	0.4	0.3	0.5	5.3
PORTUNUS SP.	524	618	21458	8464	1747	11974	2790
SWIMMING CRABS	1.8	4.7	57.8	14.5	3.7	15.3	6.4
CALLINECTES SP.	439167	249091	413694	974250	1081643	452375	209892
BLUE CRABS	10614.8	4376.5	5531.7	13749.7	20703.7	4808.3	4065.0
MENIPPE MERCENARIA	0	3169	0	0	0	0	0
STONE CRAB	0.0	12.0	0.0	0.0	0.0	0.0	0.0
LIBINIA SP.	12	140	0	0	0	0	0
SPIDER CRAB	0.0	0.8	0.0	0.0	0.0	0.0	0.0
STOMOLOPHUS MELEAGRIS	6	4283	0	108190	0	0	0
JELLY BOMB OR CABBAGE HEAD	2.7	983.6	0.0	7296.9	0.0	0.0	0.0
APLYSIA SP.	0	8	0	0	43	6	318
SEA HARES	0.0	4.9	0.0	0.0	8.0	0.0	27.1

TABLE 7.3. (CONTINUED)

SPECIES	1975 NUMBER WT(KG)	1976 NUMBER WT(KG)	1977 NUMBER WT(KG)	1978 NUMBER WT(KG)	1979 NUMBER WT(KG)	1980 NUMBER WT(KG)	1981 NUMBER WT(KG)
LOLIGO PEALEI	80	0	0	0	0	0	0
COMMON SQUID	0.[illegible]	0.0	0.0	0.0	0.0	0.0	0.0
LOLLIGUNCULA BREVIS	30206	45783	44698	67921	77331	95386	59015
BRIEF SQUID	219.6	206.4	289.0	314.5	273.7	333.1	263.8
LIMULUS POLYPHEMUS	0	0	0	0	0	0	16
HORSESHOE CRAB	0.0	0.0	0.0	0.0	0.0	0.0	12.8
ASTERIAS FORBESI	126	627	83	0	0	0	0
COMMON STARFISH	3.3	0.9	0.1	0.0	0.0	0.0	0.0
HYLA CINEREA	0	47	0	0	0	0	0
GREEN TREEFROG	0.0	0.0	0.0	0.0	0.9	0.0	0.0
CHELYDRA SERPENTINA	0	0	0	0	6	0	0
SNAPPING TURTLE	0.0	0.0	0.0	0.0	0.9	0.0	0.0
MALACLEMYS TERRAPIN	187	629	1694	1164	898	130	106
DIAMONDBACK TERRAPIN	68.2	162.3	401.4	319.0	231.9	34.6	27.6
CARETTA CARETTA	0	0	0	12	0	0	0
ATLANTIC LOGGERHEAD	0.0	0.0	0.0	237.5	0.0	0.0	0.0

TABLE 7.4 The ten most abundant species and percent of the total impingement catch, January 1975 - December 1981.

Jan - Dec 1975		Jan - Dec 1976	
White Shrimp	24.4	Bay Anchovy	30.3
Bay Anchovy	19.4	White Shrimp	11.4
Blue Crabs	13.3	Atlantic Menhaden	9.0
Atlantic Croaker	7.0	Brown Shrimp	7.4
Atlantic Menhaden	6.0	Gizzard Shad	6.1
Weakfish	3.C	Spot	5.3
Hake Unid. (Urophycis)	3.1	Blue Crabs	4.1
Blueback Herring	3.0	Weakfish	4.1
Blackcheek Tonguefish	2.6	Star Drum	3.8
Spot	2.0	Atlantic Croaker	3.5
Percent of Total	84.4	Percent of Total	84.9

Jan - Dec 1977		Jan - Dec 1978	
Atlantic Menhaden	52.7	Atlantic Menhaden	57.9
Bay Anchovy	22.2	Bay Anchovy	12.9
Spot	5.0	Blue Crabs	5.2
Blue Crabs	2.5	Spot	3.0
Atlantic Croaker	2.5	T-Con or Hardback Shr.	1.9
Spotted Hake	1.7	Spotted Hake	1.9
Brown Shrimp	1.6	Brown Shrimp	1.7
Pink Shrimp	1.1	Atlantic Silverside	1.6
Star Drum	1.0	Atlantic Croaker	1.6
Weakfish	1.0	Blackcheek Tonguefish	1.5
Percent of Total	91.3	Percent of Total	89.1

TABLE 7.4 (Cont'd)

Jan - Dec 1979	
Bay Anchovy	27.2
Spot	12.0
Atlantic Croaker	10.0
Blue Crabs	9.7
Atlantic Menhaden	6.9
Blueback Herring	5.2
Brown Shrimp	5.1
Pink Shrimp	3.8
Weakfish	2.4
Grass Shrimp	2.3
Percent of Total	84.7

Jan - Dec 1980	
Atlantic Menhaden	43.9
Bay Anchovy	26.4
Blue Crabs	4.6
Spot	3.2
Atlantic Croaker	3.0
White Shrimp	2.6
Star Drum	2.5
T-Con or Hardback Shr.	1.5
Grass Shrimp	1.1
Bighead Searobin	1.0
Percent of Total	89.9

Jan - Dec 1981	
Atlantic Menhaden	43.8
Bay Anchovy	32.1
Spot	6.3
Blue Crabs	2.2
T-Con or Hardback Shr.	1.7
Blueback Herring	1.4
Rough Silverside	1.3
Spotted Hake	1.0
Atlantic Silverside	0.9
Star Drum	0.8
Percent of Total	91.6

TABLE 7.5 EXPANDED MONTHLY IMPINGEMENT DATA, JANUARY 1975 - DECEMBER 1981.

SPECIES	JANUARY 1975 NUMBER	JANUARY 1975 WT. (KG)	JANUARY 1976 NUMBER	JANUARY 1976 WT. (KG)
BAY ANCHOVY	19921	39.5	519647	679.0
BLUE CRAB	9905	38.6	1240	2.0
CROAKER	3300	14.4	54907	351.3
FLOUNDER	22	2.0	1563	59.3
MENHADEN	39923	686.0	53357	1441.4
MISC. SPECIES	65	2.0	.	.
MULLET	301	28.3	917	55.6
OTHER FINFISH	11882	63.7	98343	483.9
OTHER SHELLFISH	2395	24.9	9101	4.0
SHRIMP	19590	61.9	26289	97.6
SPOT	4011	60.7	23572	306.8
TROUT	374	6.3	2901	54.6
TOTAL	111689	1028.3	791837	3515.5

SPECIES	JANUARY 1977 NUMBER	JANUARY 1977 WT. (KG)	JANUARY 1978 NUMBER	JANUARY 1978 WT. (KG)
BAY ANCHOVY	539622	625.4	478302	874.6
BLUE CRAB	.	.	50972	110.3
CROAKER	55547	1381.3	56913	73.8
FLOUNDER	.	.	1308	43.6
MENHADEN	1574074	12283.7	6892173	43567.3
MISC. SPECIES	.	.	.	.
MULLET	5415	198.1	9572	129.6
OTHER FINFISH	2175[illegible]1	835.3	212656	1050.3
OTHER SHELLFISH	48[illegible]	2.3	53284	76.1
SHRIMP	8[illegible]	2.3	68817	196.1
SPOT	78833	1588.7	285253	391[illegible].6
TROUT	14850	331.7	29918	1013.4
TOTAL	2491648	17248.8	8139168	51049.7

TABLE 7.5 (CONTINUED)

SPECIES	JANUARY 1979 NUMBER	JANUARY 1979 WT. (KG)	JANUARY 1980 NUMBER	JANUARY 1980 WT. (KG)
BAY ANCHOVY	473110	863.1	513879	1044.3
BLUE CRAB	74152	206.6	58456	108.0
CROAKER	18172	25.5	44672	57.7
FLOUNDER	2114	65.6	798	45.5
MENHADEN	118215	2076.3	837921	11515.3
MISC. SPECIES	254	8.3	6	3.2
MULLET	875	8.8	4515	15.1
OTHER FINFISH	506042	747.9	191755	620.6
OTHER SHELLFISH	165764	799.0	26595	15.1
SHRIMP	103807	667.1	39702	134.2
SPOT	65497	996.4	171190	2127.5
TROUT	1352	19.4	861	20.7
TOTAL	1529354	6484.0	1890350	15707.2

SPECIES	JANUARY 1981 NUMBER	JANUARY 1981 WT. (KG)
BAY ANCHOVY	605997	698.3
BLUE CRAB	176	0.2
CROAKER	24132	165.4
FLOUNDER	207	32.8
MENHADEN	972927	11561.8
MISC. SPECIES	.	.
MULLET	16616	740.9
OTHER FINFISH	164489	893.3
OTHER SHELLFISH	26029	14.6
SHRIMP	941	3.4
SPOT	45542	591.1
TROUT	1399	92.2
TOTAL	1858455	14794.0

TABLE 7.5 (CONTINUED)

SPECIES	FEBRUARY 1975 NUMBER	FEBRUARY 1975 WT. (KG)	FEBRUARY 1976 NUMBER	FEBRUARY 1976 WT. (KG)
BAY ANCHOVY	9982	16.6	136818	224.9
BLUE CRAB	36071	143.8	76767	401.3
CROAKER	15274	48.0	41917	815.5
FLOUNDER	56	12.0	973	42.3
MENHADEN	30786	742.5	123184	2427.5
MISC. SPECIES	42	1.2	36	10.0
MULLET	2303	328.8	872	35.2
OTHER FINFISH	52143	305.0	71640	497.9
OTHER SHELLFISH	6111	51.9	30257	39.8
SHRIMP	18368	65.1	27519	116.0
SPOT	3479	75.4	124479	1345.5
TROUT	217	16.0	2625	50.8
TOTAL	174832	1806.3	637087	6006.7

SPECIES	FEBRUARY 1977 NUMBER	FEBRUARY 1977 WT. (KG)	FEBRUARY 1978 NUMBER	FEBRUARY 1978 WT. (KG)
BAY ANCHOVY	.	.	33740	54.2
BLUE CRAB	.	.	168	0.5
CROAKER	.	.	2184	7.4
FLOUNDER	.	.	1204	45.8
MENHADEN	.	.	332640	1713.0
MISC. SPECIES	.	.	.	.
MULLET	.	.	5488	212.3
OTHER FINFISH	.	.	123900	625.3
OTHER SHELLFISH	.	.	112784	44.8
SHRIMP	.	.	.	.
SPOT	.	.	7028	69.2
TROUT	.	.	1092	20.1
TOTAL	.	.	620228	2792.6

TABLE 7.5 (CONTINUED)

SPECIES	FEBRUARY 1979 NUMBER	FEBRUARY 1979 WT. (KG)	FEBRUARY 1980 NUMBER	FEBRUARY 1980 WT. (KG)
BAY ANCHOVY	152642	223.9	277352	618.6
BLUE CRAB	1659	4.3	22430	33.4
CROAKER	1281	2.3	29964	55.1
FLOUNDER	217	12.0	75	26.2
MENHADEN	17759	359.3	2395259	27328.9
MISC. SPECIES	.	.	93	0.4
MULLET	819	9.9	9643	201.3
OTHER FINFISH	18571	91.9	223775	1190.4
OTHER SHELLFISH	22841	9.9	17665	6.9
SHRIMP	588	3.1	7814	31.9
SPOT	1253	26.2	57754	771.3
TROUT	266	6.8	2274	63.7
TOTAL	217896	749.6	3044777	30328.1

SPECIES	FEBRUARY 1981 NUMBER	FEBRUARY 1981 WT. (KG)
BAY ANCHOVY	500343	858.5
BLUE CRAB	9405	48.5
CROAKER	9105	147.7
FLOUNDER	763	66.2
MENHADEN	2526412	22165.7
MISC. SPECIES	.	.
MULLET	3224	135.9
OTHER FINFISH	97662	874.3
OTHER SHELLFISH	26292	21.8
SHRIMP	1951	7.8
SPOT	125820	1374.7
TROUT	2070	59.6
TOTAL	3303047	25760.7

TABLE 7.5 (CONTINUED)

SPECIES	MARCH NUMBER	1975 WT. (KG)	MARCH NUMBER	1976 WT. (KG)
BAY ANCHOVY	35528	64.2	206894	325.8
BLUE CRAB	22903	220.4	51189	671.5
CROAKER	70994	218.3	15012	357.9
FLOUNDER	261	17.0	373	20.3
MENHADEN	15908	621.9	3805	209.3
MISC. SPECIES	54	0.8	179	20.8
MULLET	284	29.2	326	4.7
OTHER FINFISH	77572	639.8	32564	231.7
OTHER SHELLFISH	2693	16.2	9006	17.2
SHRIMP	18776	116.3	8331	43.8
SPOT	3490	108.0	9773	107.1
TROUT	476	43.0	163	4.3
TOTAL	248939	2095.4	337615	2014.4

SPECIES	MARCH NUMBER	1977 WT. (KG)	MARCH NUMBER	1978 WT. (KG)
BAY ANCHOVY	891426	1326.3	436168	813.9
BLUE CRAB	136232	123.3	121832	262.4
CROAKER	44586	1290.6	3666	19.5
FLOUNDER	1334	95.6	2685	184.6
MENHADEN	3752796	22102.5	1858834	8572.2
MISC. SPECIES	181	74.5	.	.
MULLET	7018	93.1	2592	194.1
OTHER FINFISH	324328	3295.7	470943	3253.5
OTHER SHELLFISH	127359	58.1	28318	11.8
SHRIMP	1247	5.7	.	.
SPOT	214540	2505.1	46143	440.1
TROUT	9404	300.9	3191	102.7
TOTAL	5510451	31271.4	2974372	13854.8

TABLE 7.5 (CONTINUED)

SPECIES	MARCH 1979 NUMBER	MARCH 1979 WT. (KG)	MARCH 1980 NUMBER	MARCH 1980 WT. (KG)
BAY ANCHOVY	57957	73.4	155566	362.3
BLUE CRAB	97066	535.5	114127	251.5
CROAKER	11122	2.5	48019	120.8
FLOUNDER	384	23.0	543	18.6
MENHADEN	12227	284.5	576430	4031.4
MISC. SPECIES	.	.	8	6.2
MULLET	14309	0.5	1837	40.9
OTHER FINFISH	12724	68.9	65780	435.9
OTHER SHELLFISH	98471	37.0	41920	18.7
SHRIMP	308	1.4	11121	27.6
SPOT	535492	169.2	13873	186.2
TROUT	15	0.5	574	28.6
TOTAL	840075	1196.4	1029798	5528.7

SPECIES	MARCH 1981 NUMBER	MARCH 1981 WT. (KG)
BAY ANCHOVY	382366	537.9
BLUE CRAB	26369	70.7
CROAKER	5902	98.4
FLOUNDER	589	44.0
MENHADEN	353251	3411.8
MISC. SPECIES	260	3.9
MULLET	577	23.4
OTHER FINFISH	141098	1186.9
OTHER SHELLFISH	32613	59.9
SHRIMP	3298	15.8
SPOT	331142	3754.7
TROUT	1469	31.5
TOTAL	1278934	9238.9

TABLE 7.5 (CONTINUED)

SPECIES	APRIL NUMBER	1975 WT. (KG)	APRIL NUMBER	1976 WT. (KG)
BAY ANCHOVY	54744	96.7	134040	248.5
BLUE CRAB	20994	368.6	8640	148.5
CROAKER	44052	123.2	1935	37.0
FLOUNDER	564	29.4	105	2.1
MENHADEN	17892	283.3	2400	39.2
MISC. SPECIES	258	16.9	5565	950.7
MULLET	78	5.4	90	0.1
OTHER FINFISH	50658	335.3	8070	45.1
OTHER SHELLFISH	8304	26.5	1620	1.3
SHRIMP	5112	25.9	2325	22.0
SPOT	1806	37.7	1065	16.5
TROUT	72	1.9	75	2.0
TOTAL	204534	1350.8	165930	1513.0

SPECIES	APRIL NUMBER	1977 WT. (KG)	APRIL NUMBER	1978 WT. (KG)
BAY ANCHOVY	295440	481.0	83240	189.8
BLUE CRAB	25635	466.3	103090	1295.2
CROAKER	51158	669.8	3110	40.6
FLOUNDER	1494	153.9	3910	215.2
MENHADEN	1176908	7163.6	915250	3812.9
MISC. SPECIES	1996	112.2	116840	7372.2
MULLET	653	0.4	190	0.1
OTHER FINFISH	152576	1884.7	94160	1489.8
OTHER SHELLFISH	17716	10.7	3300	3.9
SHRIMP	480	3.4	90	0.5
SPOT	103620	1050.5	22930	412.4
TROUT	6900	216.4	10000	338.9
TOTAL	1834576	12212.9	1356110	15161.5

TABLE 7.5 (CONTINUED)

SPECIES	APRIL 1979 NUMBER	APRIL 1979 WT. (KG)	APRIL 1980 NUMBER	APRIL 1980 WT. (KG)
BAY ANCHOVY	36360	62.1	200231	300.2
BLUE CRAB	61418	608.5	101490	631.4
CROAKER	3555	7.2	137496	265.0
FLOUNDER	2296	31.5	191	9.7
MENHADEN	4[illegible]0	53.4	406211	1863.9
MISC. SPECIES	106	12.0	66	2.3
MULLET	803	0.5	137	1.1
OTHER FINFISH	17505	122.0	51949	312.5
OTHER SHELLFISH	9308	5.8	17816	10.7
SHRIMP	158	0.8	5237	15.6
SPOT	15143	28.6	10711	103.5
TROUT	.	.	215	8.3
TOTAL	150972	932.4	931750	3524.2

SPECIES	APRIL 1981 NUMBER	APRIL 1981 WT. (KG)
BAY ANCHOVY	35768	33.0
BLUE CRAB	16515	163.7
CROAKER	3480	59.8
FLOUNDER	376	28.3
MENHADEN	100868	624.5
MISC. SPECIES	13148	56.6
MULLET	2625	18.5
OTHER FINFISH	30438	225.2
OTHER SHELLFISH	11178	48.0
SHRIMP	1200	8.0
SPOT	28703	327.0
TROUT	45	1.6
TOTAL	244344	1594.2

TABLE 7.5 (CONTINUED)

SPECIES	MAY NUMBER	1975 WT. (KG)	MAY NUMBER	1976 WT. (KG)
BAY ANCHOVY	47555	85.6	51414	84.5
BLUE CRAB	18117	571.8	10215	258.5
CROAKER	39723	58.9	14896	30.1
FLOUNDER	322	8.5	62	9.9
MENHADEN	21354	358.2	17174	202.6
MISC. SPECIES	1964	16.7	7705	70.9
MULLET	54	3.9	574	0.2
OTHER FINFISH	30674	119.7	12562	50.9
OTHER SHELLFISH	5568	11.8	2217	5.2
SHRIMP	2362	7.1	35077	87.5
SPOT	14612	84.5	8029	26.1
TROUT	.	.	62	0.0
TOTAL	182305	1326.7	159987	826.4

SPECIES	MAY NUMBER	1977 WT. (KG)	MAY NUMBER	1978 WT. (KG)
BAY ANCHOVY	62275	121.5	176833	499.7
BLUE CRAB	25571	854.6	89376	2404.2
CROAKER	16109	22.1	95157	630.8
FLOUNDER	1023	37.7	4982	150.2
MENHADEN	535497	4965.3	493183	3396.5
MISC. SPECIES	12141	298.1	382	88.9
MULLET	6509	2.9	273	0.1
OTHER FINFISH	96480	344.5	159006	2027.9
OTHER SHELLFISH	13109	11.6	32866	17.1
SHRIMP	18658	25.0	464	4.1
SPOT	67906	189.8	116596	1454.9
TROUT	275	7.4	26716	930.0
TOTAL	855553	6870.5	1195834	11604.4

TABLE 7.5 (CONTINUED)

SPECIES	MAY 1979 NUMBER	MAY 1979 WT. (KG)	MAY 1980 NUMBER	MAY 1980 WT. (KG)
BAY ANCHOVY	190915	473.3	83568	103.1
BLUE CRAB	68713	1817.8	29303	489.9
CROAKER	590069	711.1	24048	79.7
FLOUNDER	10916	72.1	1698	14.5
MENHADEN	141700	1463.9	12516	138.2
MISC. SPECIES	259	15.0	225	3.9
MULLET	1346	2.1	55	2.3
OTHER FINFISH	127962	718.0	14050	92.9
OTHER SHELLFISH	32143	20.2	8912	4.9
SHRIMP	92046	117.8	480	3.5
SPOT	445807	742.3	27141	55.6
TROUT	80	4.7	47	0.9
TOTAL	1701956	6158.3	202043	1079.4

SPECIES	MAY 1981 NUMBER	MAY 1981 WT. (KG)
BAY ANCHOVY	10282	14.2
BLUE CRAB	6479	252.9
CROAKER	155	4.1
FLOUNDER	238	15.5
MENHADEN	2025	20.4
MISC. SPECIES	4071	27.9
MULLET	444	0.2
OTHER FINFISH	5672	42.2
OTHER SHELLFISH	4484	22.5
SHRIMP	310	4.8
SPOT	1416	10.3
TROUT	.	.
TOTAL	35576	415.0

TABLE 7.5 (CONTINUED)

SPECIES	JUNE 1975 NUMBER	JUNE 1975 WT. (KG)	JUNE 1976 NUMBER	JUNE 1976 WT. (KG)
BAY ANCHOVY	30830	53.5	182352	361.2
BLUE CRAB	24920	561.3	26652	548.2
CROAKER	14040	46.7	37674	102.6
FLOUNDER	1950	18.1	828	46.1
MENHADEN	28250	741.0	39468	1609.7
MISC. SPECIES	520	7.0	2280	20.3
MULLET	3060	4.5	180	0.4
OTHER FINFISH	16240	55.0	41160	148.1
OTHER SHELLFISH	1340	3.4	8028	12.7
SHRIMP	24980	85.6	260166	1097.7
SPOT	14670	66.5	29424	96.6
TROUT	2160	3.7	125454	200.6
TOTAL	162960	1646.3	753666	4244.2

SPECIES	JUNE 1977 NUMBER	JUNE 1977 WT. (KG)	JUNE 1978 NUMBER	JUNE 1978 WT. (KG)
BAY ANCHOVY	63178	118.7	48849	106.5
BLUE CRAB	38562	1408.8	48976	1971.0
CROAKER	233704	431.1	67815	150.6
FLOUNDER	4040	54.0	1448	30.3
MENHADEN	277306	3295.0	33618	1142.4
MISC. SPECIES	5237	82.8	1519	55.9
MULLET	3509	5.4	182	0.4
OTHER FINFISH	69263	376.4	39427	280.3
OTHER SHELLFISH	5062	5.6	5388	3.0
SHRIMP	200683	1088.1	85372	366.0
SPOT	189815	398.0	17114	75.4
TROUT	87597	213.8	43034	94.7
TOTAL	1177956	7477.7	392742	4276.5

TABLE 7.5 (CONTINUED)

SPECIES	JUNE 1979 NUMBER	JUNE 1979 WT. (KG)	JUNE 1980 NUMBER	JUNE 1980 WT. (KG)
BAY ANCHOVY	209624	466.5	.	.
BLUE CRAB	85427	3931.9	.	.
CROAKER	432745	474.5	.	.
FLOUNDER	10001	163.0	.	.
MENHADEN	115031	945.6	.	.
MISC. SPECIES	775	38.1	.	.
MULLET	1192	3.3	.	.
OTHER FINFISH	83568	393.1	.	.
OTHER SHELLFISH	23069	13.9	.	.
SHRIMP	397777	1952.6	.	.
SPOT	170168	366.6	.	.
TROUT	48305	59.6	.	.
TOTAL	1577682	8808.7	.	.

SPECIES	JUNE 1981 NUMBER	JUNE 1981 WT. (KG)
BAY ANCHOVY	9655	13.4
BLUE CRAB	22686	1004.1
CROAKER	897	10.5
FLOUNDER	443	17.0
MENHADEN	1611	12.7
MISC. SPECIES	2473	25.8
MULLET	472	0.5
OTHER FINFISH	12254	63.9
OTHER SHELLFISH	7726	18.7
SHRIMP	2143	22.1
SPOT	3287	11.7
TROUT	24751	32.3
TOTAL	88398	1232.7

TABLE 7.5 (CONTINUED)

SPECIES	JULY NUMBER	1975 WT. (KG)	JULY NUMBER	1976 WT. (KG)
BAY ANCHOVY	15624	24.1	45031	87.1
BLUE CRAB	48999	908.0	10293	320.4
CROAKER	12119	62.8	23624	115.9
FLOUNDER	1931	45.0	2370	141.8
MENHADEN	26784	848.7	74247	3385.1
MISC. SPECIES	11473	65.1	959	29.4
MULLET	424	2.3	606	2.5
OTHER FINFISH	22978	124.0	58938	190.8
OTHER SHELLFISH	18538	31.3	9458	12.8
SHRIMP	116949	504.2	173000	699.0
SPOT	12543	61.2	17818	94.9
TROUT	22535	47.9	83842	170.3
TOTAL	310897	2724.6	500186	5250.0

SPECIES	JULY NUMBER	1977 WT. (KG)	JULY NUMBER	1978 WT. (KG)
BAY ANCHOVY	16120	28.6	83096	193.0
BLUE CRAB	3255	209.6	117800	2299.4
CROAKER	2108	11.0	60667	351.8
FLOUNDER	1147	189.1	7983	275.2
MENHADEN	69347	2280.7	138671	4941.6
MISC. SPECIES	7192	62.0	9758	104.[illegible]
MULLET	7688	23.5	1891	6.8
OTHER FINFISH	15624	132.9	119412	634.4
OTHER SHELLFISH	23653	48.0	92520	49.5
SHRIMP	29791	177.5	223123	1370.5
SPOT	9466	35.5	45260	257.2
TROUT	4278	17.1	113662	528.8
TOTAL	189689	3215.5	1013843	10962.6

TABLE 7.5 (CONTINUED)

SPECIES	JULY NUMBER	1979 WT. (KG)	JULY NUMBER	1980 WT. (KG)
BAY ANCHOVY	61386	121.2	3825	2.6
BLUE CRAB	22551	1274.3	15636	396.0
CROAKER	18303	67.1	874	7.8
FLOUNDER	2005	96.0	589	22.2
MENHADEN	29906	1579.2	2040	38.0
MISC. SPECIES	46506	144.7	7552	22.0
MULLET	794	4.7	2896	7.1
OTHER FINFISH	44628	205.7	20162	75.3
OTHER SHELLFISH	33068	21.7	22890	18.6
SHRIMP	56992	496.7	21557	159.2
SPOT	24610	108.2	4966	16.6
TROUT	58425	131.7	7093	13.2
TOTAL	399174	4251.2	110080	778.6

SPECIES	JULY NUMBER	1981 WT. (KG)
BAY ANCHOVY	7378	9.1
BLUE CRAB	26391	817.5
CROAKER	2652	21.0
FLOUNDER	1295	99.3
MENHADEN	5122	47.0
MISC. SPECIES	3890	56.6
MULLET	2822	11.8
OTHER FINFISH	22340	191.6
OTHER SHELLFISH	21002	40.1
SHRIMP	19220	278.4
SPOT	5173	20.8
TROUT	8319	21.6
TOTAL	131[illegible]04	1614.8

TABLE 7.5 (CONTINUED)

SPECIES	AUGUST NUMBER	1975 WT. (KG)	AUGUST NUMBER	1976 WT. (KG)
BAY ANCHOVY	17879	18.4	11885	26.5
BLUE CRAB	51252	2173.7	30107	737.6
CROAKER	20932	63.1	3119	34.9
FLOUNDER	1303	60.2	676	56.8
MENHADEN	3122	163.1	27348	1029.2
MISC. SPECIES	5921	45.8	5134	93.4
MULLET	1465	15.8	1693	7.7
OTHER FINFISH	35140	215.1	91185	371.9
OTHER SHELLFISH	1842	4.9	17844	28.8
SHRIMP	263844	665.3	158100	722.8
SPOT	5653	46.9	15581	94.9
TROUT	53223	99.5	20045	78.3
TOTAL	461576	3571.8	382717	3282.8

SPECIES	AUGUST NUMBER	1977 WT. (KG)	AUGUST NUMBER	1978 WT. (KG)
BAY ANCHOVY	4963	4.5	15659	16.3
BLUE CRAB	9242	344.4	207599	2268.5
CROAKER	744	8.1	4325	41.9
FLOUNDER	1036	82.1	2825	100.9
MENHADEN	1419	76.2	14194	937.8
MISC. SPECIES	5914	58.4	9719	90.9
MULLET	1250	12.7	430	3.5
OTHER FINFISH	42574	197.9	121870	791.0
OTHER SHELLFISH	21431	40.2	46268	77.1
SHRIMP	25204	196.2	43653	237.4
SPOT	1166	7.4	6405	56.1
TROUT	345	4.4	25575	99.1
TOTAL	115288	1032.5	498522	4720.5

TABLE 7.5 (CONTINUED)

SPECIES	AUGUST 1979 NUMBER	AUGUST 1979 WT. (KG)	AUGUST 1980 NUMBER	AUGUST 1980 WT. (KG)
BAY ANCHOVY	48245	75.1	19392	8.1
BLUE CRAB	21471	1224.2	23600	1220.7
CROAKER	6015	45.9	796	13.3
FLOUNDER	650	60.8	828	55.9
MENHADEN	35031	2322.9	3849	167.9
MISC. SPECIES	16357	116.2	6722	39.1
MULLET	1237	8.1	4442	22.1
OTHER FINFISH	66902	278.4	43660	196.1
OTHER SHELLFISH	22079	19.1	16566	25.5
SHRIMP	40406	295.4	57959	579.3
SPOT	8037	124.3	2732	28.6
TROUT	9169	33.3	3935	14.7
TOTAL	275599	4603.7	184481	2371.3

SPECIES	AUGUST 1981 NUMBER	AUGUST 1981 WT. (KG)
BAY ANCHOVY	1217	1.0
BLUE CRAB	14872	425.5
CROAKER	1248	31.2
FLOUNDER	1124	80.1
MENHADEN	26939	409.4
MISC. SPECIES	861	9.4
MULLET	5487	27.4
OTHER FINFISH	16562	208.3
OTHER SHELLFISH	6208	30.4
SHRIMP	24956	403.9
SPOT	4852	54.0
TROUT	6038	[illegible]2.8
TOTAL	110364	1692.4

TABLE 7.5 (CONTINUED)

SPECIES	SEPTEMBER 1975 NUMBER	SEPTEMBER 1975 WT. (KG)	SEPTEMBER 1976 NUMBER	SEPTEMBER 1976 WT. (KG)
BAY ANCHOVY	21636	21.2	30015	33.5
BLUE CRAB	39098	1778.0	22135	1077.0
CROAKER	1156	18.5	518	18.2
FLOUNDER	236	22.1	608	56.4
MENHADEN	7031	226.5	3998	242.2
MISC. SPECIES	7962	76.9	3840	48.2
MULLET	369	6.4	1620	10.7
OTHER FINFISH	41625	213.3	67333	356.3
OTHER SHELLFISH	9887	64.4	14401	14.6
SHRIMP	132777	849.0	189098	1170.4
SPOT	762	6.9	2430	67.8
TROUT	21781	49.9	5108	18.4
TOTAL	284320	3333.1	341154	3113.7

SPECIES	SEPTEMBER 1977 NUMBER	SEPTEMBER 1977 WT. (KG)	SEPTEMBER 1978 NUMBER	SEPTEMBER 1978 WT. (KG)
BAY ANCHOVY	13600	15.6	10920	12.2
BLUE CRAB	22250	702.9	42443	1421.6
CROAKER	230	2.6	270	4.2
FLOUNDER	1670	107.3	488	36.5
MENHADEN	2400	153.6	7320	527.6
MISC. SPECIES	1620	14.8	5385	60.6
MULLET	110	4.4	293	6.5
OTHER FINFISH	48850	270.3	50099	201.6
OTHER SHELLFISH	13910	21.5	9115	10.0
SHRIMP	30170	167.7	28200	152.9
SPOT	840	9.6	450	15.0
TROUT	1260	4.3	1965	7.0
TOTAL	13691[illegible]	1474.6	156948	2455.7

TABLE 7.5 (CONTINUED)

SPECIES	SEPTEMBER 1979 NUMBER	SEPTEMBER 1979 WT. (KG)	SEPTEMBER 1980 NUMBER	SEPTEMBER 1980 WT. (KG)
BAY ANCHOVY	25450	42.8	65736	32.0
BLUE CRAB	360073	7896.5	29562	1125.4
CROAKER	12887	122.0	294	3.6
FLOUNDER	6466	238.0	168	7.5
MENHADEN	16839	250.7	7770	325.1
MISC. SPECIES	147	50.2	9138	57.3
MULLET	353	1.7	594	3.2
OTHER FINFISH	135581	626.6	43908	200.5
OTHER SHELLFISH	15341	12.4	19488	17.6
SHRIMP	243815	961.5	52998	545.2
SPOT	13489	91.9	726	7.3
TROUT	89633	249.4	936	4.2
TOTAL	920074	10543.7	231318	2328.9

SPECIES	SEPTEMBER 1981 NUMBER	SEPTEMBER 1981 WT. (KG)
BAY ANCHOVY	2616	1.8
BLUE CRAB	15234	699.4
CROAKER	402	17.3
FLOUNDER	480	35.5
MENHADEN	3090	51.0
MISC. SPECIES	228	0.9
MULLET	300	1.2
OTHER FINFISH	14418	115.6
OTHER SHELLFISH	3846	2.0
SHRIMP	10044	35.0
SPOT	534	8.2
TROUT	2670	5.3
TOTAL	53862	973.2

1

IMAGE EVALUATION TEST TARGET (MT-3)

150mm

6"

1

IMAGE EVALUATION
TEST TARGET (MT-3)

150mm

6"

1

IMAGE EVALUATION TEST TARGET (MT-3)

1.0 1.1 1.25 1.4 1.6 1.8 2.0 2.2 2.5 2.8 3.2 3.6 4.0

150mm

6"

1

IMAGE EVALUATION
TEST TARGET (MT-3)

150mm

6"

TABLE 7.5 (CONTINUED)

SPECIES	OCTOBER 1975 NUMBER	OCTOBER 1975 WT. (KG)	OCTOBER 1976 NUMBER	OCTOBER 1976 WT. (KG)
BAY ANCHOVY	48277	57.4	46606	55.5
BLUE CRAB	135429	3282.5	6829	186.5
CROAKER	1106	57.9	39	0.7
FLOUNDER	1322	99.7	86	22.5
MENHADEN	3679	99.4	360	22.5
MISC. SPECIES	145	41.4	24278	100.0
MULLET	310	9.5	298	15.9
OTHER FINFISH	75574	309.1	389149	1104.1
OTHER SHELLFISH	4392	41.7	22006	22.1
SHRIMP	166553	1060.0	65903	528.6
SPOT	1519	71.9	650	21.5
TROUT	20285	56.5	729	3.9
TOTAL	458591	5187.0	556933	2083.8

SPECIES	OCTOBER 1977 NUMBER	OCTOBER 1977 WT. (KG)	OCTOBER 1978 NUMBER	OCTOBER 1978 WT. (KG)
BAY ANCHOVY	44764	48.6	27720	35.7
BLUE CRAB	19360	505.2	34745	957.2
CROAKER	23	0.8	248	6.0
FLOUNDER	403	38.0	490	47.9
MENHADEN	2085	71.4	29438	1730.1
MISC. SPECIES	10184	49.6	7471	51.1
MULLET	280	5.8	794	12.5
OTHER FINFISH	52940	286.5	26241	227.3
OTHER SHELLFISH	26103	19.2	38068	40.3
SHRIMP	38316	316.8	19288	120.5
SPOT	535	5.3	781	27.2
TROUT	1403	6.1	515	18.8
TOTAL	196396	1353.3	185799	3274.6

TABLE 7.5 (CONTINUED)

SPECIES	OCTOBER 1979 NUMBER	OCTOBER 1979 WT. (KG)	OCTOBER 1980 NUMBER	OCTOBER 1980 WT. (KG)
BAY ANCHOVY	329278	528.6	106223	72.4
BLUE CRAB	181001	2687.2	26845	336.8
CROAKER	2638	78.8	345	28.7
FLOUNDER	4169	318.2	222	18.3
MENHADEN	58001	693.1	943	45.0
MISC. SPECIES	4587	86.1	26523	111.7
MULLET	768	14.9	460	15.3
OTHER FINFISH	146257	784.0	66438	329.0
OTHER SHELLFISH	10748	11.7	23340	47.6
SHRIMP	141871	1051.2	100754	870.2
SPOT	5626	56.3	1028	22.5
TROUT	55259	153.5	1654	13.3
TOTAL	940203	6463.6	354785	1910.8

SPECIES	OCTOBER 1981 NUMBER	OCTOBER 1981 WT. (KG)
BAY ANCHOVY	3061	2.4
BLUE CRAB	26025	379.5
CROAKER	23	0.7
FLOUNDER	70	11.3
MENHADEN	1721	42.8
MISC. SPECIES	4658	29.8
MULLET	512	6.7
OTHER FINFISH	9655	135.5
OTHER SHELLFISH	7007	5.5
SHRIMP	10137	38.1
SPOT	147	7.9
TROUT	117	1.8
TOTAL	63133	662.0

TABLE 7.5 (CONTINUED)

SPECIES	NOVEMBER 1975 NUMBER	NOVEMBER 1975 WT. (KG)	NOVEMBER 1976 NUMBER	NOVEMBER 1976 WT. (KG)
BAY ANCHOVY	154145	183.0	187590	222.3
BLUE CRAB	18970	460.9	4230	23.0
CROAKER	631	25.3	1560	4.4
FLOUNDER	36	2.6	.	.
MENHADEN	976	11.3	2370	67.9
MISC. SPECIES	1756	18.1	1350	14.3
MULLET	2142	31.1	270	12.6
OTHER FINFISH	17619	90.8	115440	312.6
OTHER SHELLFISH	5344	3.8	22020	117.1
SHRIMP	58838	358.7	183060	590.0
SPOT	179	11.1	7920	94.4
TROUT	1107	7.6	6630	44.4
TOTAL	261943	1204.3	532440	1503.0

SPECIES	NOVEMBER 1977 NUMBER	NOVEMBER 1977 WT. (KG)	NOVEMBER 1978 NUMBER	NOVEMBER 1978 WT. (KG)
BAY ANCHOVY	264383	475.4	20678	31.0
BLUE CRAB	48177	493.7	20903	228.7
CROAKER	1160	14.9	83	3.3
FLOUNDER	1566	75.7	263	27.5
MENHADEN	65811	915.9	43350	2161.2
MISC. SPECIES	2194	16.6	6825	25.1
MULLET	560	20.5	773	19.2
OTHER FINFISH	116132	881.1	49668	314.7
OTHER SHELLFISH	42194	240.4	38109	48.6
SHRIMP	80828	337.5	7298	66.8
SPOT	57771	800.3	300	21.9
TROUT	31160	165.1	128	11.9
TOTAL	711936	4437.1	188378	2959.9

TABLE 7.5 (CONTINUED)

SPECIES	NOVEMBER 1979 NUMBER	NOVEMBER 1979 WT. (KG)	NOVEMBER 1980 NUMBER	NOVEMBER 1980 WT. (KG)
BAY ANCHOVY	1060935	1937.1	343344	223.4
BLUE CRAB	68483	432.6	21056	165.8
CROAKER	3735	41.6	2689	4.5
FLOUNDER	533	126.6	102	16.1
MENHADEN	32085	448.5	4805	91.7
MISC. SPECIES	9368	43.9	42414	112.1
MULLET	443	7.2	1212	19.7
OTHER FINFISH	168664	811.8	101400	626.2
OTHER SHELLFISH	19899	19.1	42641	144.6
SHRIMP	100276	545.1	48475	311.8
SPOT	4290	107.6	676	18.2
TROUT	10845	77.0	433	3.8
TOTAL	1479556	4598.1	609247	1737.9

SPECIES	NOVEMBER 1981 NUMBER	NOVEMBER 1981 WT. (KG)
BAY ANCHOVY	520388	432.3
BLUE CRAB	24488	147.3
CROAKER	293	13.3
FLOUNDER	.	.
MENHADEN	2423	77.9
MISC. SPECIES	15465	61.8
MULLET	2445	26.6
OTHER FINFISH	111499	807.7
OTHER SHELLFISH	16913	11.0
SHRIMP	11821	129.8
SPOT	1035	11.2
TROUT	428	9.9
TOTAL	707198	1728.8

TABLE 7.5 (CONTINUED)

SPECIES	DECEMBER 1975 NUMBER	DECEMBER 1975 WT. (KG)	DECEMBER 1976 NUMBER	DECEMBER 1976 WT. (KG)
BAY ANCHOVY	182283	283.9	269390	396.8
BLUE CRAB	12509	107.2	744	2.0
CROAKER	9119	285.0	14539	348.4
FLOUNDER	31	6.5	419	32.3
MENHADEN	1920	61.2	193921	2384.8
MISC. SPECIES	377	1.9	203	0.9
MULLET	2161	46.2	2170	137.2
OTHER FINFISH	148794	444.0	235300	751.2
OTHER SHELLFISH	2314	3.2	10635	45.2
SHRIMP	71065	334.8	43912	146.9
SPOT	2180	54.2	78182	1380.8
TROUT	1358	15.9	10324	123.0
TOTAL	434111	1644.0	859739	5749.5

SPECIES	DECEMBER 1977 NUMBER	DECEMBER 1977 WT. (KG)	DECEMBER 1978 NUMBER	DECEMBER 1978 WT. (KG)
BAY ANCHOVY	1430359	2329.0	1015134	1688.6
BLUE CRAB	85410	422.9	136346	540.7
CROAKER	616	5.5	1984	15.4
FLOUNDER	1353	83.4	1418	105.2
MENHADEN	1160527	6455.7	157224	2261.4
MISC. SPECIES	178	12.0	19600	81.8
MULLET	11619	243.0	5611	53.6
OTHER FINFISH	276139	1121.6	477800	2028.2
OTHER SHELLFISH	25649	54.0	224914	746.2
SHRIMP	37020	147.9	75113	546.9
SPOT	90219	1016.0	20685	368.0
TROUT	16127	243.8	1558	20.6
TOTAL	3135166	12134.8	2137387	8456.6

TABLE 7 5 (CONTINUED)

SPECIES	DECEMBER 1979 NUMBER	DECEMBER 1979 WT. (KG)	DECEMBER 1980 NUMBER	DECEMBER 1980 WT. (KG)
BAY ANCHOVY	388715	733.3	800400	440.7
BLUE CRAB	39629	84.3	9870	49.4
CROAKER	9529	44.0	6743	91.4
FLOUNDER	663	39.2	37	16.9
MENHADEN	183039	3399.1	28109	491.4
MISC. SPECIES	62	0.1	2769	9.5
MULLET	4086	42.5	3560	21.4
OTHER FINFISH	379617	1179.4	185447	691.7
OTHER SHELLFISH	13392	9.3	62767	175.6
SHRIMP	40099	162.3	29654	176.5
SPOT	50353	806.3	17705	227.6
TROUT	5374	84.2	1105	14.0
TOTAL	1114558	6584.0	1148166	2406.1

SPECIES	DECEMBER 1981 NUMBER	DECEMBER 1981 WT. (KG)
BAY ANCHOVY	1034395	809.6
BLUE CRAB	21252	55.7
CROAKER	3180	77.1
FLOUNDER	198	19.6
MENHADEN	253219	2215.5
MISC. SPECIES	9385	45.8
MULLET	5983	68.4
OTHER FINFISH	298121	1180.3
OTHER SHELLFISH	113533	66.5
SHRIMP	16201	109.5
SPOT	65799	882.8
TROUT	1698	31.4
TOTAL	1822964	5562.2

TABLE 7.5 (CONTINUED)

SPECIES	TOTALS 1975 NUMBER	TOTALS 1975 WT. (KG)	TOTALS 1976 NUMBER	TOTALS 1976 WT. (KG)
BAY ANCHOVY	638404	944.1	1821682	2745.6
BLUE CRAB	439167	10614.8	249091	4376.5
CROAKER	232446	1022.1	209740	2216.9
FLOUNDER	8034	323.1	8063	469.8
MENHADEN	197625	4843.1	541632	13061.4
MISC. SPECIES	30537	293.8	51529	1358.9
MULLET	12951	511.4	9616	282.8
OTHER FINFISH	581099	2914.8	1221684	4544.5
OTHER SHELLFISH	68728	284.0	156593	320.8
SHRIMP	899214	4133.9	1172780	5322.3
SPOT	64904	685.3	318923	3642.9
TROUT	123588	348.2	257958	750.6
TOTAL	3296697	26918.6	6019291	39103.0

SPECIES	TOTALS 1977 NUMBER	TOTALS 1977 WT. (KG)	TOTALS 1978 NUMBER	TOTALS 1978 WT. (KG)
BAY ANCHOVY	3626130	5574.6	2430339	4515.5
BLUE CRAB	413694	5531.7	974250	13749.7
CROAKER	405985	3837.8	296422	1345.3
FLOUNDER	15066	916.8	29004	1212.9
MENHADEN	8618170	59763.6	10915895	74764.0
MISC. SPECIES	46787	771.0	177499	7930.9
MULLET	44611	609.8	28089	638.7
OTHER FINFISH	1412477	9626.9	1945182	12924.3
OTHER SHELLFISH	321048	511.6	684934	1128.4
SHRIMP	463271	2468.1	551418	3061.7
SPOT	814731	7606.2	568945	7112.0
TROUT	173599	1511.0	257354	3186.0
TOTAL	16355569	98729.1	18859331	131569.4

TABLE 7.5 (CONTINUED)

SPECIES	TOTALS 1979 NUMBER	TOTALS 1979 WT. (KG)	TOTALS 1980 NUMBER	TOTALS 1980 WT. (KG)
BAY ANCHOVY	3034617	5600.4	2569516	3297.7
BLUE CRAB	1081643	20703.7	452375	4808.3
CROAKER	1110051	1622.5	295940	727.6
FLOUNDER	40414	1246.0	5930	251.4
MENHADEN	764153	13876.5	4275853	46036.8
MISC. SPECIES	78421	514.6	95516	367.7
MULLET	27025	104.2	29351	349.5
OTHER FINFISH	1708021	6027.7	1008324	4771.1
OTHER SHELLFISH	466123	979.1	300600	485.8
SHRIMP	1218143	6255.0	375751	2855.0
SPOT	1339765	3623.9	308502	3564.9
TROUT	278723	820.1	19137	185.4
TOTAL	11147099	61373.7	9736795	67701.2

SPECIES	TOTALS 1981 NUMBER	TOTALS 1981 WT. (KG)
BAY ANCHOVY	3113466	3411.5
BLUE CRAB	209892	4065.0
CROAKER	51469	646.5
FLOUNDER	5783	449.6
MENHADEN	4250608	40639.5
MISC. SPECIES	59439	318.5
MULLET	41507	1061.5
OTHER FINFISH	924208	5924.8
OTHER SHELLFISH	276831	341.0
SHRIMP	102222	1056.6
SPOT	613450	7054.4
TROUT	49004	300.0
TOTAL	9697879	65268.9

TABLE 7.6 BSEP IMPINGEMENT JANUARY 1975 - DECEMBER 1981.
MEAN PUMPING RATE IN CUBIC METERS PER SECOND.

MONTH	1975	1976	1977	1978	1979	1980	1981
JANUARY	21.3	29.3	53.4	53.5	45.4	56.4	62.6
FEBRUARY	22.6	29.9	45.2	46.9	31.3	64.8	56.3
MARCH	24.8	27.1	57.0	61.6	22.5	28.0	40.9
APRIL	24.6	22.7	46.1	61.3	28.6	29.1	30.5
MAY	24.0	19.8	52.5	61.6	49.6	24.1	26.0
JUNE	24.0	33.1	49.6	50.8	54.9	16.0	29.1
JULY	23.3	37.0	60.6	65.5	63.3	23.9	54.7
AUGUST	25.1	40.6	60.9	66.3	66.2	33.1	29.3
SEPTEMBER	24.4	[illegible]1	44.2	47.4	44.0	52.9	42.2
OCTOBER	33.6	38.9	33.5	62.3	64.8	55.2	56.3
NOVEMBER	35.9	31.7	35.2	51.0	54.1	62.2	60.6
DECEMBER	34.0	42.6	42.7	62.1	53.2	56.9	62.6

TABLE 7.7 Results of ANOVA and Duncan's Multiple Comparison for Organisms Impinged January 1975 - December 1981 (Numbers per million cubic meters of water entrained)

Source	Bay Anchovy	Blue Crab	Atlantic Croaker
Year	*	*	**
Duncan's MR	79 76 80 77 75 78 81	79 75 78 80 77 76 81	75 79 76 80 77 78 81
Month	***	*	***
Duncan's MR	12 1 3 11 4 2 5 6 10 7 9 8	3 4 6 9 10 5 8 11 7 12 2 1	6 5 1 3 4 2 7 12 8 11 9 10
Log X	2.86	2.35	1.73
S^2	0.164	0.296	0.306
R^2	0.701	0.397	0.6[illegible]5
Contrast Year	NS	NS	**

NS - Not Significant - p >.05
* - .01 < P ≤ .05
** - .001 < P ≤ .01
*** - P ≤ .001

TABLE 7.7 (Cont'd)

Source	Flounder	Atlantic Menhaden	Mullet
Year	**	*	NS
Duncan's MR	79 78 77 75 76 80 81	78 77 79 80 81 76 75	77 81 80 79 75 78 76
Month	***	***	***
Duncan's MR	6 7 5 8 4 3 9 2 1 10 12 11	1 2 3 4 12 5 6 7 8 11 9 10	12 2 1 3 8 7 6 11 5 4 9 10
Log X	0.871	2.53	1.06
S^2	0.134	0.456	0.158
R^2	0.491	0.599	0.469
Contrast Year	NS	NS	NS

NS - Not Significant - $p > .05$
* - $.01 < P \leq .05$
** - $.001 < P \leq .01$
*** - $P \leq .001$

TABLE 7.7 (Cont'd)

Source	Shrimp	Spot	Seatrout
Year	***	*	NS
Duncan's MR	76 75 79 80 77 78 81	79 77 76 78 80 81 75	77 78 76 79 75 81 80
Month	***	***	***
Duncan's MR	6 9 7 8 10 11 12 1 5 2 3 4	3 1 5 6 12 2 4 7 8 11 9 10	6 7 8 9 12 1 10 11 2 3 4 5
Log X	2.21	1.99	1.40
S^2	0.296	0.318	0.439
R^2	0.697	0.628	0.517
Contrast Year	***	NS	*

NS - Not Significant - $p > .05$
* - $.01 < P \leq .05$
** - $.001 < P \leq .01$
*** - $P \leq .001$

TABLE 7.8 NUMBER OF BAY ANCHOVY IMPINGED PER MILLION CUBIC METERS OF WATER ENTRAINED DURING EACH MONTH, JANUARY 1975 TO DECEMBER 1981.

	1975	1976	1977	1978	1979	1980	1981
JANUARY	349.2	6612.9	3774.4	3335.2	3888.5	3402.7	3615.0
FEBRUARY	182.6	1825.8	.	297.1	2016.3	1708.7	3671.7
MARCH	534.9	2847.9	5843.1	2645.2	959.7	2071.3	3491.8
APRIL	858.6	2278.2	2469.9	524.2	489.7	2651.7	452.7
MAY	739.8	969.4	442.5	1072.2	1438.3	1293.4	147.6
JUNE	495.6	2127.3	491.5	371.2	1472.8	.	128.2
JULY	250.4	454.9	99.3	473.8	361.8	59.7	50.4
AUGUST	265.9	109.2	30.4	88.1	272.0	218.7	15.5
SEPTEMBER	342.1	210.3	118.8	88.9	223.1	479.1	23.9
OCTOBER	536.4	447.8	498.3	166.0	1896.9	718.8	20.3
NOVEMBER	1657.2	2282.7	2894.9	156.4	7567.1	2129.9	3312.7
DECEMBER	2002.3	2359.0	12505.6	6107.3	2727.7	5248.1	6170.6

TABLE 7.9 NUMBER OF BLUE CRAB
IMPINGED PER MILLION CUBIC METERS OF WATER ENTRAINED
DURING EACH MONTH, JANUARY 1975 TO DECEMBER 1981.

	1975	1976	1977	1978	1979	1980	1981
JANUARY	173.6	15.8	0.0	355.4	609.5	387.1	1.0
FEBRUARY	659.7	1024.5	.	1.5	21.0	138.2	69.0
MARCH	344.8	704.6	893.0	738.9	1607.4	1519.5	240.8
APRIL	329.2	146.8	214.3	649.2	827.2	1344.1	209.0
MAY	281.8	192.6	181.7	541.9	517.7	453.5	93.0
JUNE	400.6	310.9	300.0	372.1	600.2	.	301.2
JULY	785.2	104.0	20.1	671.6	132.9	244.1	180.3
AUGUST	762.4	276.6	56.7	1168.3	121.1	266.1	189.4
SEPTEMBER	618.2	155.5	194.3	345.4	3155.8	215.5	139.2
OCTOBER	1504.9	65.6	215.5	208.1	1042.7	181.6	172.5
NOVEMBER	203.9	51.5	527.5	158.1	488.5	130.6	155.9
DECEMBER	137.4	6.5	746.7	820.3	278.1	64.7	126.8

TABLE 7.10 NUMBER OF CROAKER IMPINGED PER MILLION CUBIC METERS OF WATER ENTRAINED DURING EACH MONTH, JANUARY 1975 TO DECEMBER 1981.

	1975	1976	1977	1978	1979	1980	1981
JANUARY	57.8	698.7	388.5	396.9	149.4	295.8	144.0
FEBRUARY	279.4	559.4	.	19.2	16.9	184.6	66.8
MARCH	1068.8	206.6	292.3	22.2	184.2	639.3	53.9
APRIL	690.9	32.9	427.7	19.6	47.9	1820.9	44.0
MAY	618.0	280.9	114.5	577.0	4445.4	372.2	2.2
JUNE	225.7	439.5	1819.2	515.3	3040.5	.	11.9
JULY	194.2	238.7	13.0	345.9	107.9	13.6	18.1
AUGUST	311.4	28.7	4.6	24.3	33.9	9.0	15.9
SEPTEMBER	18.3	3.6	2.0	2.2	112.9	2.1	3.7
OCTOBER	12.3	0.4	0.3	1.5	15.2	2.3	0.2
NOVEMBER	6.8	19.0	12.7	0.6	26.6	16.7	1.9
DECEMBER	100.2	127.3	5.4	11.9	66.9	44.2	19.0

TABLE 7.11 NUMBER OF FLOUNDER
IMPINGED PER MILLION CUBIC METERS OF WATER ENTRAINED
DURING EACH MONTH, JANUARY 1975 TO DECEMBER 1981.

	1975	1976	1977	1978	1979	1980	1981
JANUARY	0.4	19.9	0.0	9.1	17.4	5.3	1.2
FEBRUARY	1.0	13.0	.	10.6	2.9	4.6	5.6
MARCH	3.9	5.1	8.7	16.3	6.4	7.2	5.4
APRIL	8.8	1.8	12.5	24.6	30.9	2.5	4.8
MAY	5.0	1.2	7.3	30.2	82.2	26.3	3.4
JUNE	31.3	9.7	31.4	11.0	70.3	.	5.9
JULY	30.9	23.9	7.1	45.5	11.8	9.2	8.8
AUGUST	19.4	6.2	6.4	15.9	3.7	9.3	14.3
SEPTEMBER	3.7	4.3	14.6	4.0	56.7	1.2	4.4
OCTOBER	14.7	0.8	4.5	2.9	24.0	1.5	0.5
NOVEMBER	0.4	0.0	17.1	2.0	3.8	0.6	0.0
DECEMBER	0.3	3.7	11.8	8.5	4.7	0.2	1.2

TABLE 7.12 NUMBER OF MENHADEN IMPINGED PER MILLION CUBIC METERS OF WATER ENTRAINED DURING EACH MONTH, JANUARY 1975 TO DECEMBER 1981.

	1975	1976	1977	1978	1979	1980	1981
JANUARY	699.8	679.0	11009.9	48059.3	971.6	5548.3	5803.9
FEBRUARY	563.1	1643.9	.	2929.2	234.6	14756.6	18539.8
MARCH	239.5	52.4	24598.7	11273.0	202.5	7674.8	3225.9
APRIL	280.6	40.8	9839.2	5763.5	58.2	5379.6	1276.8
MAY	332.2	323.8	3805.1	2990.3	1067.5	193.7	29.1
JUNE	454.1	460.4	2157.5	255.4	808.2	.	21.4
JULY	429.2	750.1	427.3	790.6	176.3	31.9	41.8
AUGUST	46.4	251.2	8.7	79.9	197.5	43.4	343.1
SEPTEMBER	111.2	28.0	21.0	59.6	147.6	56.6	28.2
OCTOBER	40.9	3.5	23.2	176.3	334.1	6.4	11.4
NOVEMBER	10.5	28.8	720.6	328.0	228.8	29.8	15.4
DECEMBER	21.1	1698.2	10146.4	945.9	1284.4	184.3	1510.6

TABLE 7.13 NUMBER OF MULLET
IMPINGED PER MILLION CUBIC METERS OF WATER ENTRAINED
DURING EACH MONTH, JANUARY 1975 TO DECEMBER 1981.

	1975	1976	1977	1978	1979	1980	1981
JANUARY	5.3	11.7	37.9	66.7	7.2	29.9	99.1
FEBRUARY	42.1	11.6	.	48.3	10.8	59.4	23.7
MARCH	4.3	4.5	46.0	15.7	237.0	24.5	5.3
APRIL	1.2	1.5	5.5	1.2	10.8	1.8	33.2
MAY	0.8	10.8	46.3	1.7	10.1	0.9	6.4
JUNE	49.2	2.1	27.3	1.4	8.4	.	6.3
JULY	6.8	6.1	47.4	10.8	4.7	45.2	19.3
AUGUST	21.8	15.6	7.7	2.4	7.0	50.1	69.9
SEPTEMBER	5.8	11.4	1.0	2.4	3.1	4.3	2.7
OCTOBER	3.4	2.9	3.1	4.8	4.4	3.1	3.4
NOVEMBER	23.0	3.3	6.1	5.8	3.2	7.5	15.6
DECEMBER	23.7	19.0	101.6	33.8	28.7	23.3	35.7

TABLE 7.14 NUMBER OF SHRIMP IMPINGED PER MILLION CUBIC METERS OF WATER ENTRAINED DURING EACH MONTH, JANUARY 1975 TO DECEMBER 1981.

	1975	1976	1977	1978	1979	1980	1981
JANUARY	343.4	334.5	6.1	479.9	853.2	262.9	5.6
FEBRUARY	336.0	367.2	.	0.0	7.8	48.1	14.3
MARCH	282.7	114.7	8.2	0.0	5.1	148.1	30.1
APRIL	80.2	39.5	4.0	0.6	2.1	69.4	15.2
MAY	36.7	661.4	132.6	2.8	693.4	7.4	4.5
JUNE	401.6	3035.1	1561.3	648.7	2794.8	.	28.5
JULY	1874.0	1747.7	183.6	1272.2	335.9	336.6	131.3
AUGUST	3924.6	1452.3	154.6	245.7	227.8	653.6	317.9
SEPTEMBER	2099.4	1325.0	263.5	229.5	2136.9	386.3	91.8
OCTOBER	1850.7	633.2	426.5	115.5	817.3	681.8	67.2
NOVEMBER	632.6	2227.6	885.0	55.2	715.2	300.7	75.3
DECEMBER	780.6	384.5	323.7	451.9	281.4	194.4	96.6

TABLE 7.15 NUMBER OF SPOT IMPINGED PER MILLION CUBIC METERS OF WATER ENTRAINED DURING EACH MONTH, JANUARY 1975 TO DECEMBER 1981.

	1975	1976	1977	1978	1979	1980	1981
JANUARY	70.3	300.0	551.4	1989.1	538.3	1133.5	271.7
FEBRUARY	63.6	1661.2	.	61.9	16.6	355.8	923.3
MARCH	52.5	134.5	1406.3	279.8	8867.5	184.7	3024.0
APRIL	28.3	18.1	866.3	144.4	203.9	141.8	363.3
MAY	227.3	151.4	482.5	706.9	3358.6	420.1	20.3
JUNE	235.8	343.3	1476.8	130.0	1195.6	.	43.6
JULY	201.0	180.0	58.5	258.1	145.0	77.5	35.3
AUGUST	84.1	143.1	7.2	36.0	45.3	30.8	61.8
SEPTEMBER	12.0	17.0	7.3	3.7	118.2	5.3	4.9
OCTOBER	16.9	6.2	6.0	4.7	32.4	7.0	1.0
NOVEMBER	1.9	96.4	632.6	2.3	30.6	4.2	6.6
DECEMBER	23.9	684.6	788.8	124.4	353.3	116.1	392.5

TABLE 7.16 NUMBER OF TROUT IMPINGED PER MILLION CUBIC METERS OF WATER ENTRAINED DURING EACH MONTH, JANUARY 1975 TO DECEMBER 1981.

	1975	1976	1977	1978	1979	1980	1981
JANUARY	6.6	36.9	103.9	208.6	11.1	5.7	8.3
FEBRUARY	4.0	35.0	.	9.6	3.5	14.0	15.2
MARCH	7.2	2.2	61.6	19.4	0.2	7.6	13.4
APRIL	1.1	1.3	57.7	63.0	0.0	2.8	0.6
MAY	0.0	1.2	2.0	162.0	0.6	0.7	0.0
JUNE	34.7	1463.6	681.5	327.0	339.4	.	328.6
JULY	361.1	847.0	26.4	648.1	344.3	110.7	56.8
AUGUST	791.7	184.1	2.1	143.9	51.7	44.4	76.9
SEPTEMBER	344.4	35.8	11.0	16.0	785.6	6.8	24.4
OCTOBER	225.4	7.0	15.6	3.1	318.3	11.3	0.8
NOVEMBER	11.9	80.7	341.2	1.0	77.4	2.7	2.7
DECEMBER	14.9	90.4	141.0	9.4	37.7	7.2	10.1

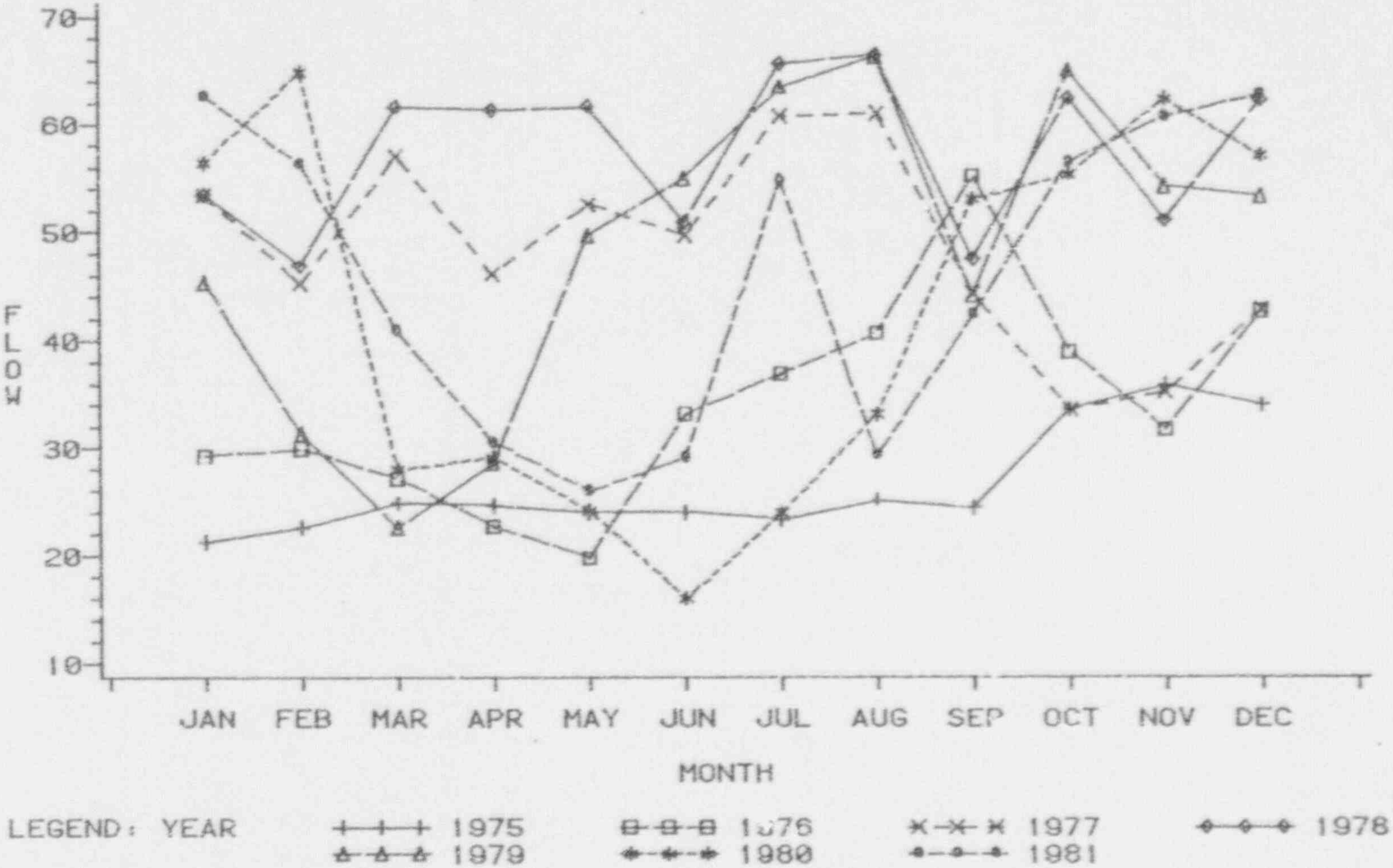


Figure 7.1 Estimated intake flow (cubic meters per second) at BSEP by month, 1975 through 1981.

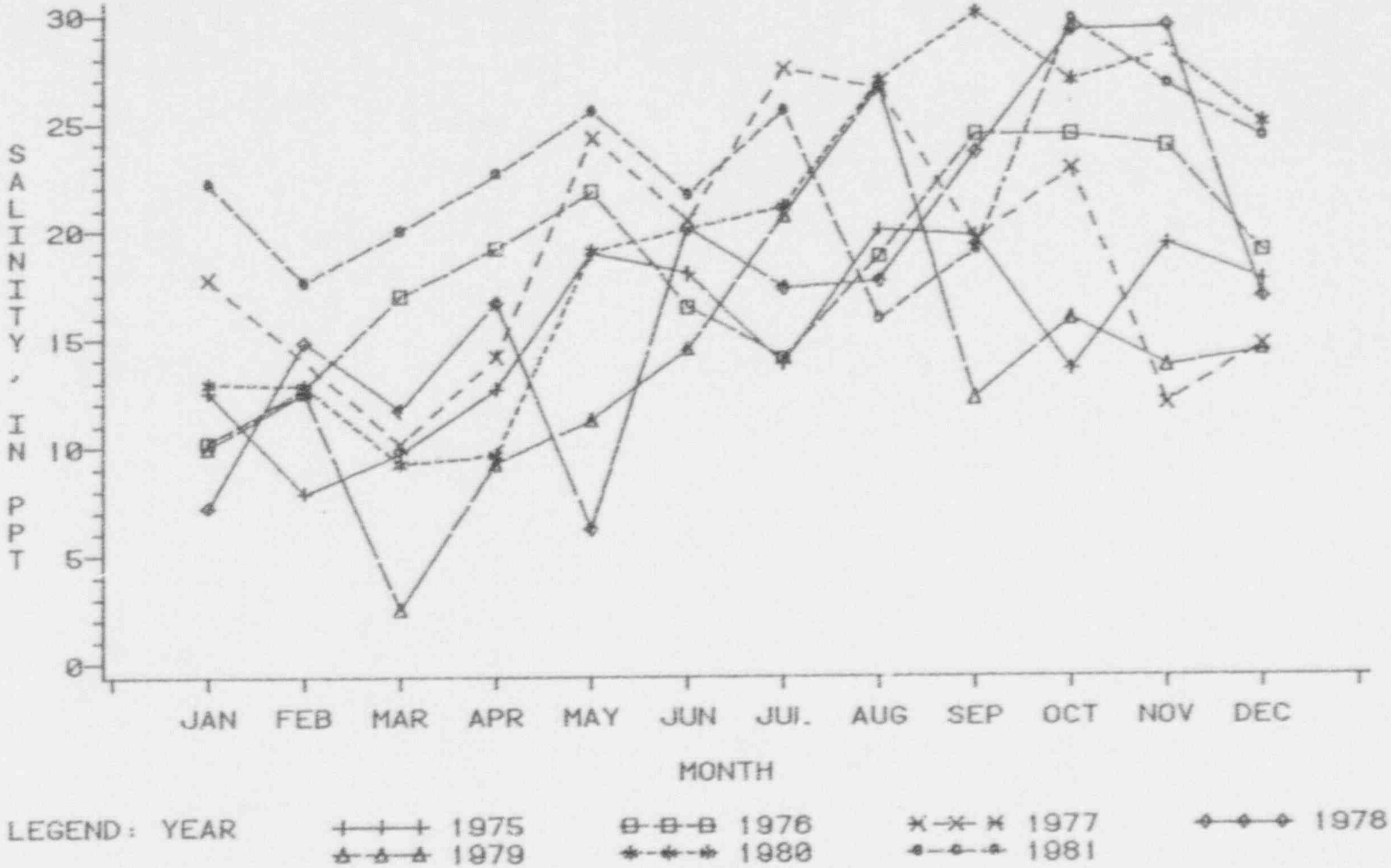


Figure 7.2 Average salinity (PPT) at BSEP intake by month, 1975 through 1981.

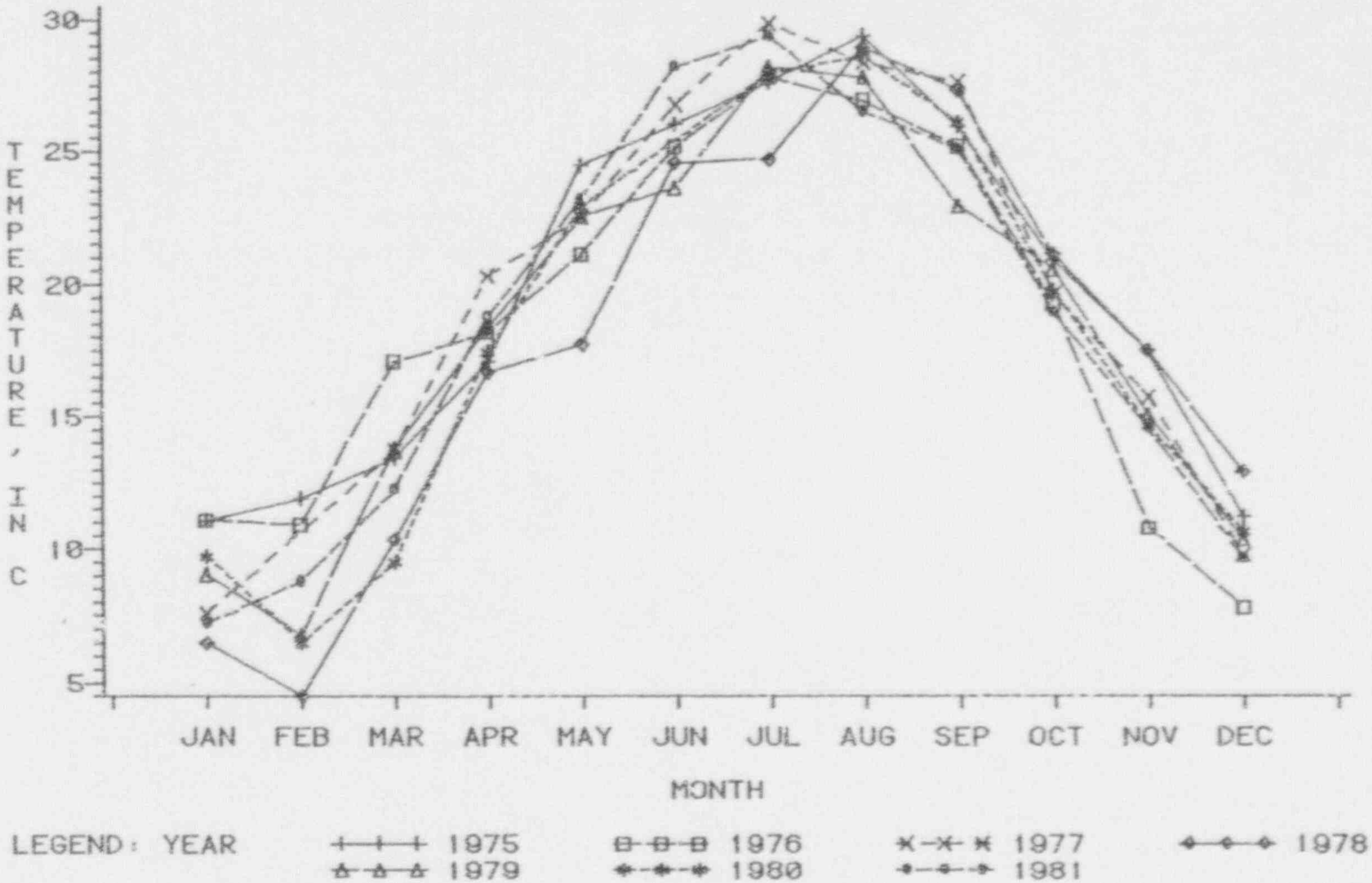


Figure 7.3 Average water temperature (°C) at BSEP intake by month, 1975 through 1981.

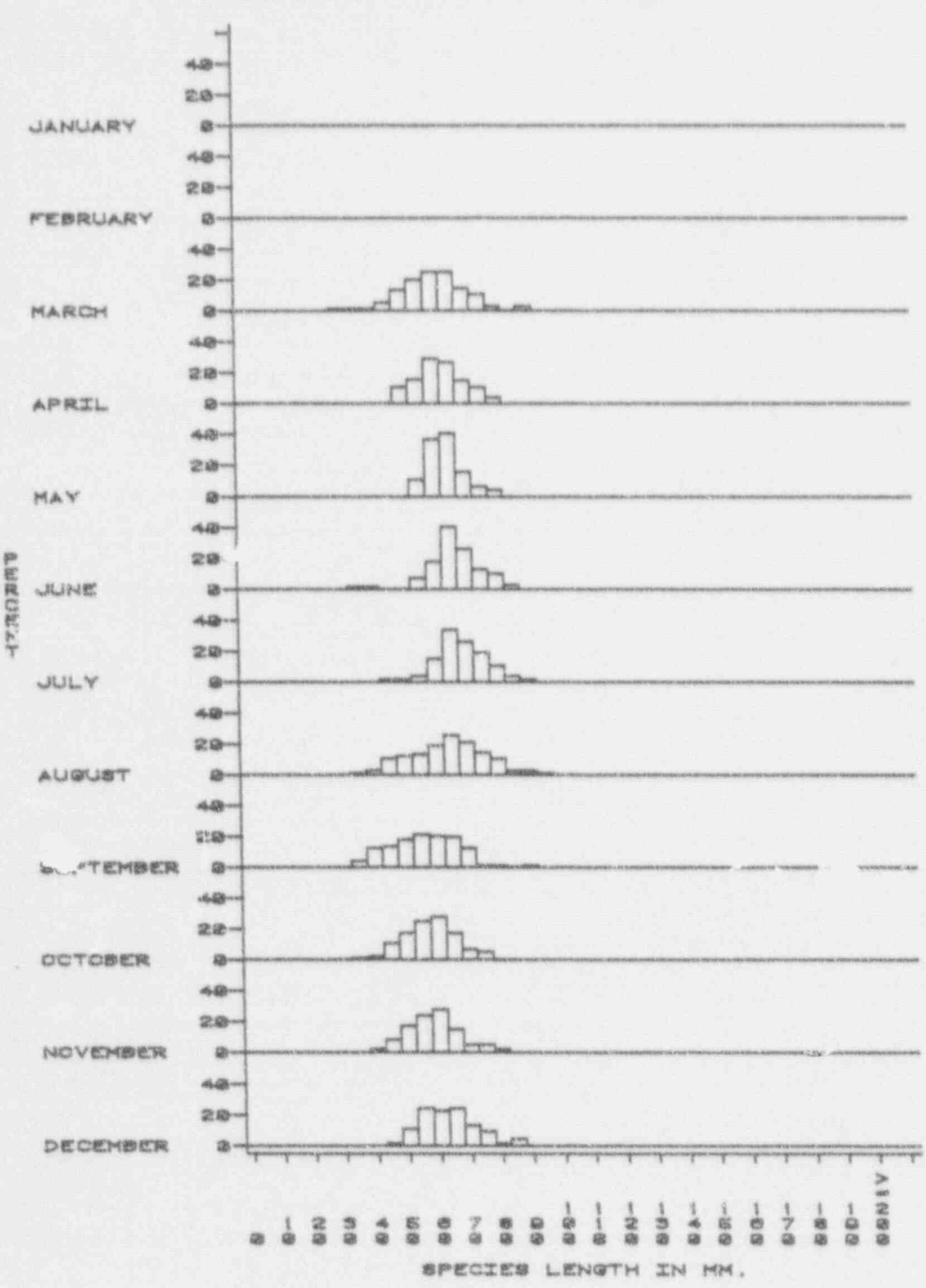


Figure 7.4a Impingement relative length frequency.

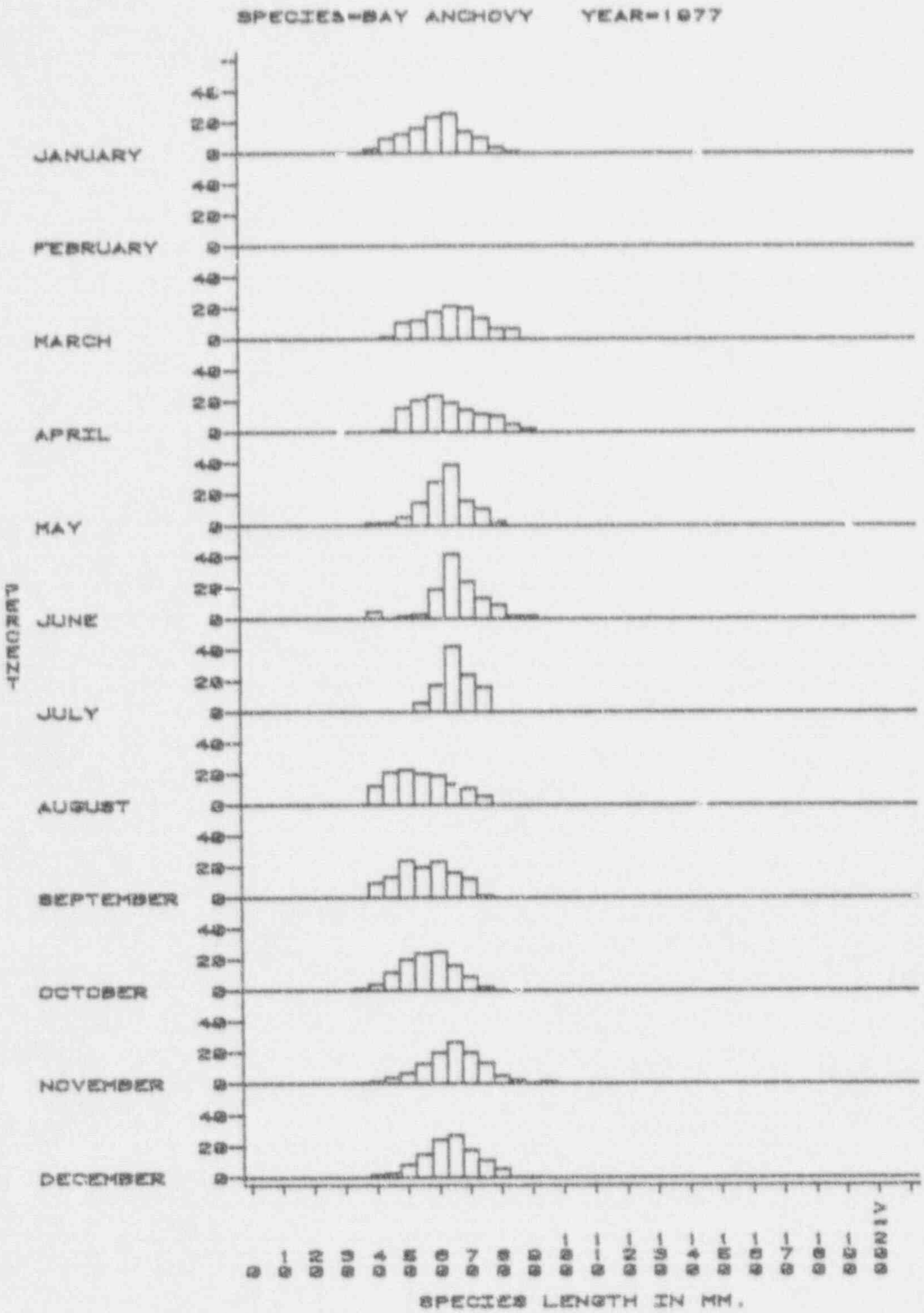


Figure 7.4b Impingement relative length frequency.

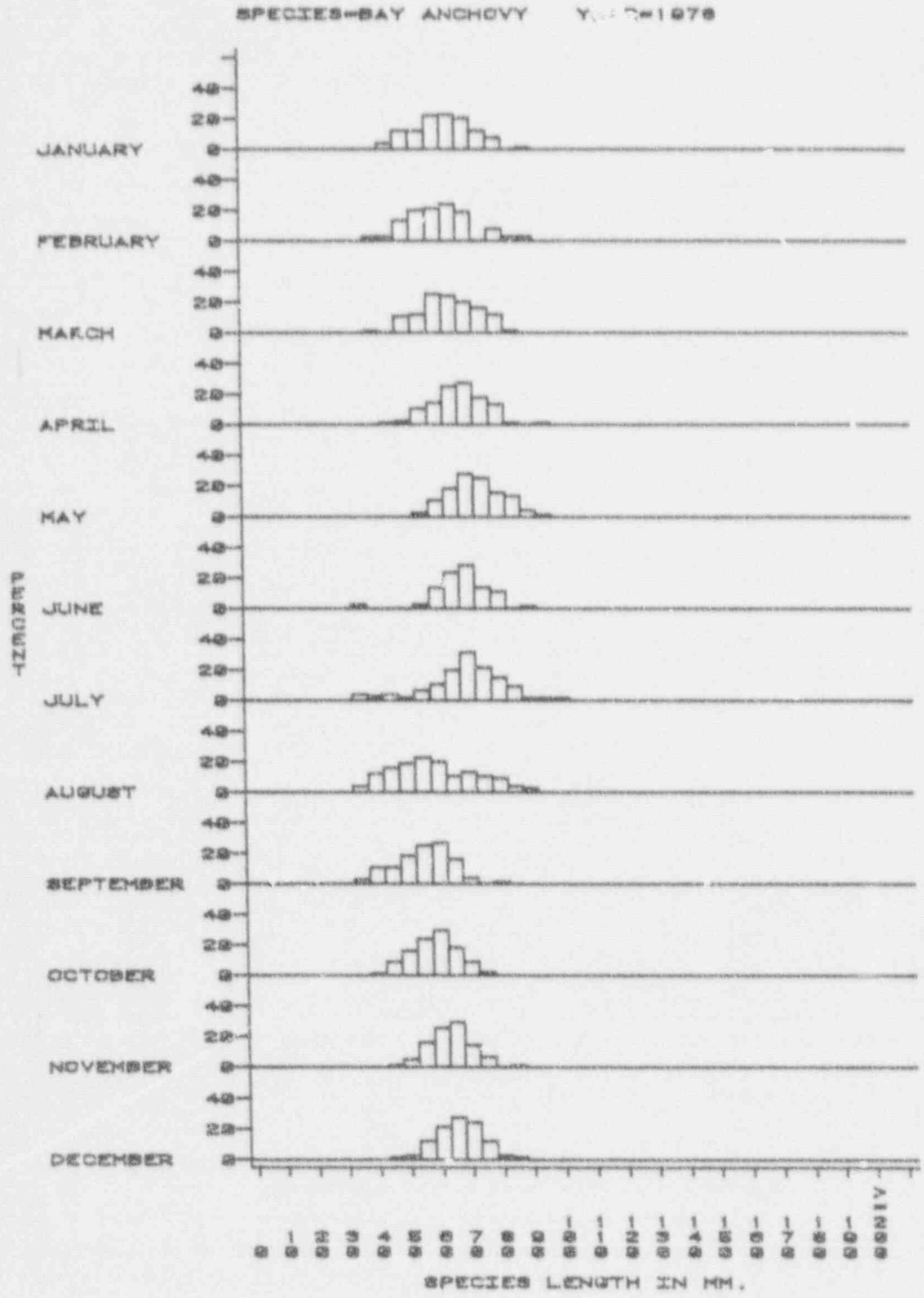


Figure 7.4c Impingement relative length frequency.

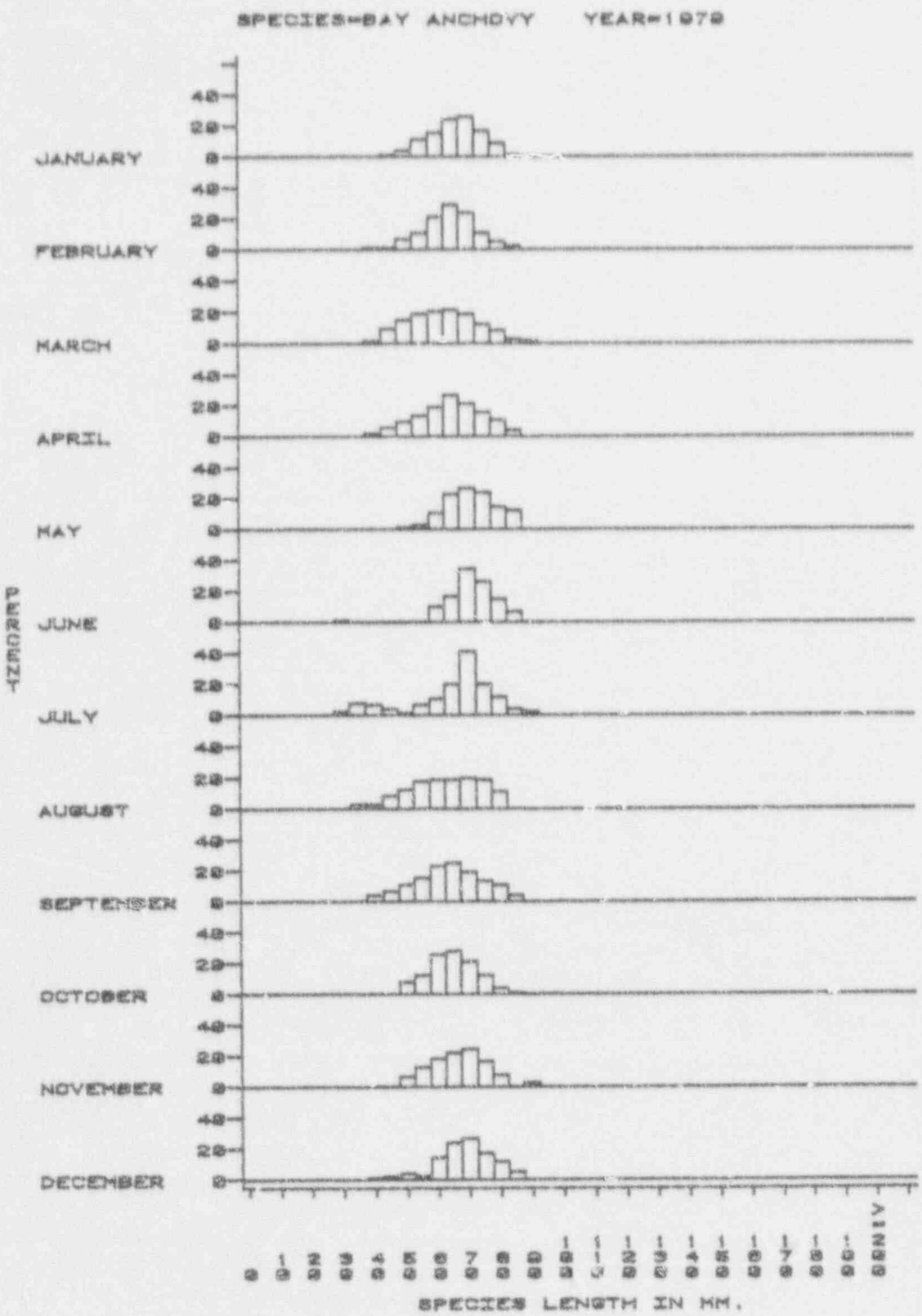


Figure 7.4d Impingement relative length frequency.

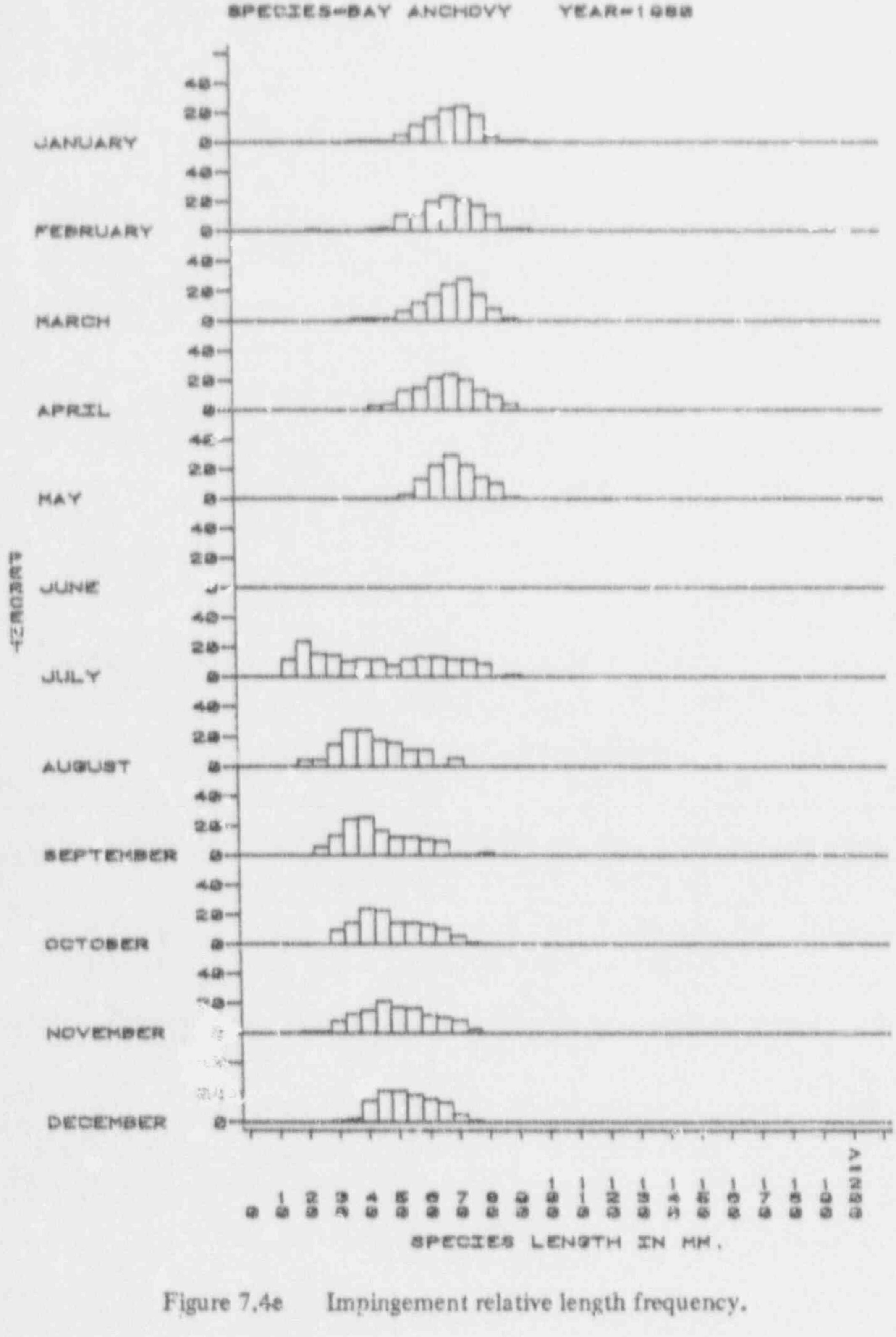


Figure 7.4e Impingement relative length frequency.

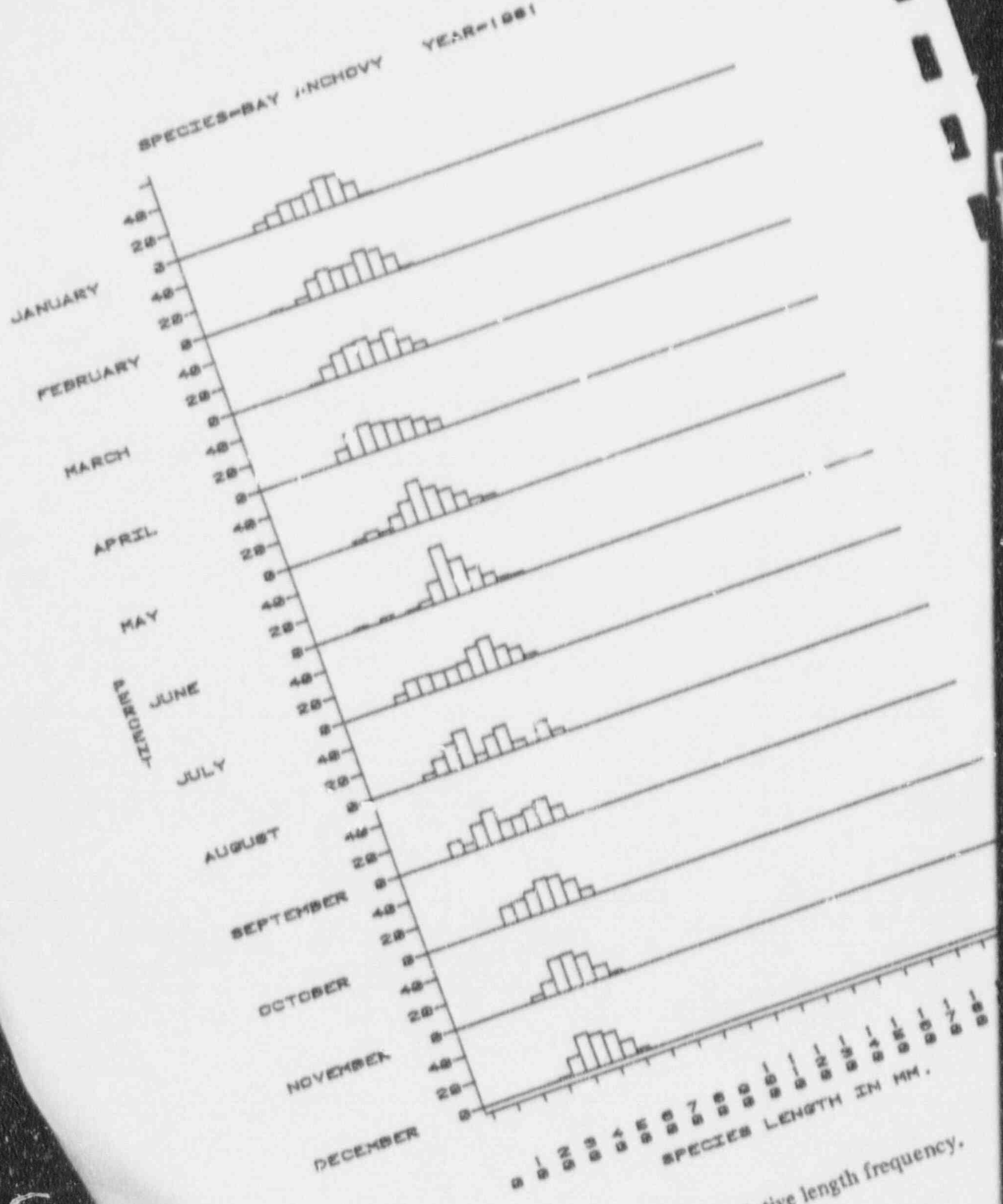


Figure 7.4f Impingement relative length frequency.

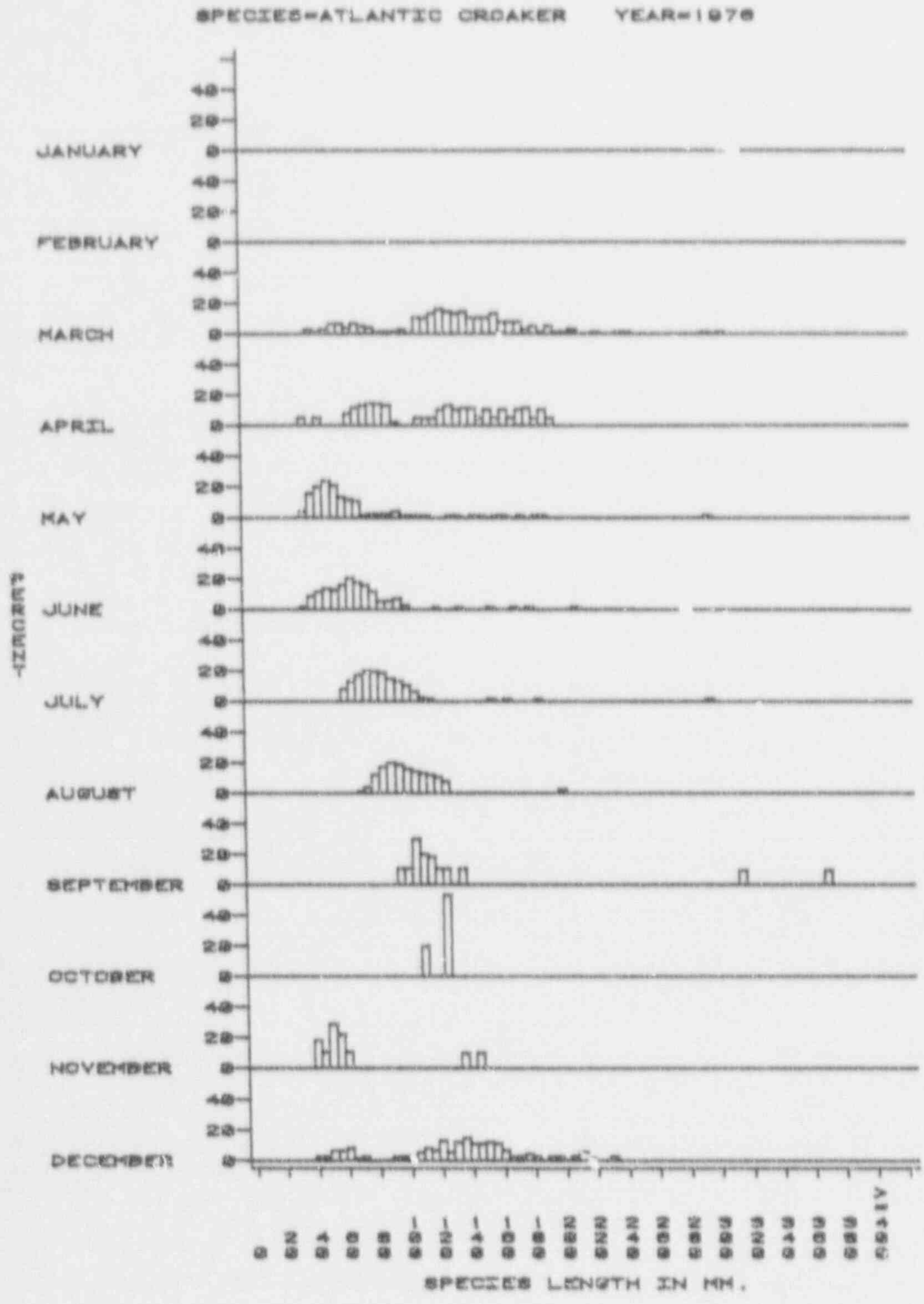


Figure 7.5a Impingement relative length frequency

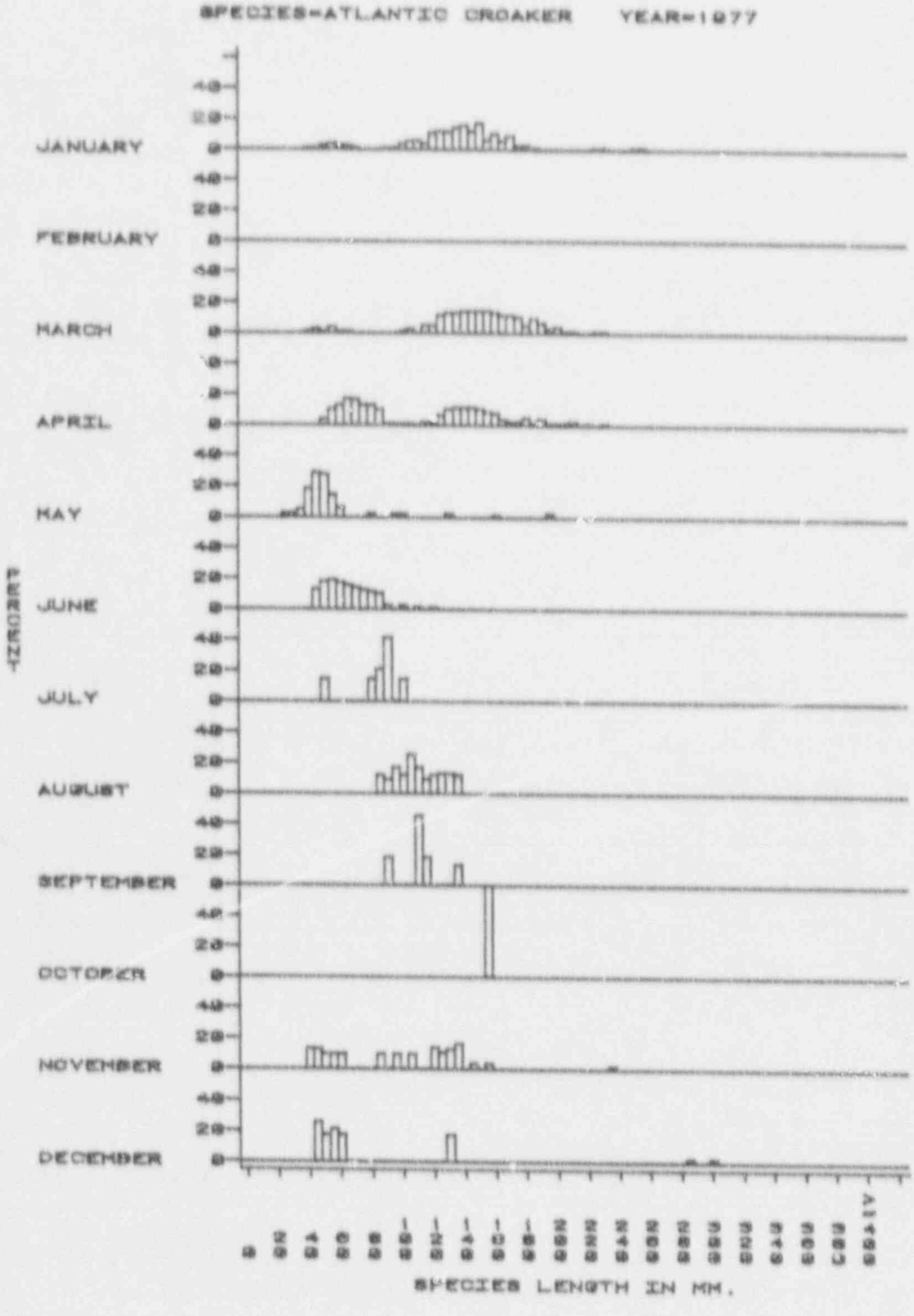


Figure 7.5b Impingement relative length frequency

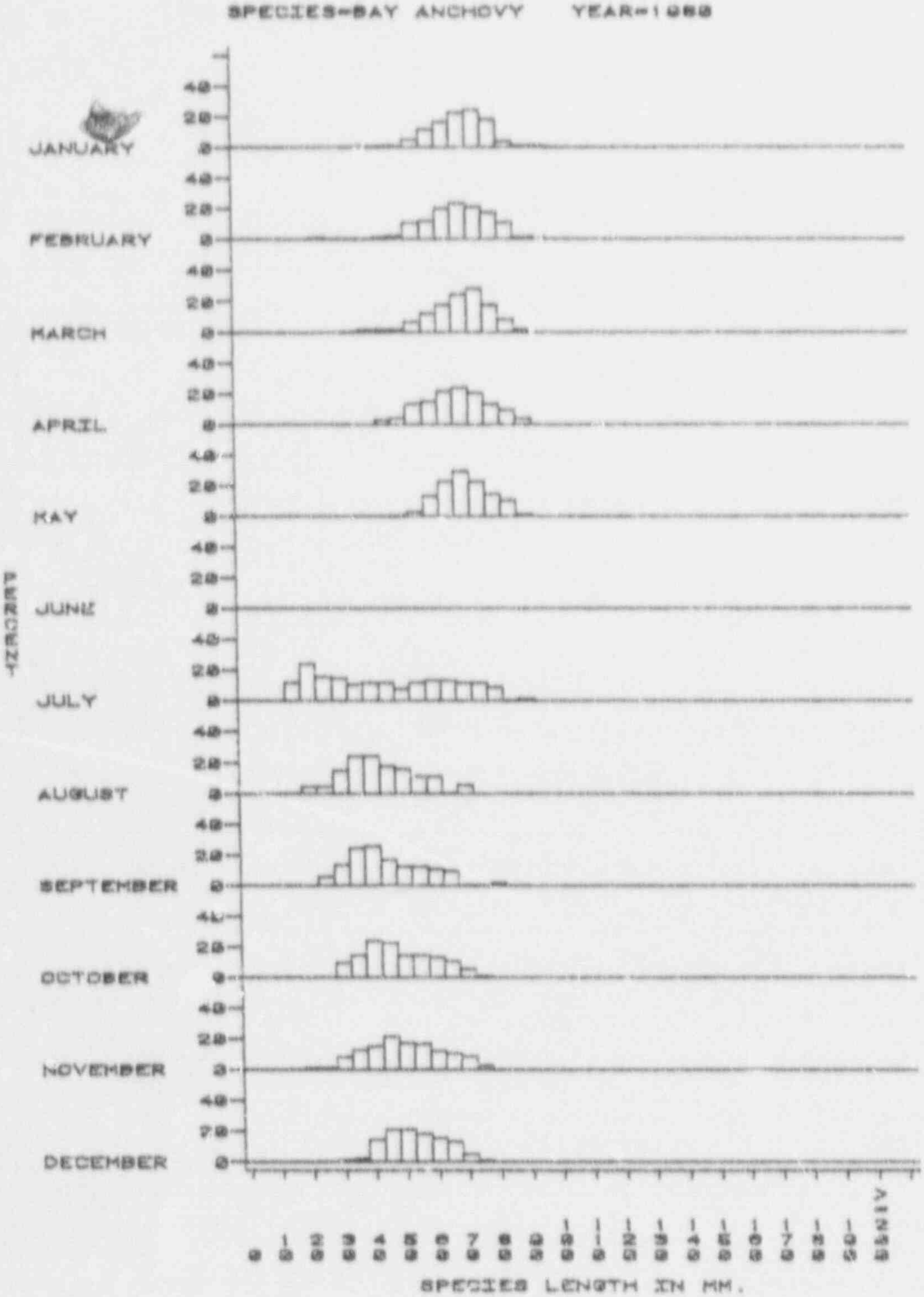


Figure 7.4e Impingement relative length frequency.

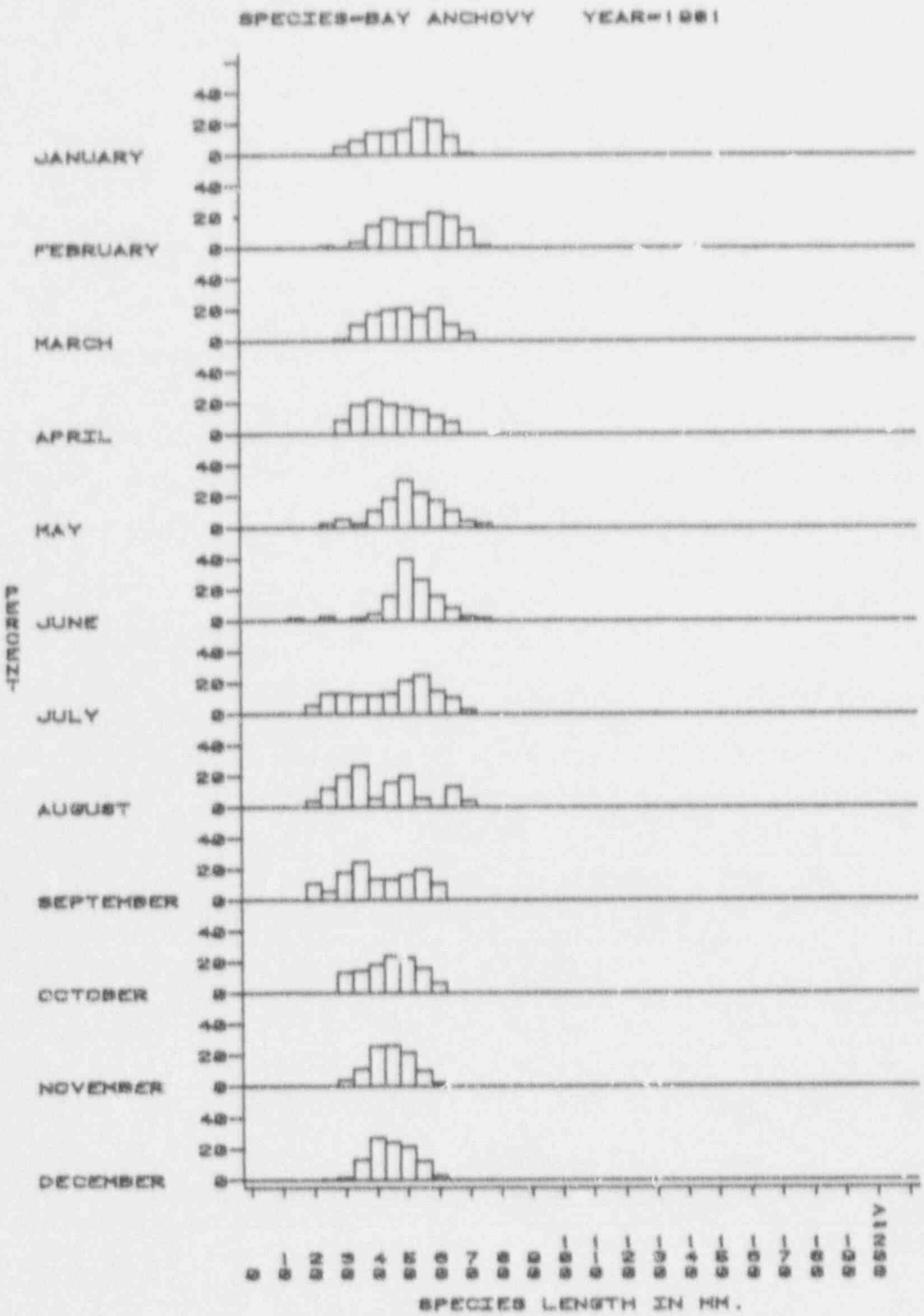


Figure 7.4f Impingement relative length frequency.

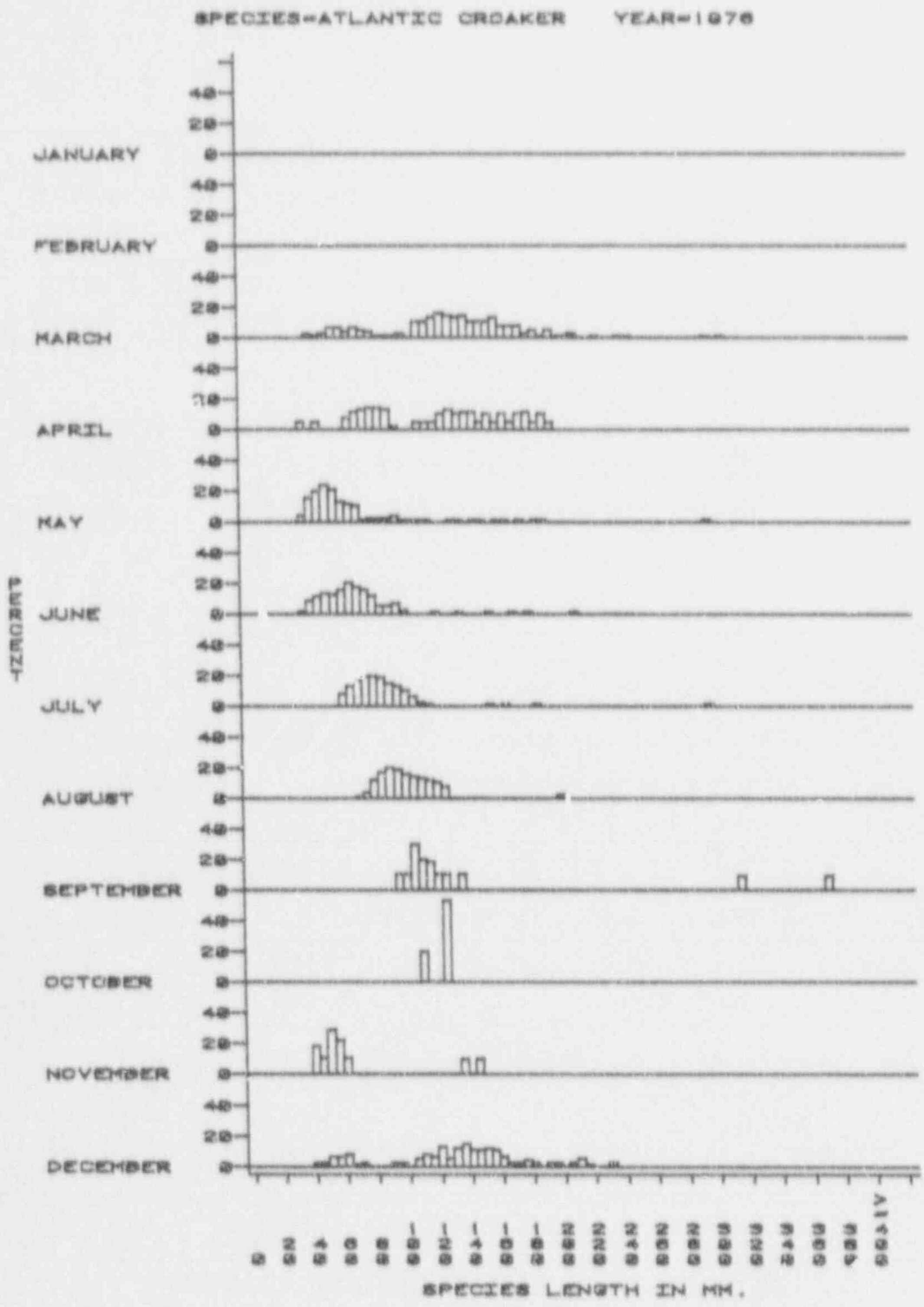


Figure 7.5a Impingement relative length frequency

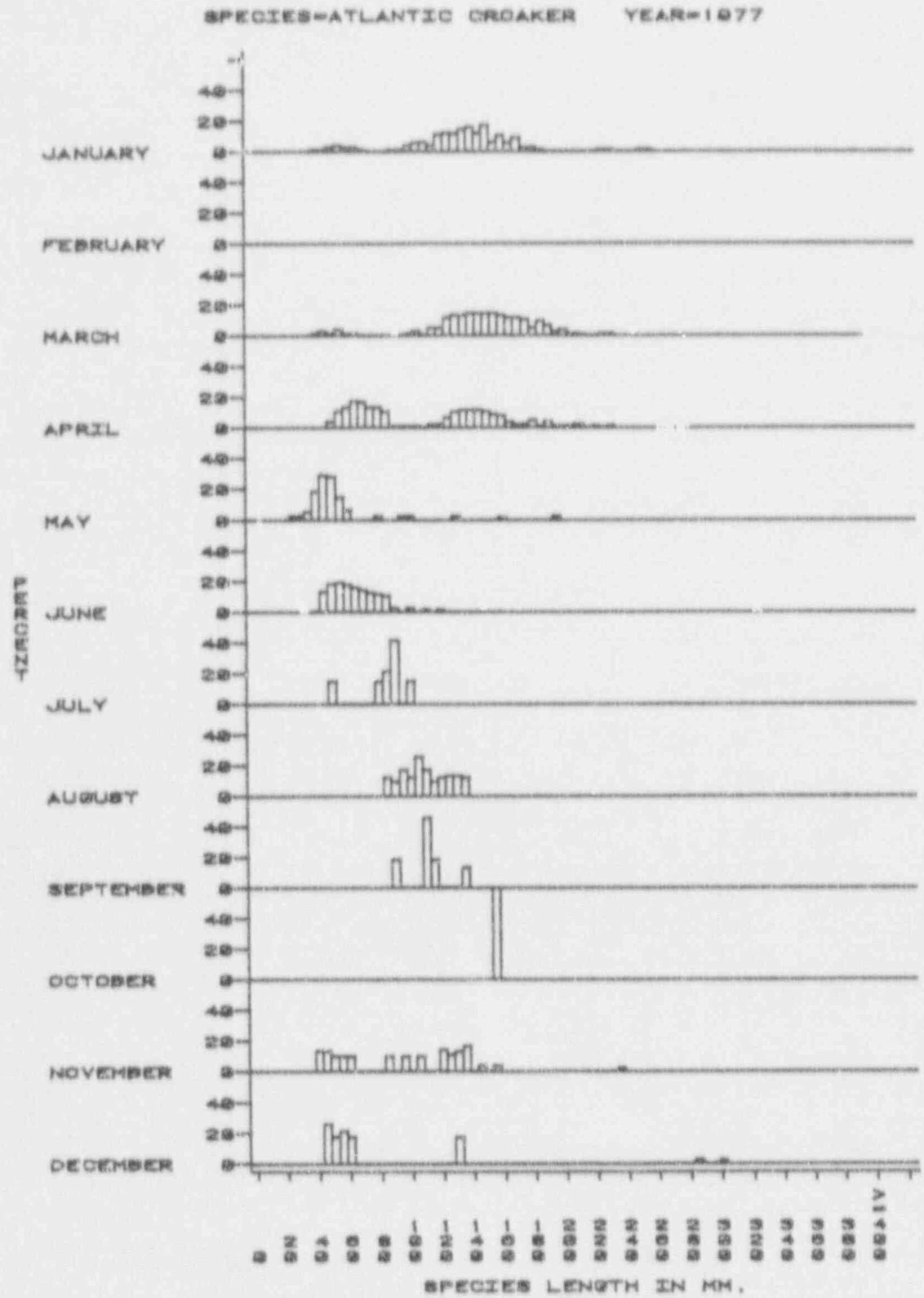


Figure 7.5b Impingement relative length frequency

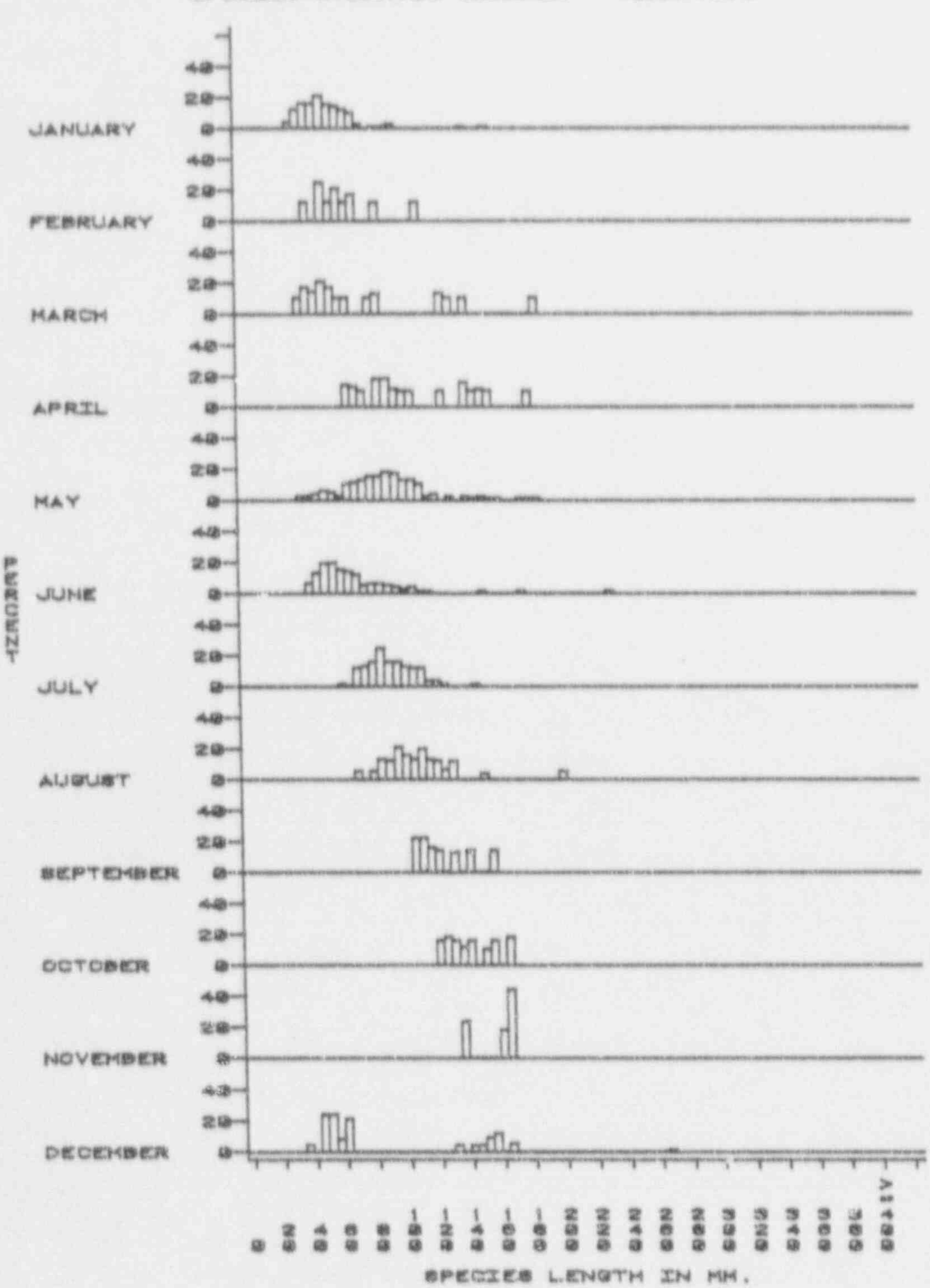


Figure 7.5c Impingement relative length frequency

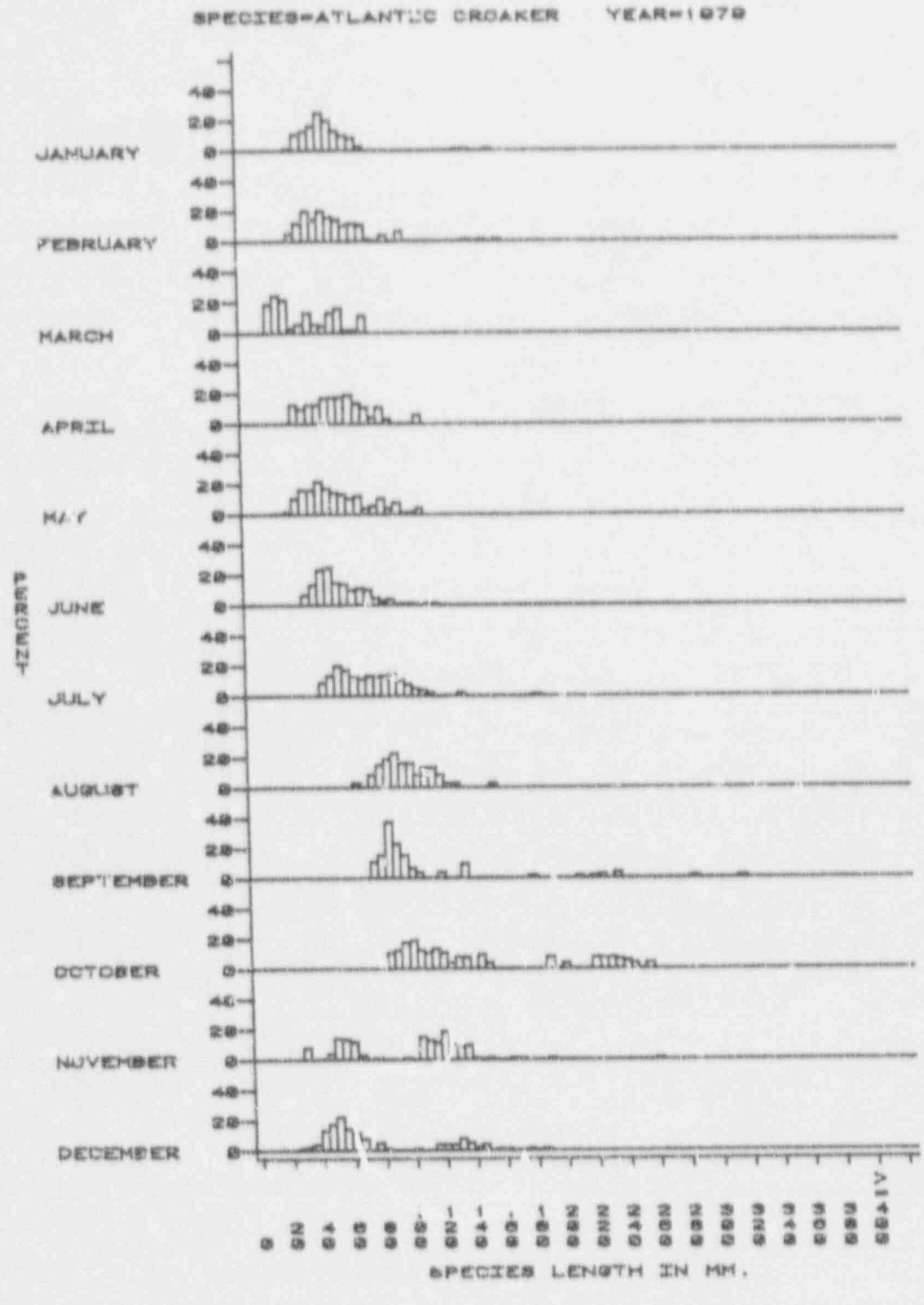


Figure 7.5d Impingement relative length frequency

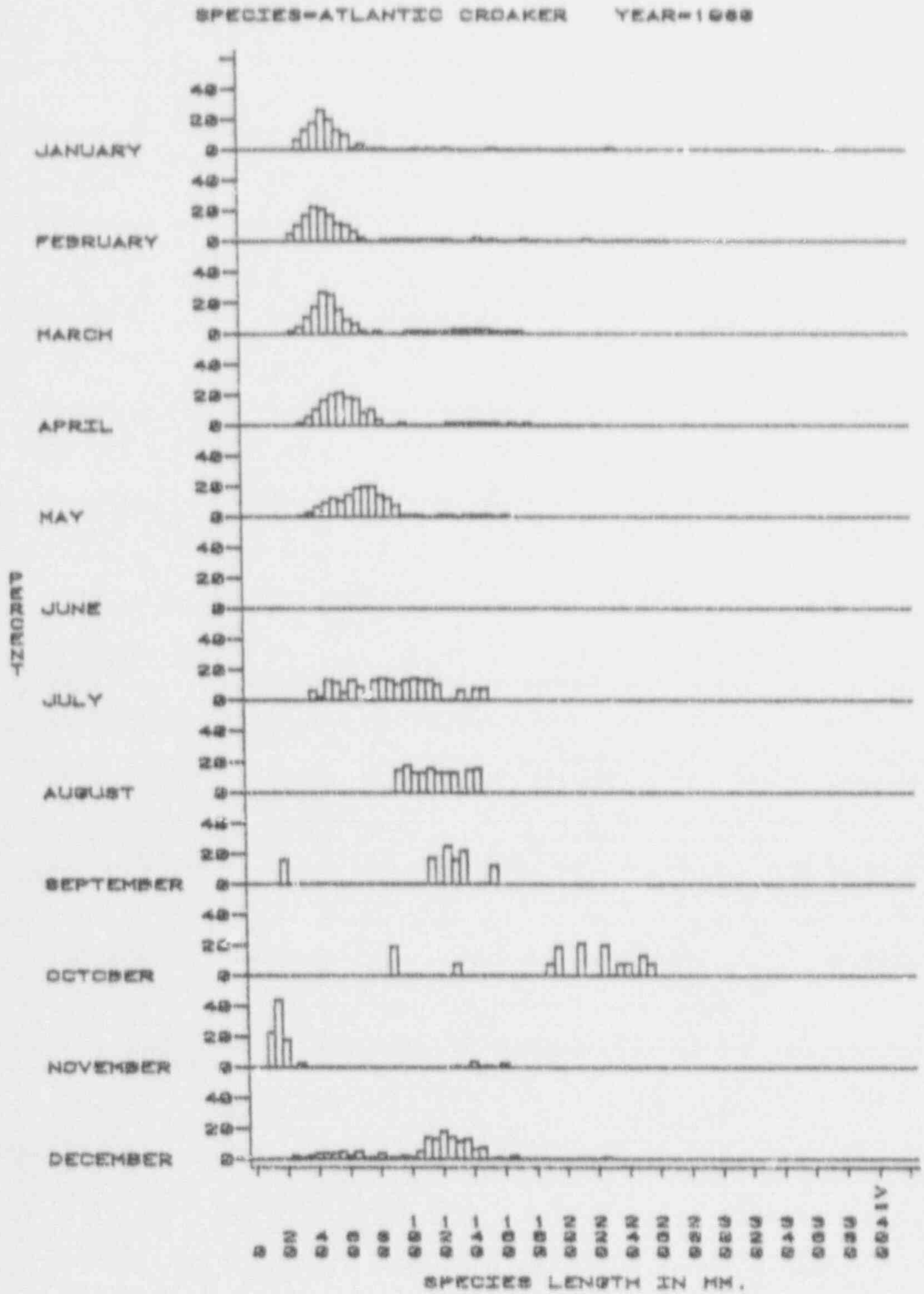


Figure 7.5e Impingement relative length frequency

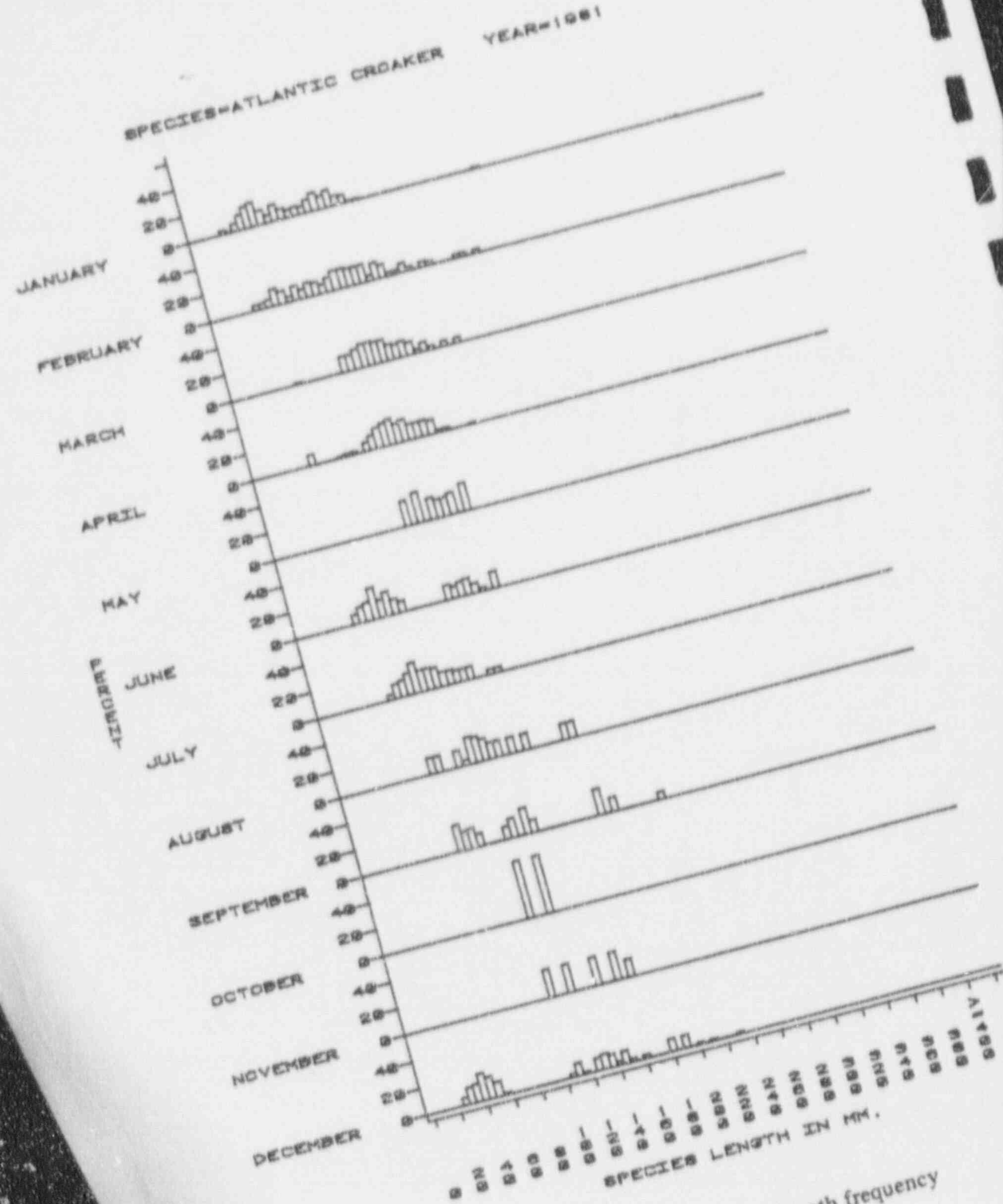


Figure 7.5f Impingement relative length frequency

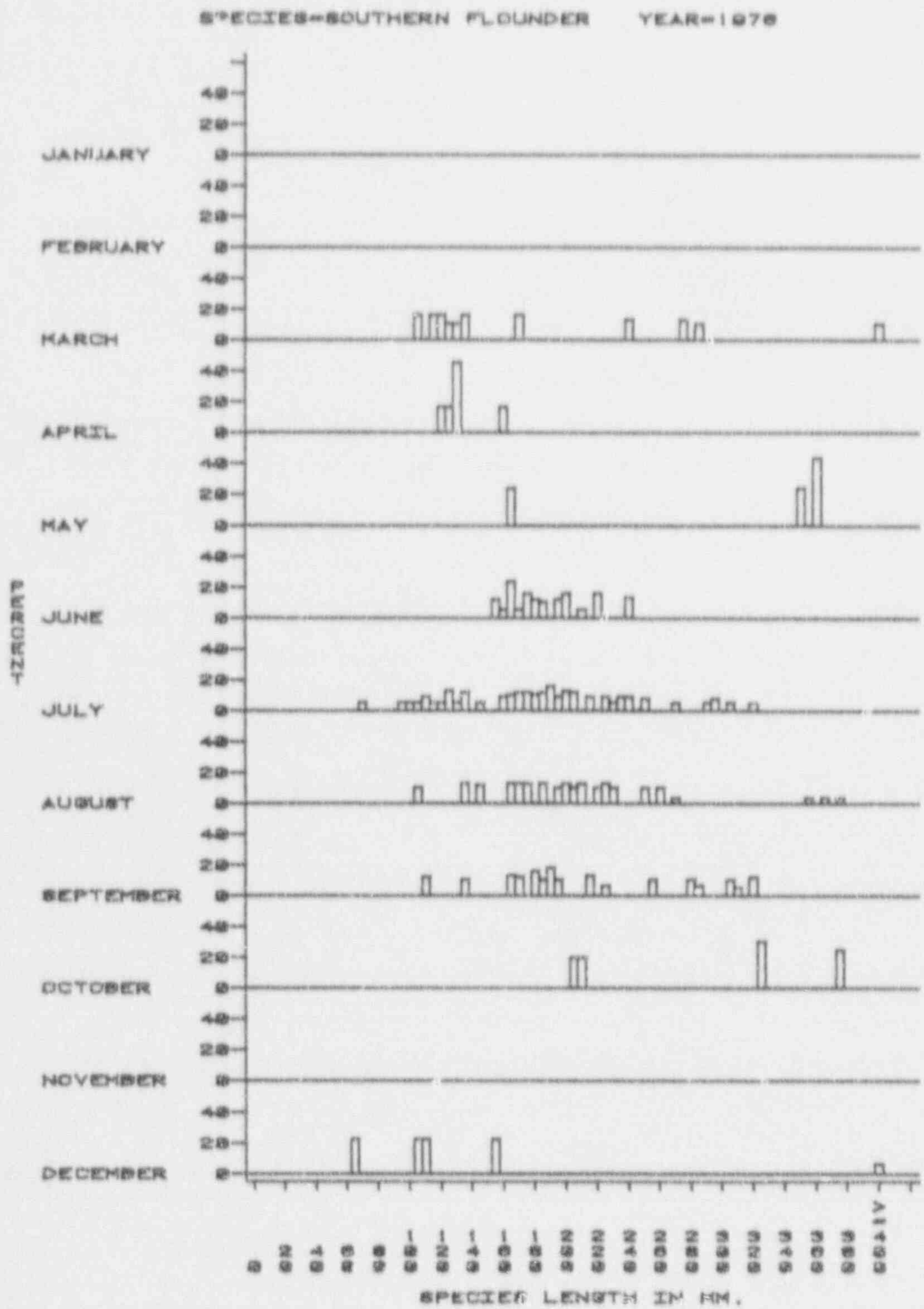


Figure 7.6a Impingement relative length frequency

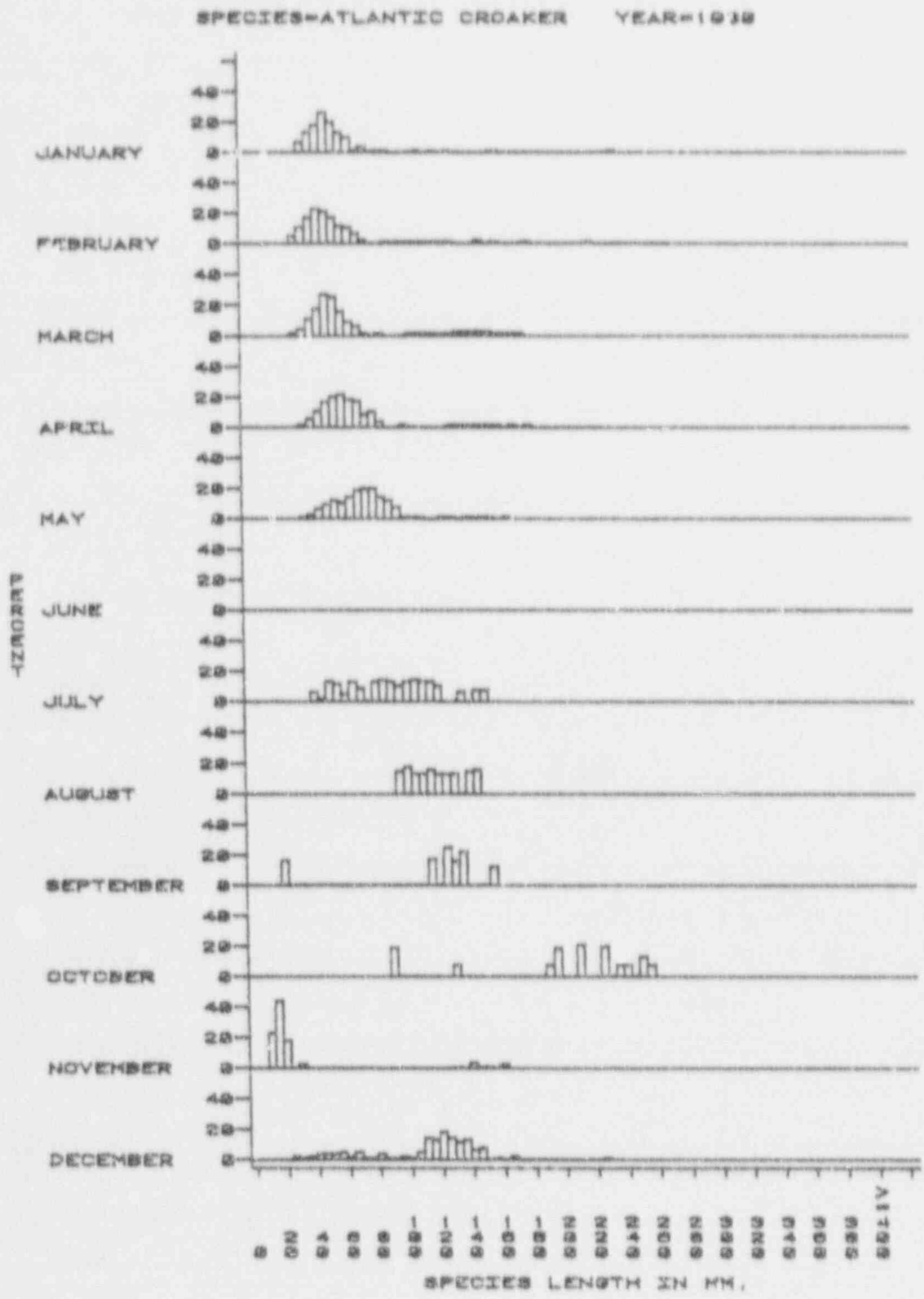


Figure 7.5e Impingement relative length frequency

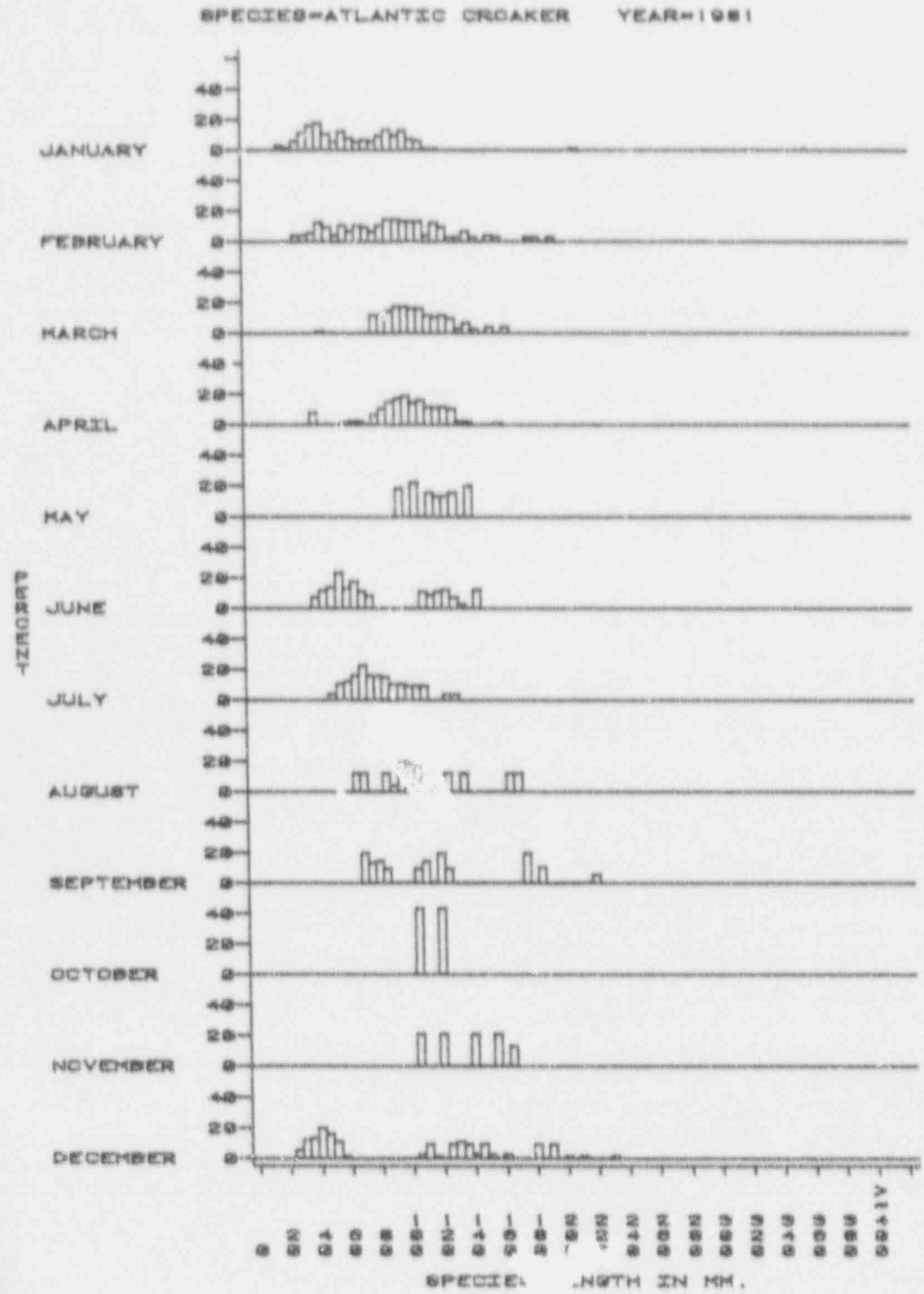


Figure 7.5f Impingement relative length frequency

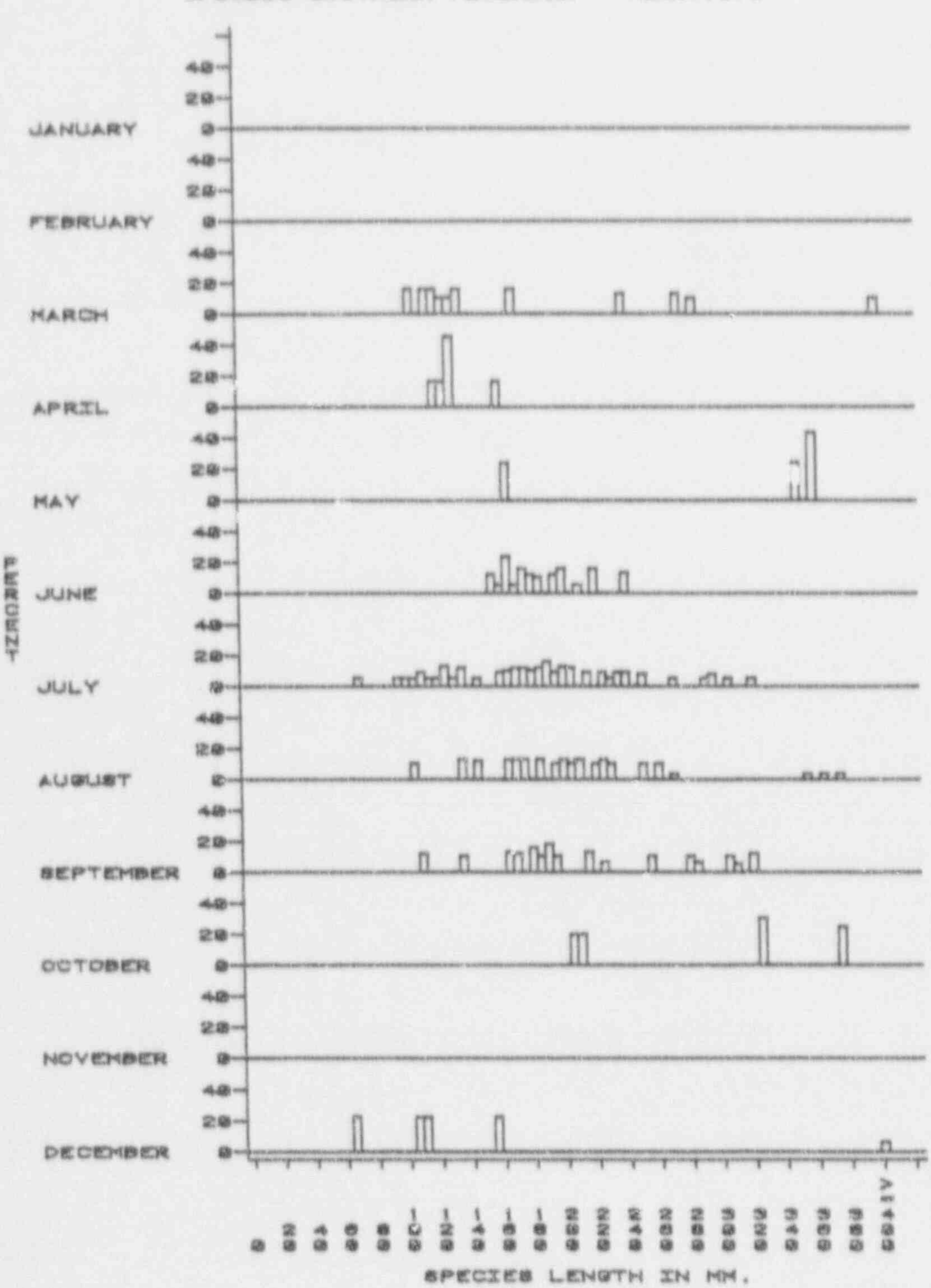


Figure 7.6a Impingement relative length frequency

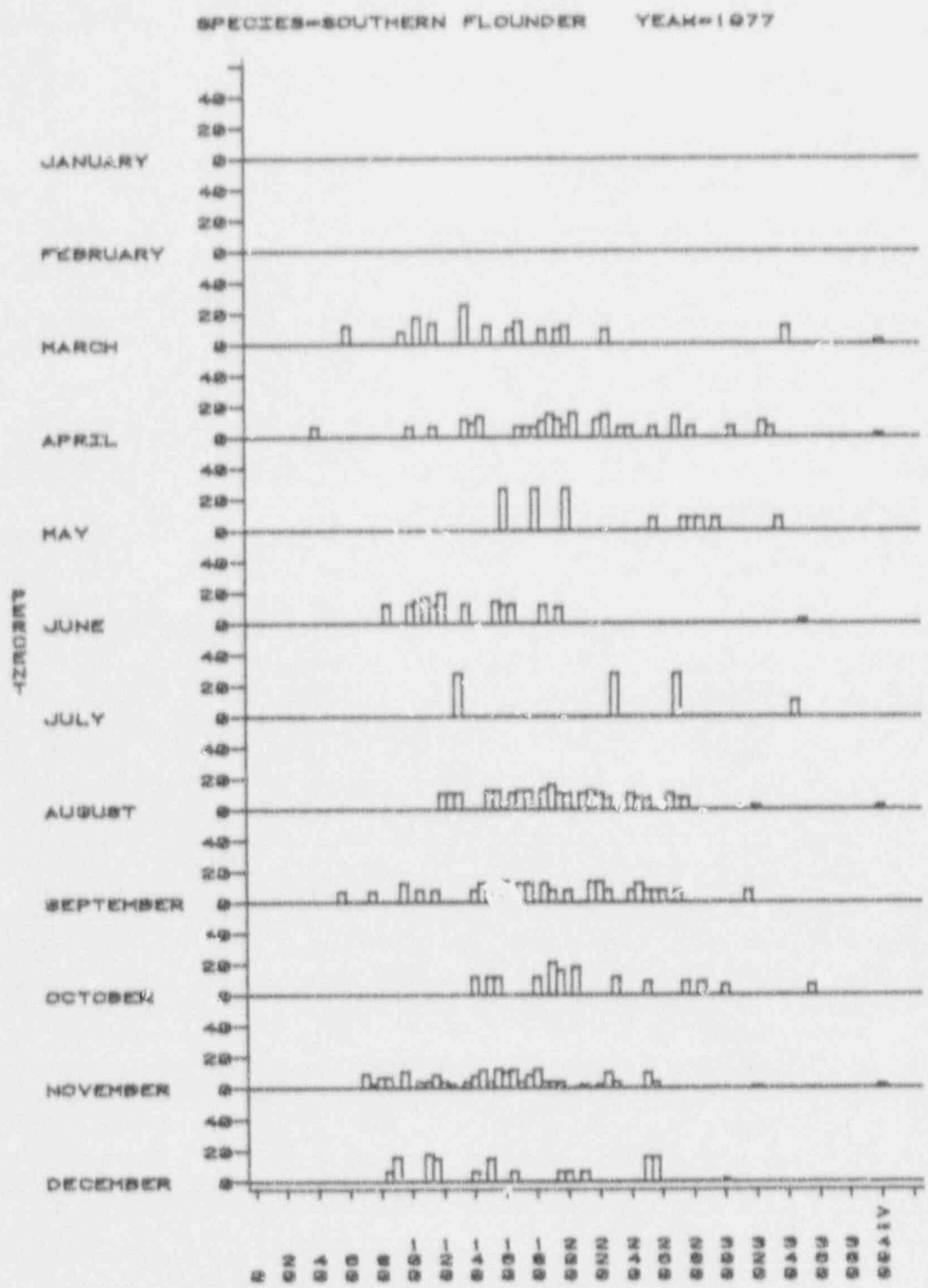


Figure 7.6b Impingement relative length frequency

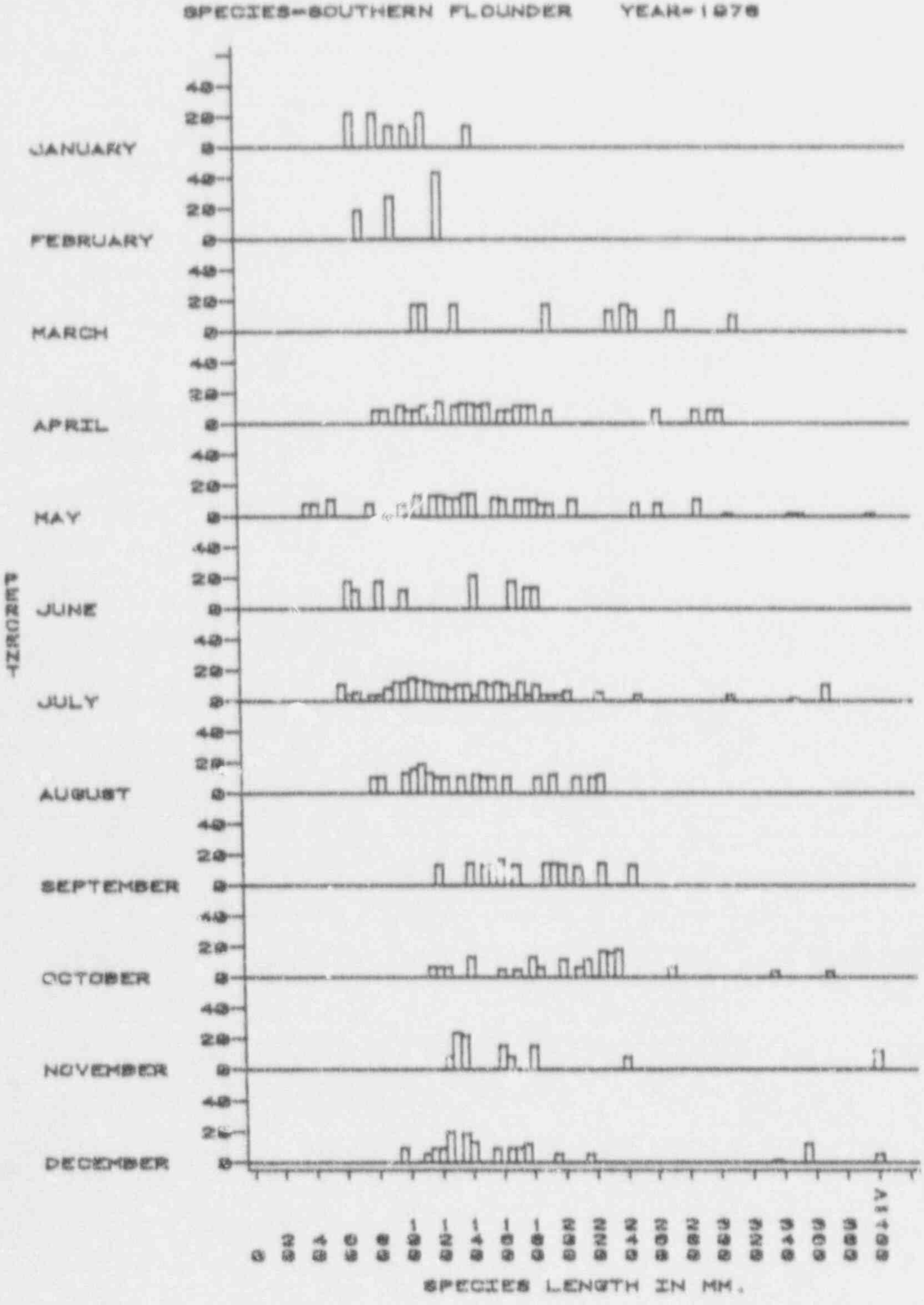


Figure 7.6c Impingement relative length frequency

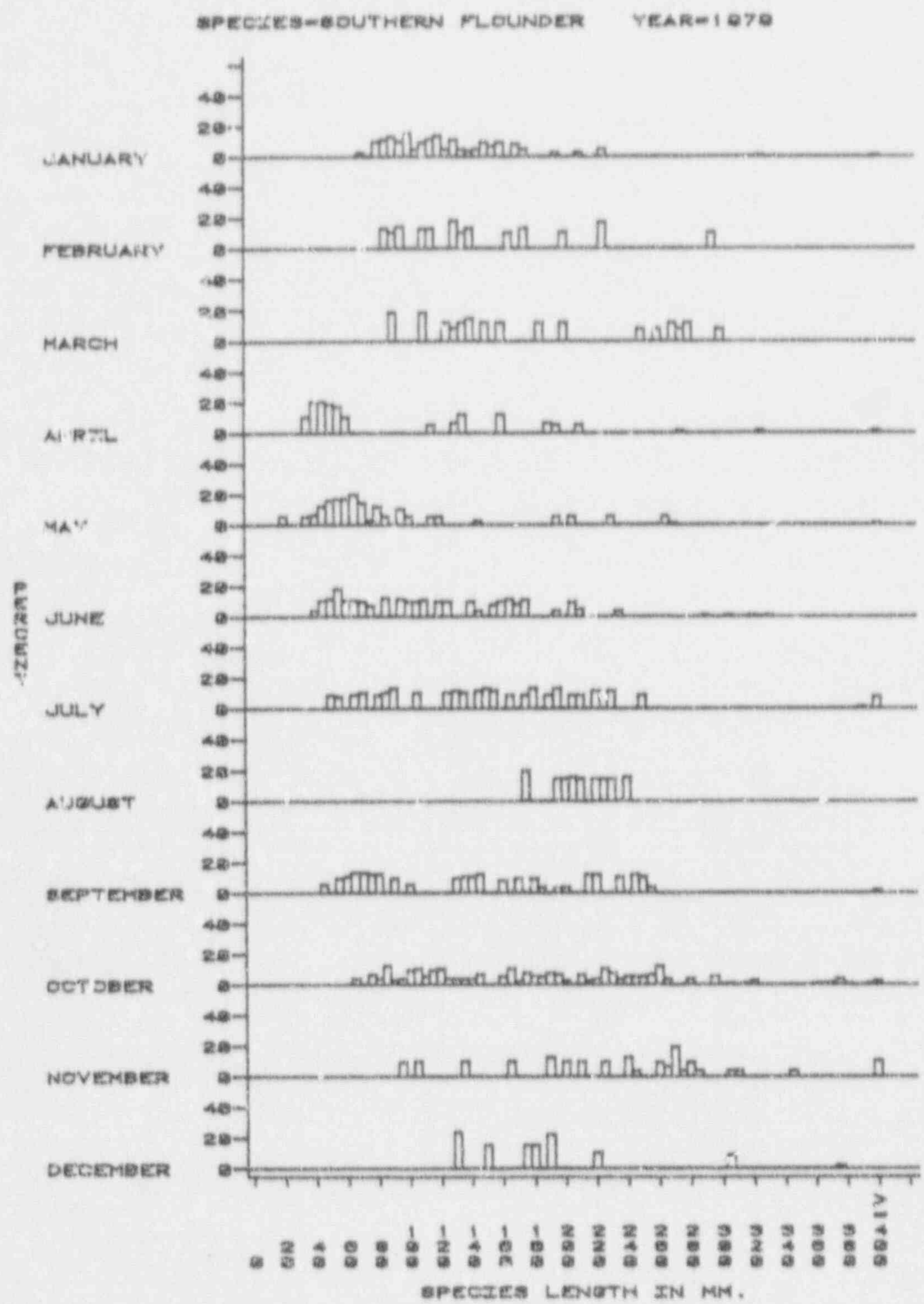


Figure 7.6d Impingement relative length frequency

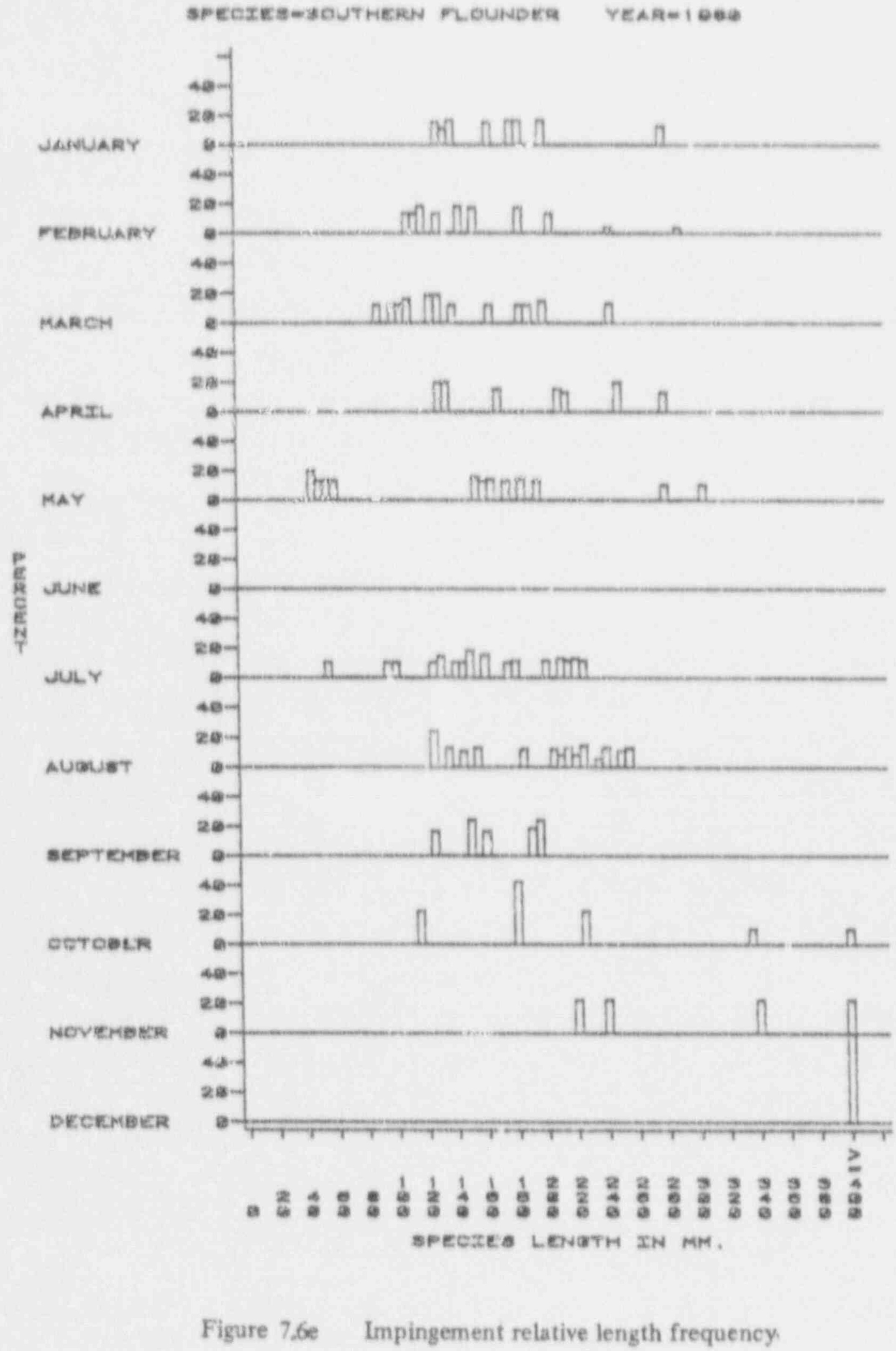


Figure 7.6e Impingement relative length frequency

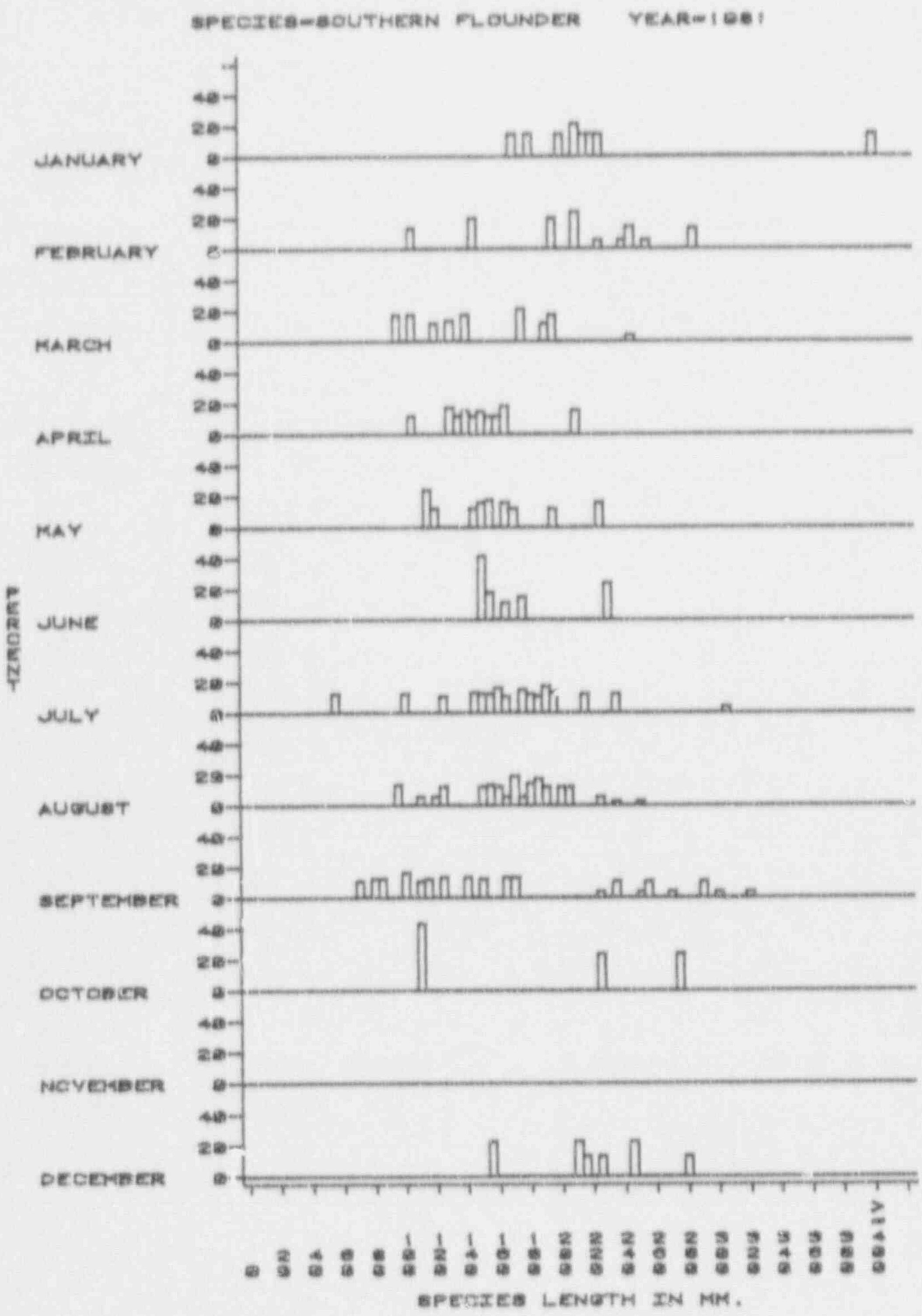


Figure 7.6f Impingement relative length frequency

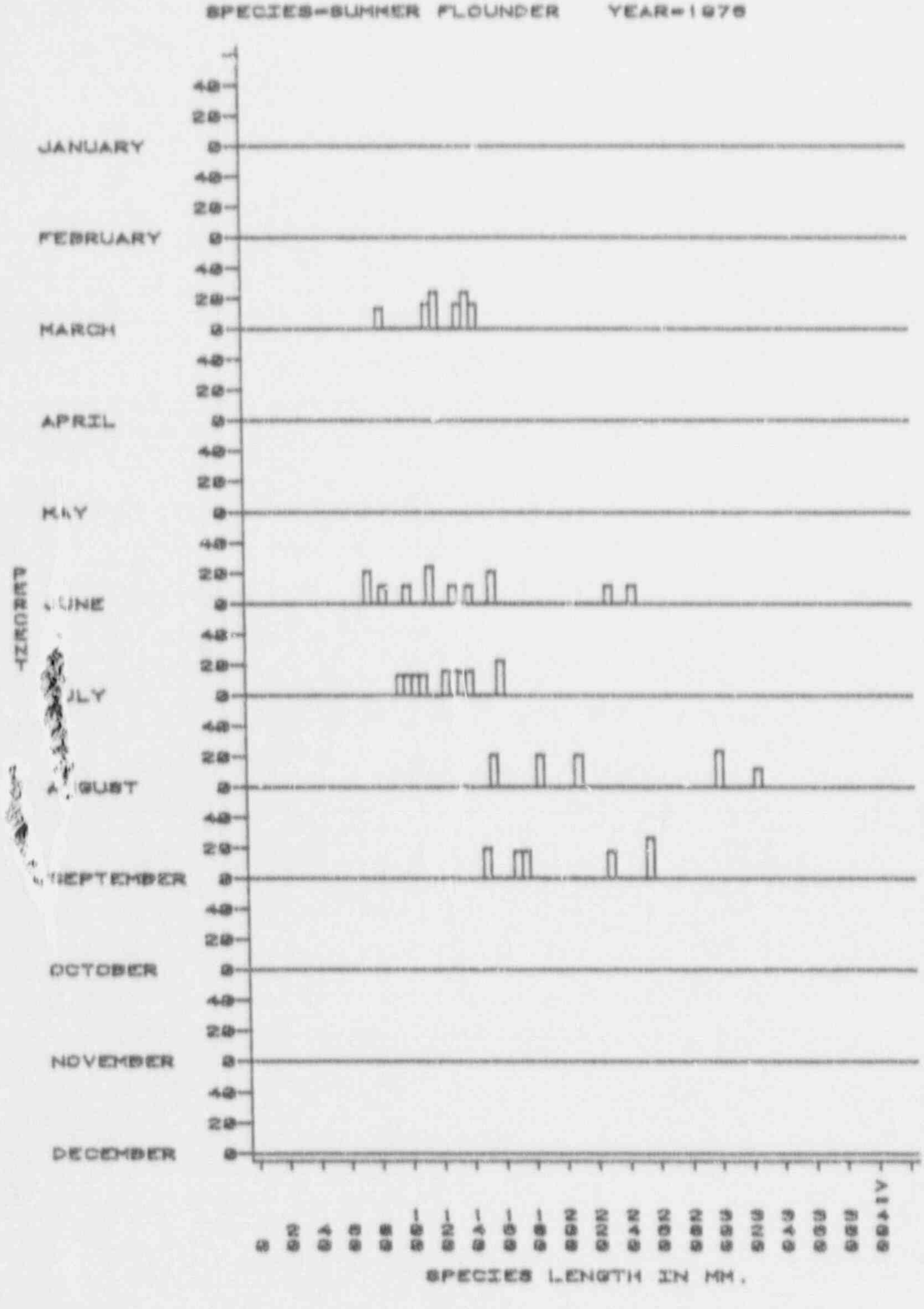


Figure 7.7a Impingement relative lengtn frequency

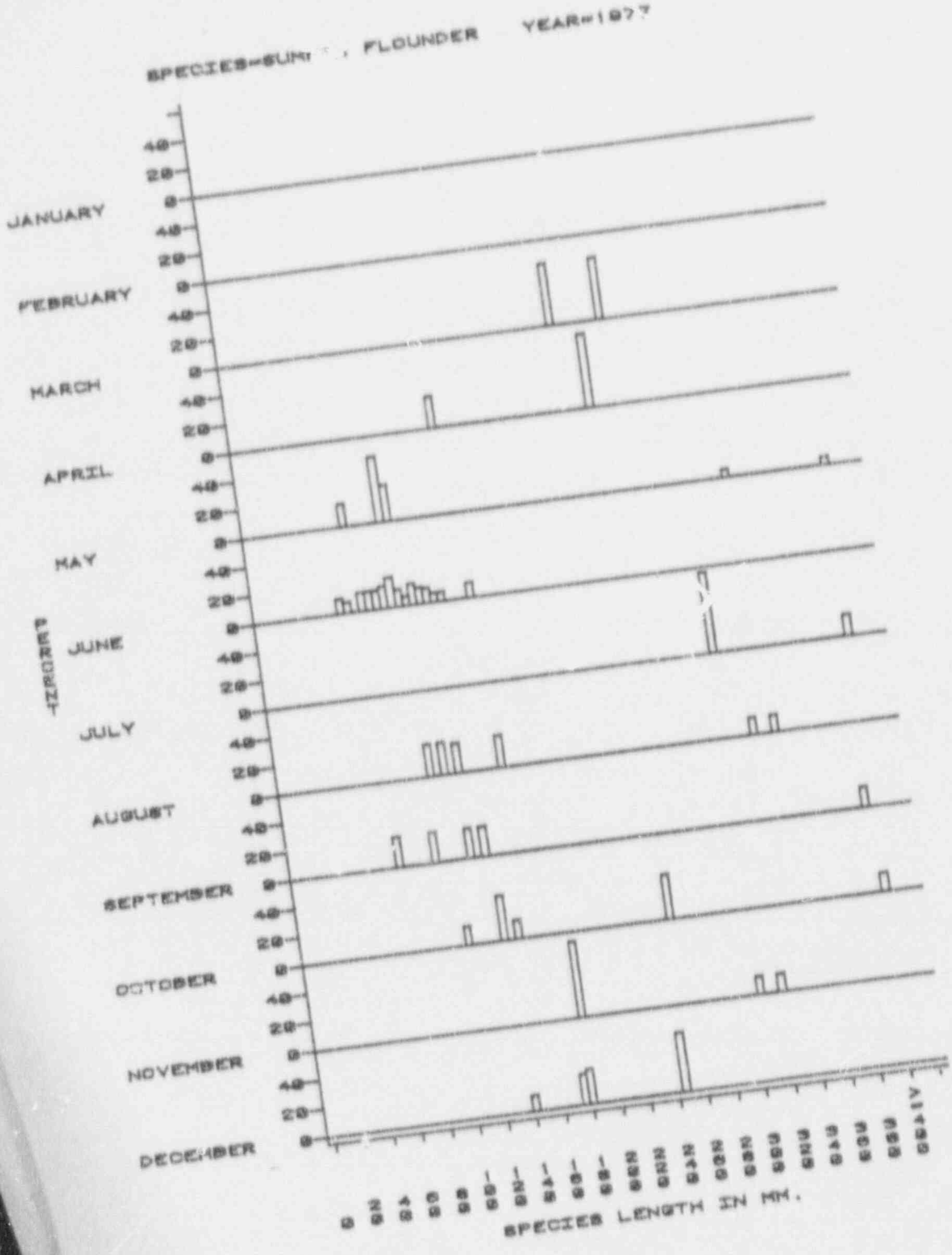


Figure 7.7b Impingement relative length frequency

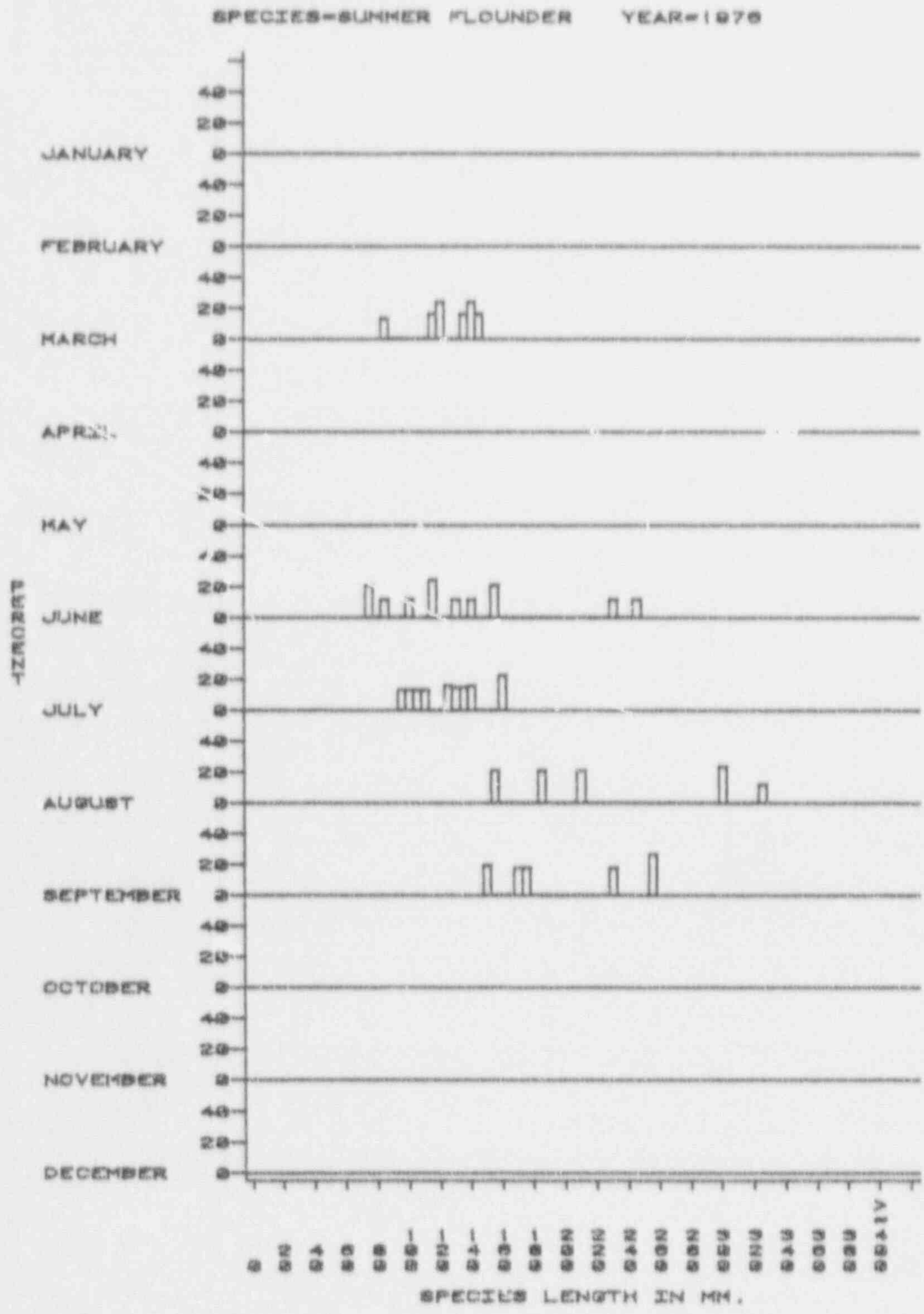


Figure 7.7a Impingement relative length frequency

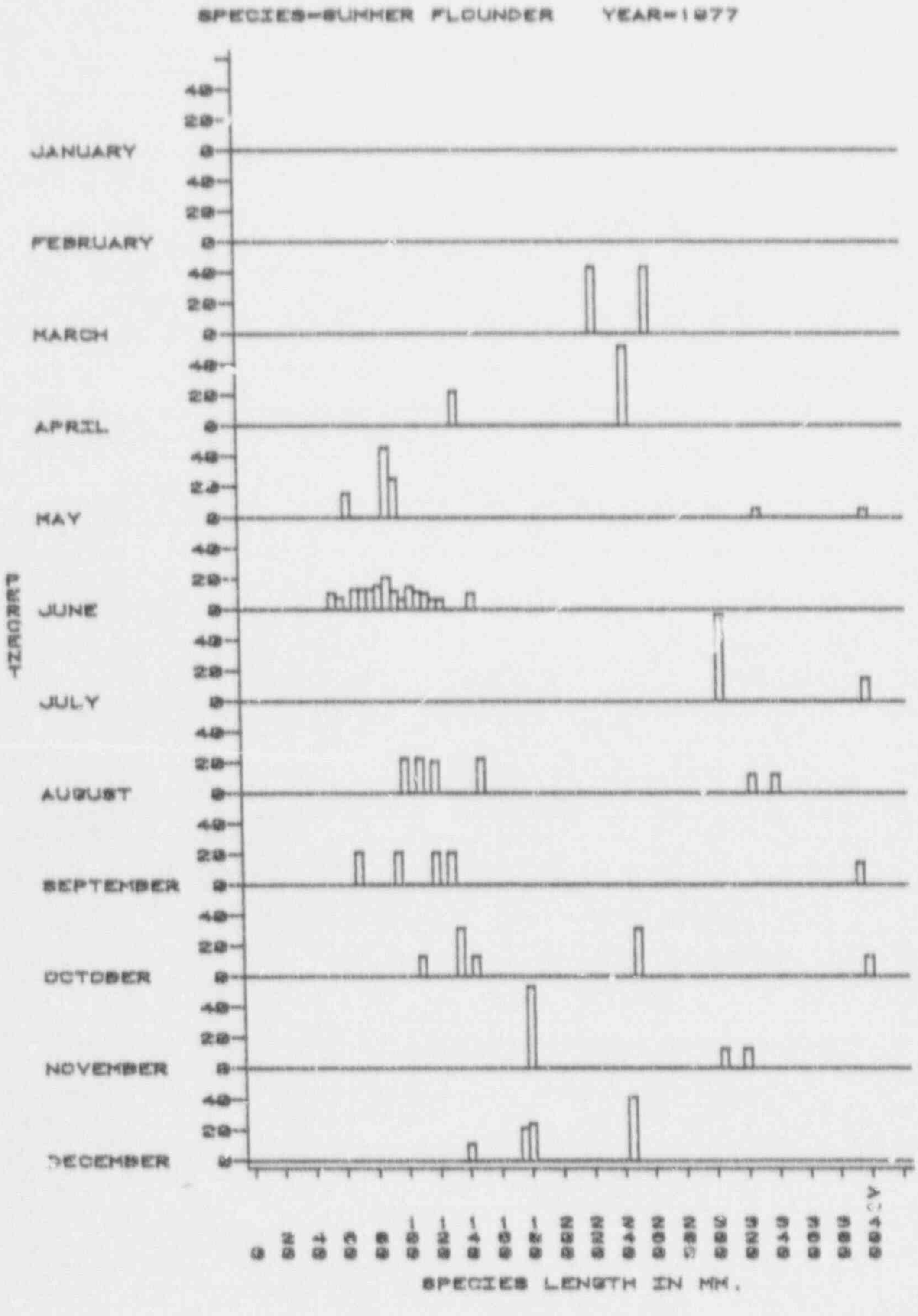


Figure 7.7b Impingement relative length frequency

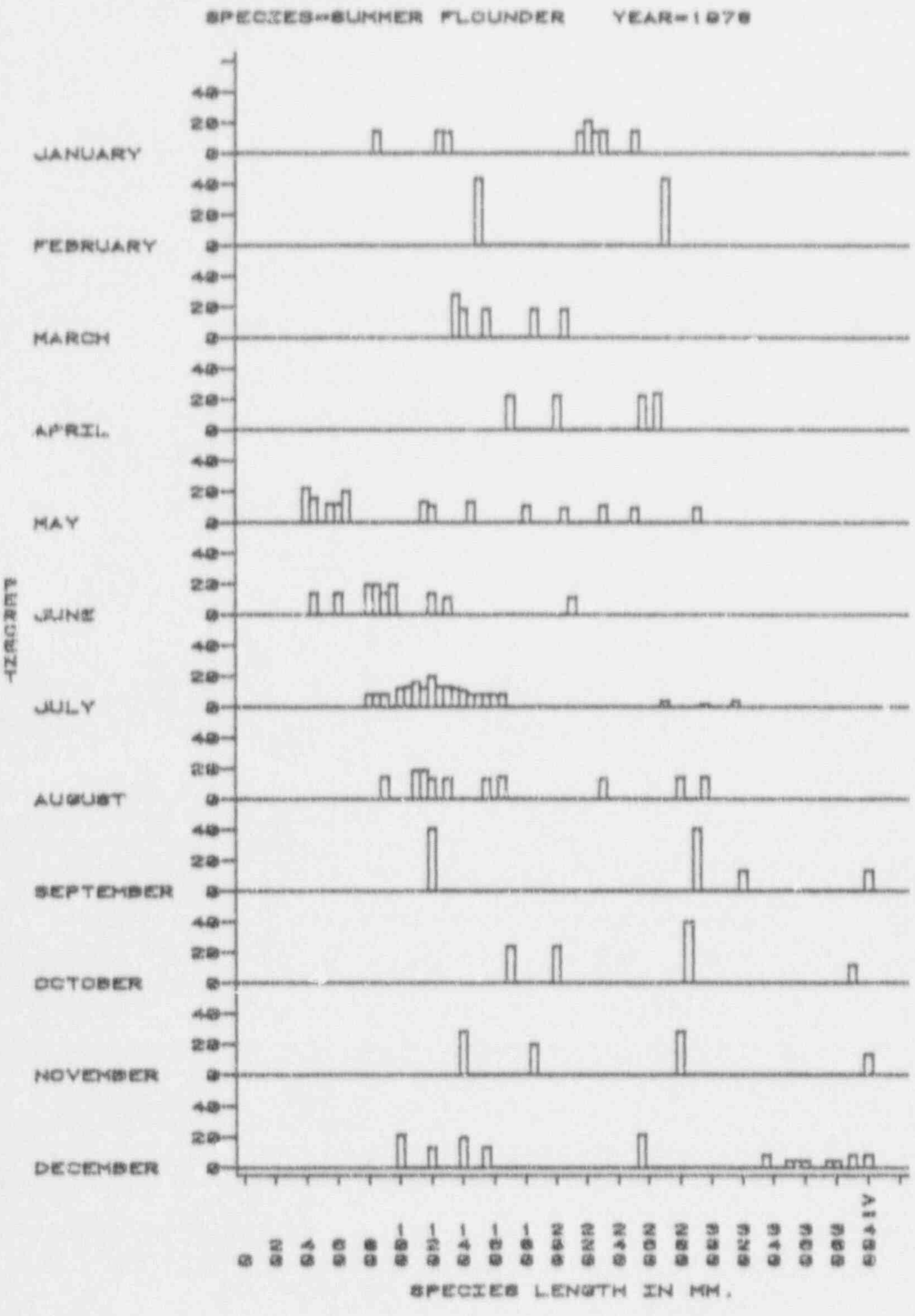


Figure 7.7c Impingement relative length frequency

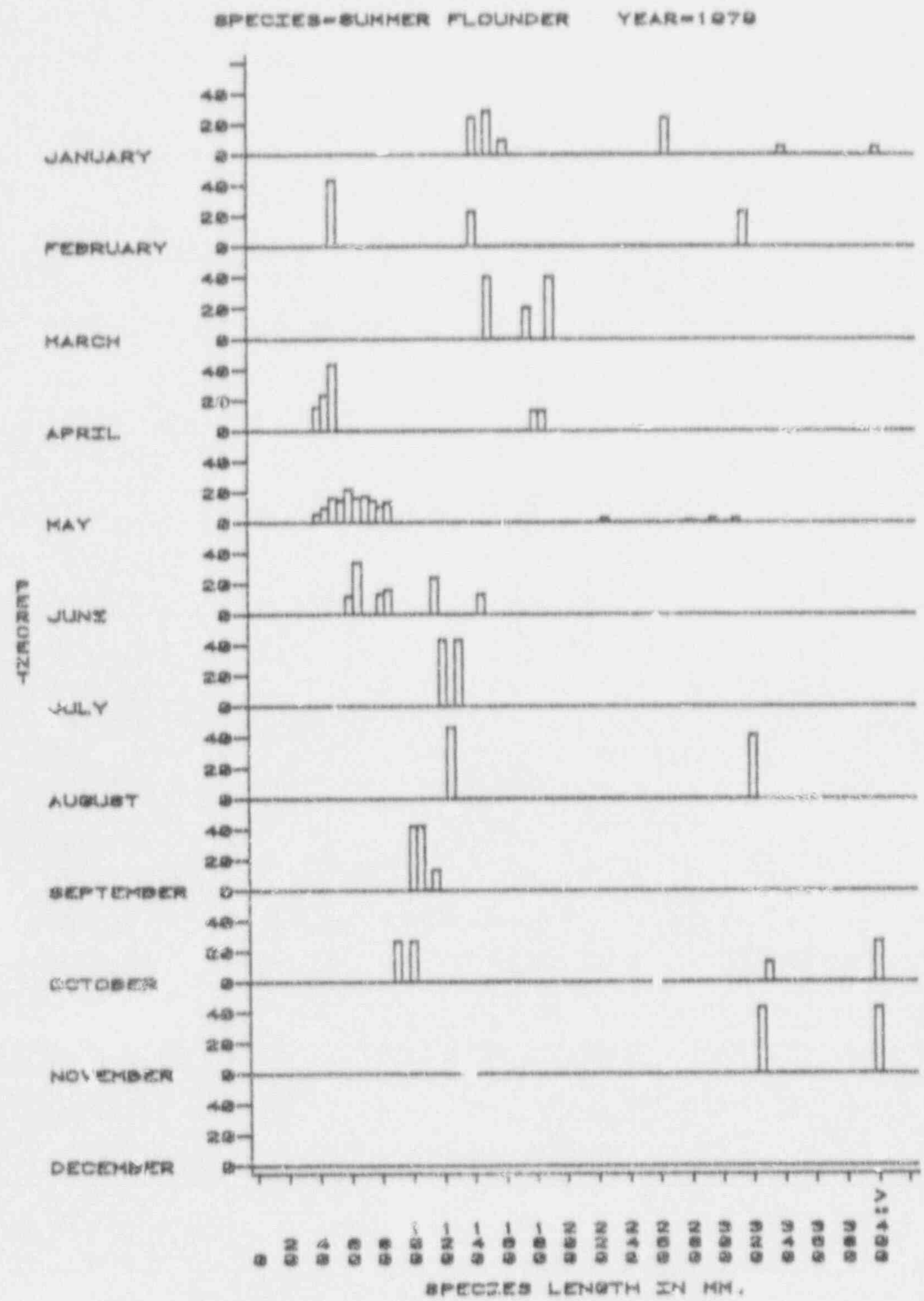


Figure 7.7d Impingement relative length frequency

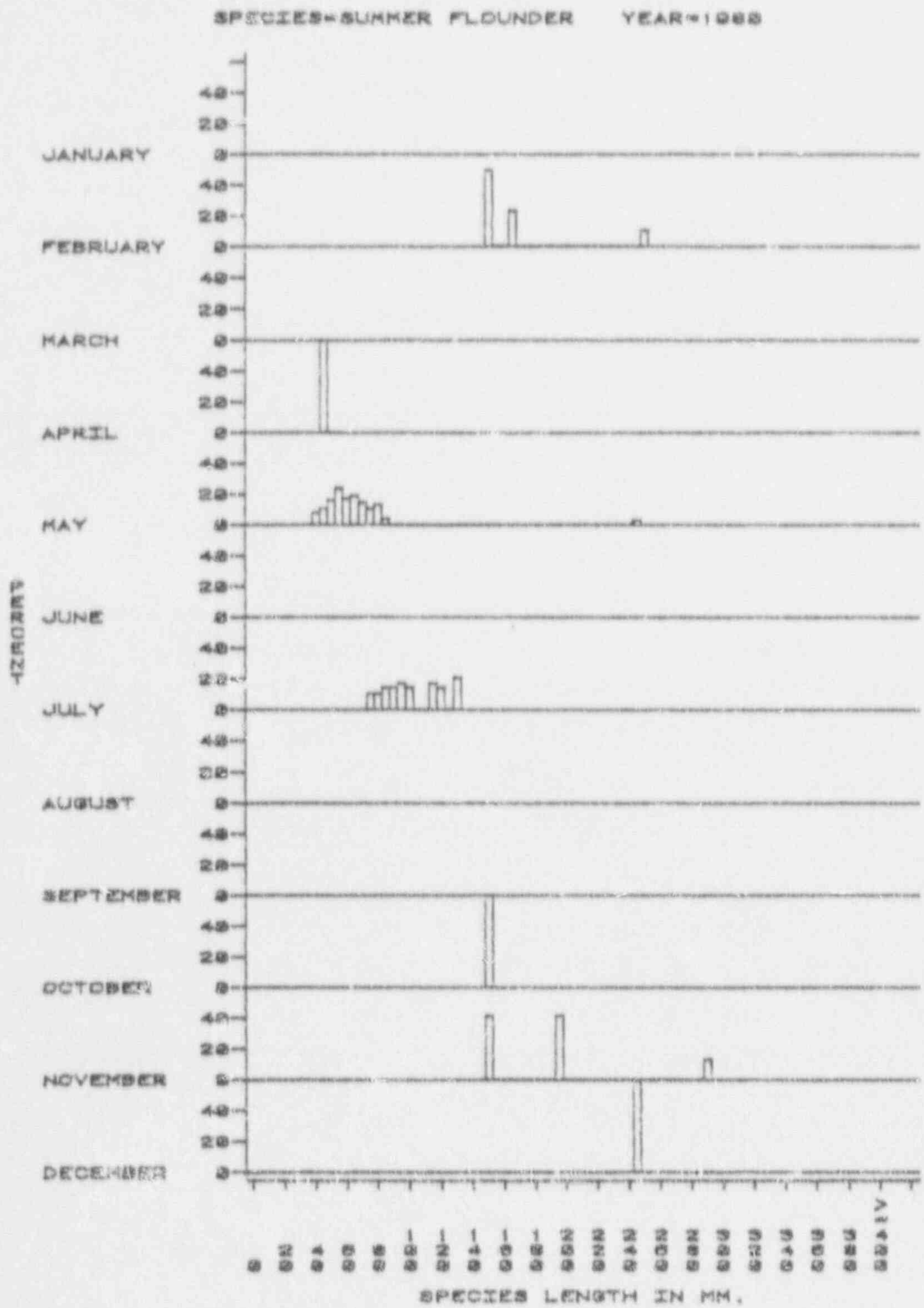


Figure 7.7e Impingement relative length frequency

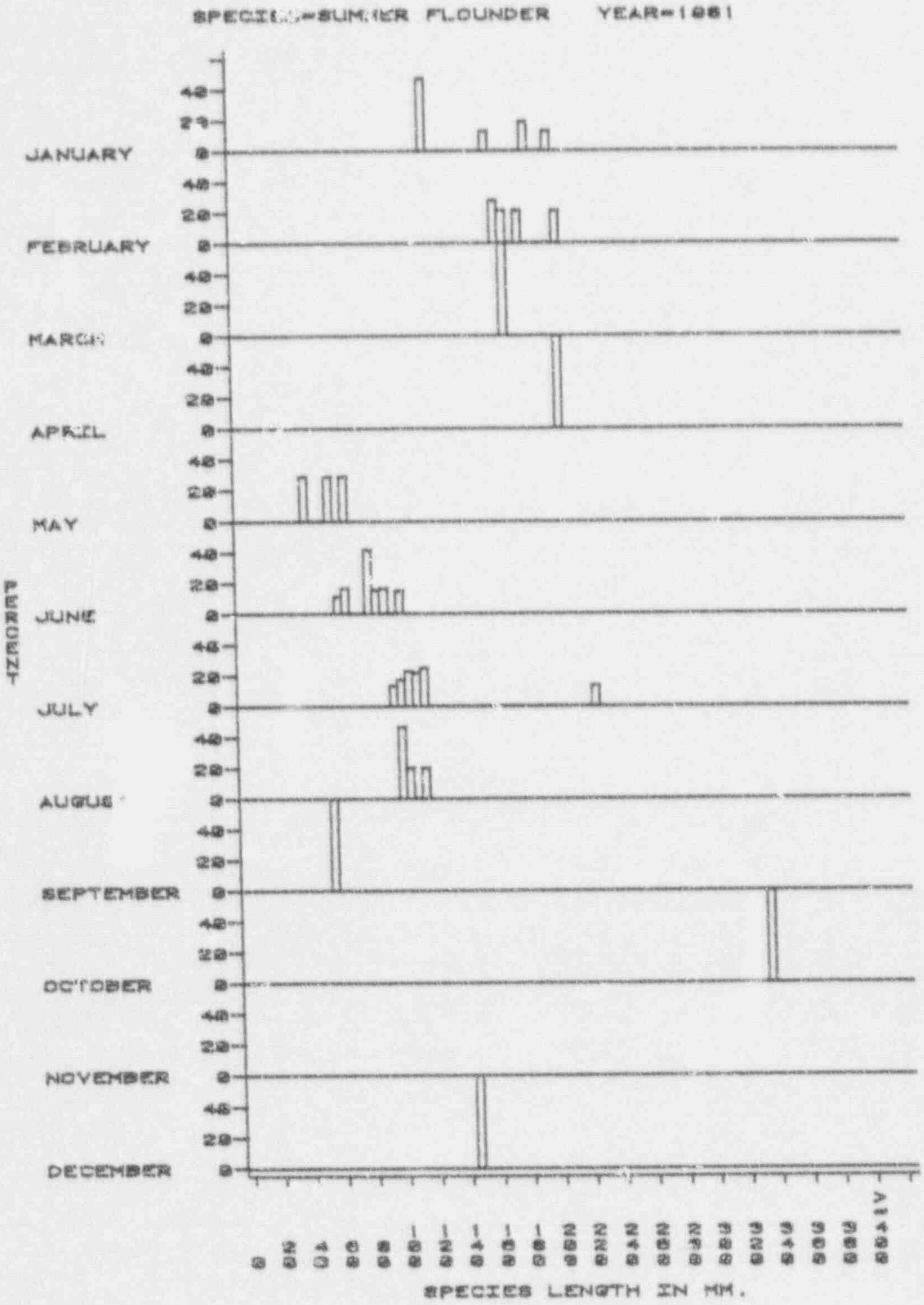


Figure 7.7f . Impingement relative length frequency

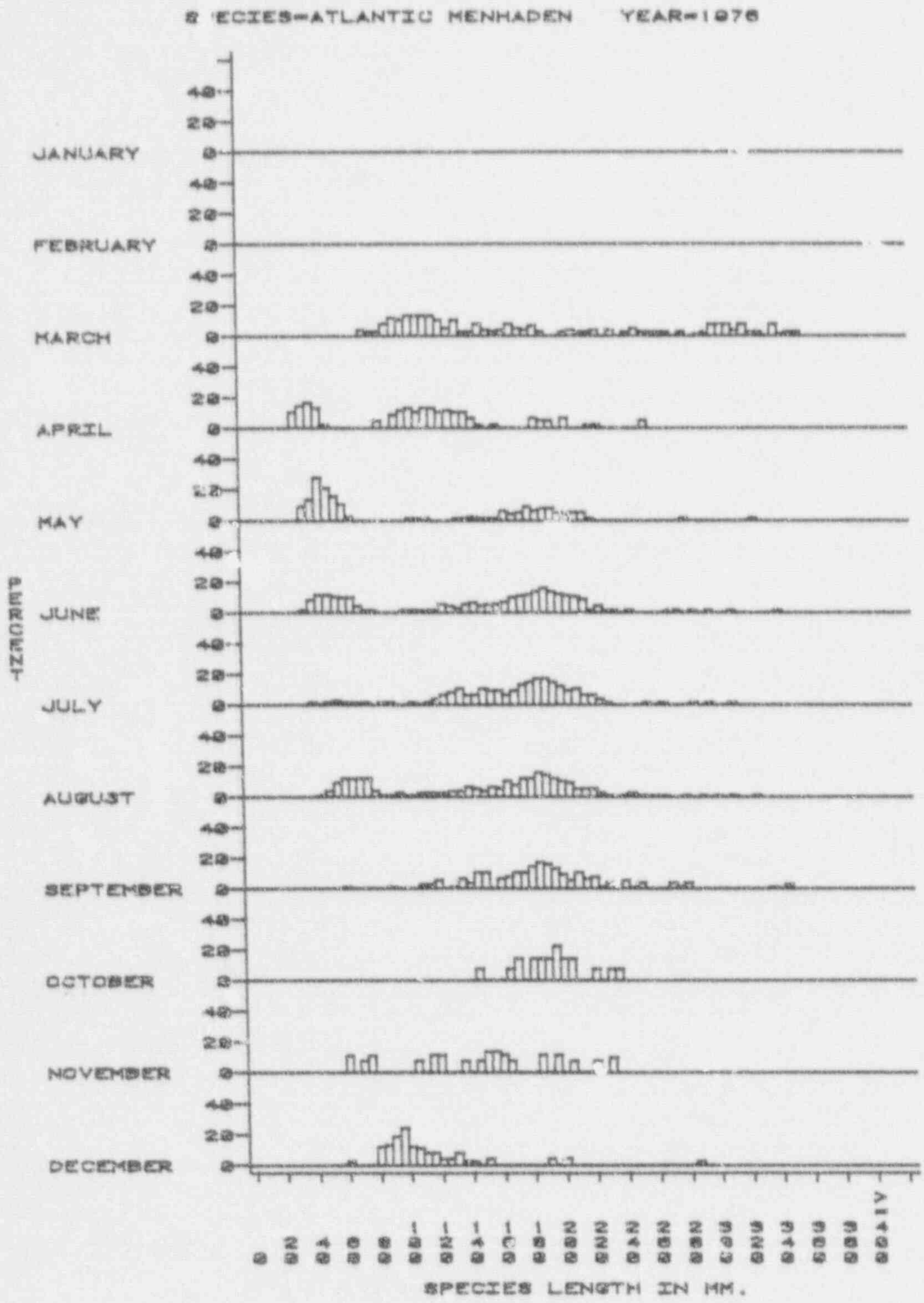


Figure 7.8a Impingement relative length frequency

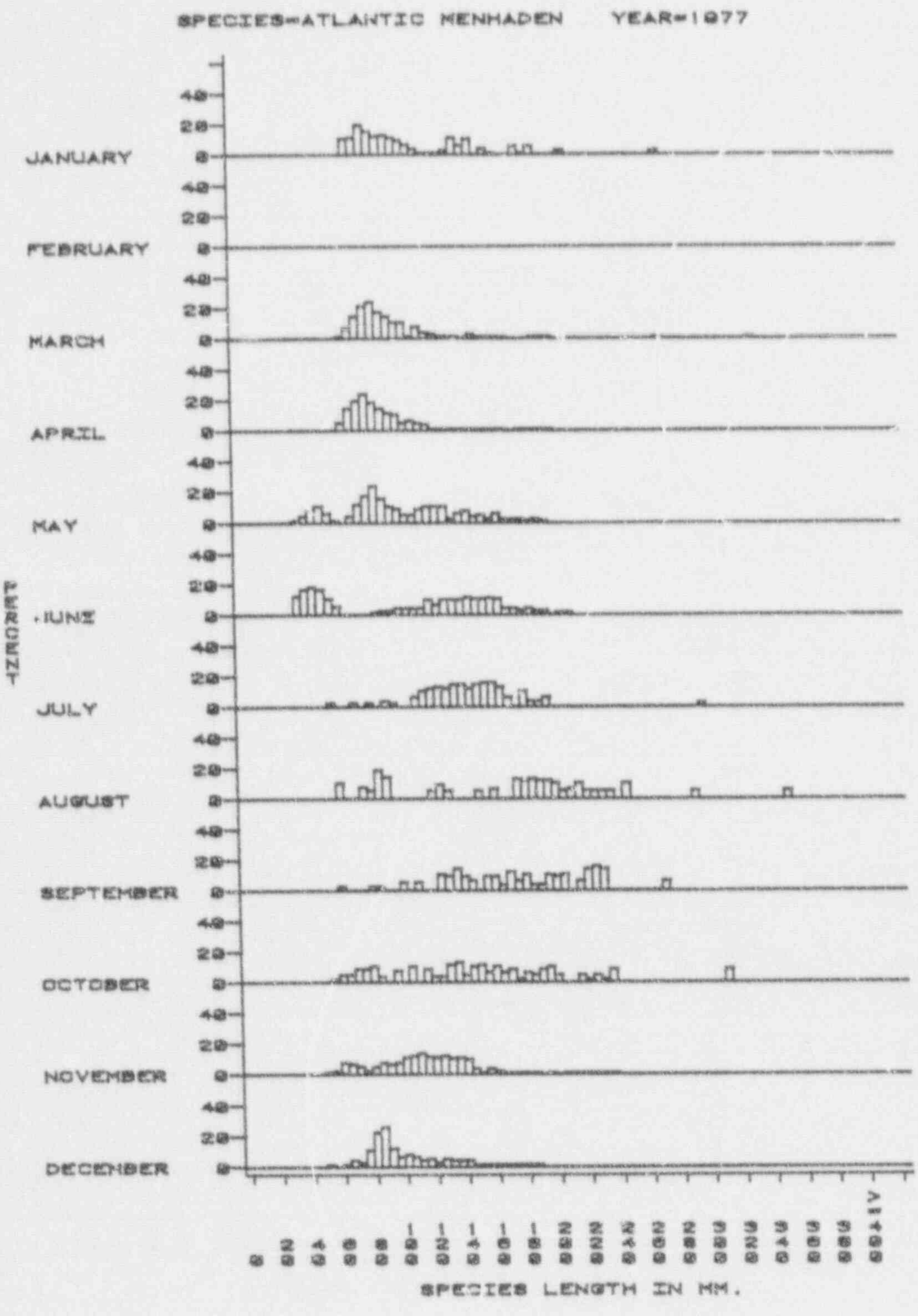
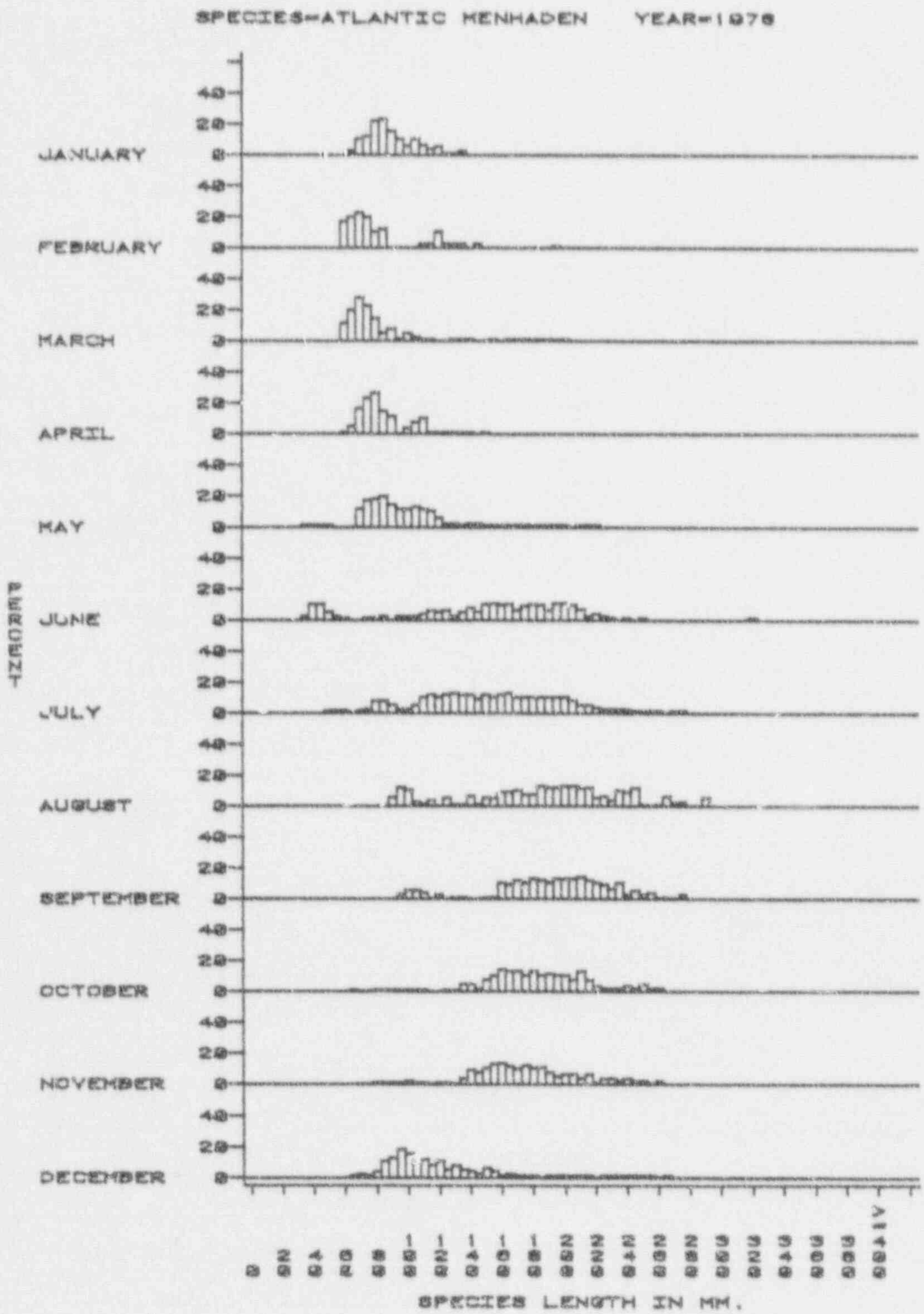


Figure 7.8b Impingement relative length frequency



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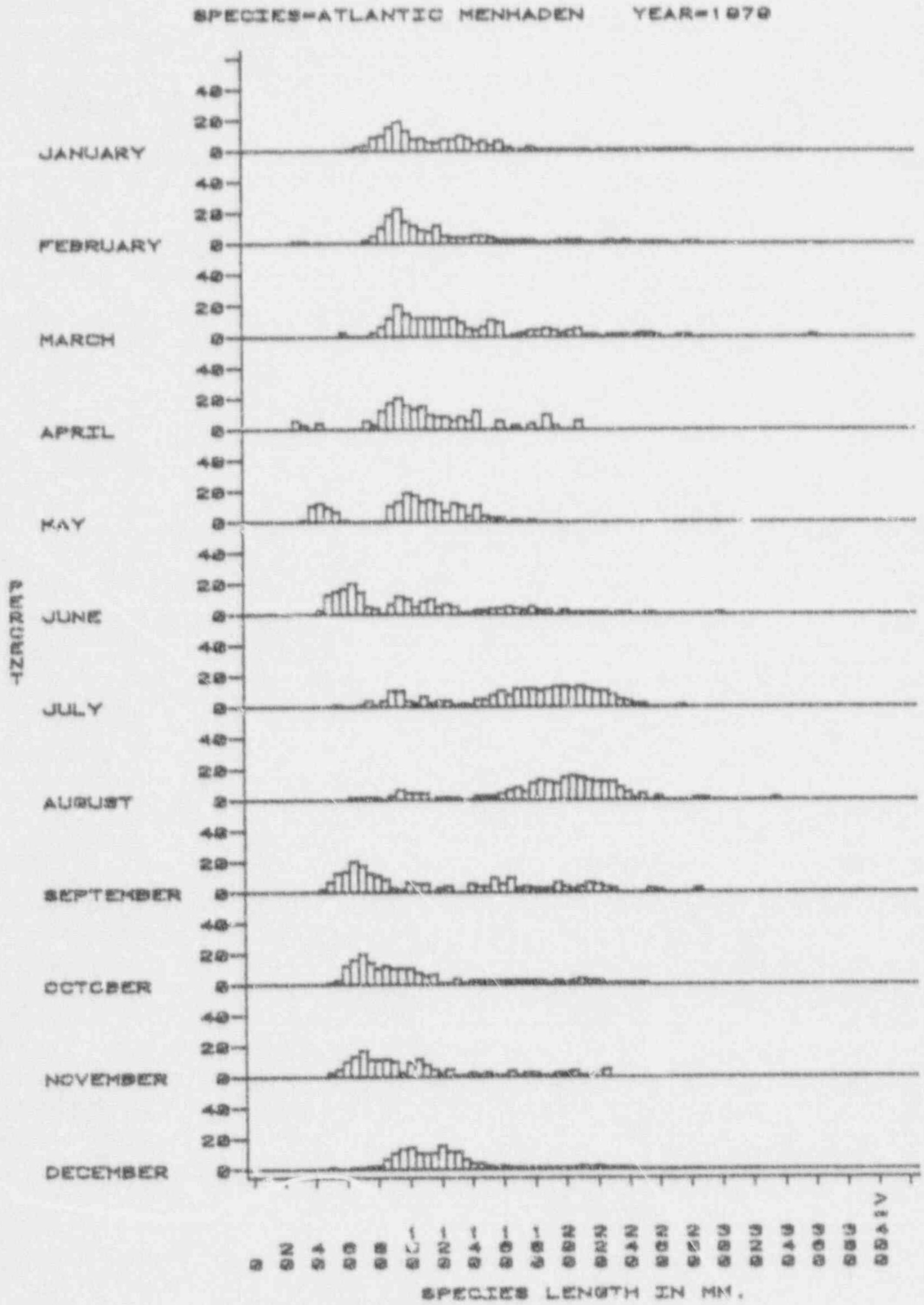
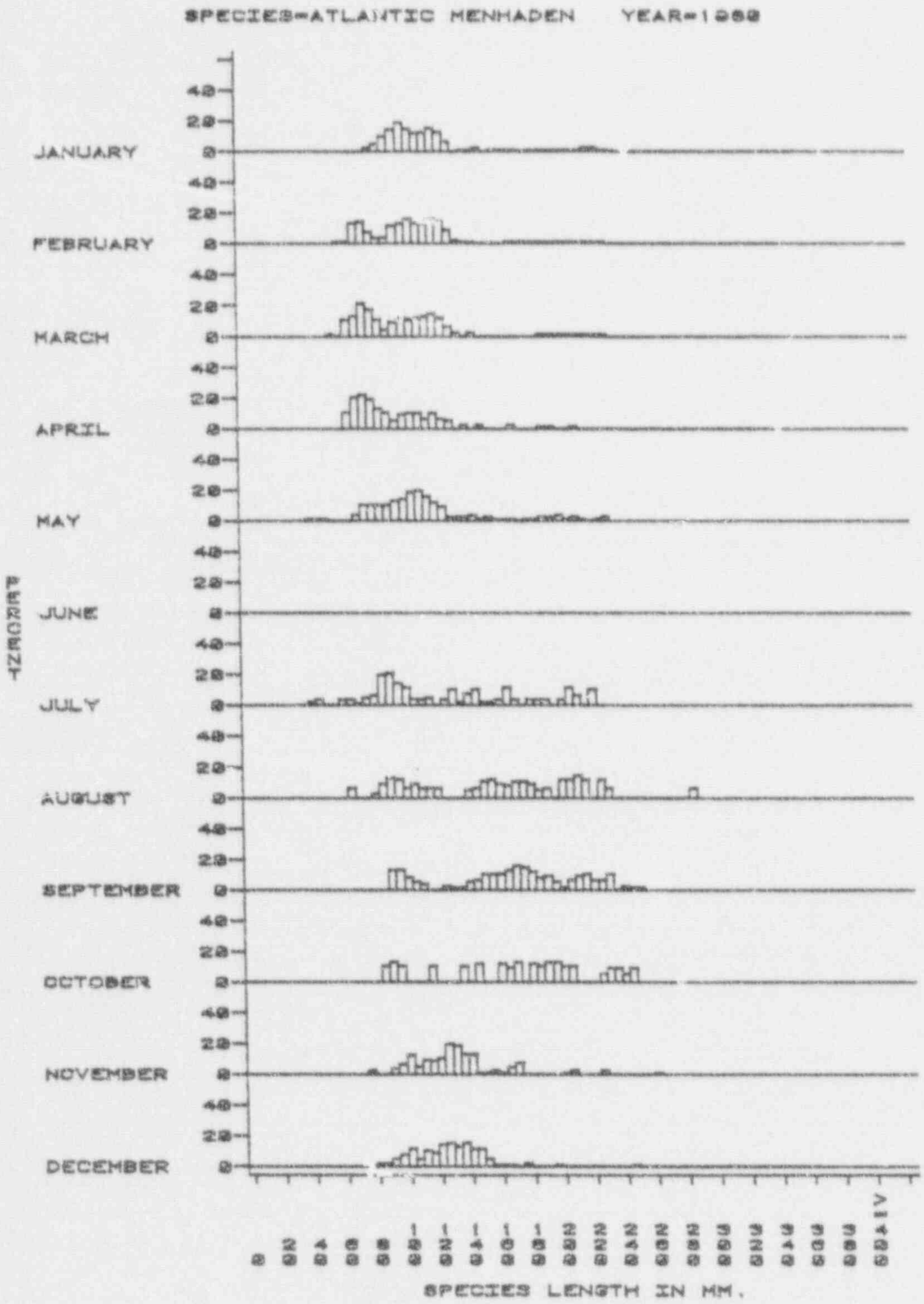


Figure 7.8d Impingement relative length frequency



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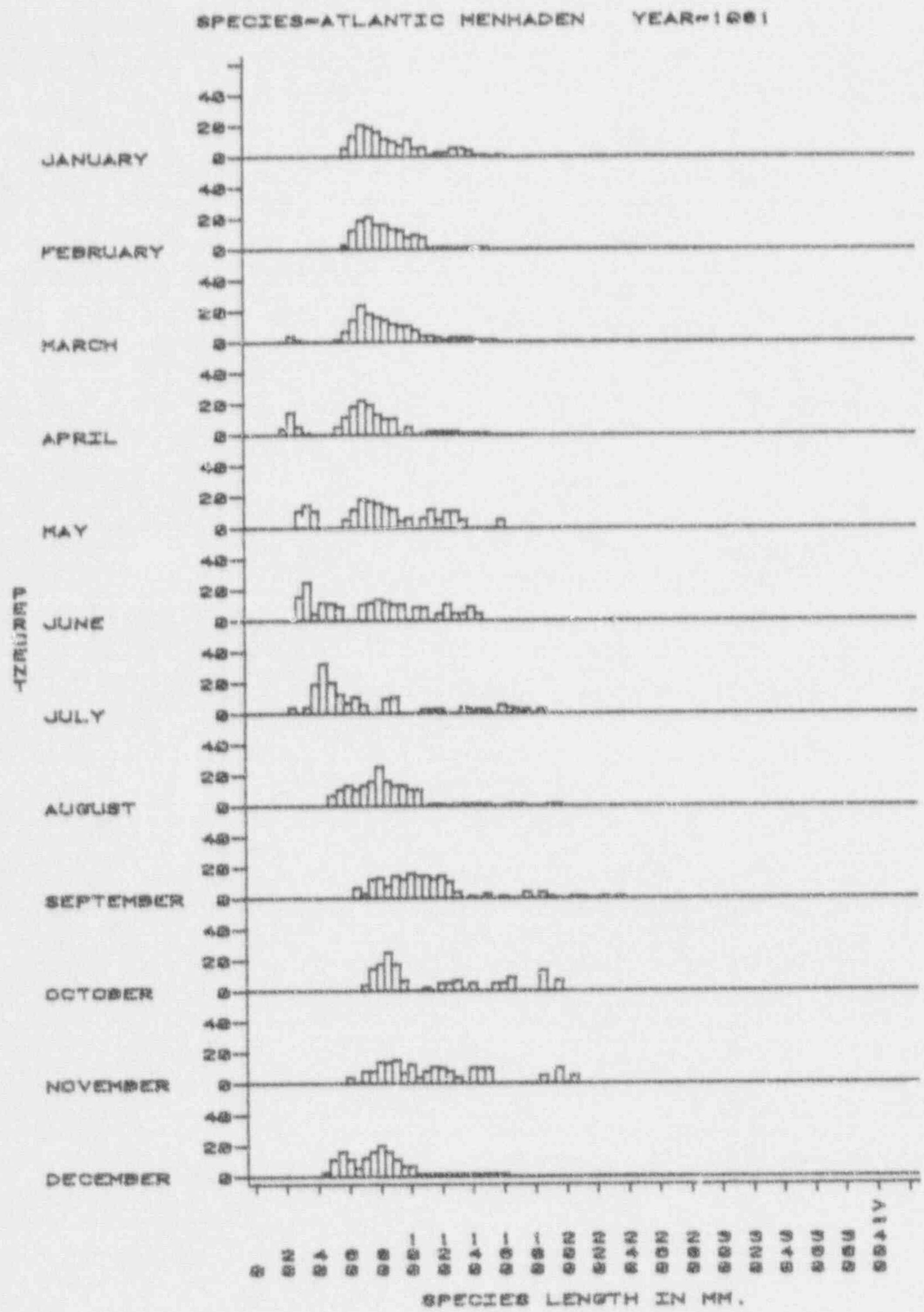

Figure 7.8f Im, ingement relative length frequency

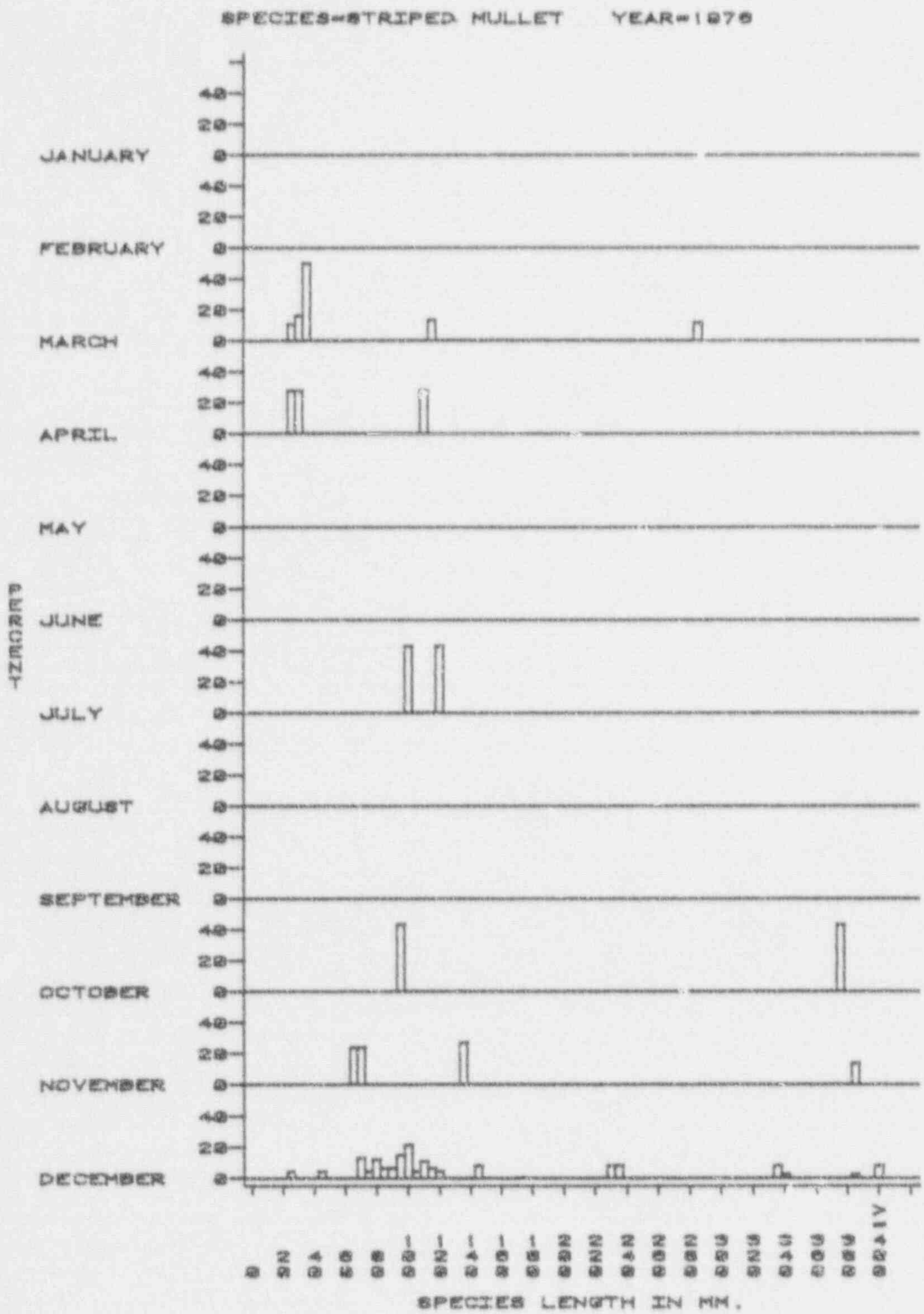

Figure 7.9a Impingement relative length frequency

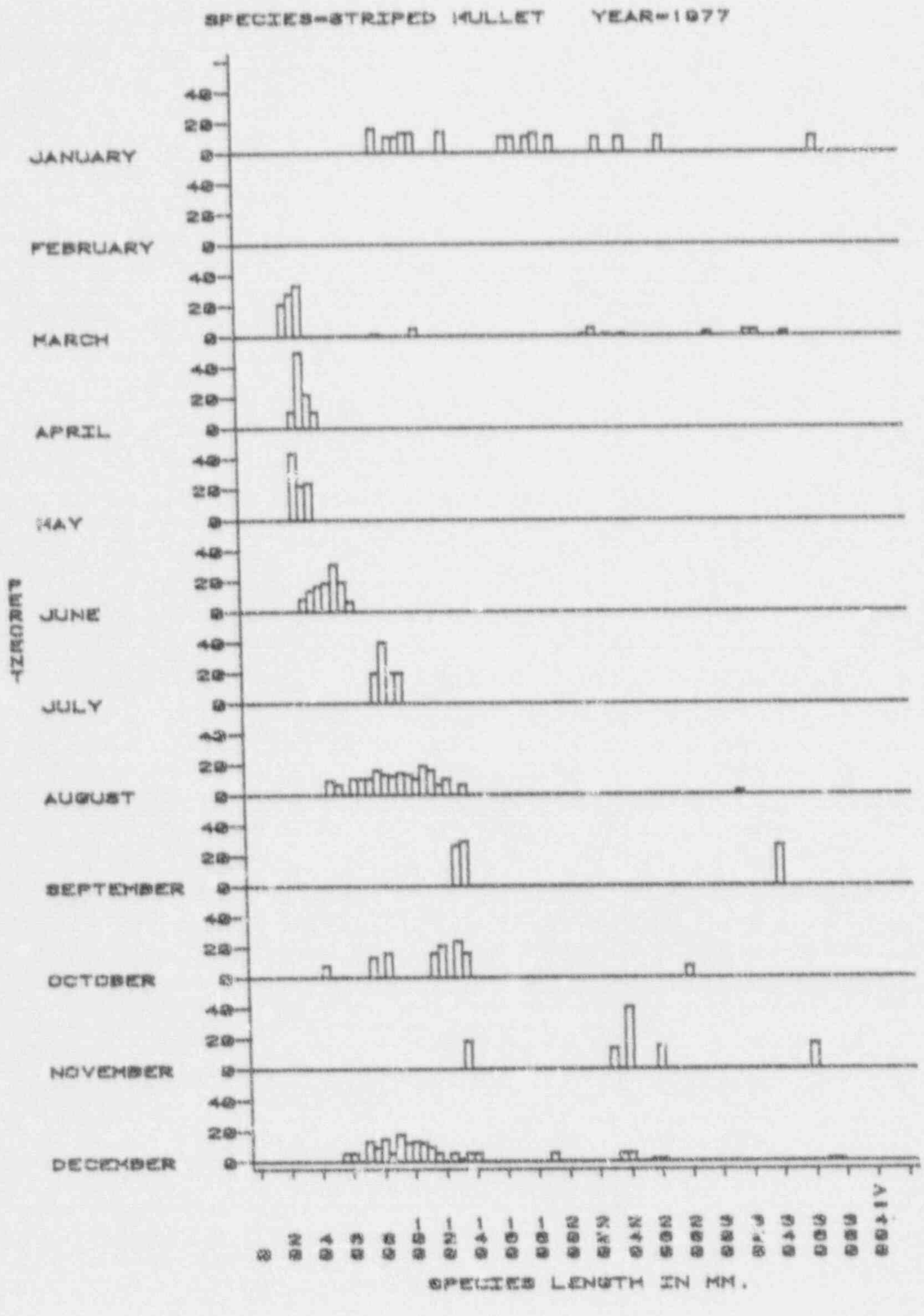

Figure 7.9b Impingement relative length frequency

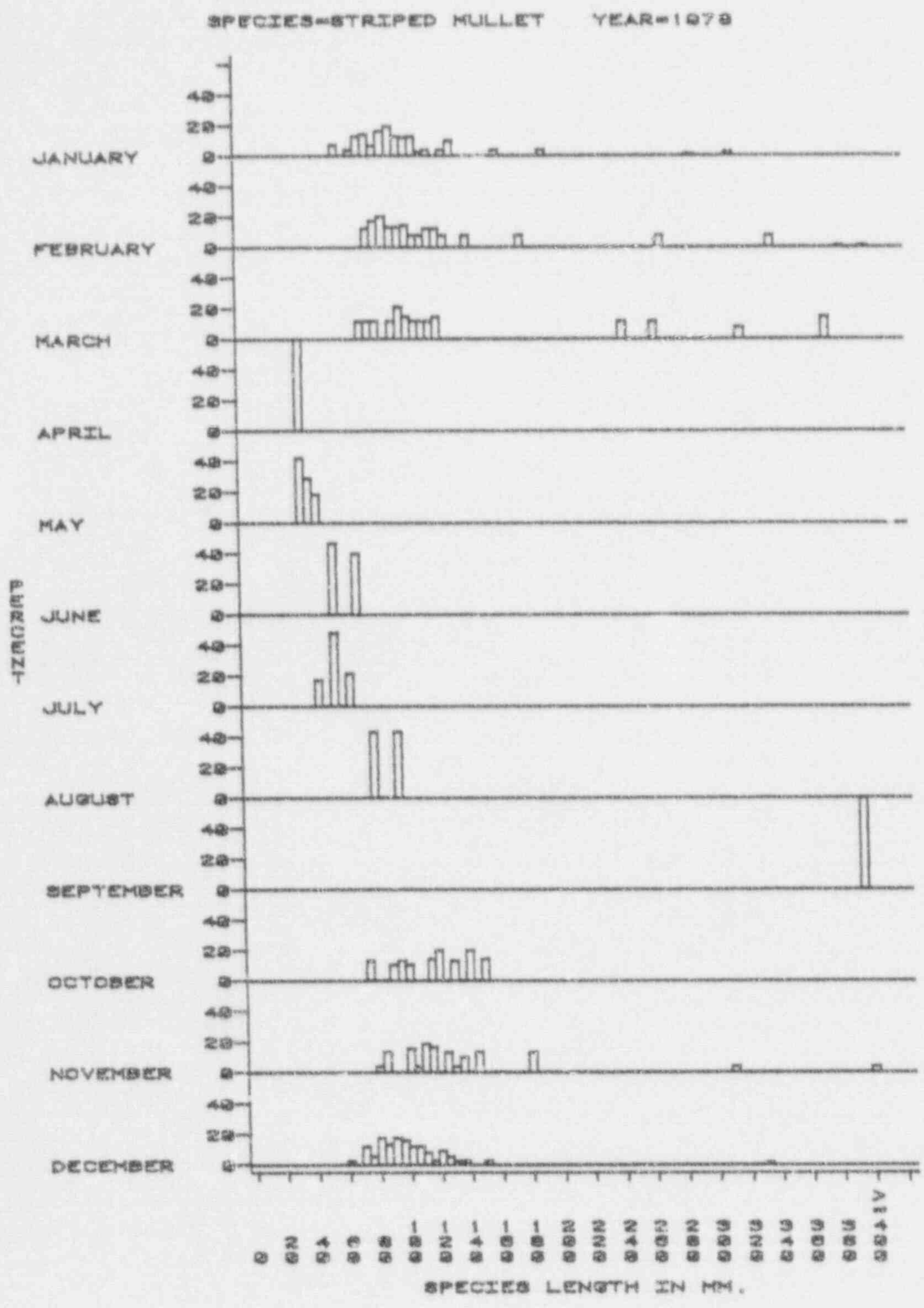

Figure 7.9c Impingement relative length frequency

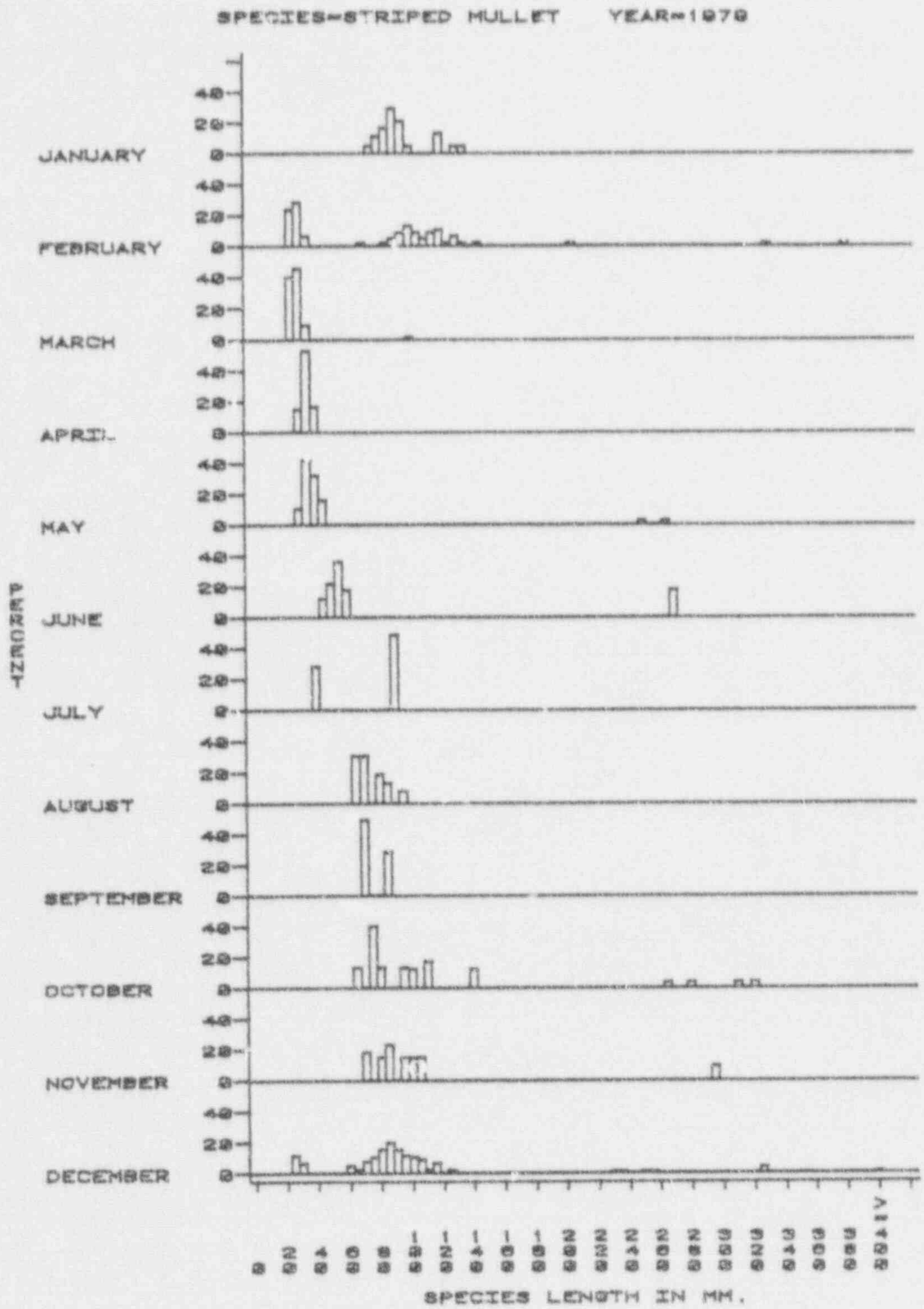

Figure 7.9d Impingement relative length frequency

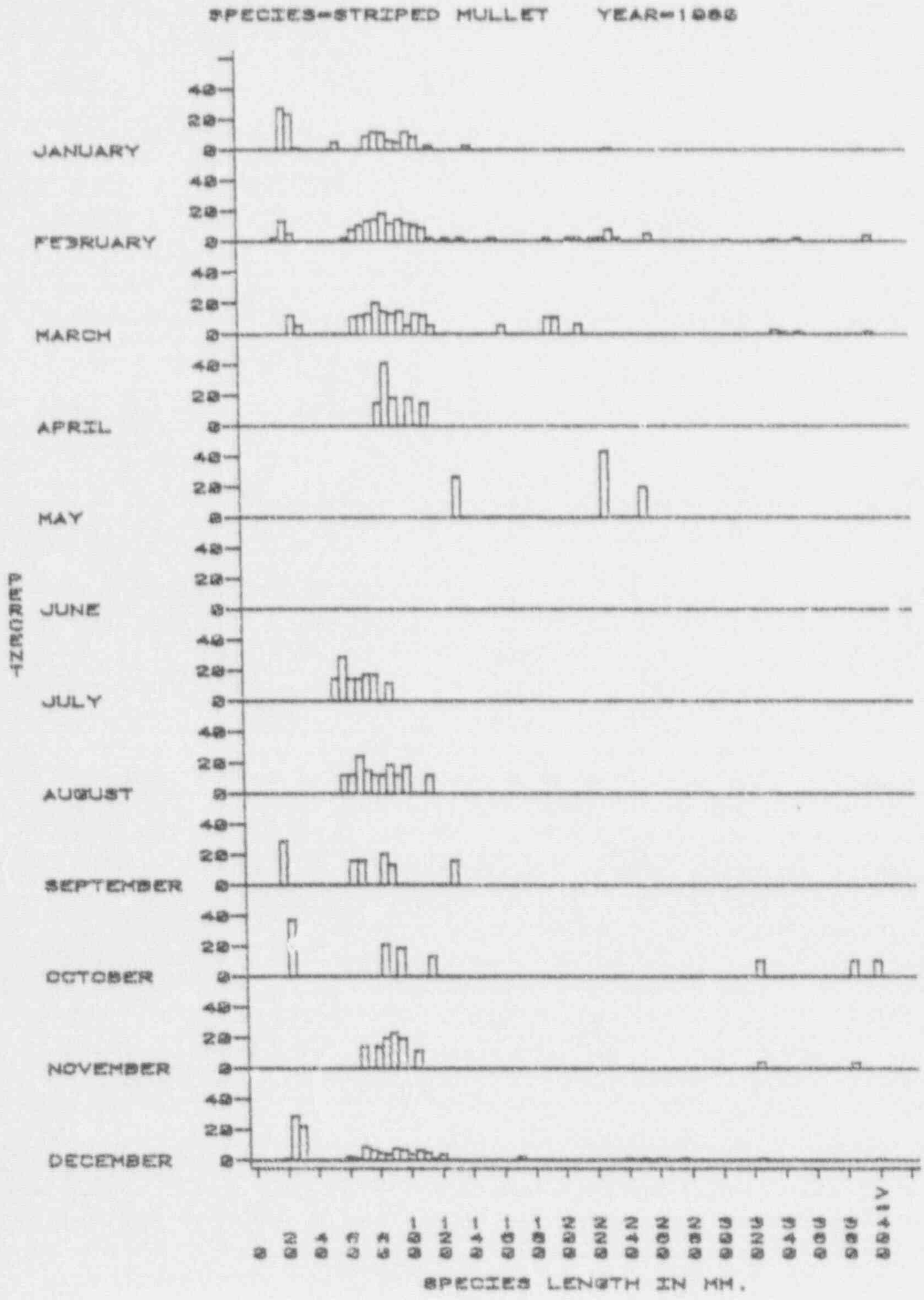

Figure 7.9e Impingement relative length frequency

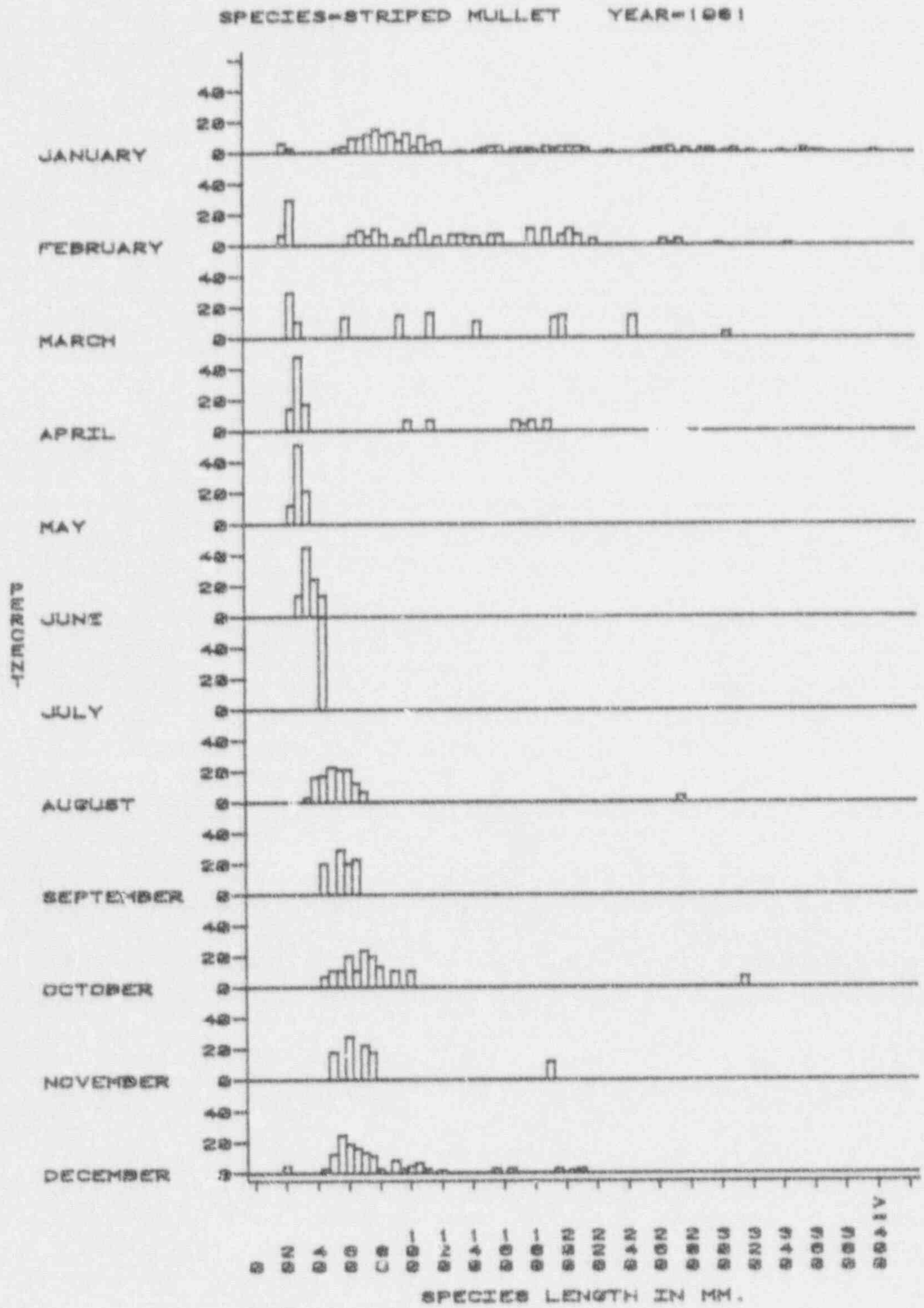

Figure 7.9f Impingement relative length frequency

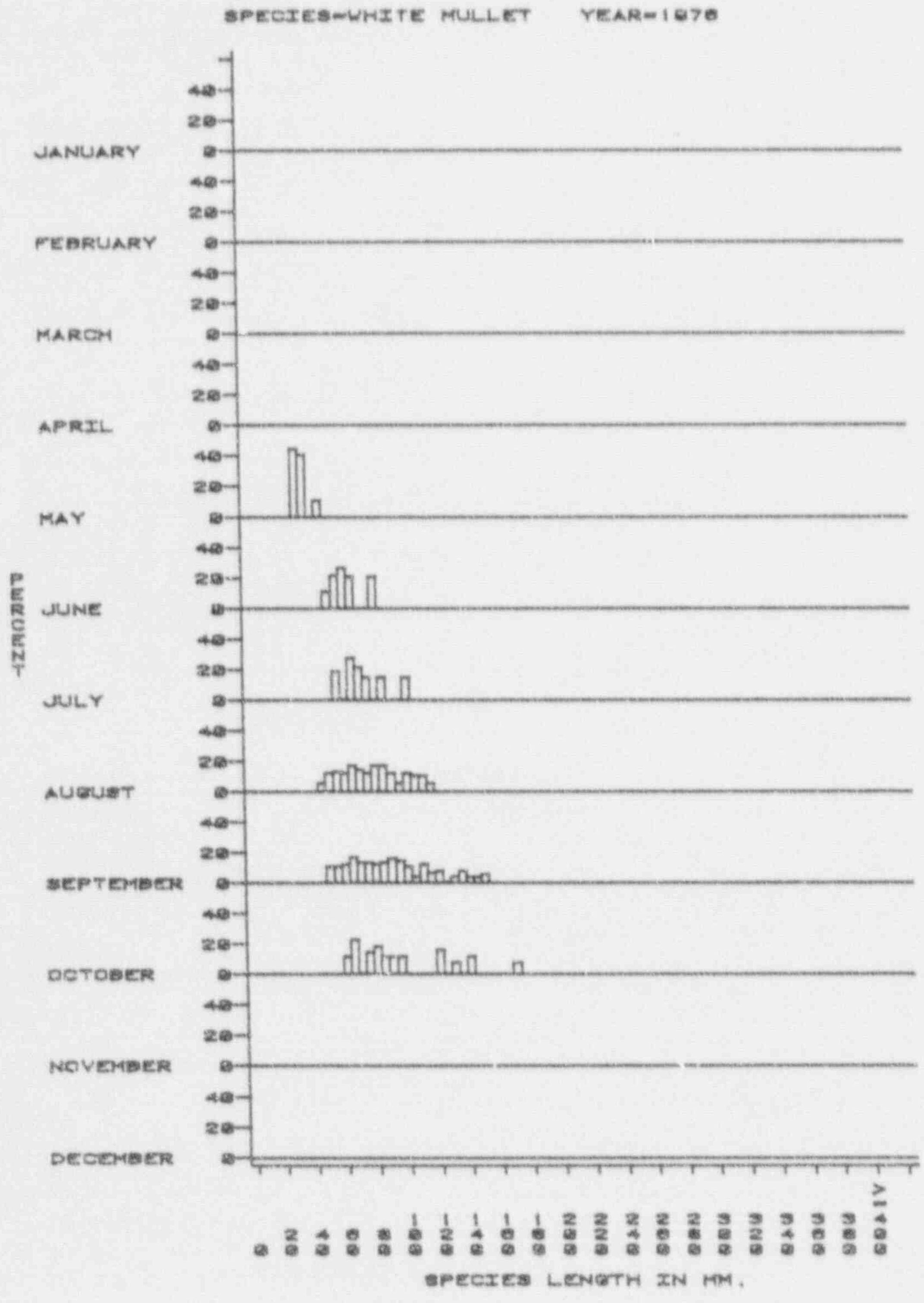

Figure 7.10a Impingement relative length frequency

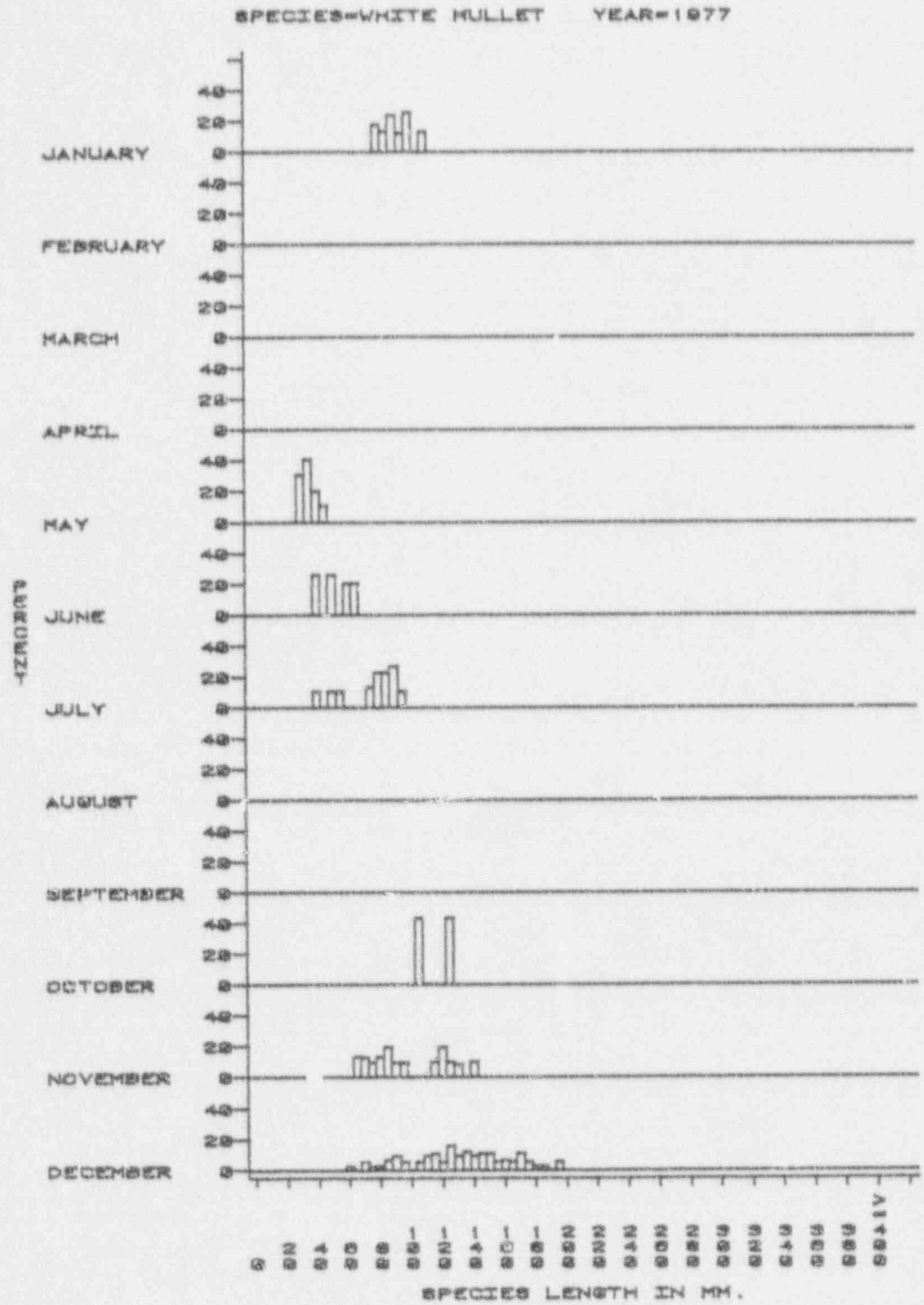

Figure 7.10b Impingement relative length frequency

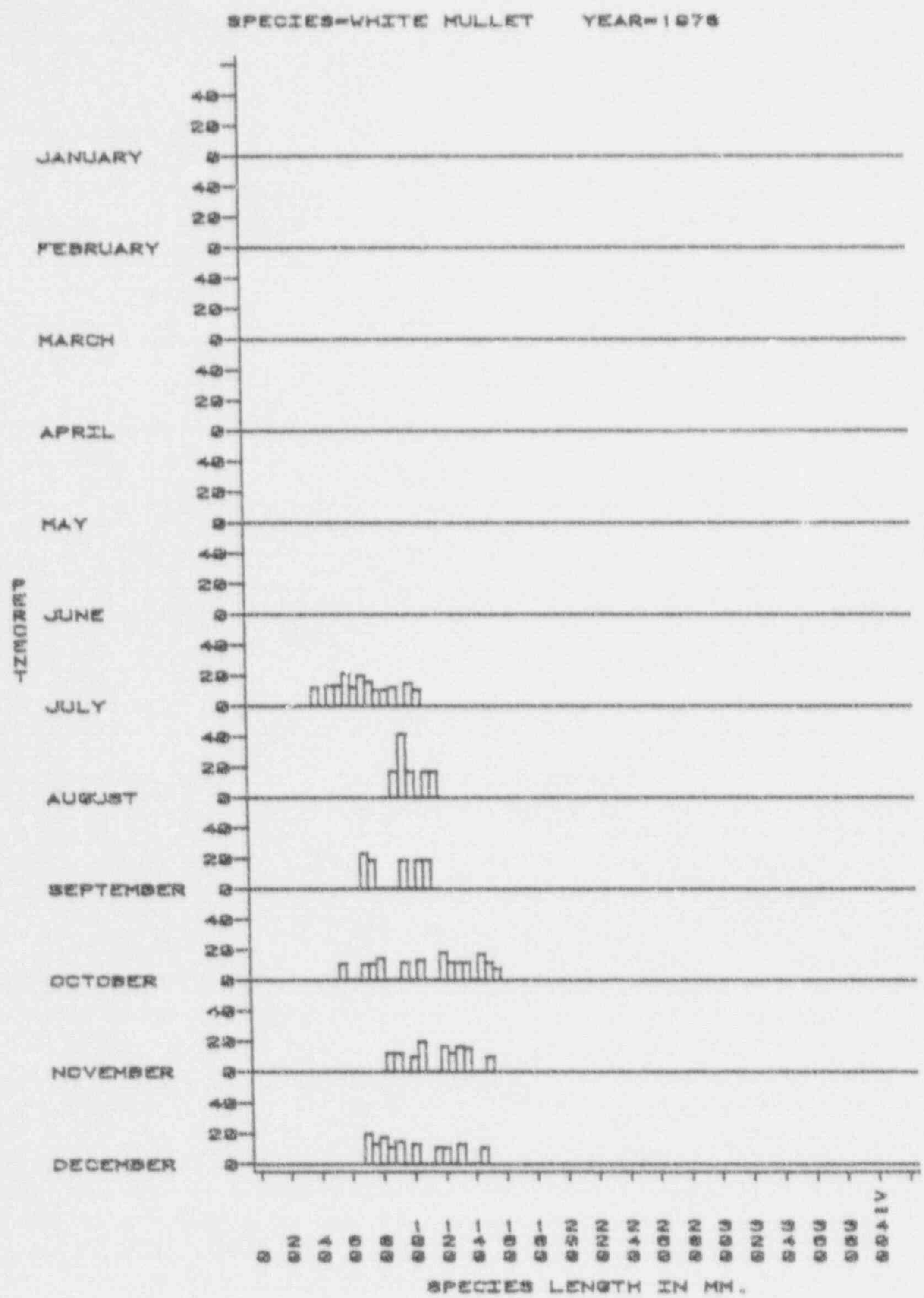

Figure 7.10c Impingement relative length frequency

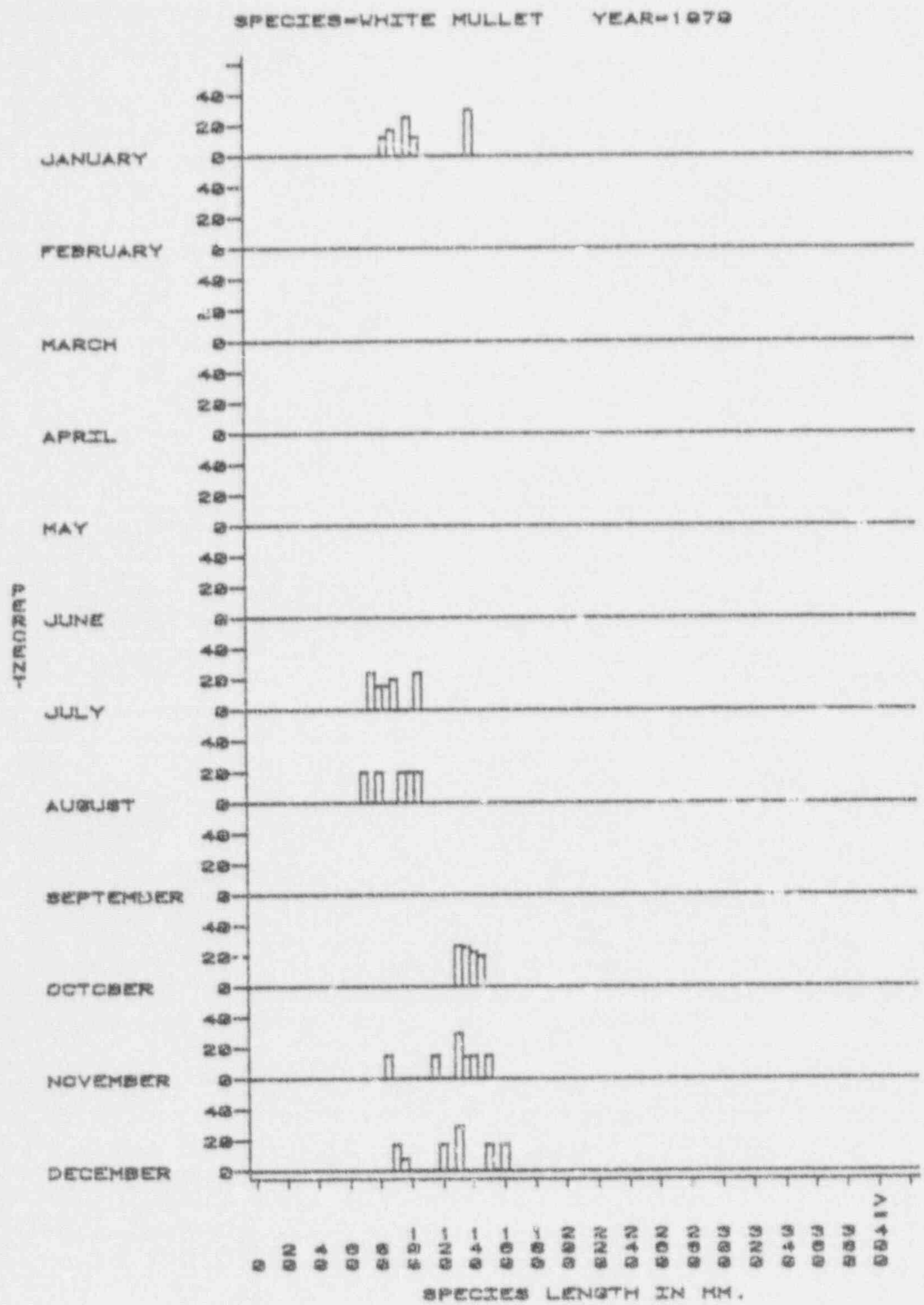

Figure 7.10d Impingement relative length frequency

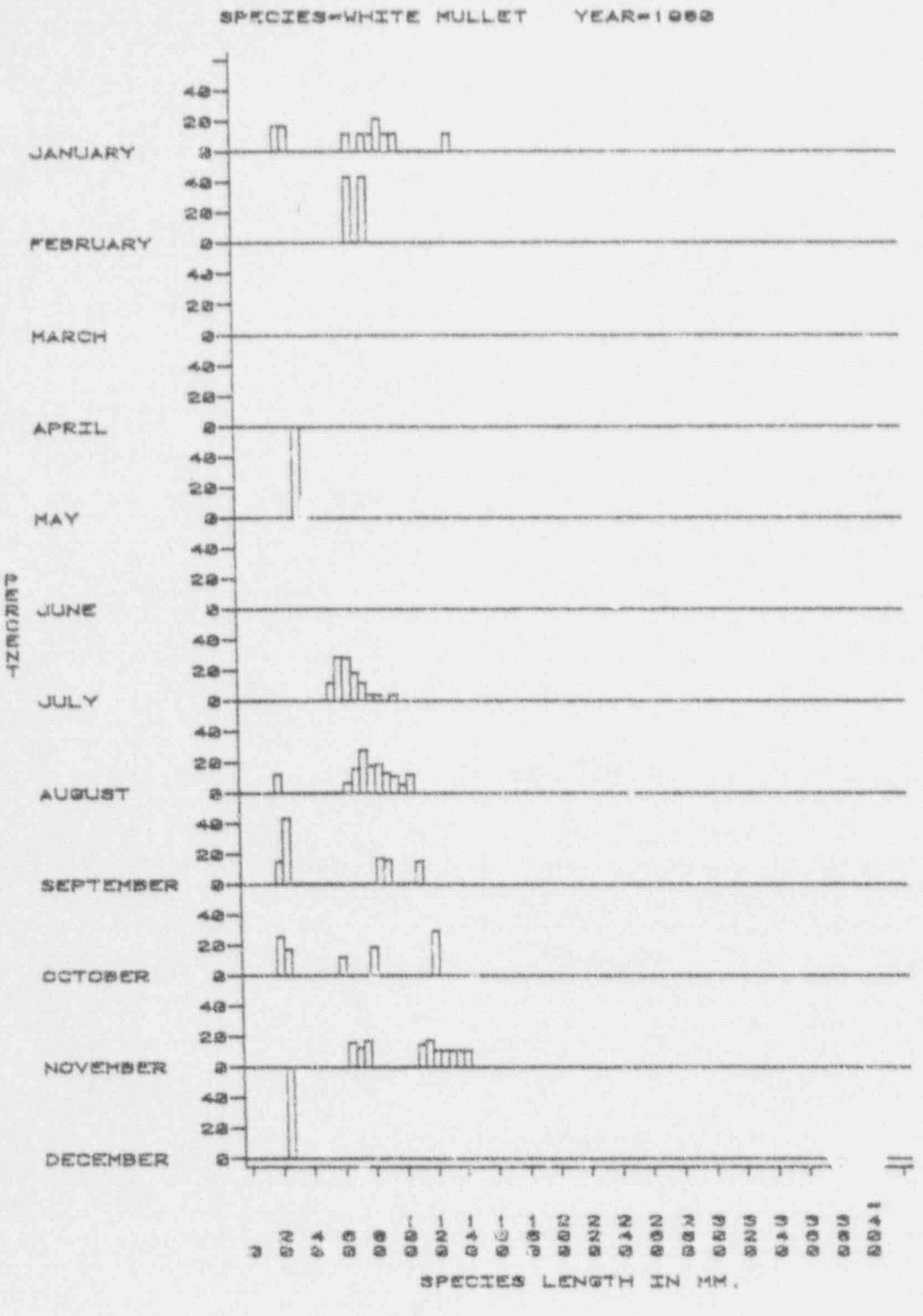

Figure 7.10e Impingement relative length frequency

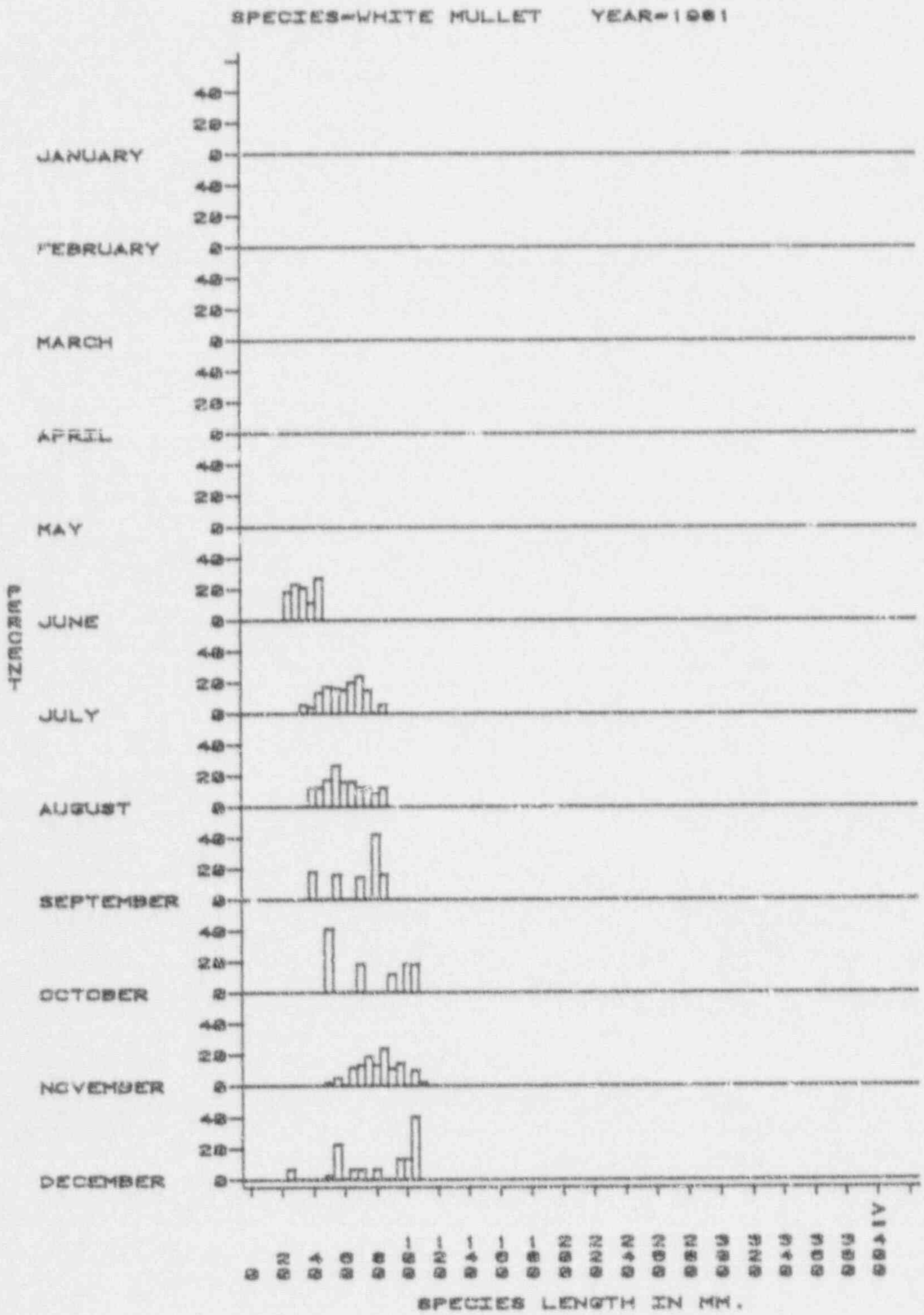

Figure 7.10f Impingement relative length frequency

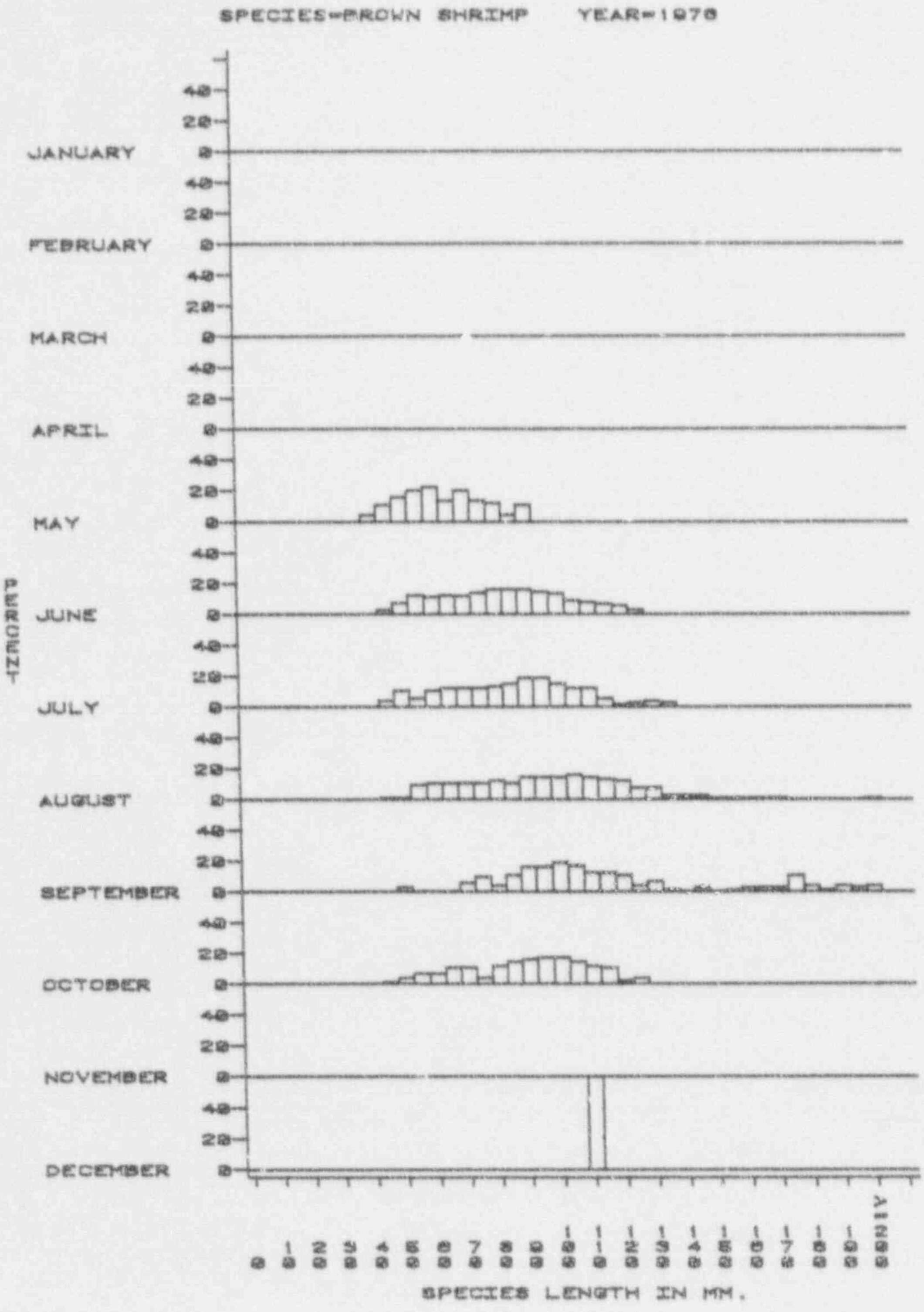

Figure 7.11a Impingement relative length frequency

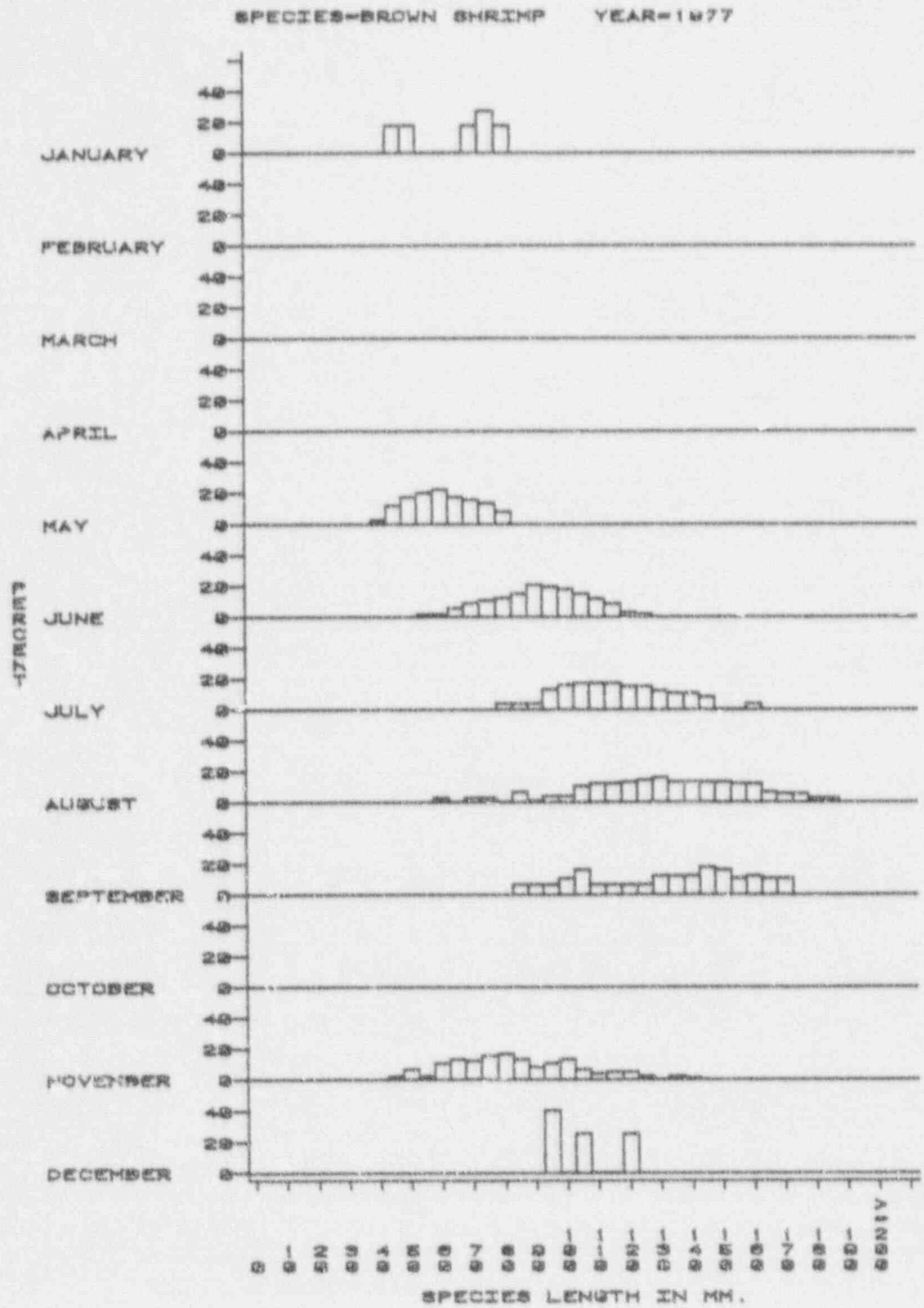

Figure 7.11b Impingement relative length frequency

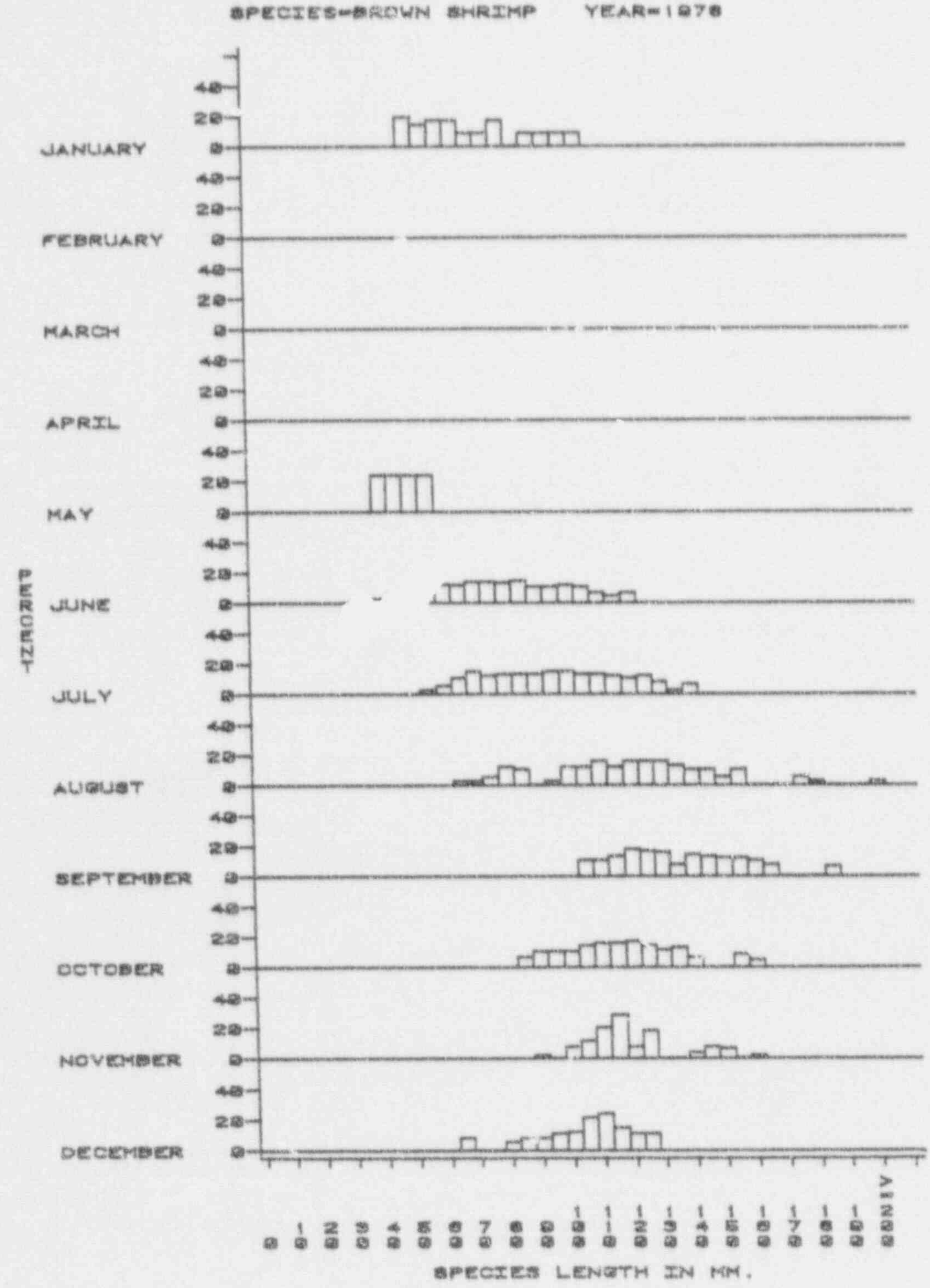

Figure 7.11c Impingement relative length frequency

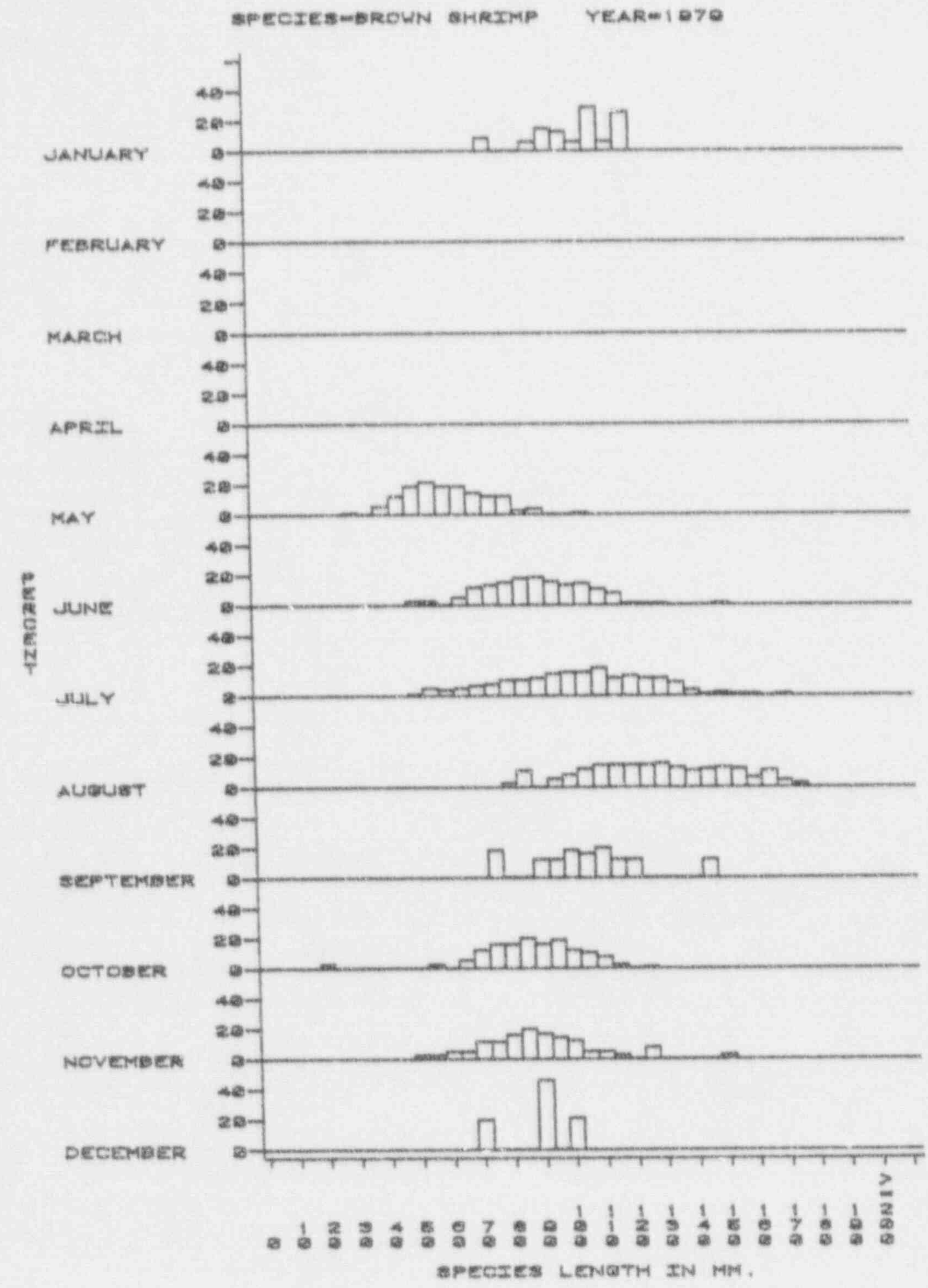

Figure 7.11d Impingement relative length frequency

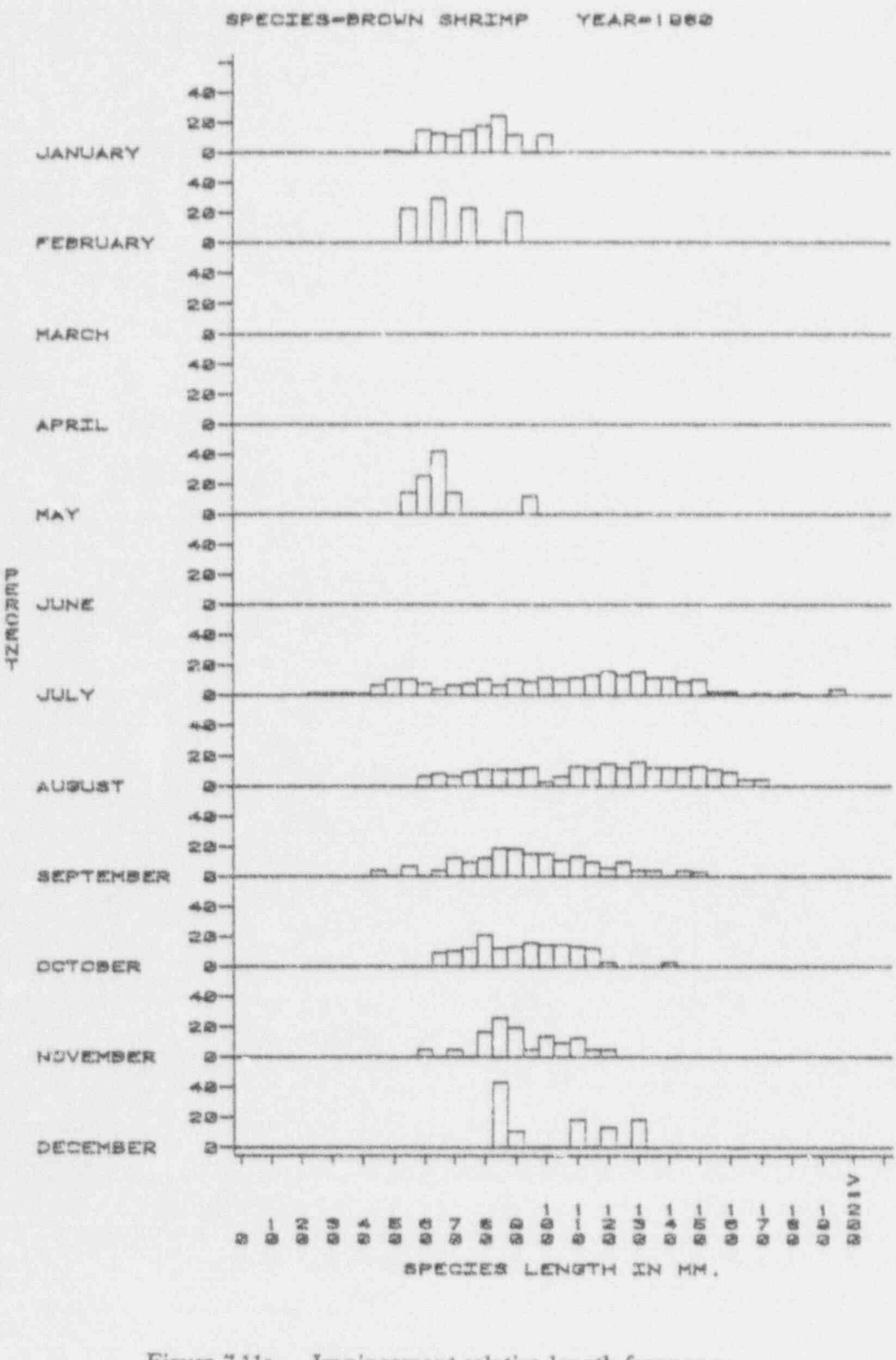

Figure 7.11e Impingement relative length frequency

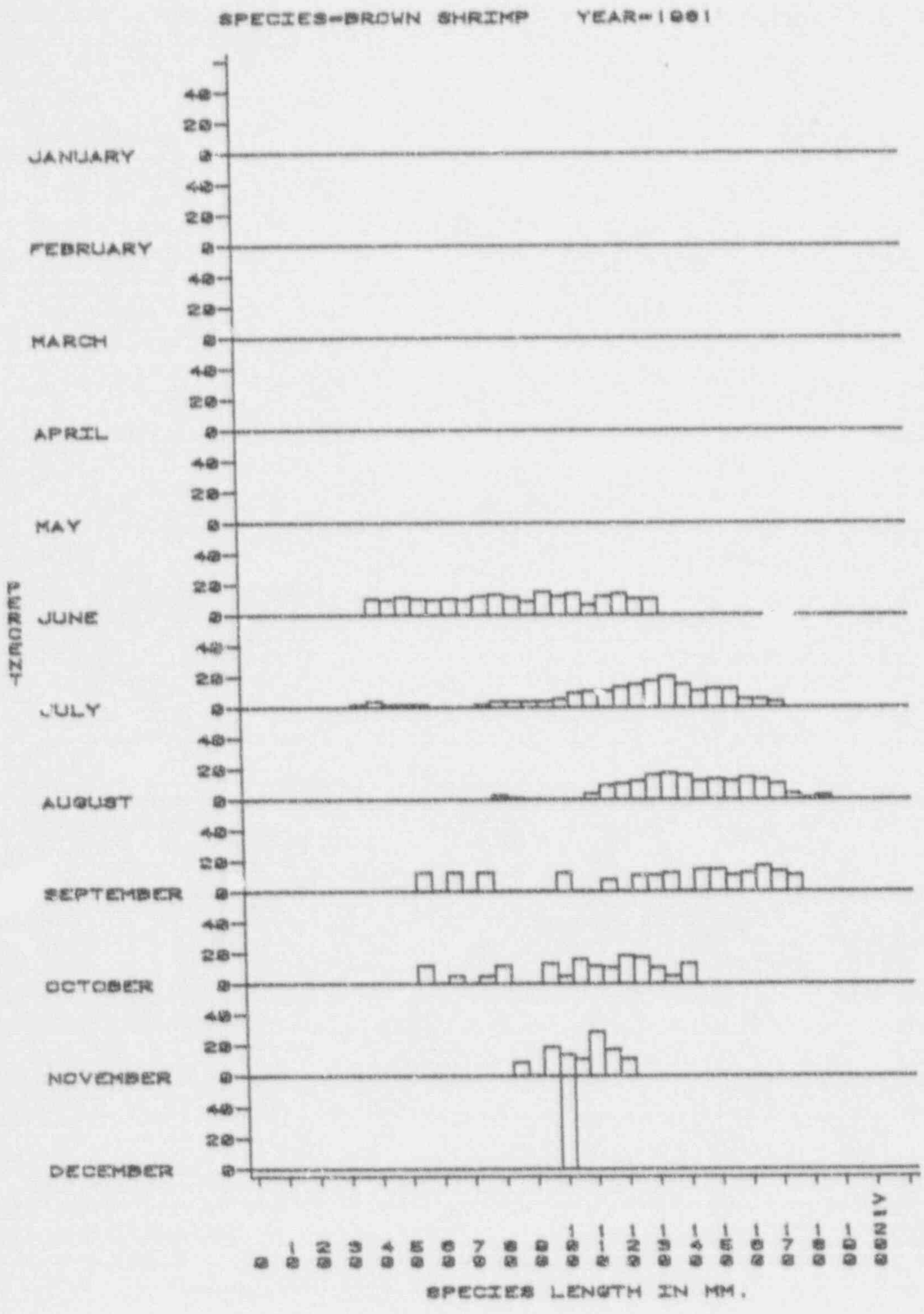

Figure 7.11f Impingement relative length frequency

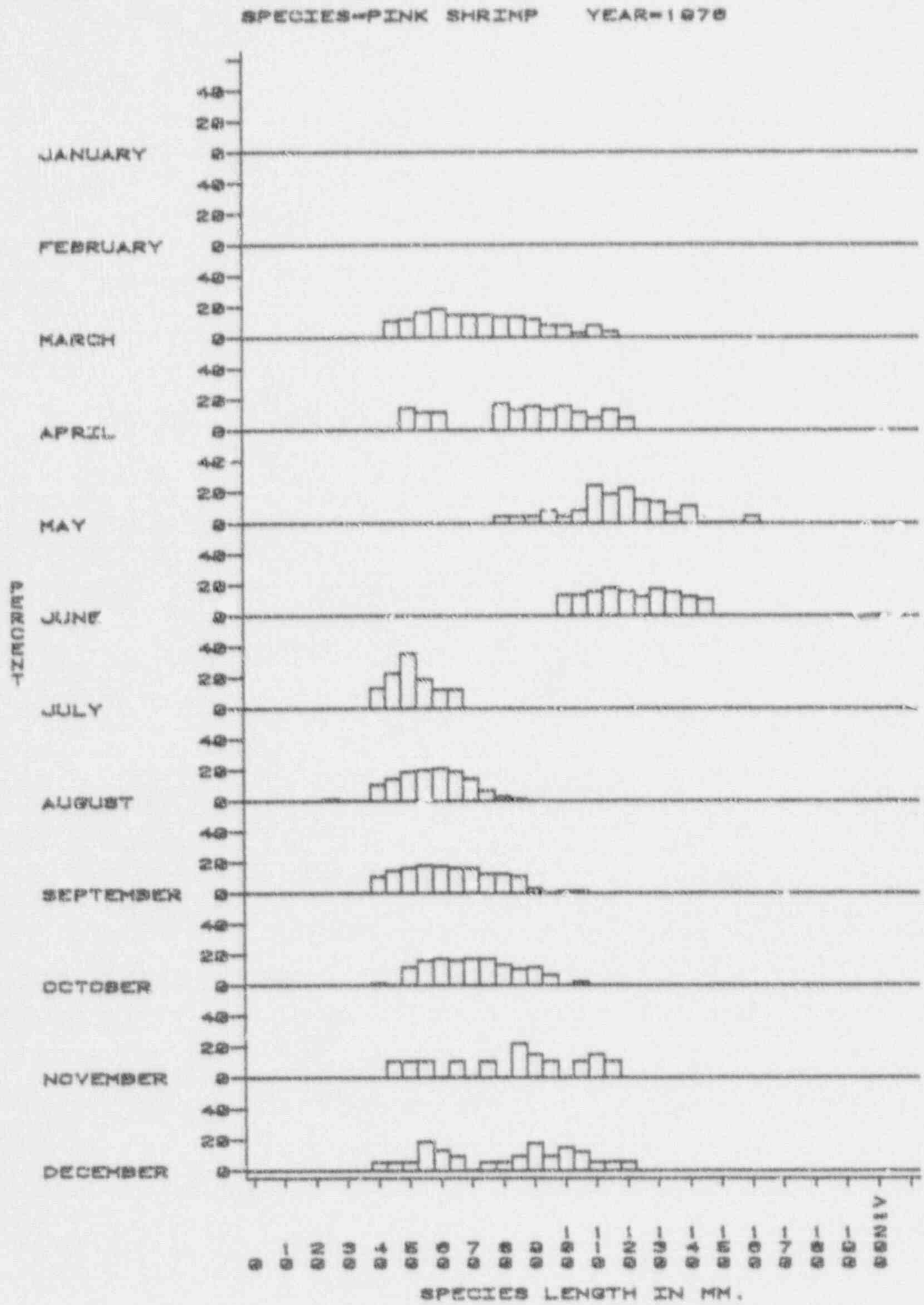

Figure 7.12a Impingement relative length frequency

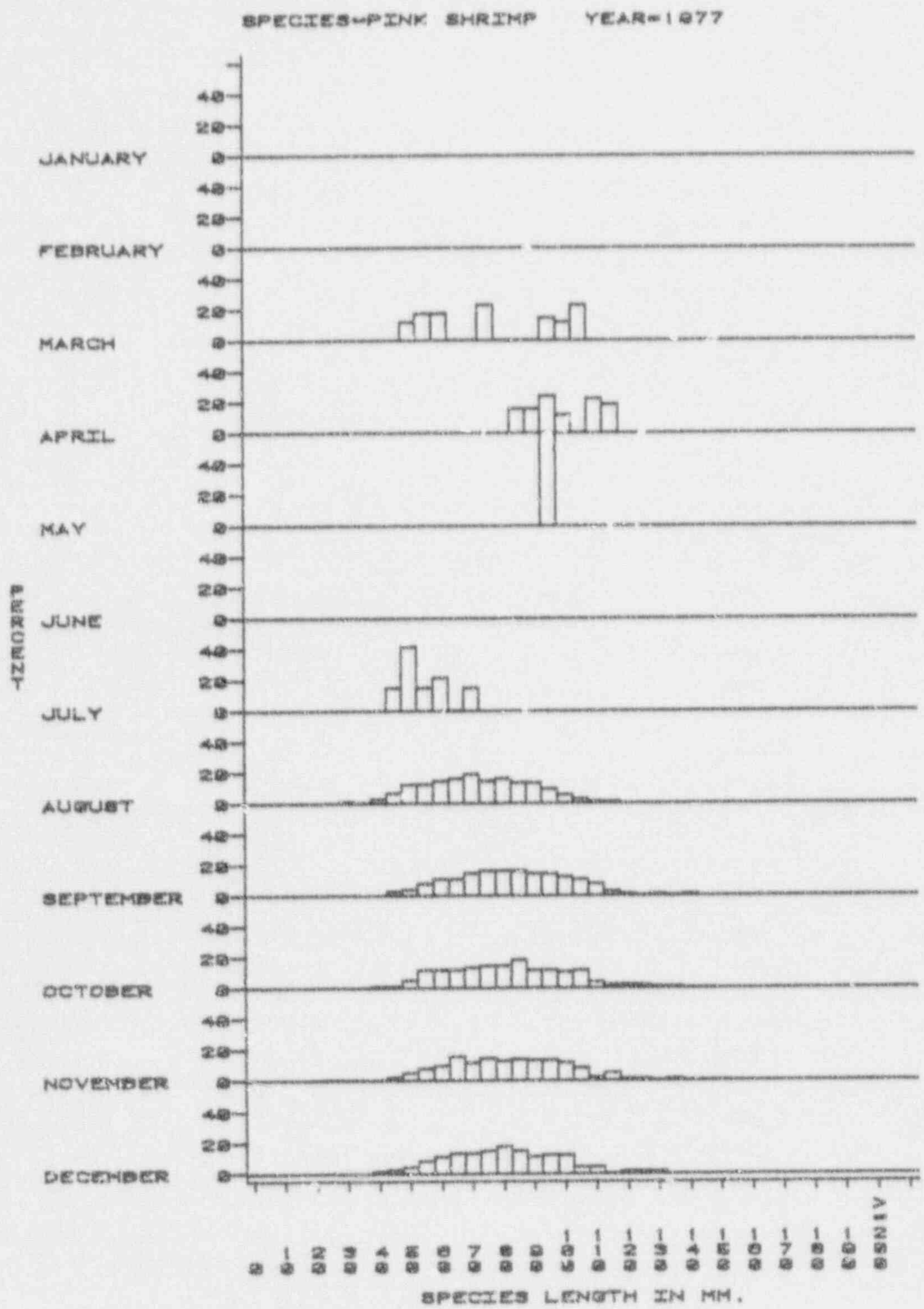

Figure 7.12b Impingement relative length frequency

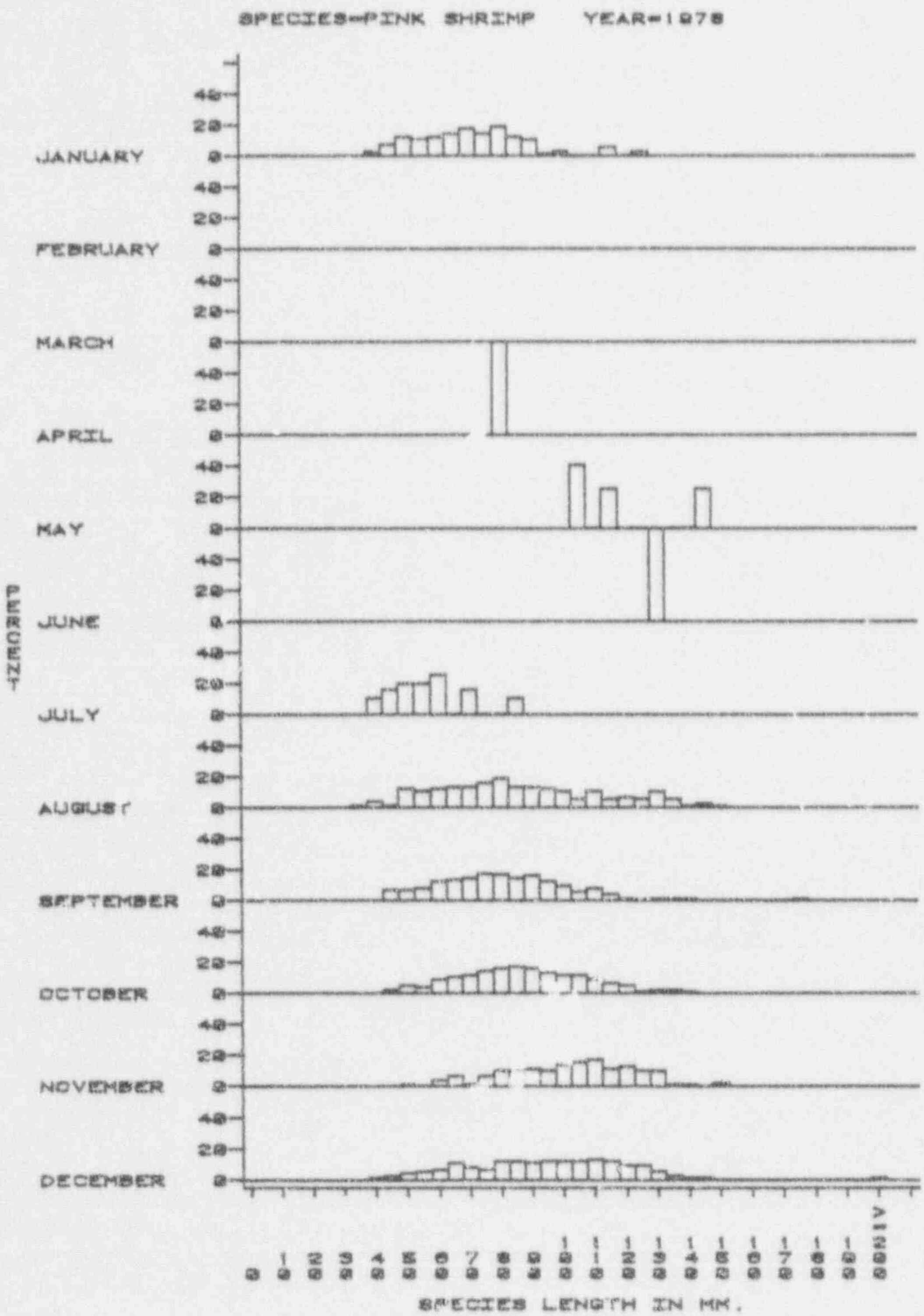

Figure 7.12c Impingement relative length frequency

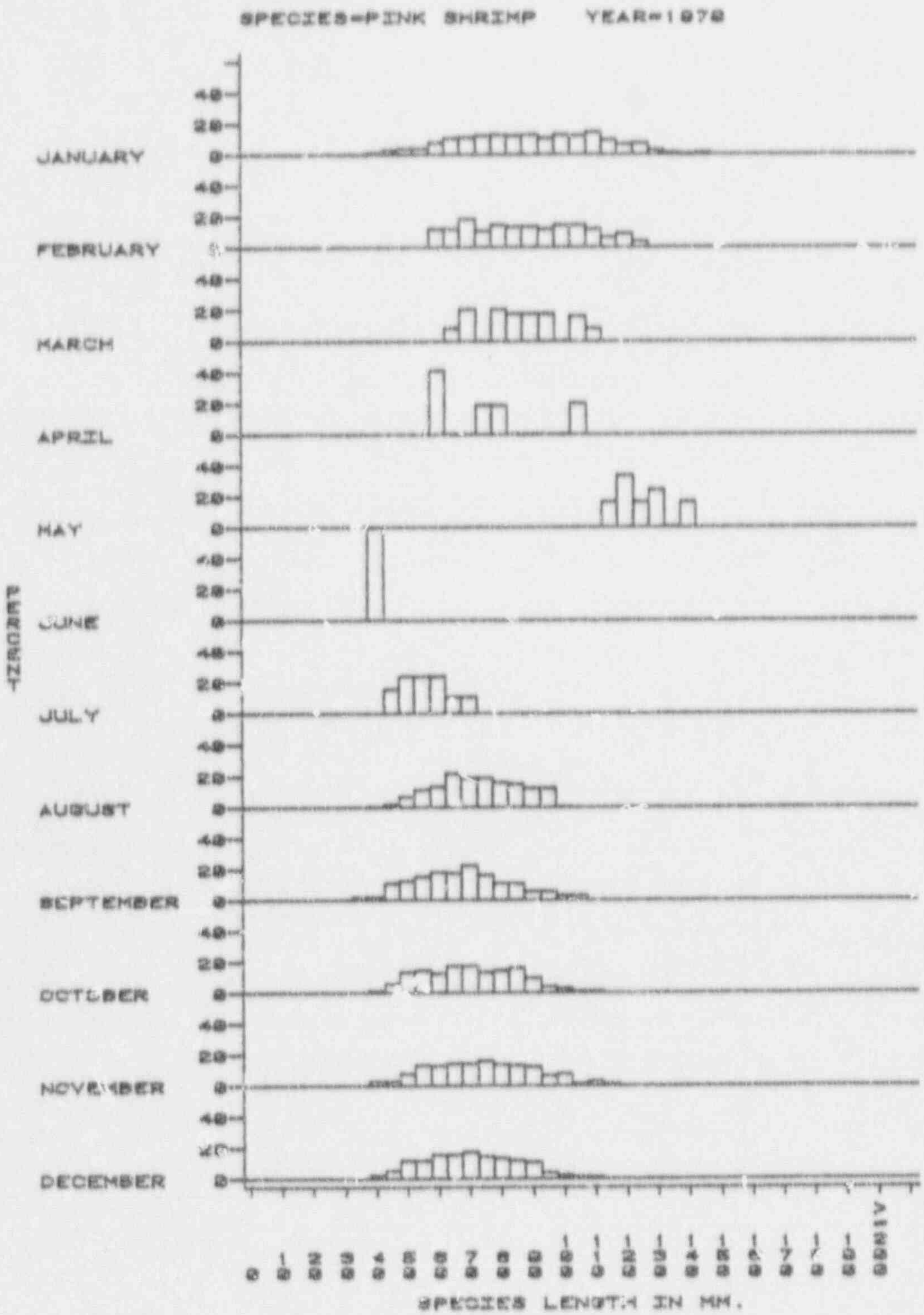

Figure 7.12d Impingement relative length frequency

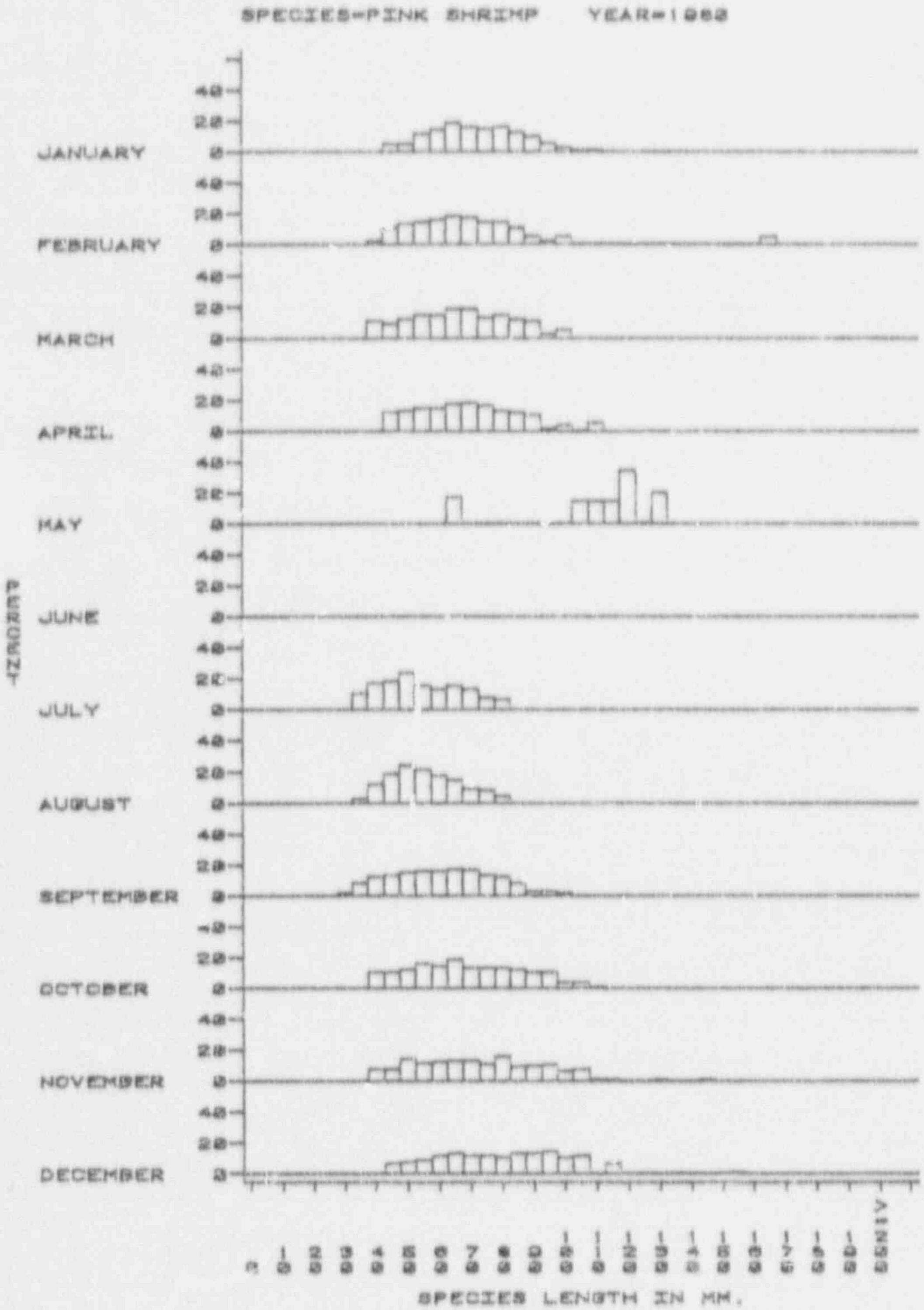

Figure 7.12e Impingement relative length frequency

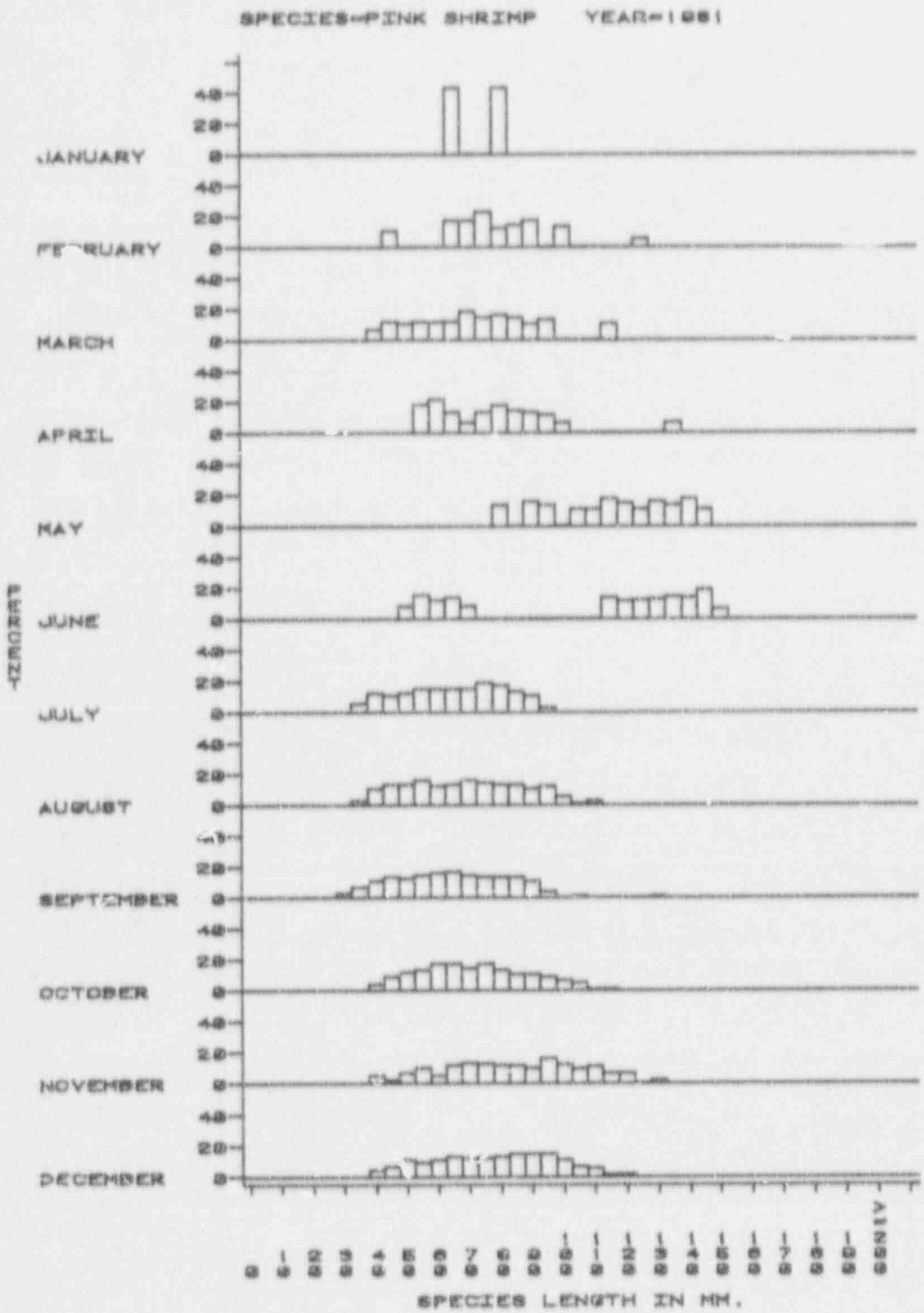

Figure 7.12f Impingement relative length frequency

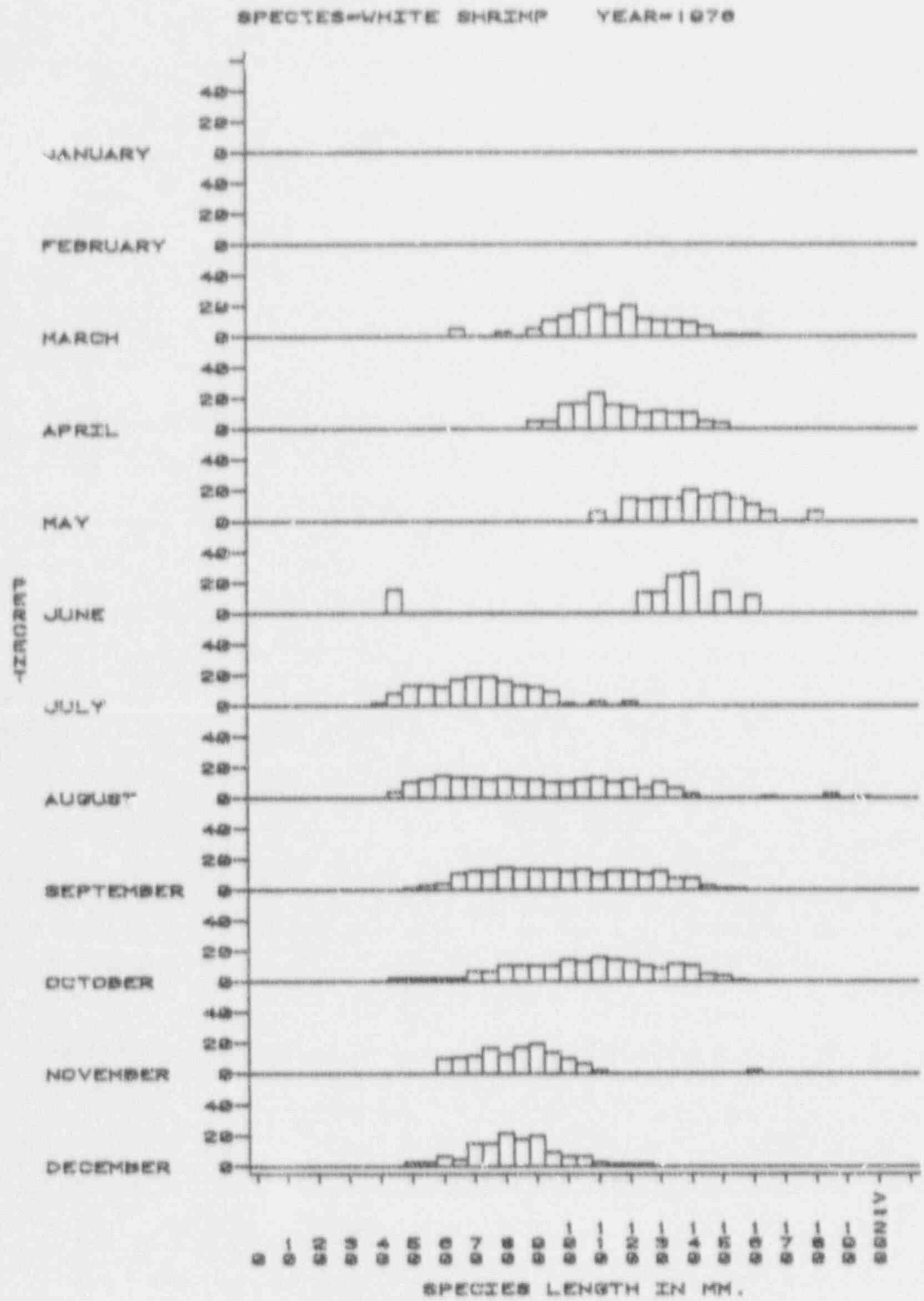

Figure 7.13a Impingement relative length frequency

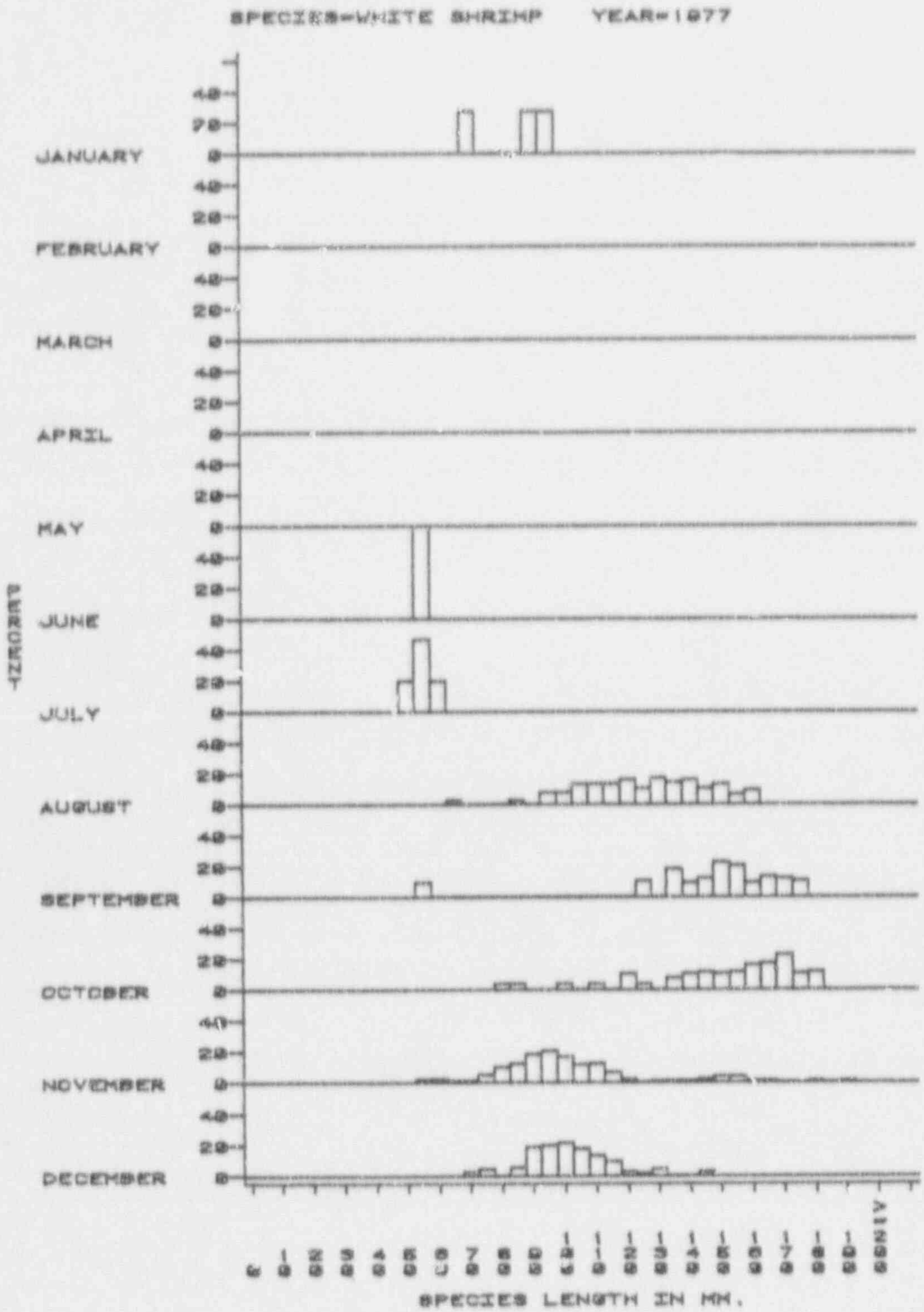

Figure 7.13b Impingement relative length frequency

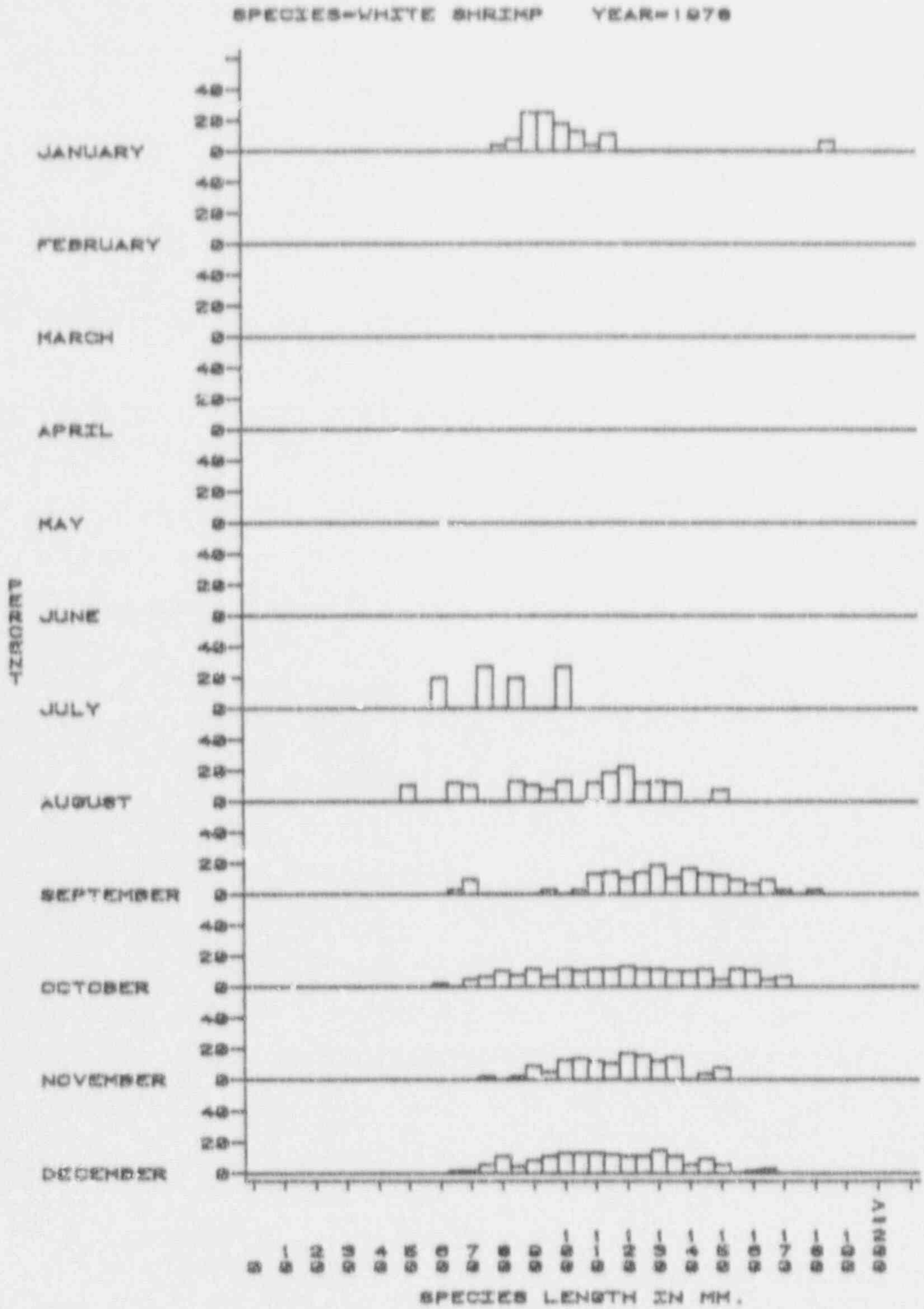

Figure 7.13c Impingement relative length frequency

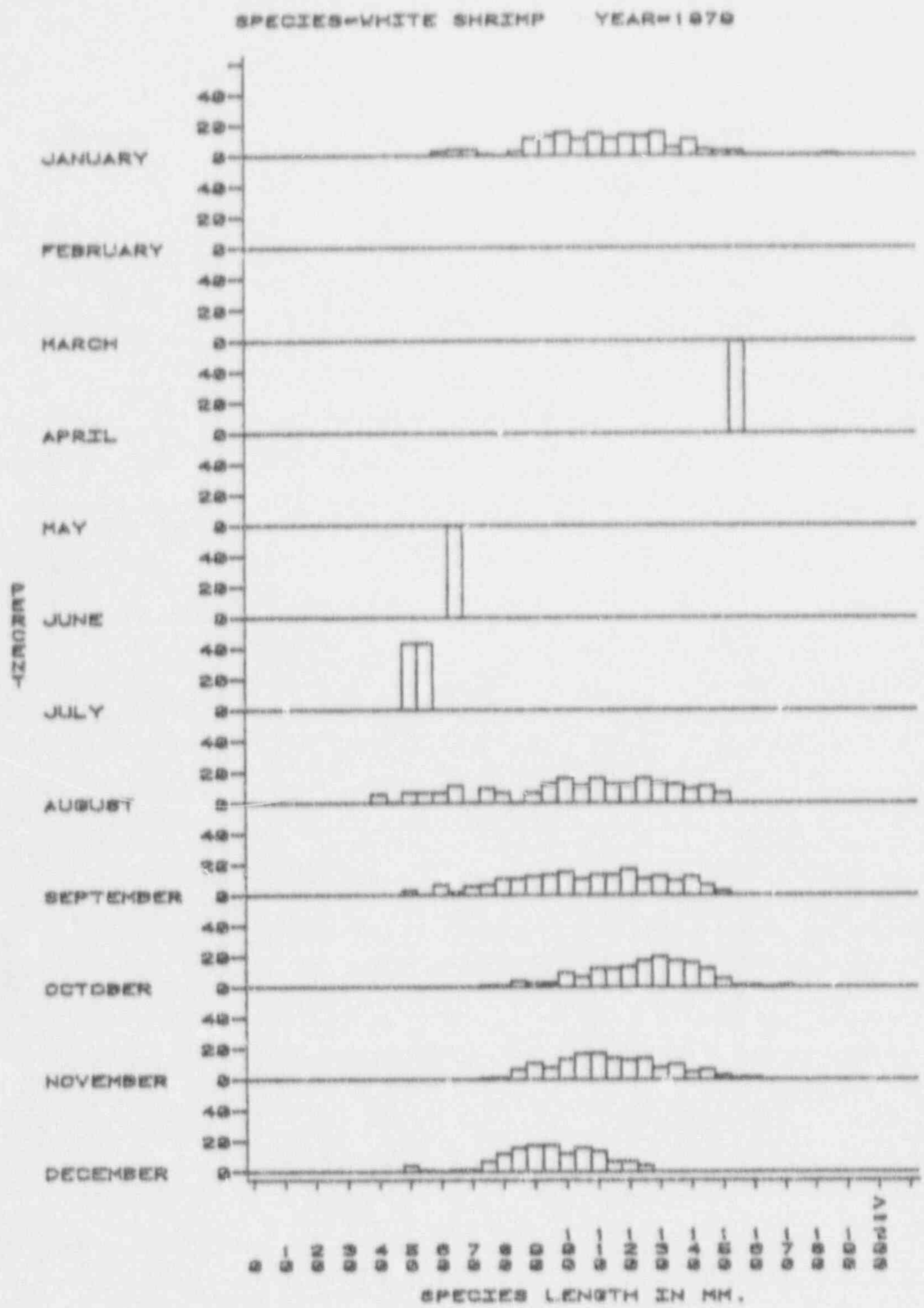

Figure 7.13d Impingement relative length frequency

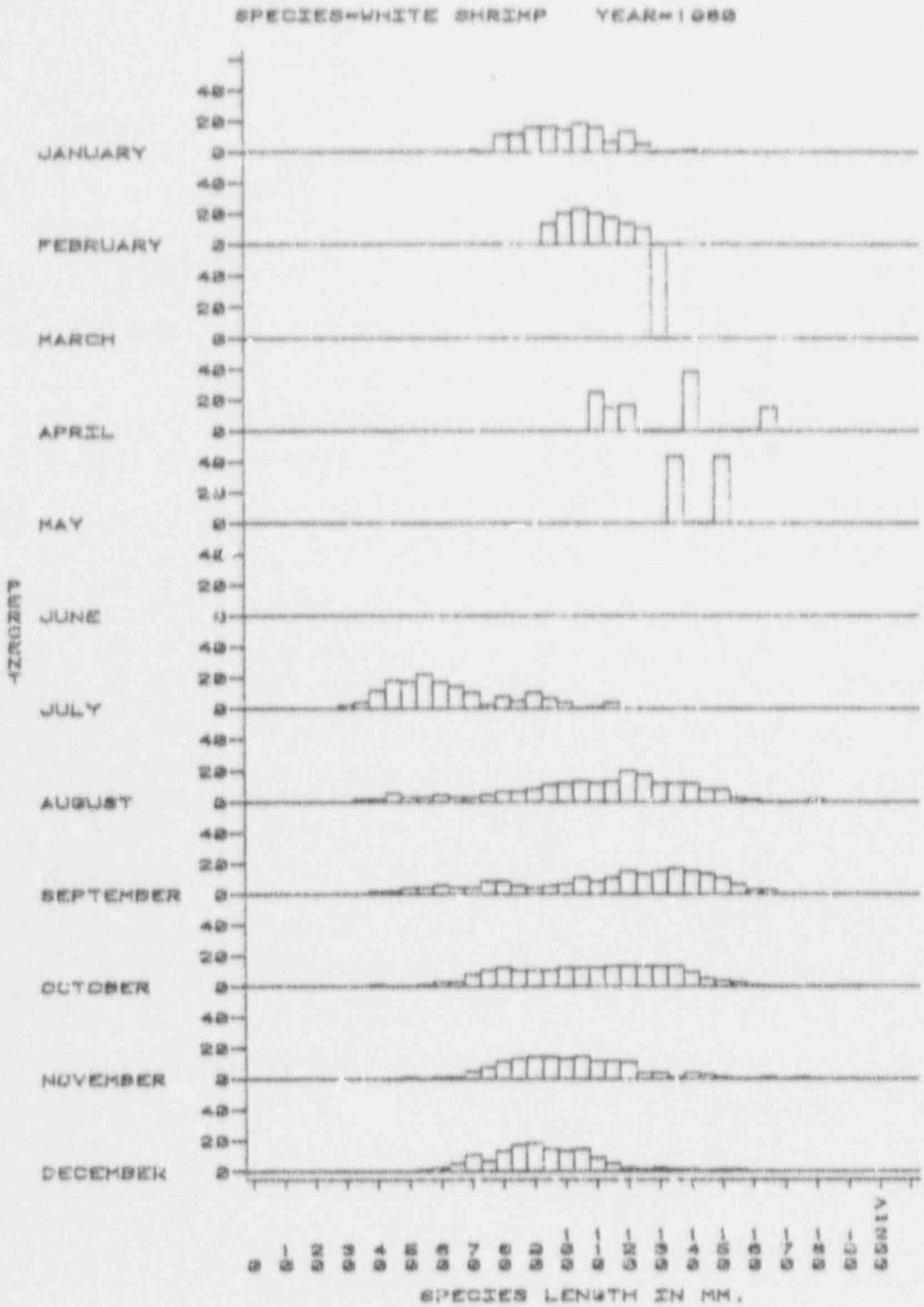

Figure 7.13e Impingement relative length frequency

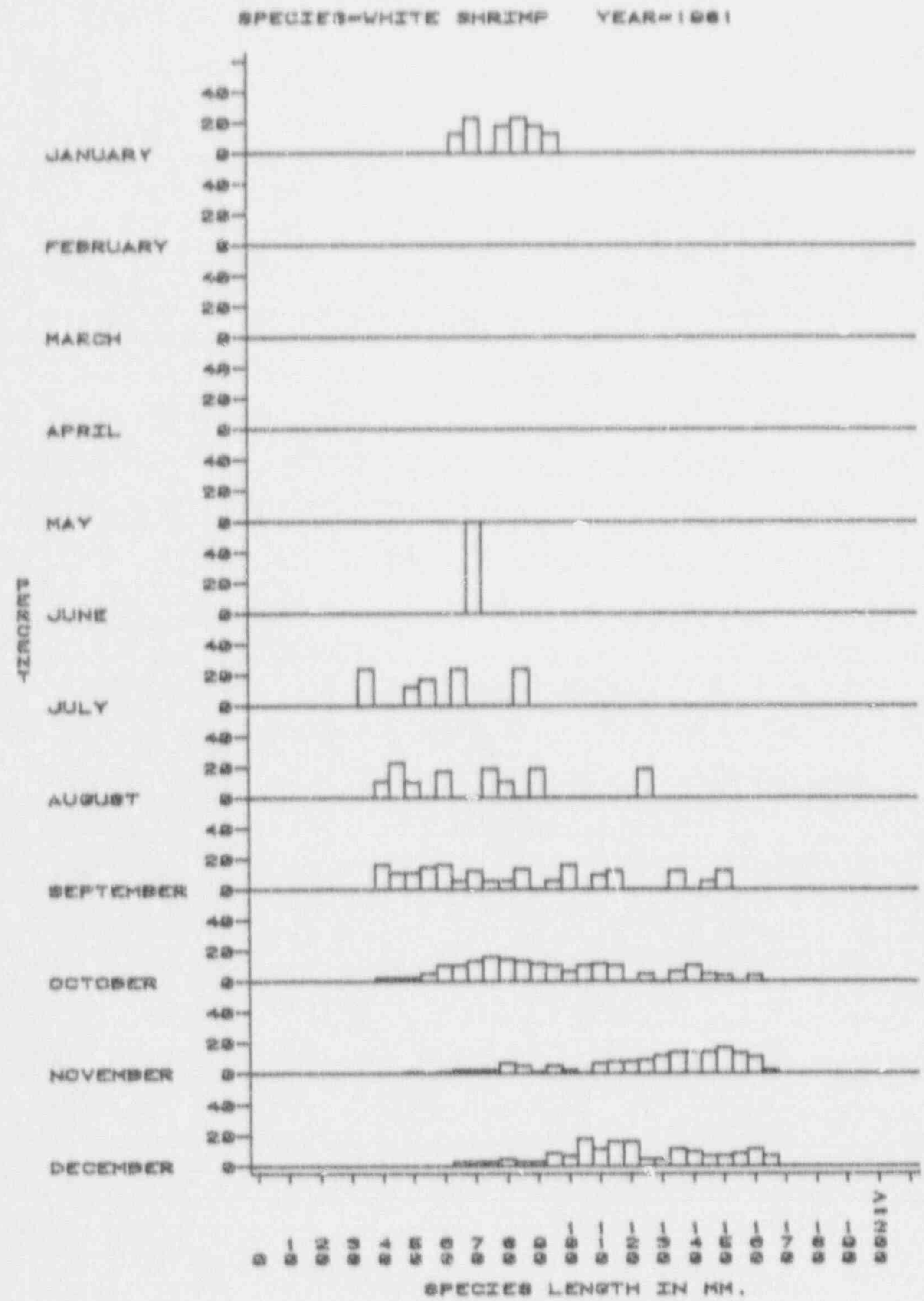

Figure 7.13f · Impingement relative length frequency

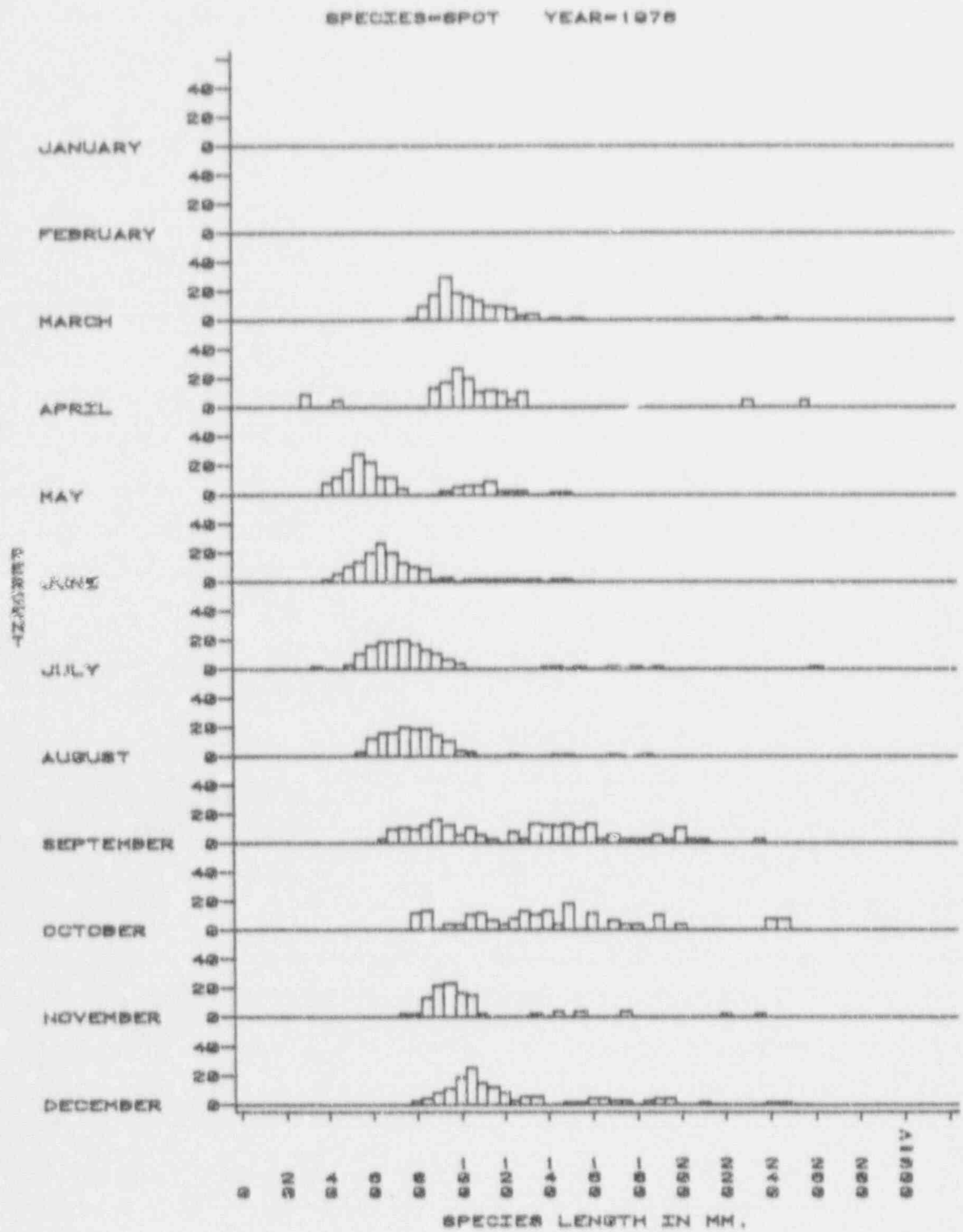

Figure 7.14a Impingement relative length frequency

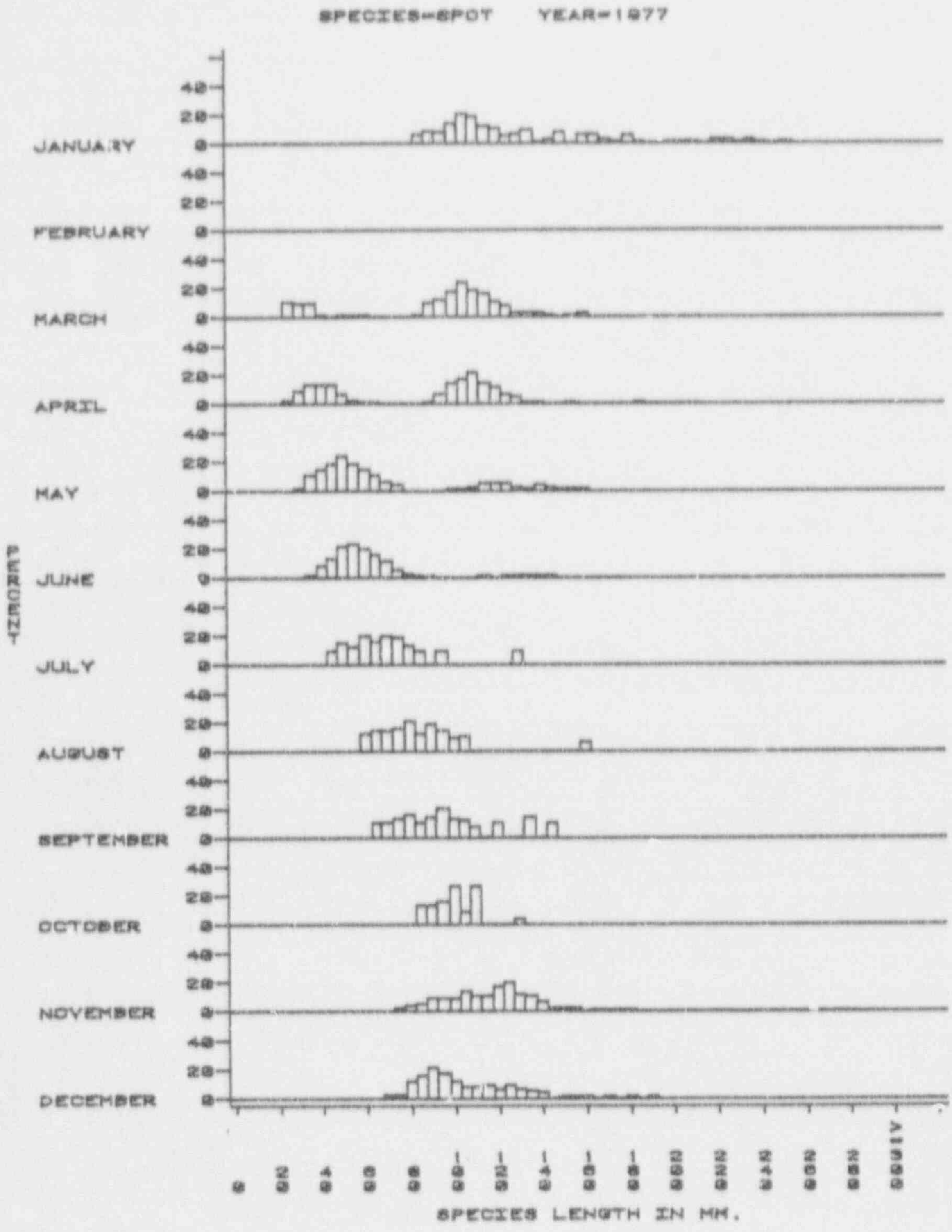

Figure 7.14b Impingement relative length frequency

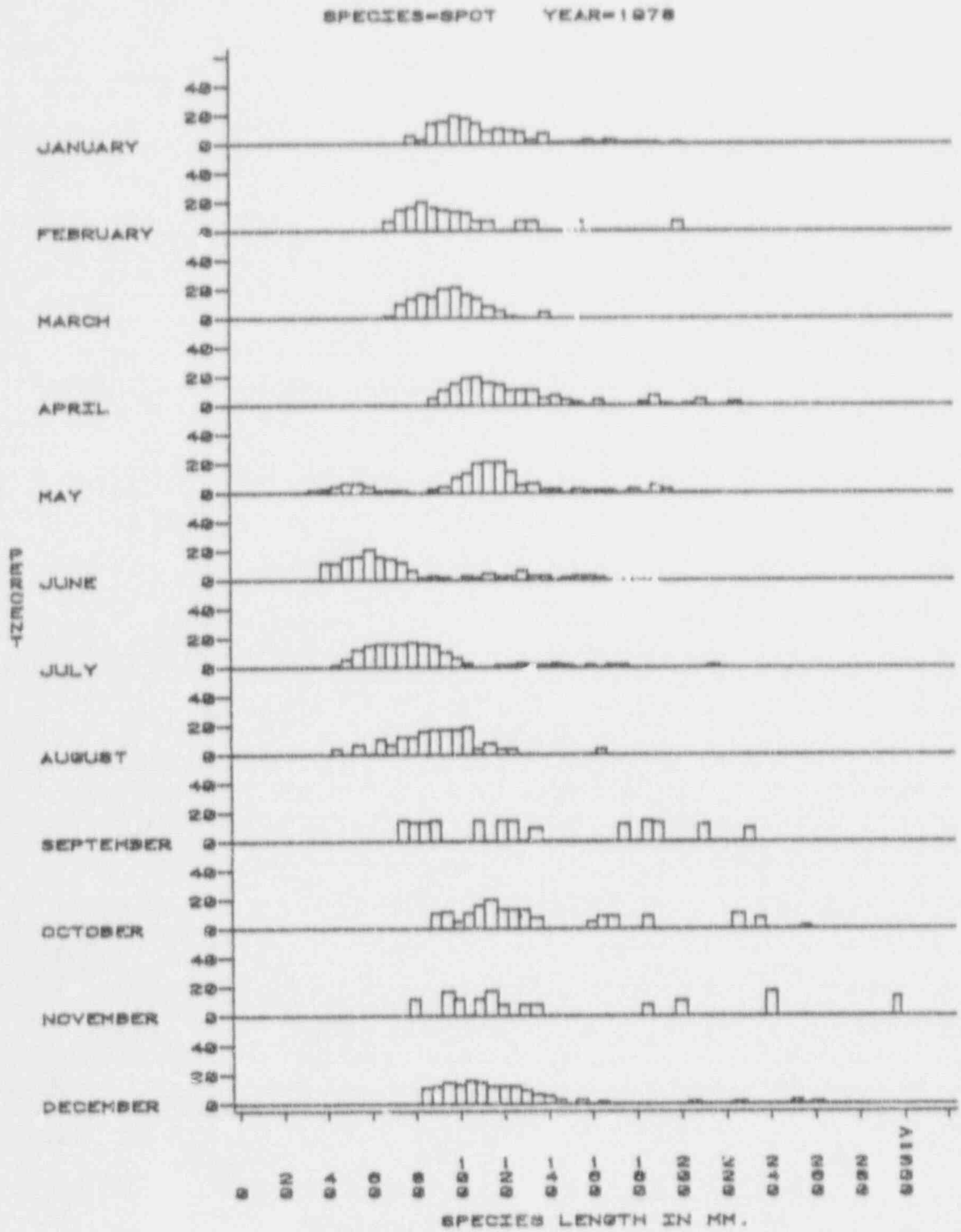

Figure 7.14c Impingement relative length frequency

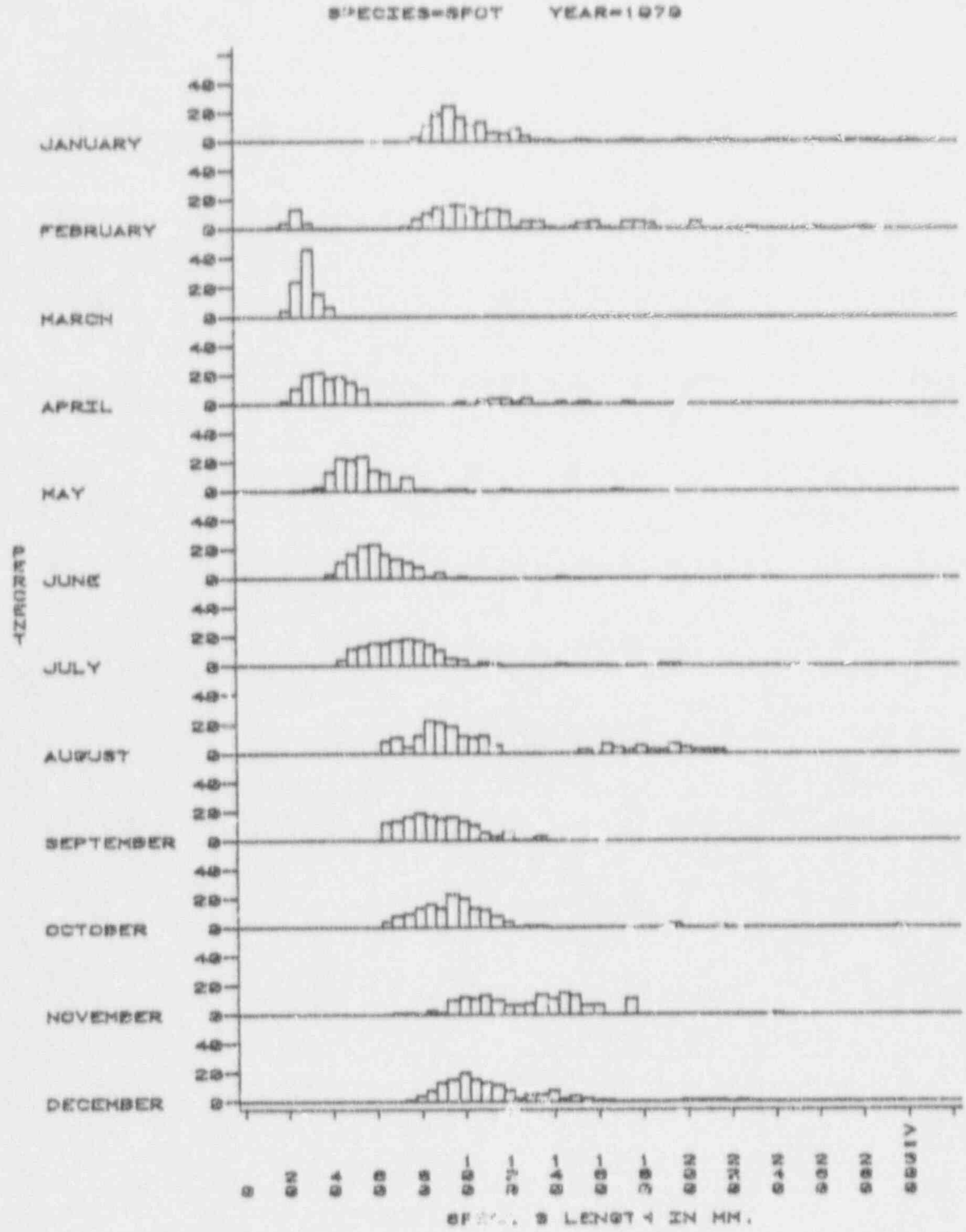

Figure 7.14d Impingement relative length frequency

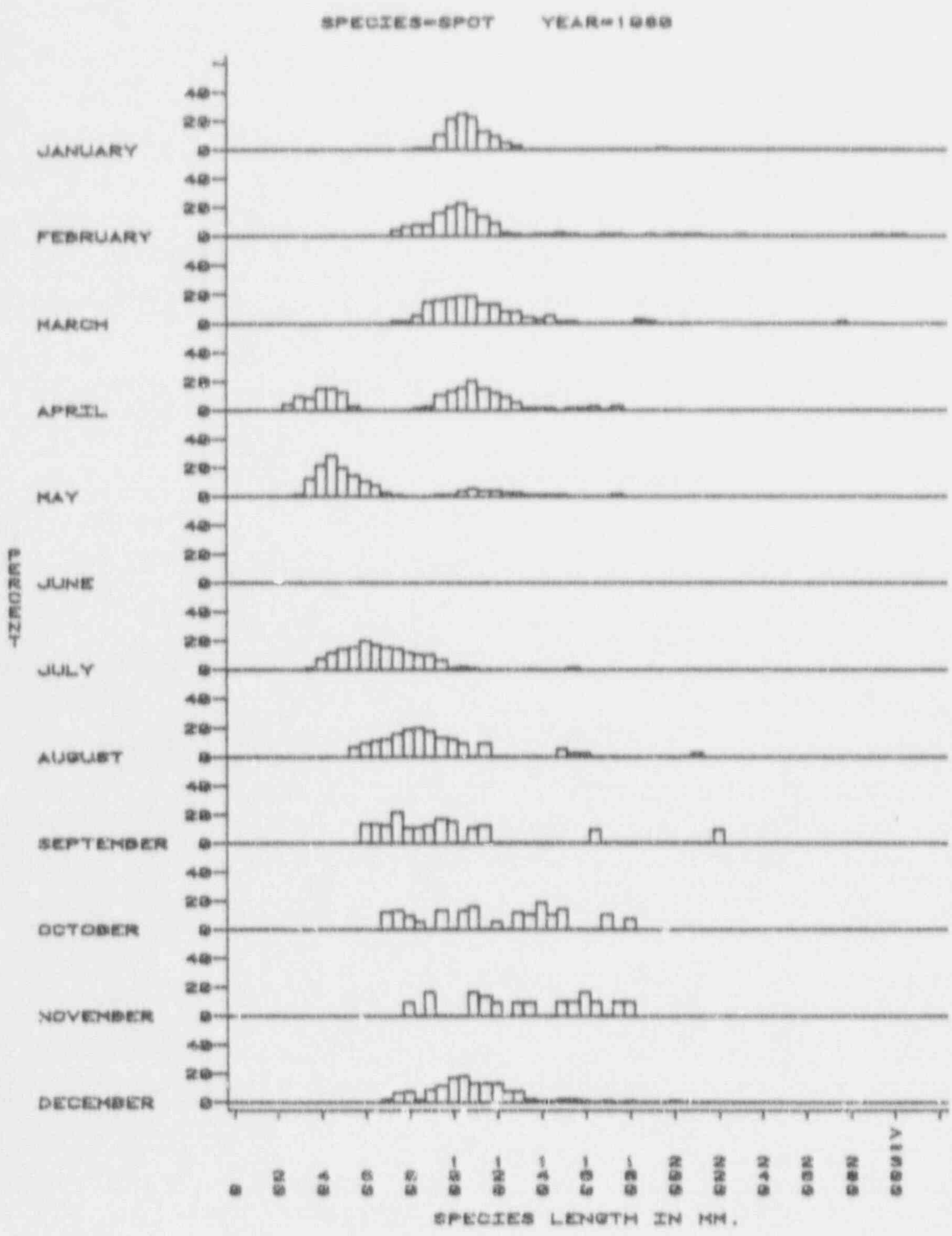

Figure 7.14e Impingement relative length frequency

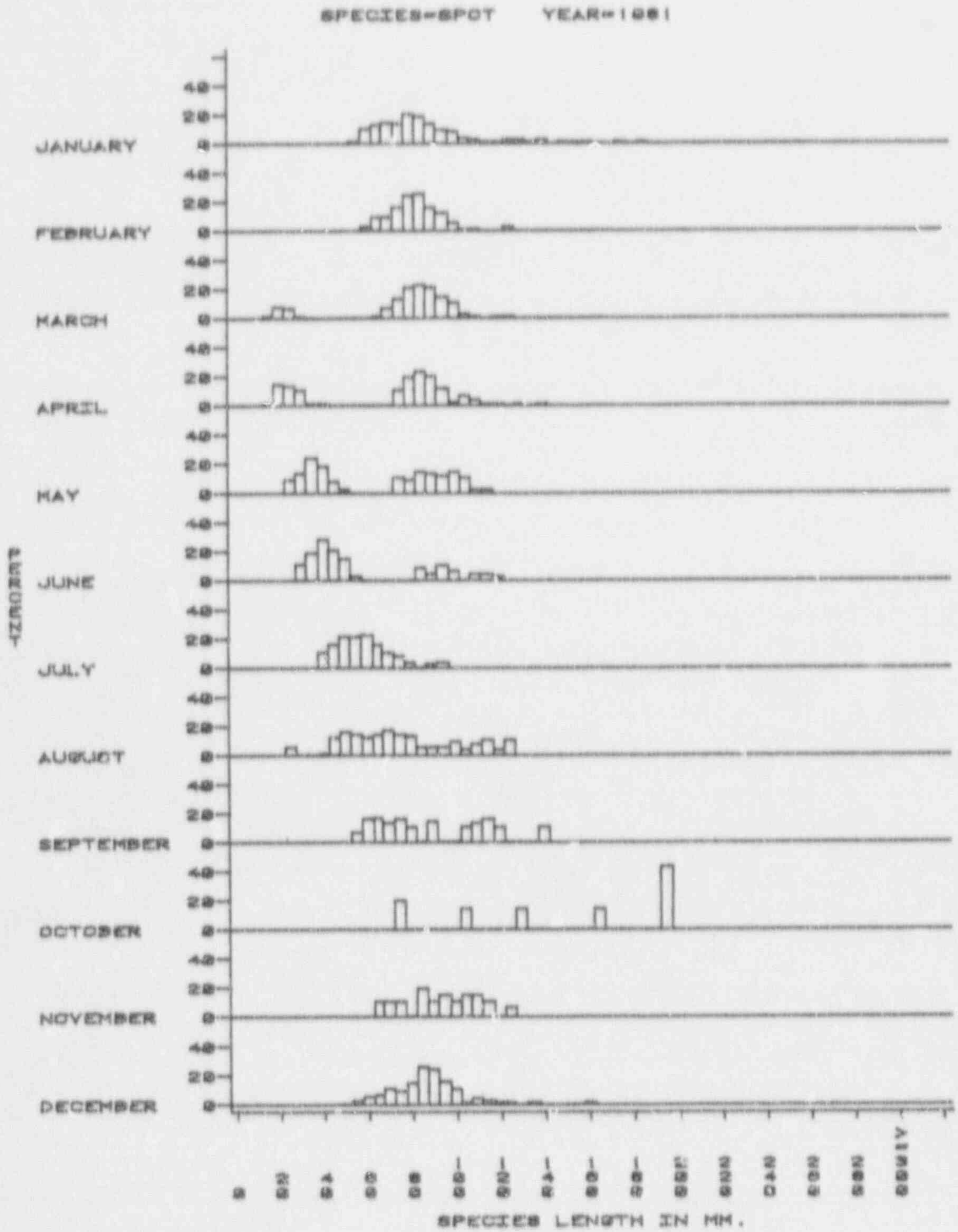

Figure 7.14f Impingement relative length frequency

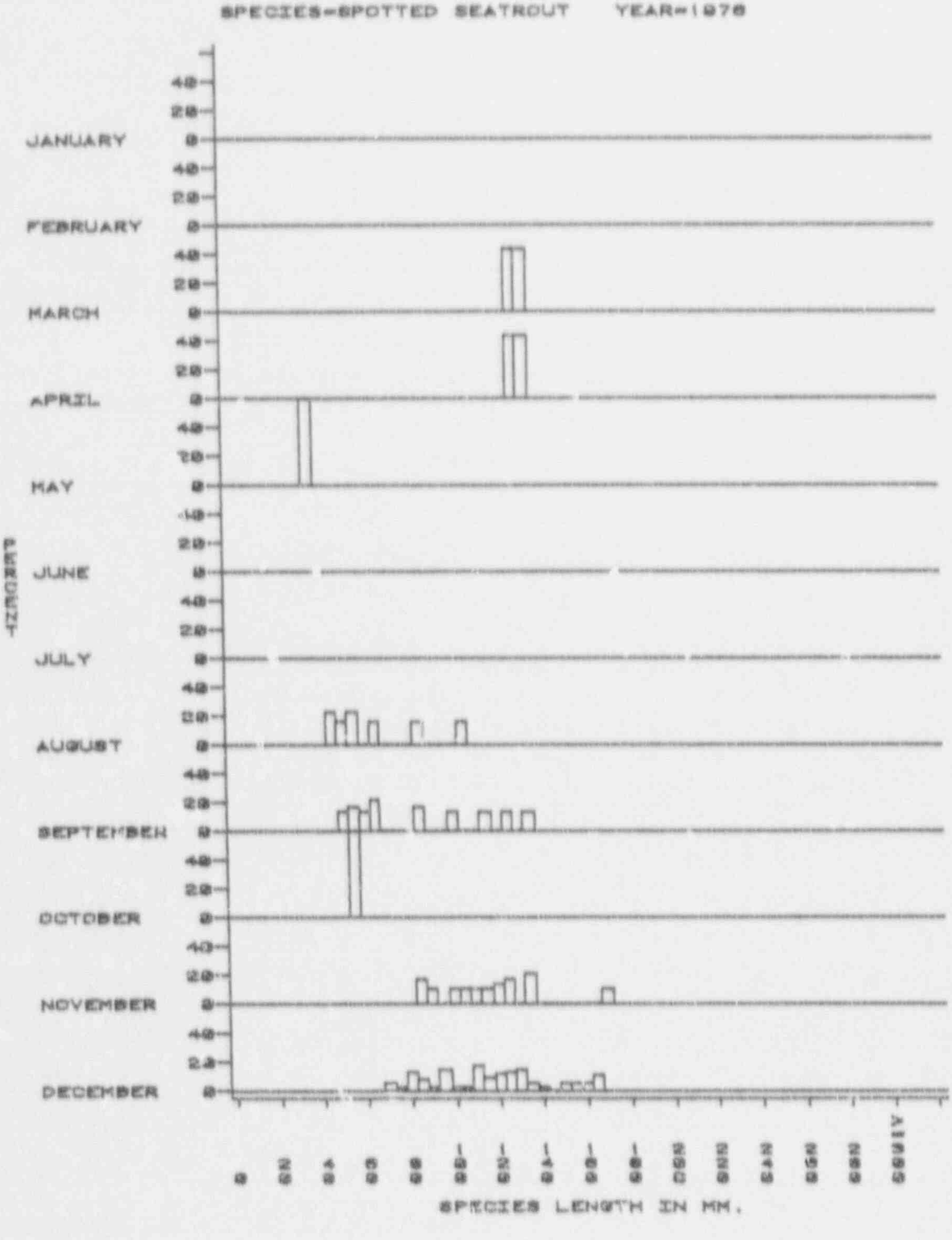

Figure 7.15a Impingement relative length frequency

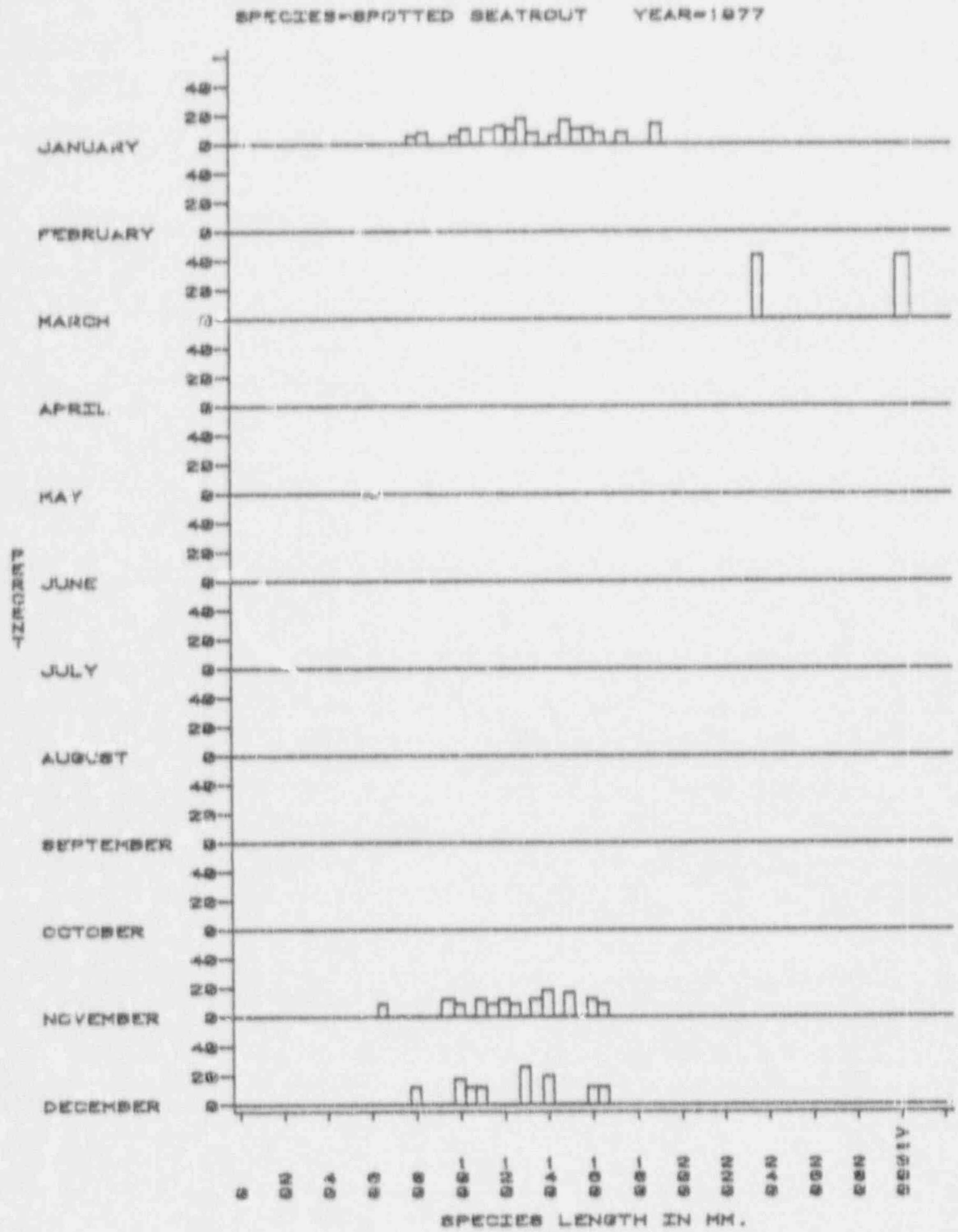

Figure 7.15b Impingement relative length frequency

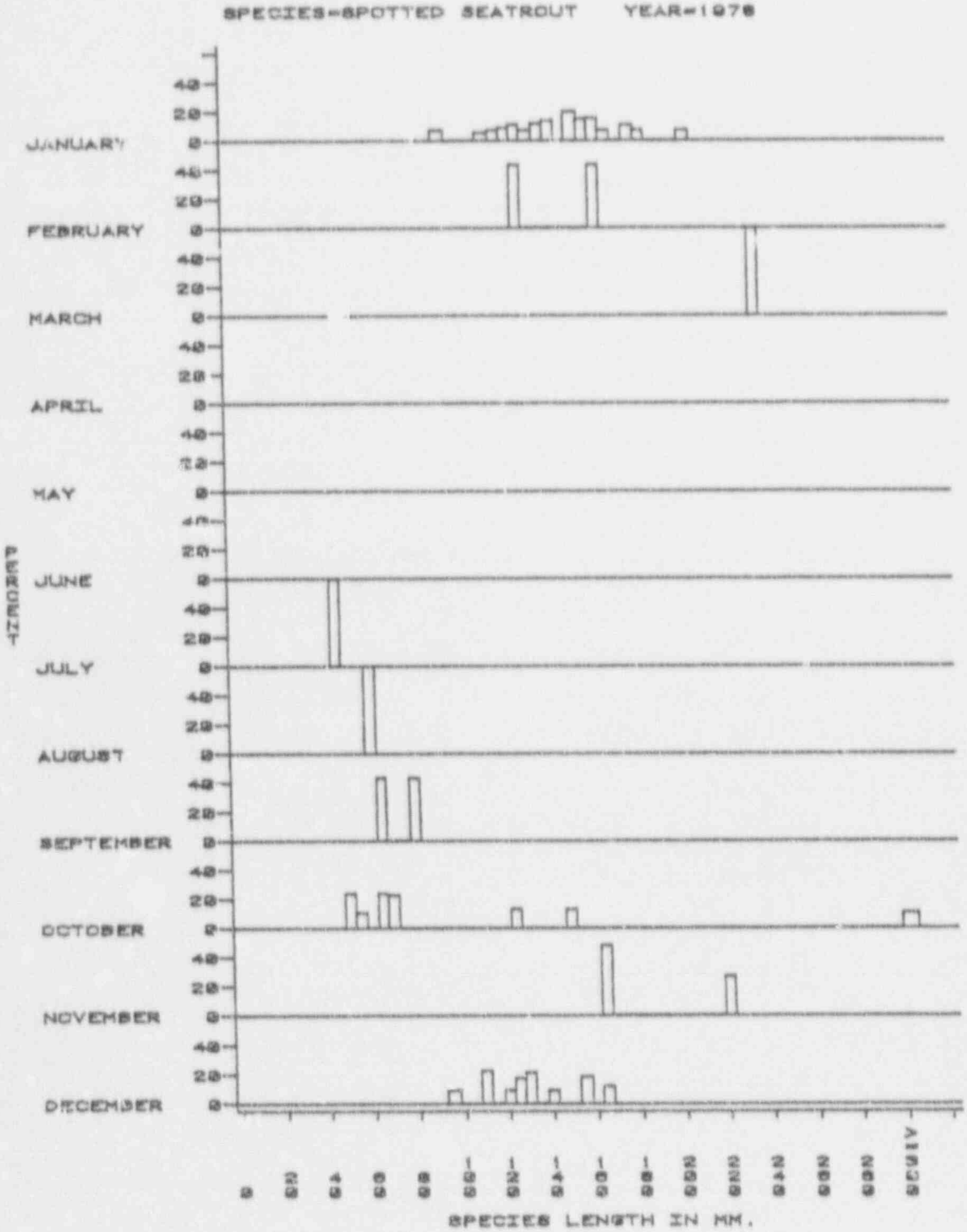

Figure 7.15c Impingement relative length frequency

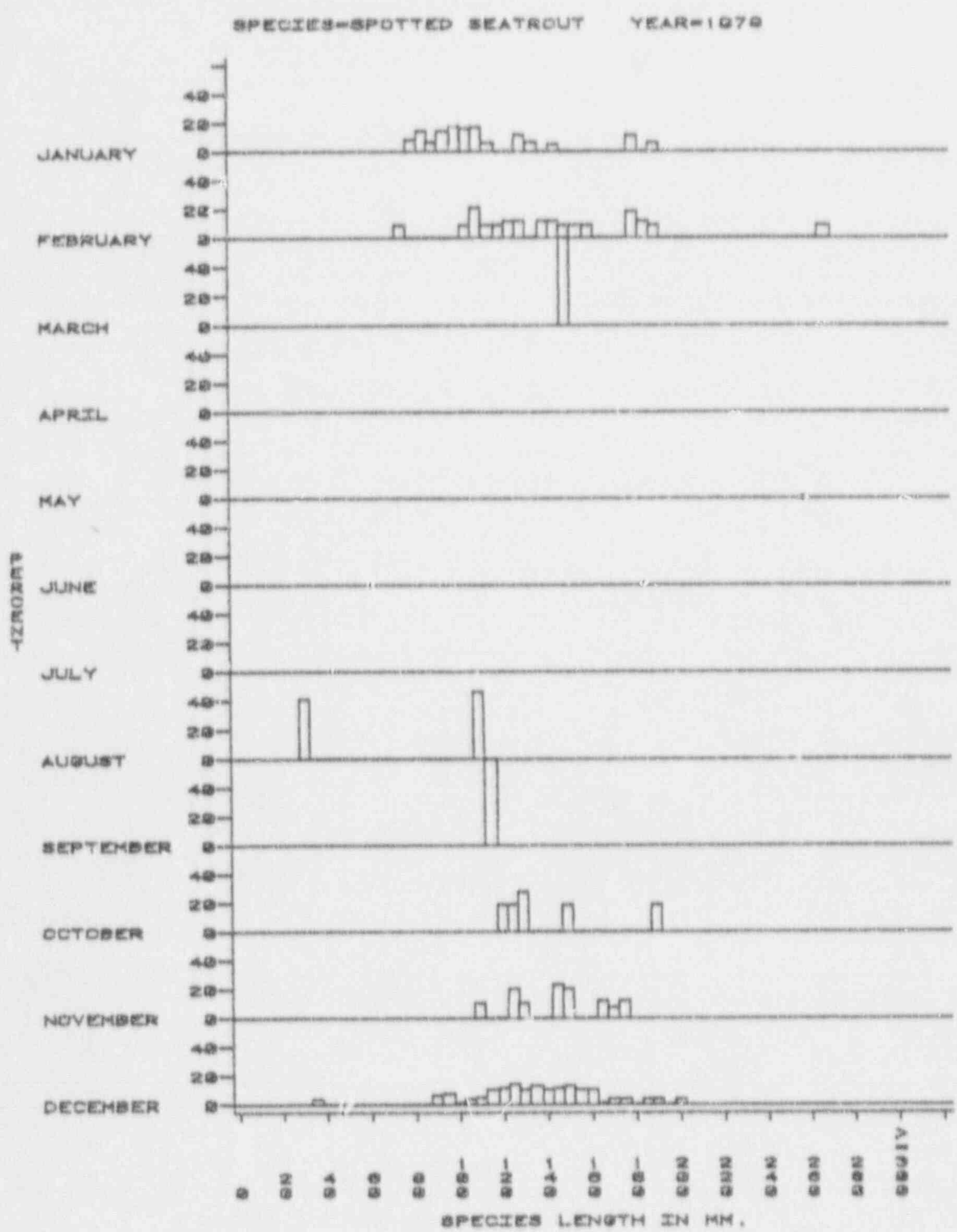

Figure 7.15d Impingement relative length frequency

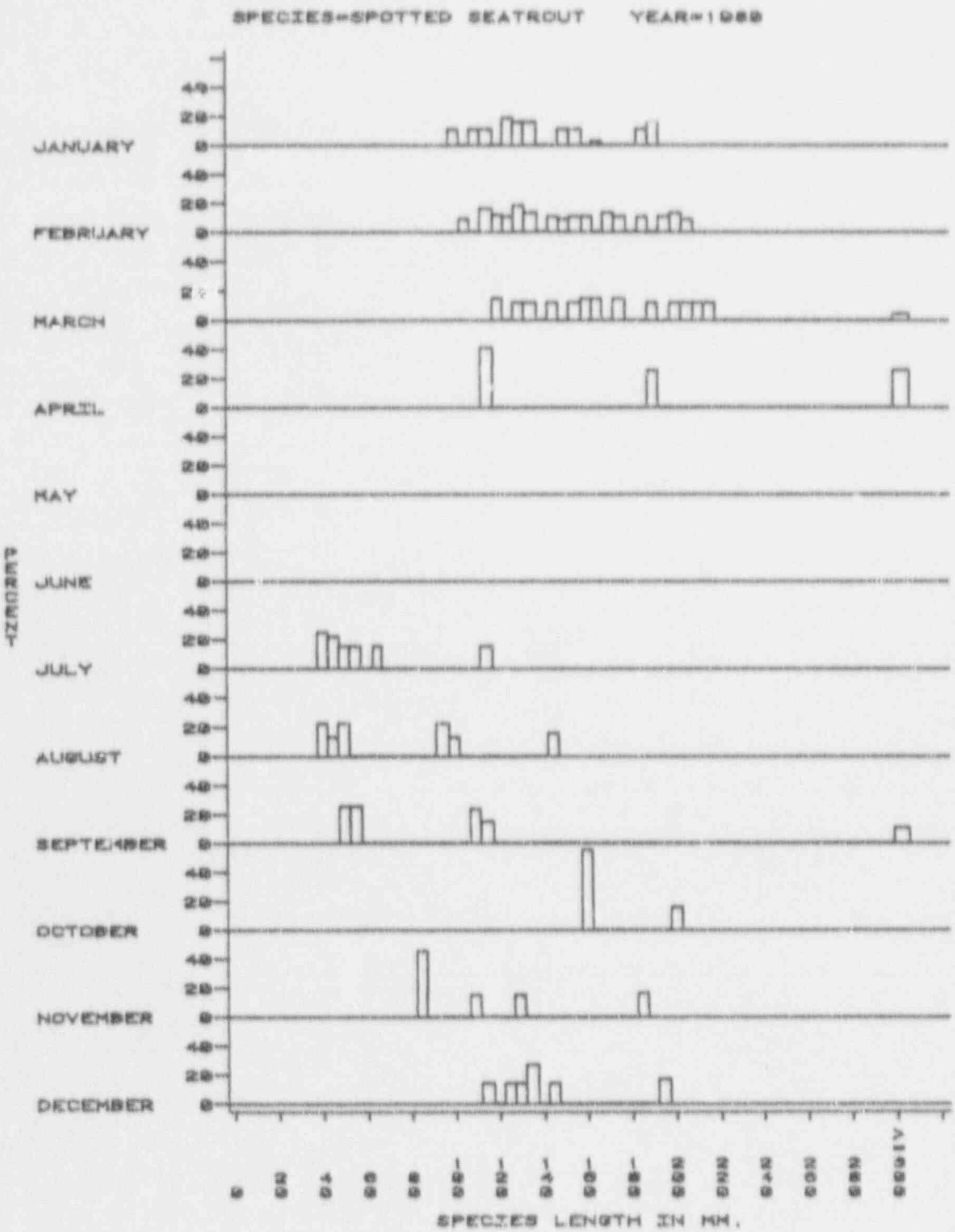

Figure 7.15e Impingement relative length frequency

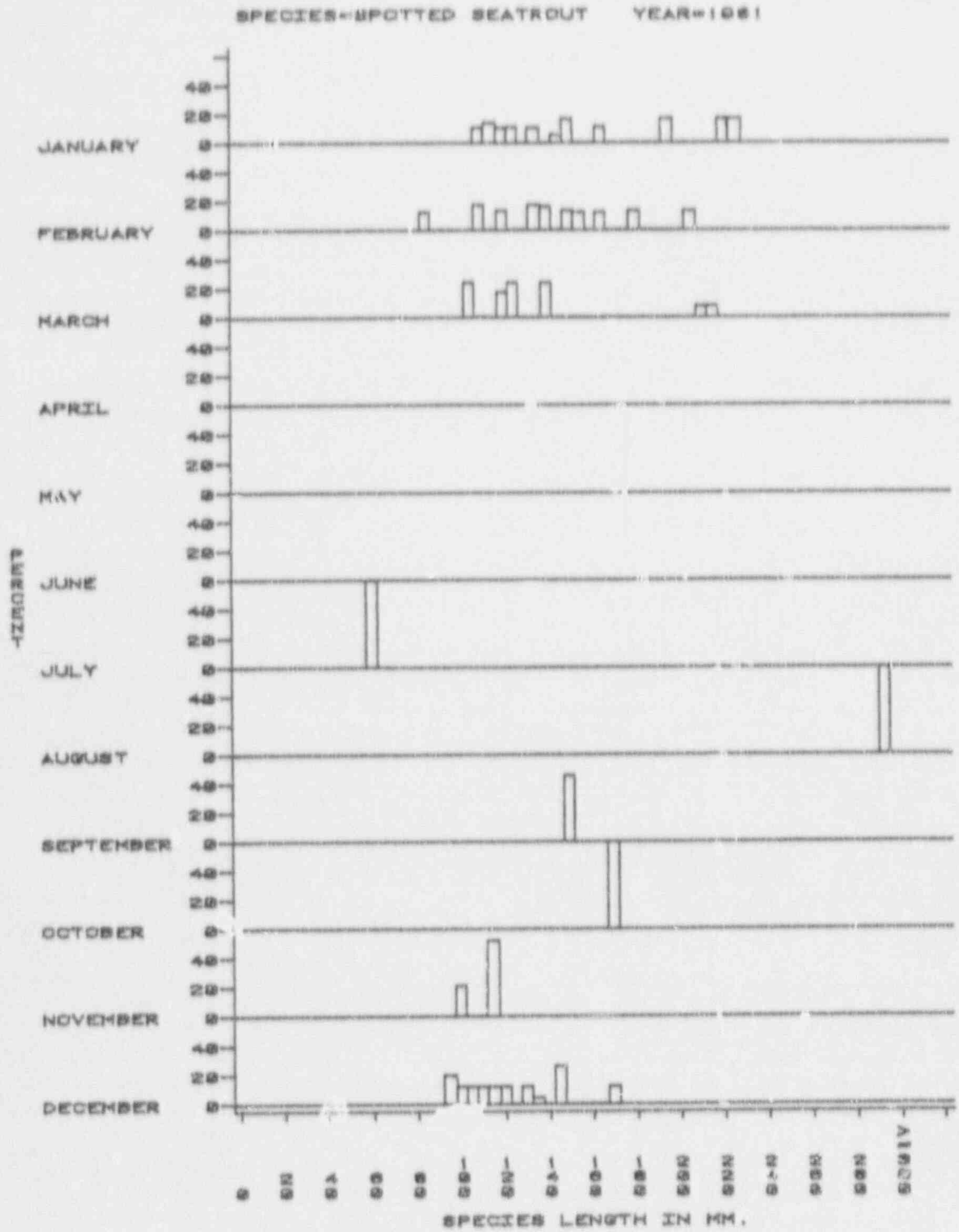

Figure 7.15f Impingement relative length frequency

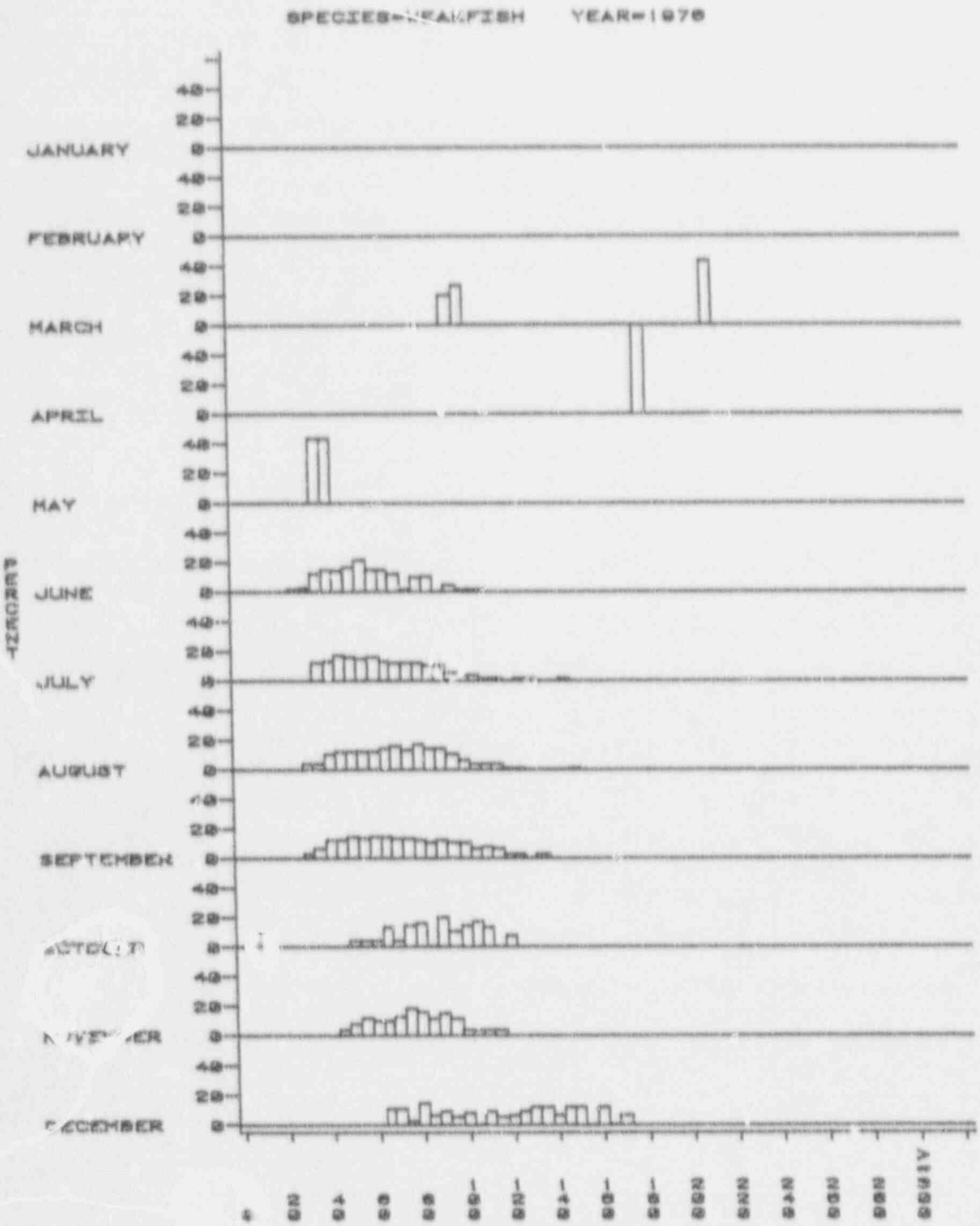

Figure 7.16a · Impingement relative length frequency

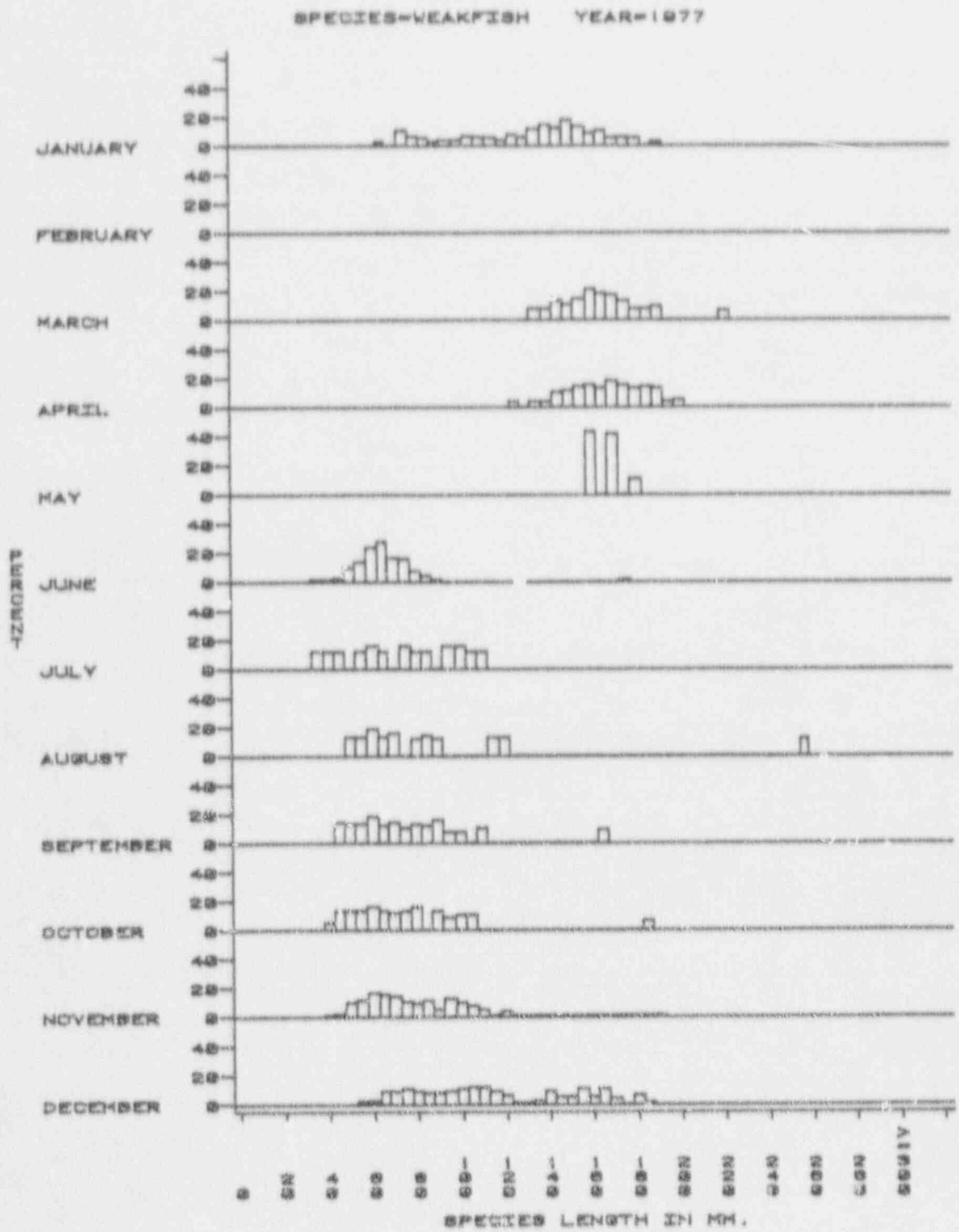

Figure 7.16b . Impingement relative length frequency

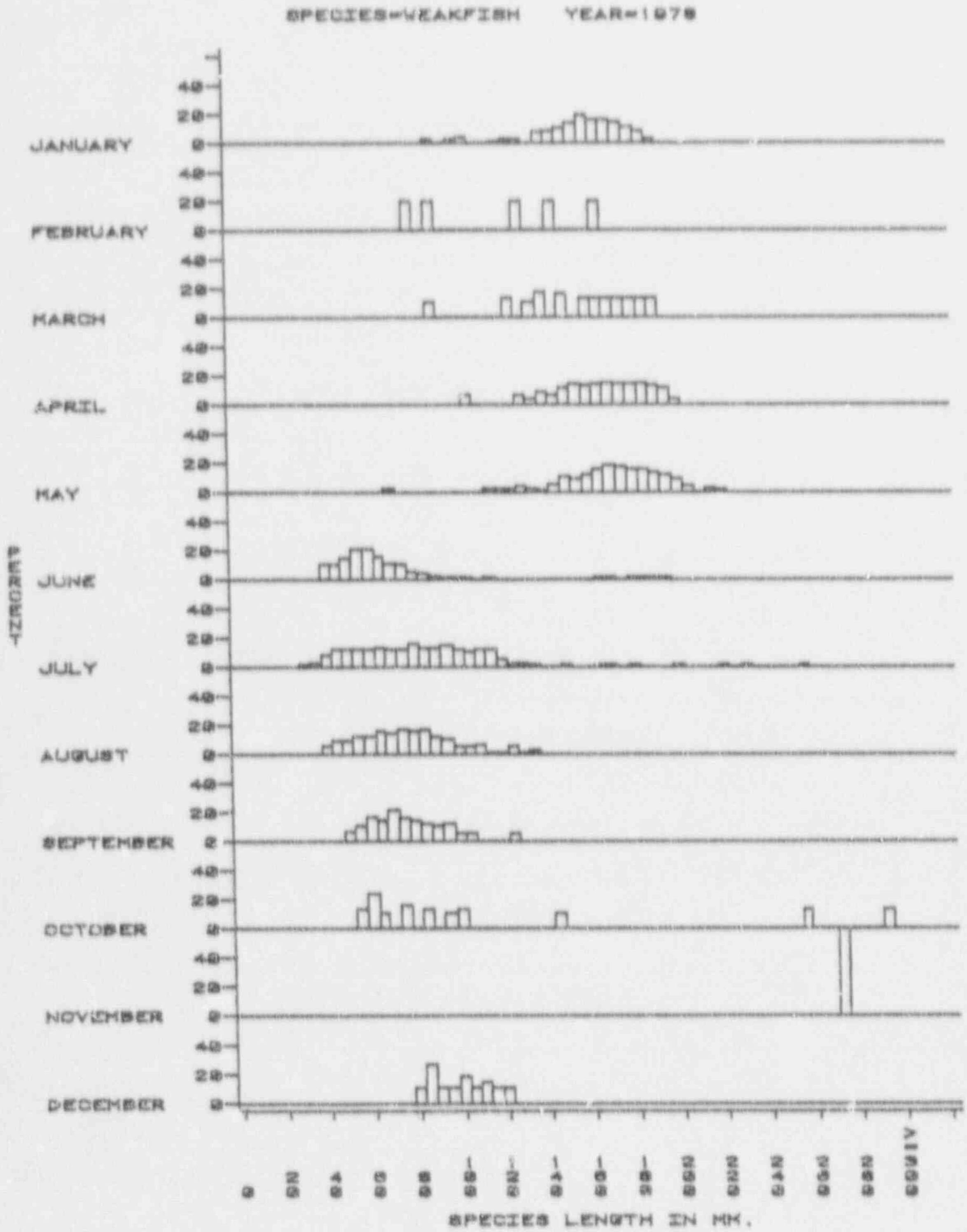

Figure 7.16c Impingement relative length frequency

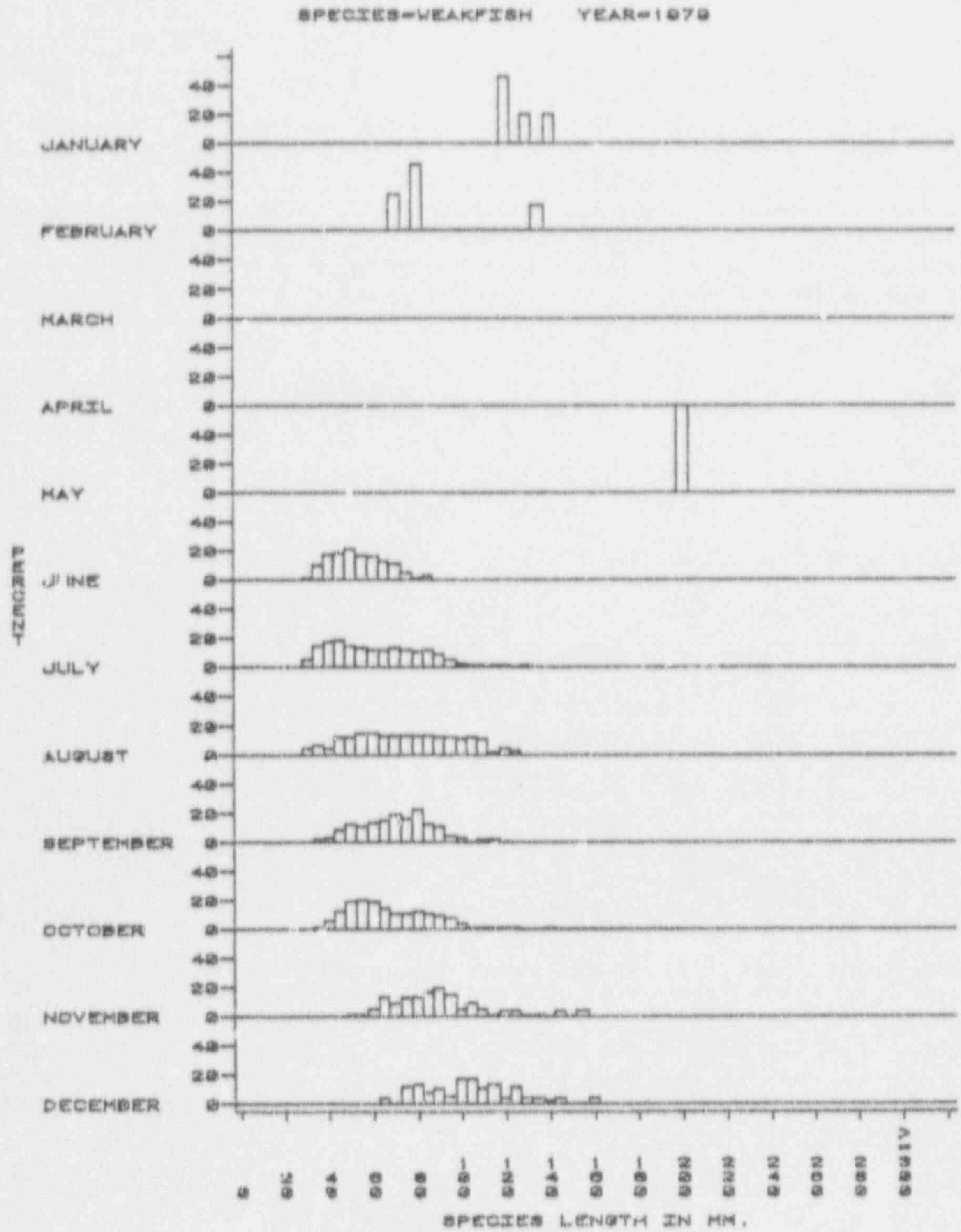

Figure 7.16d Impingement relative length frequency

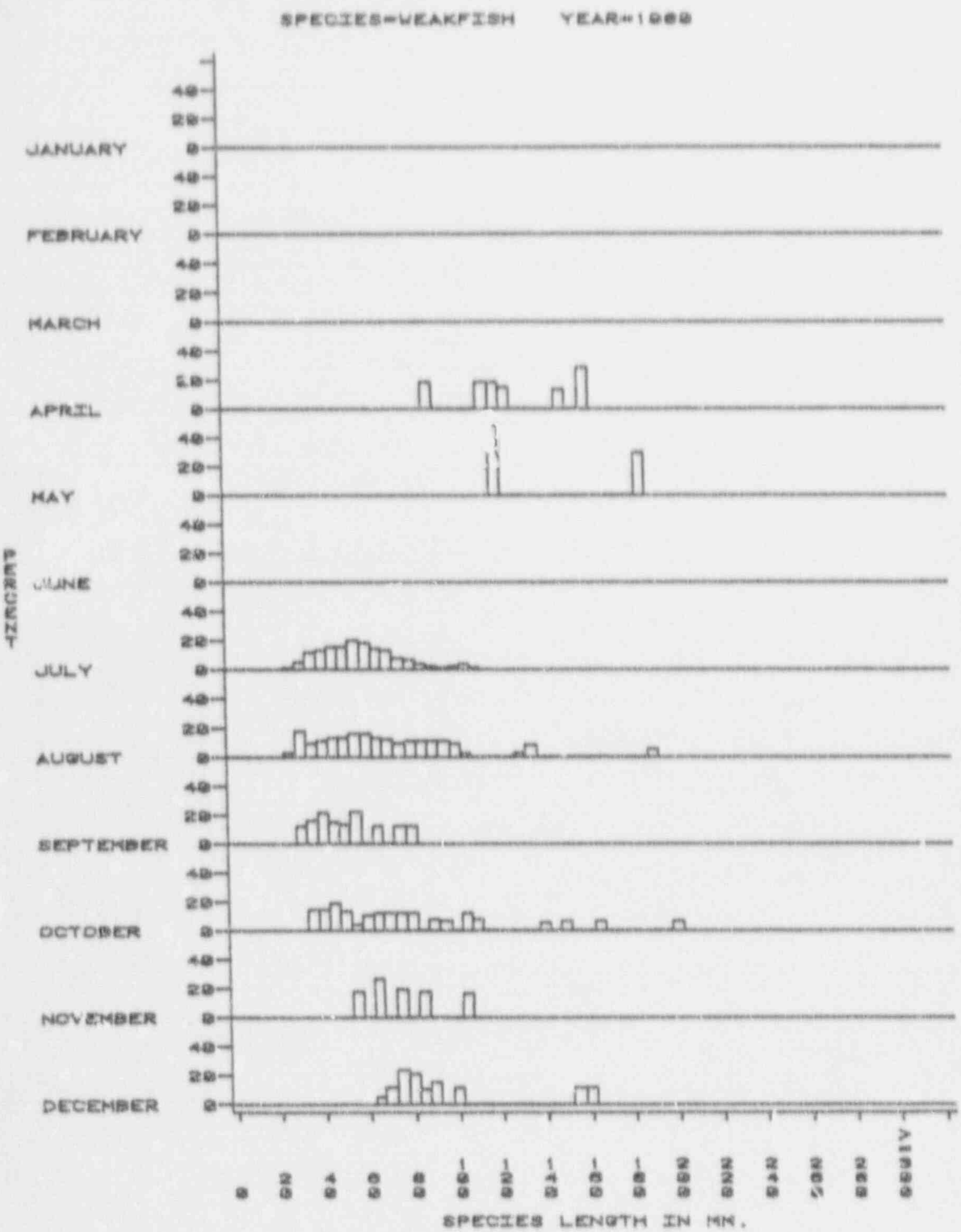

Figure 7.16e Impingement relative length frequency

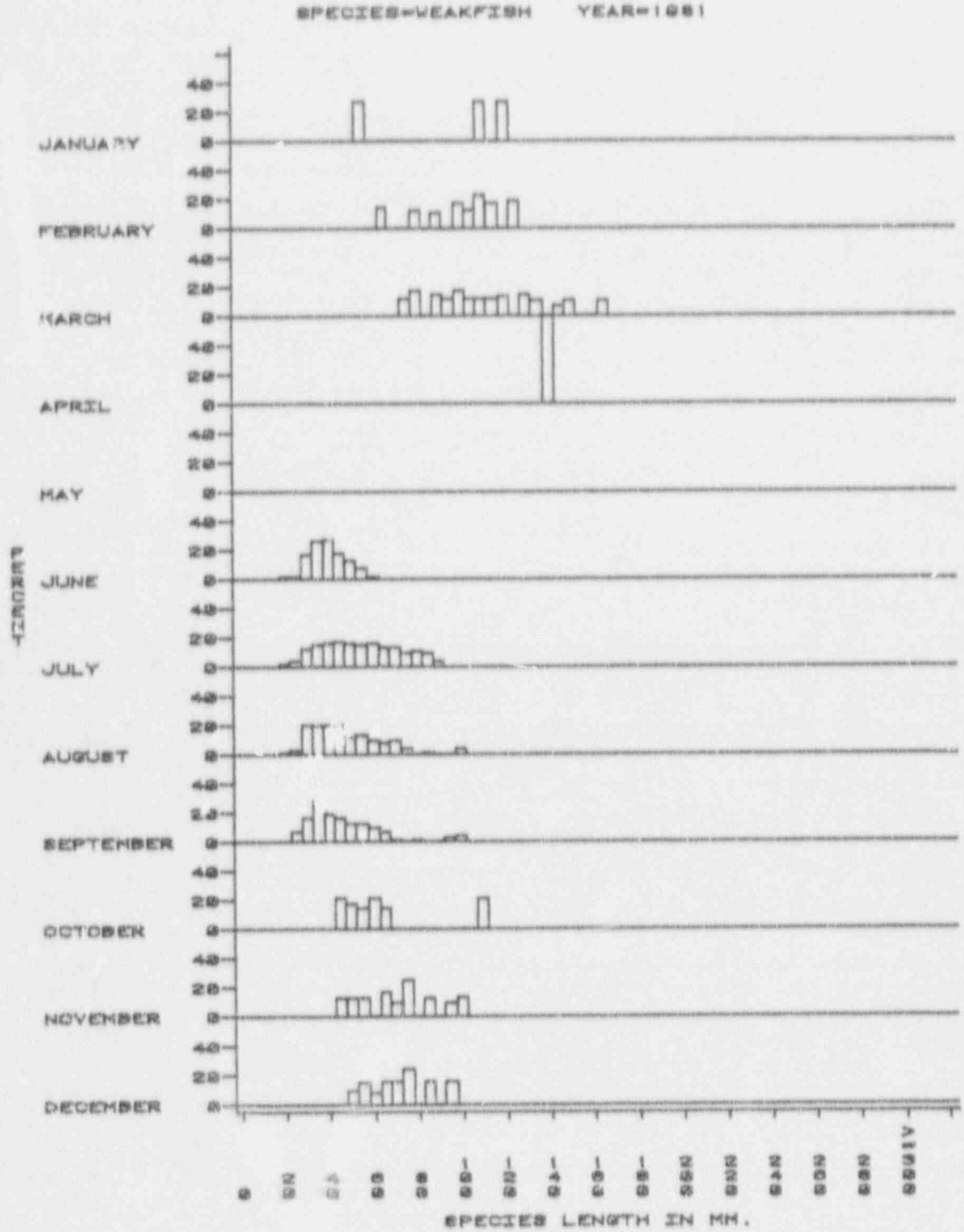

Figure 7.16f Impingement relative length frequency

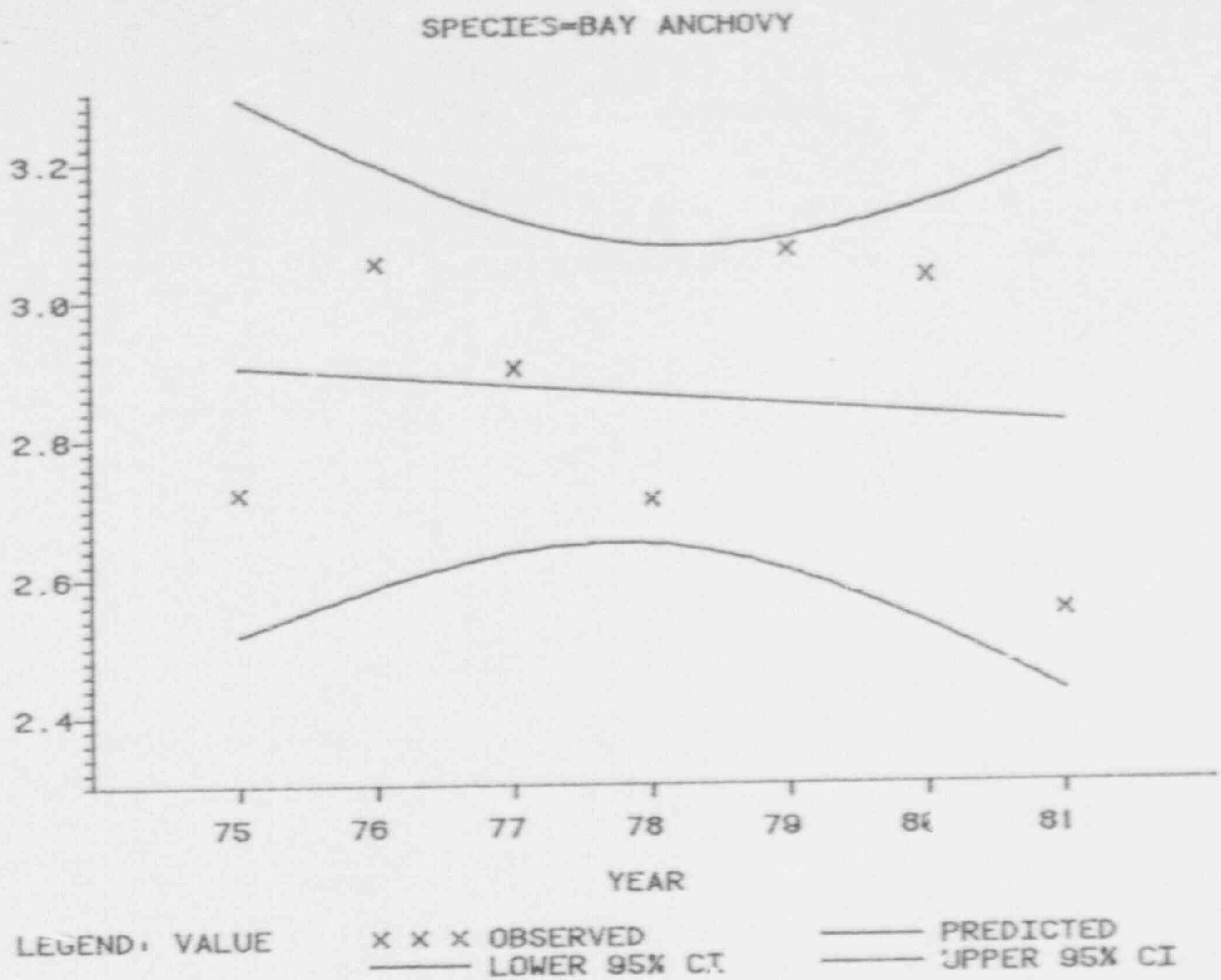

Figure 7.17. Impingement Trend Analysis

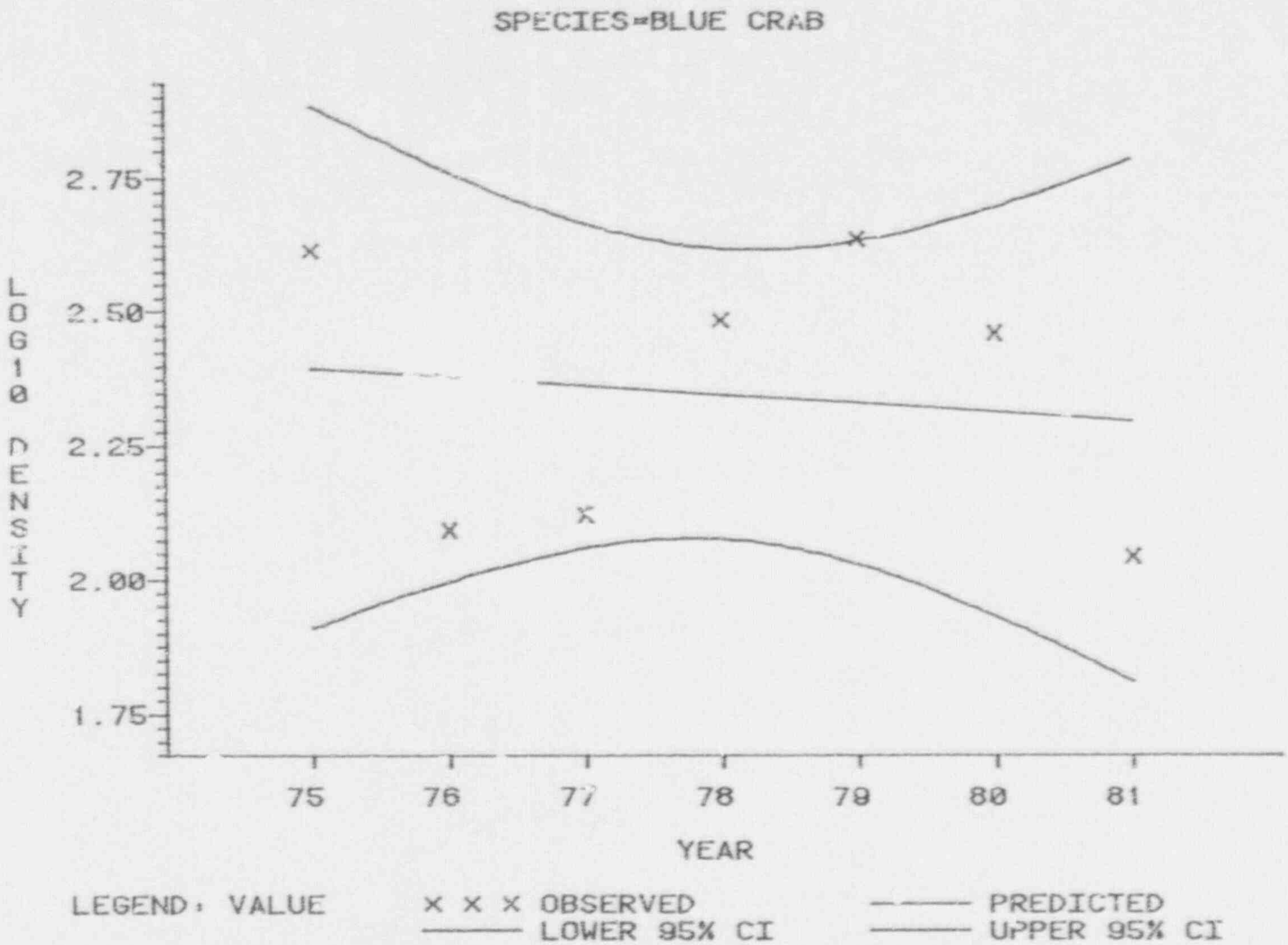

Figure 7.18 Impingement Trend Analysis

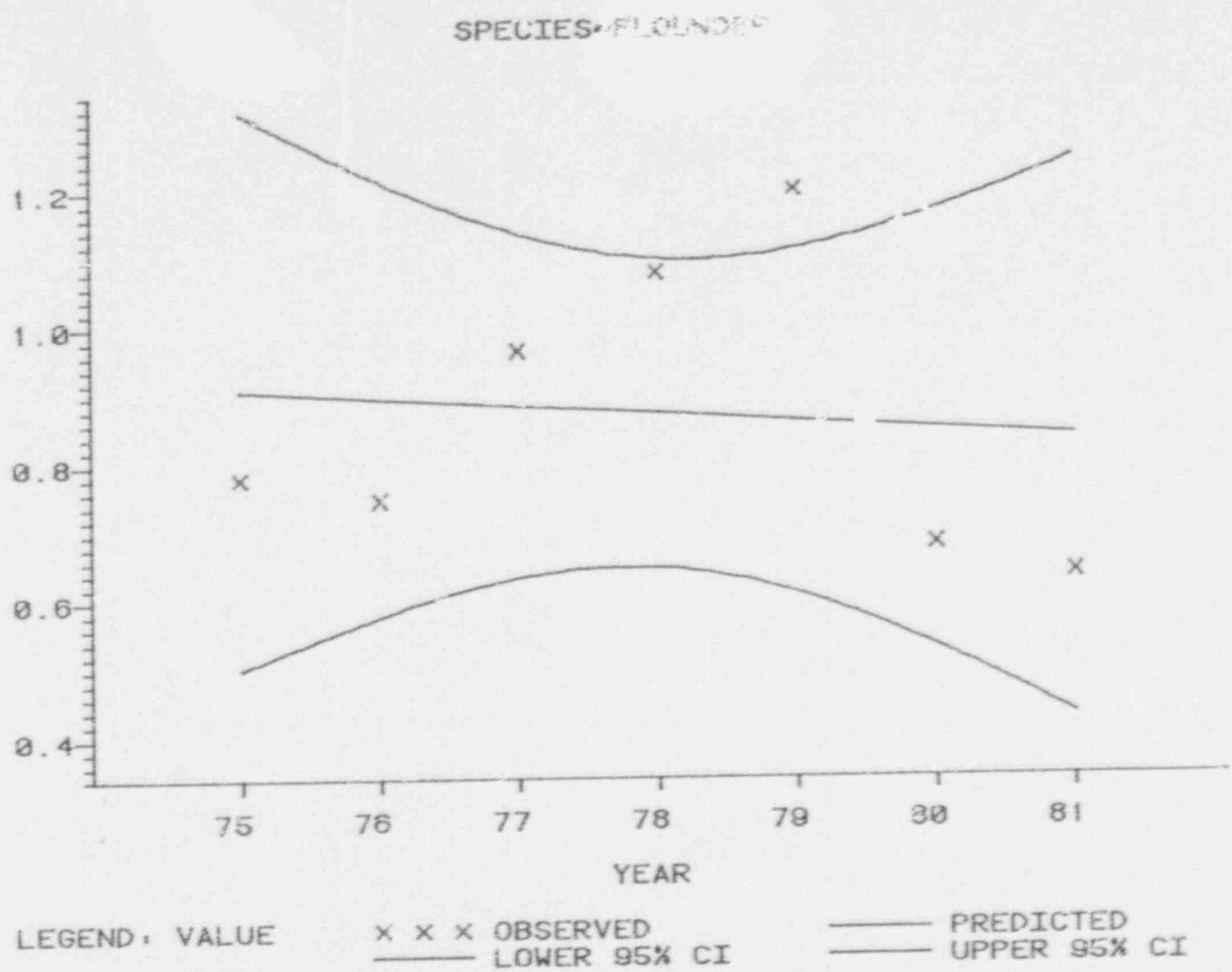

Figure 7.19 Impingement Trend Analysis

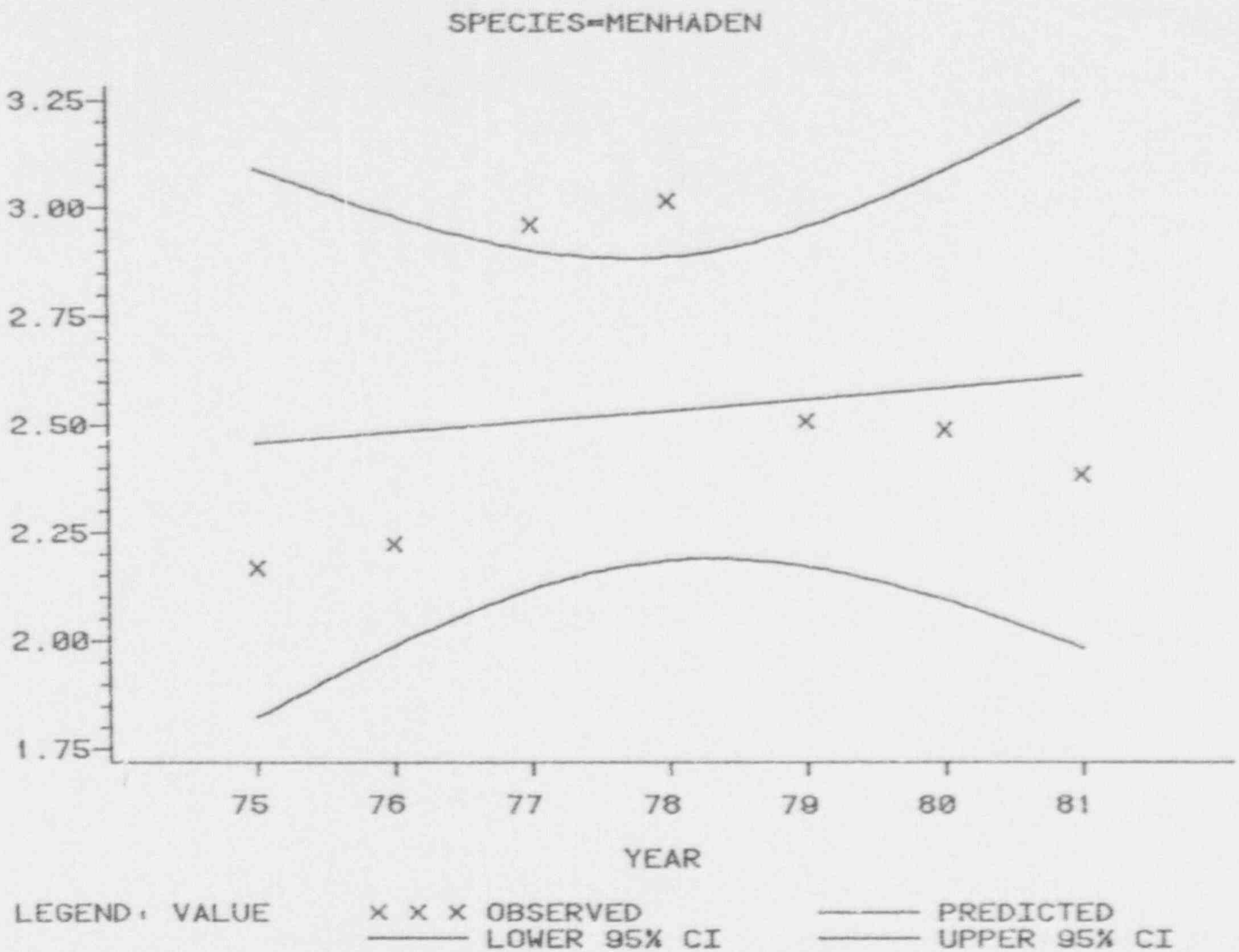

Figure 7.20 Impingement Trend Analysis

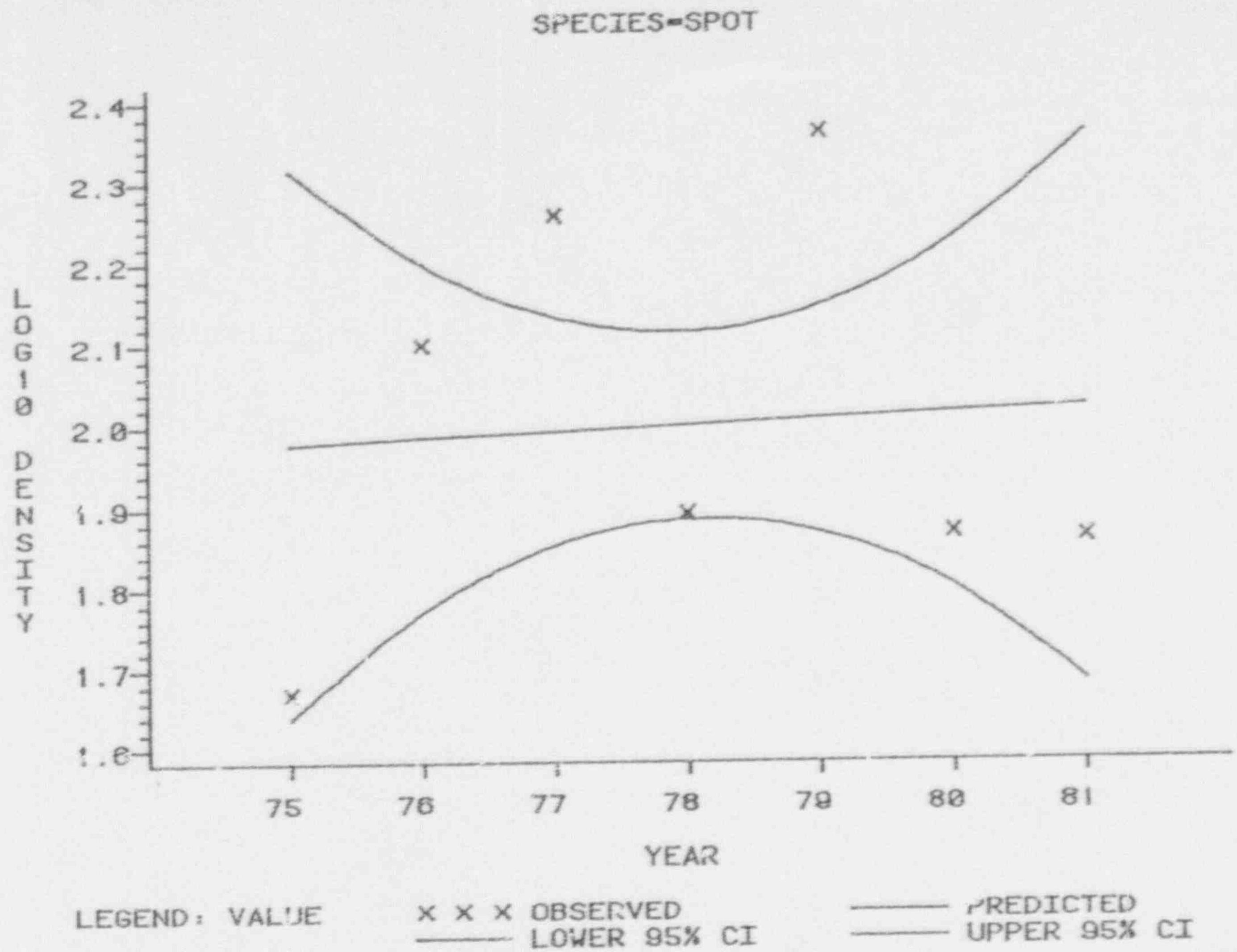

Figure 7.21 Impingement trend analysis

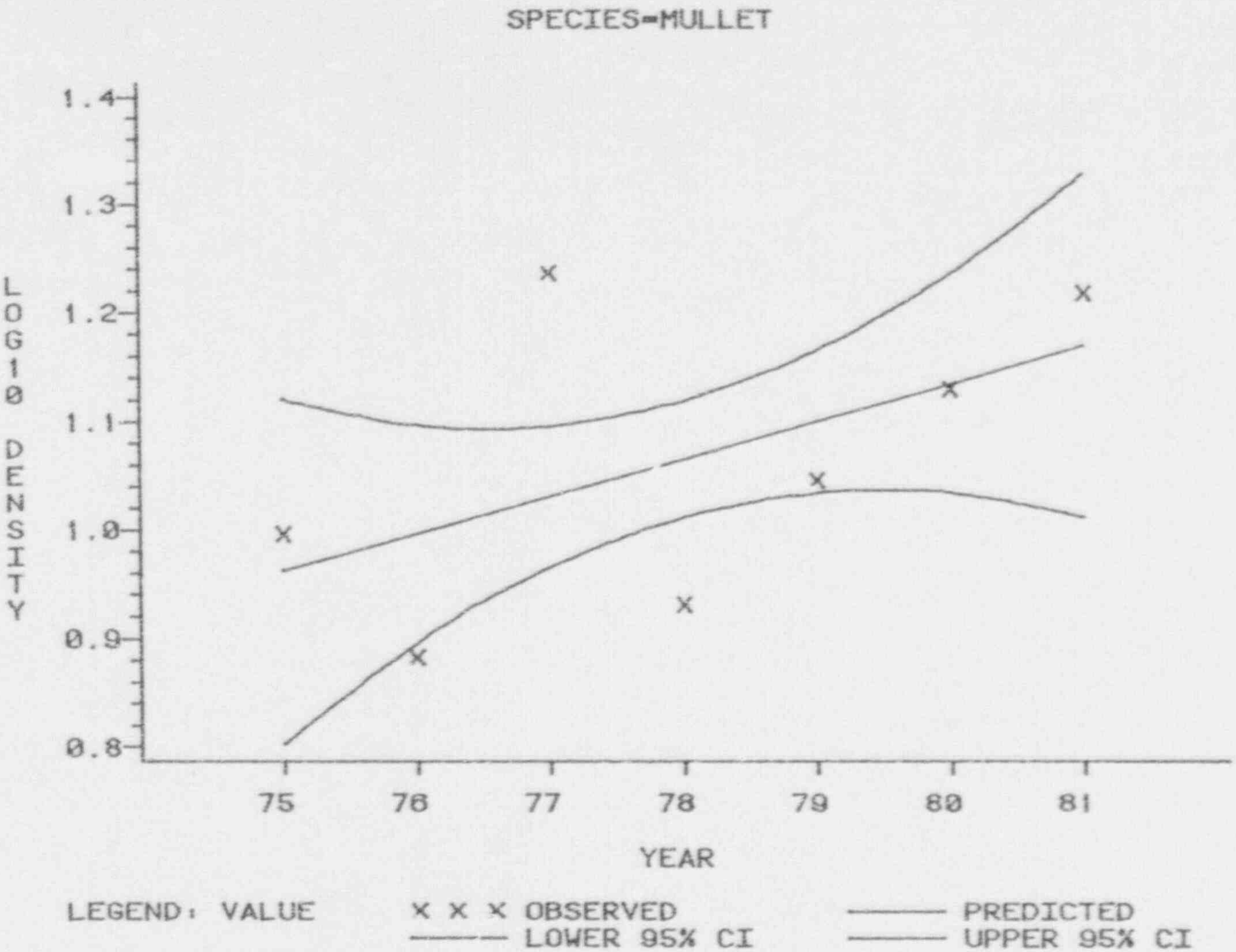

Figure 7.22 Impingement trend analysis

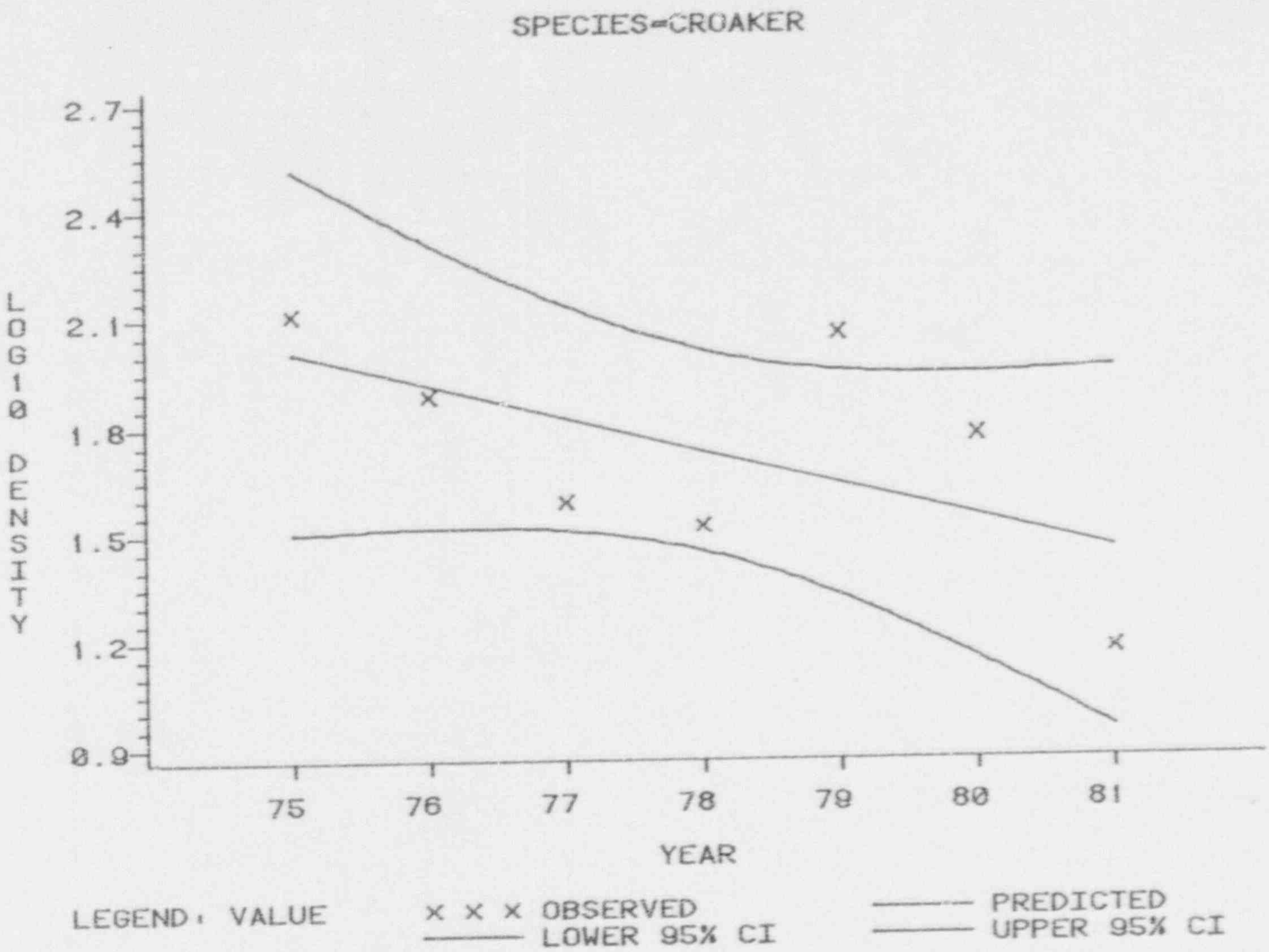

Figure 7.23 Impingement Trend Analysis

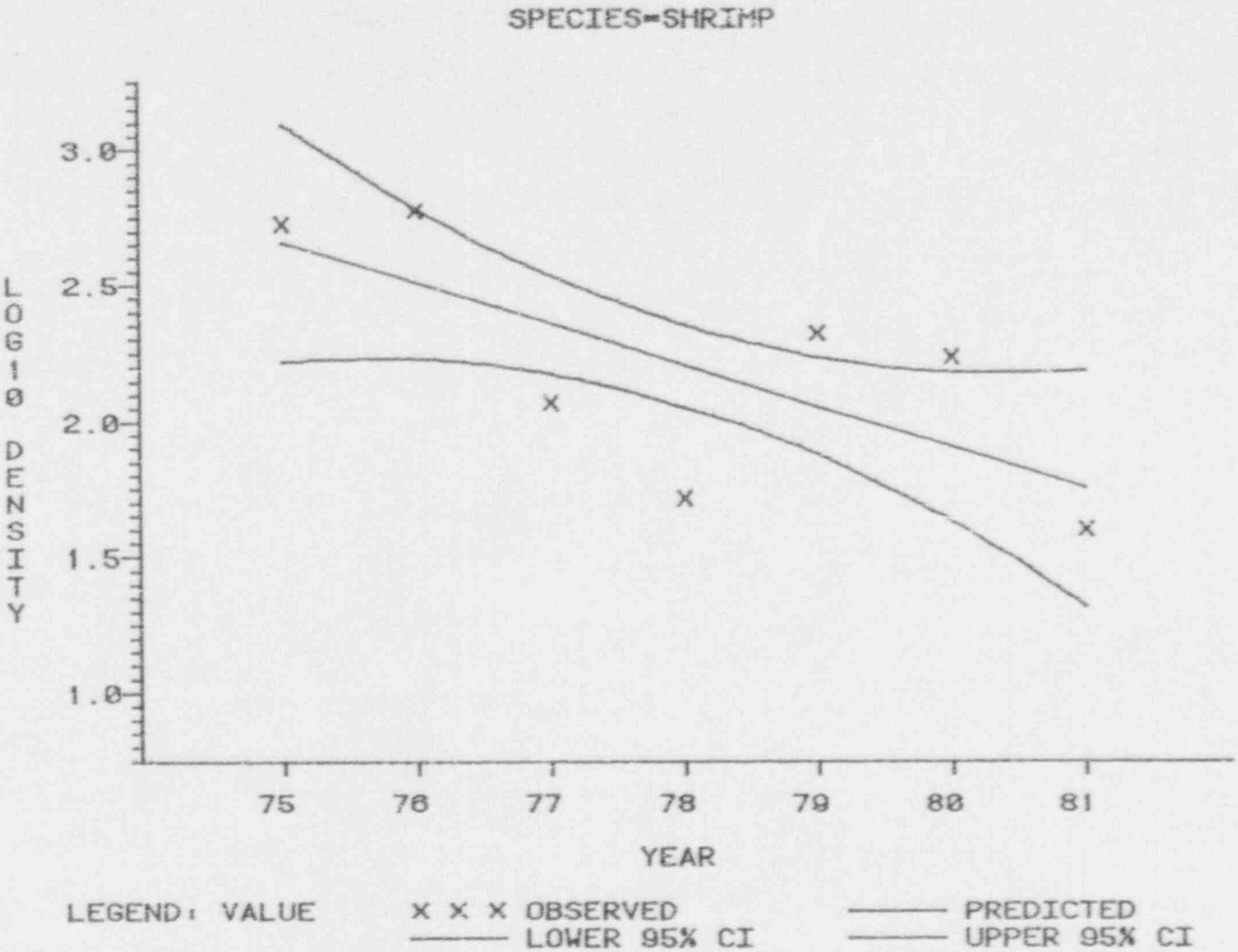

Figure 7.24 Impingement trend analysis

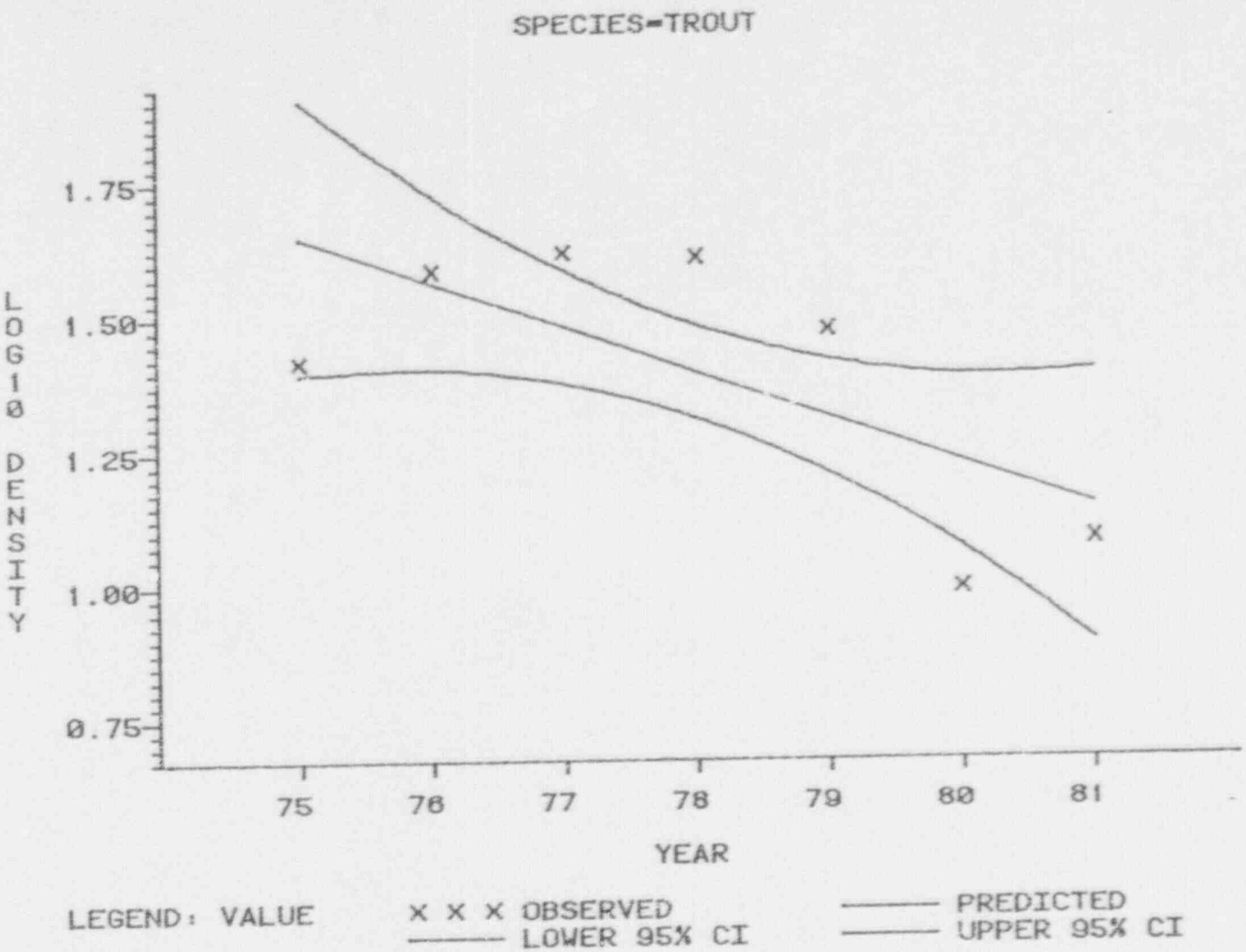

Figure 7.25 Impingement trend analysis

8.0 LITERATURE CITED

Birkhead, W. S., C. R. Bennett, E. R. Pendleton, and B. J. Copeland. 1977. Nursery utilization of the Dutchman Creek estuary, North Carolina, 1971-1976. Raleigh, N.C.: North Carolina State University.

Carolina Power & Light Company. 1974. Brunswick Steam Electric Plant, impingement studies, January 19, 1974 - November 4, 1974. Raleigh, N.C.

______________. 1975a. Brunswick Steam Electric Plant, impingement studies, January 19, 1974 - January 18, 1975. Raleigh, N.C.

______________. 1975b. Ecological monitoring of the borrow pit and freshwater drainage canal at Brunswick Steam Electric Plant, Southport, North Carolina, May 1974 - July 1975. Raleigh, North Carolina.

______________. 1977a. Ecological monitoring of the borrow pit and freshwater drainage canal at Brunswick Steam Electric Plant, Southport, North Carolina, January - December 1976. Raleigh, North Carolina.

______________. 1977b. Impingement studies at the Brunswick Steam Electric Plant, 1975 - 1976. Raleigh, N.C.

______________. 1979a. Intake canal tide monitoring at the Brunswick Steam Electric Plant, February 20, 1975 - August 8, 1978. BSEP Cape Fear Studies, Volume II. New Hill, North Carolina.

______________. 1979b. Ocean thermal plume studies at the Brunswick Steam Electric Plant. 1975-1978. BSEP Cape Fear Studies, Volume IV. New Hill, North Carolina.

______________. 1979c. Brunswick Steam Electric Plant, ocean larval fish, November 1976 - August 1978. BSEP Cape Fear Studies, Volume V. New Hill, North Carolina.

______________. 1979d. Impingement studies at the Brunswick Steam Electric Plant, Southport, North Carolina, 1974 - 1978. BSEP Cape Fear Studies, Volume XVII. New Hill, N.C.

______________. 1979e. Special river Tucker trawl study. BSEP Cape Fear Studies, Volume V, Addendum 1. New Hill, North Carolina.

______________. 1980a. Supplement 1, Brunswick Steam Electric Plant, Cape Fear Studies, 1979 Monitoring Report. Southport, N.C.

______________. 1980b. Brunswick Steam Electric Plant, Cape Fear Studies, Interpretive Report, January 1980. New Hill, N.C.

Carpenter, J. H. 1968. Disposal of waste heat, Brunswick Steam Electric Plant, Carolina Power & Light Company: interim report. Raleigh, N.C.

Carpenter, J. H. and W. L. Yonts. 1979. Dye tracer and current meter studies of the Cape Fear estuary, 1976 - 1978. BSEP Cape Fear Studies, Volume I. Raleigh, N.C.: Carolina Power & Light Company.

Copeland, B. J. and W. S. Birkhead. 1972. Some ecological studies of the lower Cape Fear River estuary, ocean outfall and Dutchman Creek, 1971. Raleigh, N.C.: North Carolina State University.

______________. 1973a. Dutchman Creek estuary, North Carolina, as a nursery area. Raleigh, N.C.: North Carolina State University.

______________. 1973b. Baseline ecology of the lower Cape Fear River estuary and ocean off Oak Island, North Carolina, 1971 - 1972. Raleigh, N.C.: North Carolina State University.

Copeland, B. J. and R. G. Hodson. 1977. Larvae and postlarvae in the Cape Fear estuary, North Carolina - 1976 - 1977. Raleigh, N.C.: North Carolina State University.

Copeland, B. J., W. S. Birkhead, and R. G. Hodson. 1974a. Intensive sampling of the Brunswick Power Plant intake area and discharge canal, January - March 1974. Raleigh, N.C.: North Carolina State University. 78 pp.

______________. 1974b. Ecological monitoring of the area of Brunswick Nuclear Power Plant, 1971 - 1973. Raleigh, N.C.: North Carolina State University.

______________. 1974c. Intensive sampling of the Brunswick Power Plant intake areas and discharge canal. January - September 1974. Raleigh, N.C.: North Carolina State University.

Copeland, B. J., R. G. Hodson, and W. S. Birkhead. 1975. Entrainment and entrainment mortality at the Brunswick Nuclear Power Plant, p. 1-31. In B. J. Copeland (ed.), Report on entrainment and entrainment mortality of zooplankton and larvae, and impingement and movement of fish. Raleigh, N.C.: North Carolina State University.

Copeland, B. J., R. G. Hodson, and R. J. Monroe. 1979. Larvae and postlarvae in the Cape Fear estuary, North Carolina, during operation of the Brunswick Steam Electric Plant, 1974 - 1978. Raleigh, N.C.: North Carolina State University.

Hildebrand, S. F. and L. E. Cable. 1930. Development and life history of fourteen teleostean fishes at Beaufort, North Carolina. U. S. Bur. Fish. Bull. 46:383-488.

Hobbie, J. E. 1971. Some ecological measurements of the Cape Fear River. Raleigh, N.C.: North Carolina State University.

Hodson, R. G. 1979. Utilization of marsh habitats as primary nursery areas by young fish and shrimp, Cape Fear estuary, North Carolina. BSEP Cape Fear Studies, Volume VIII. Raleigh, N.C.: North Carolina State University.

Hodson, R. G., R. G. Fechhelm, and R. J. Monroe. 1979. Temperature tolerance of spot *Leiostomus xanthurus*, in the Cape Fear River Estuary, N.C.

Hodson, R. G., C. R. Bennett, and R. J. Monroe. 1981. Ichthyoplankton samples for simultaneous replicate samples at surface and bottom. Estuaries 4(3):176-184.

Hunt, J. H. et al. 1979. Relationship between environmental factors and brown shrimp production in Pamlico Sound, North Carolina. Chapel Hill, N.C.: University of North Carolina.

Hodson, R. G., J. W. Schneider, and B. J. Copeland. 1977. Assessment of entrainment during one unit operation of the Brunswick Steam Electric Plant, 1974-1976. Raleigh, N.C.: North Carolina State University.

Hogarth, W. T. and K. L. Nichols. 1981. Brunswick Steam Electric Plant intake modifications to reduce entrainment and impingement losses. New Hill, N.C.: Carolina Power & Light Company.

Huish, M. T. and C. Benedict. 1976. Studies of sonically tagged fish in the lower Cape Fear River. Raleigh, N.C.: North Carolina State University.

MacPherson, K. A., R. W. Laney, and W. S. Birkhead. 1976. Brunswick Steam Electric Plant, amended shrimp tagging studies in the Cape Fear River, January 15, 1976. Raleigh, N.C.: Carolina Power & Light Company.

_______________. 1977. Brunswick Steam Electric Plant, shrimp tagging studies in the Cape Fear River, September - October 1976. Raleigh, N.C.: Carolina Power & Light Company.

Pritchard, D. W. 1967. What is an estuary: physical viewpoint, p. 3-5. In G. H. Lauff (ed.), Estuaries, Washington, DC: AAAS.

Rulifson, R. A. and M. T. Huish. 1975. Temperature and current velocity effects on juvenile striped mullet, spot, and pinfish swimming performances. Raleigh, N.C.: North Carolina State University.

Schwartz, F. J. 1974. An ecological study in the vicinity of the Brunswick Power Plant of the fishes utilizing the lower Cape Fear River and adjacent ocean. Morehead City, N.C.: University of North Carolina Institute of Marine Sciences.

Schwartz, F. J. et al. 1975. An ecological study in the vicinity of the Brunswick Power Plant of the fishes, crabs, and shrimps utilizing the lower Cape Fear River, Carolina Beach Inlet, and adjacent ocean cape: A partial report for the period 23 July 1973 through 30 May 1974. Morehead City, N.C.: University of North Carolina Institute of Marine Sciences.

______________. 1979a. An ecological study of fishes and invertebrate macrofauna utilizing the Cape Fear River estuary, Carolina Beach Inlet and adjacent Atlantic Ocean, 1973 - 1977. BSEP Cape Fear Studies, Volume XIV. Morehead City, N.C.: University of North Carolina Institute of Marine Sciences.

______________. 1979b. An ecological study of fishes and invertebrate macrofauna utilizing the Cape Fear River estuary, Carolina Beach Inlet and adjacent Atlantic Ocean, 1973. BSEP Cape Fear Studies, Volume XIVa. Morehead City, N.C.: University of North Carolina Institute of Marine Sciences.

______________. 1979c. An ecological study of fishes and invertebrate macrofauna utilizing the Cape Fear River estuary, Carolina Beach Inlet and adjacent Atlantic Ocean, 1974. BSEP Cape Fear Studies, Volume XIVb. Morehead City, N.C.: University of North Carolina Institute of Marine Sciences.

______________. 1979d. An ecological study of fishes and invertebrate macrofauna utilizing the Cape Fear River estuary, Carolina Beach Inlet and adjacent Atlantic Ocean, 1975. BSEP Cape Fear Studies, Volume XIVc. Morehead City, N.C.: University of North Carolina Institute of Marine Sciences.

______________. 1979e. An ecological study of fishes and invertebrate macrofauna utilizing the Cape Fear River estuary, Carolina Beach Inlet and adjacent Atlantic Ocean, 1976. BSEP Cape Fear Studies, Volume XIVd. Morehead City, N.C.: University of North Carolina Institute of Marine Sciences.

______________. 1979f. An ecological study of fishes and invertebrate macrofauna utilizing the Cape Fear River estuary, Carolina Beach Inlet and adjacent Atlantic Ocean, 1977. BSEP Cape Fear Studies, Volume XIVe. Morehead City, N.C.: University of North Carolina Institute of Marine Sciences.

______________. 1979g. An ecological study of fishes and invertebrate macrofauna utilizing the Cape Fear River estuary, Carolina Beach Inlet and adjacent Atlantic Ocean, 1978. BSEP Cape Fear Studies, Volume XV. Morehead City, N.C.: University of North Carolina Institute of Marine Sciences.

Seneca, E. D. and L. M. Stroud. 1973. Summary: An analysis of the effects of the Brunswick Nuclear Power Plant on the productivity of *Spartina alterniflora* (smooth cordgrass) in the Oak Island Marsh, Dutchman's Creek, Walden's Creek, and Snow's Marsh. Raleigh, N.C.: North Carolina State University Department of Botany.

Seneca, E. D. et al. 1974. An analysis of the effects of the Brunswick Nuclear Power Plant on the productivity of *Spartina alterniflora* (smooth cordgrass) in the Dutchman Creek, Oak Island, Snow's Marsh and Waldens Creek Marshes, Brunswick County, North Carolina, 1973-1974. Raleigh, N.C.: North Carolina State University Department of Botany.

________________. 1975. An analysis of the effects of the Brunswick Nuclear Power Plant on the productivity of *Spartina alterniflora* (smooth cordgrass) in the Dutchman Creek, Oak Island, Snow's Marsh and Waldens Creek marshes, Brunswick County, North Carolina, 1974-1975. Raleigh, N.C.: North Carolina State University Department of Botany.

________________. 1976. An analysis of the effects of the Brunswick Nuclear Power Plant on the productivity of *Spartina alterniflora* (smooth cordgrass) in the Dutchman Creek, Oak Island, Snow's Marsh and Waldens Creek marshes, Brunswick County, North Carolina, 1975-1976. Raleigh, N.C.: North Carolina State University Department of Botany.

________________. 1977. An analysis of the effects of the Brunswick Nuclear Power Plant on the productivity of *Spartina alterniflora* (smooth cordgrass) in the Dutchman Creek, Oak Island, Snow's Marsh and Waldens Creek marshes, Brunswick County, North Carolina, 1976-1977. Raleigh, N.C.: North Carolina State University Department of Botany.

________________. 1979. An analysis of the effects of the Brunswick Nuclear Power Plant on the productivity of *Spartina alterniflora* (smooth cordgrass) in the Dutchman Creek, Oak Island, Snow's Marsh and Waldens Creek marshes, Brunswick County, North Carolina, 1978-1979. BSEP Cape Fear Studies, Volume XI. Raleigh, N.C.: North Carolina State University Department of Botany.

________________. 1980. An analysis of the effects of the Brunswick Nuclear Power Plant on the productivity of *Spartina alterniflora* (smooth cordgrass) in the Dutchman Creek, Oak Island, Snow's Marsh and Waldens Creek Marshes. Raleigh, N.C.: North Carolina State University Department of Botany.

University of North Carolina Sea Grant College Program. Coastwatch. August 1981. Raleigh, N.C.

Weinstein, M. P. 1979a. High marsh study, Cape Fear River, 1978. BSEP Cape Fear Studies, Volume IX. Pearl River, N.Y.: Lawler, Matusky & Skelly Engineers.

________________. 1979b. Larval retention report, Cape Fear River, 1978. BSEP Cape Fear Studies, Volume X. Pearl River, New York: Lawler, Matusky and Skelly Engineers.

Williams, J. B. 1978. Productivity, population dynamics, and physiological ecology of the dwarf surf clam, *Mulinia lateralis*, near a power plant intake canal, Southport, North Carolina. Raleigh, N.C.: North Carolina State University.

Appendix A

Daily Impingement Temperature
and Salinity Statistics

January 1975 - December 1981

Appendix A BSEP IMPINGEMENT JANUARY 1975 - DECEMBER 1981
DAILY STATISTICS ON TEMPERATURE & SALINITY.

	WATER TEMPERATURE				SALINITY			
DATE	MIN	MEAN	MAX	N	MIN	MEAN	MAX	N
01JAN75	11.7	12.2	13.0	3	16.0	17.0	18.8	3
02JAN75	9.9	10.9	12.0	2	12.3	13.9	15.6	2
03JAN75	7.8	10.3	12.2	3	11.5	12.8	13.7	3
04JAN75	10.6	11.0	11.5	3	14.4	17.0	19.0	3
05JAN75	10.0	10.5	11.2	3	12.0	13.3	14.4	3
06JAN75	9.1	9.7	10.8	3	12.1	13.3	14.7	3
07JAN75	10.2	10.5	10.9	2	15.0	17.3	19.6	2
08JAN75	8.7	10.5	12.3	2	11.8	12.5	13.2	2
09JAN75	11.4	12.7	14.1	2	14.2	14.3	14.5	2
10JAN75	10.5	12.3	14.2	2	12.5	12.7	12.9	2
11JAN75	14.6	14.6	14.6	2	12.5	12.9	13.3	2
12JAN75	13.6	14.0	14.3	3	10.8	13.7	18.0	3
13JAN75	10.9	12.8	14.5	3	10.9	11.4	12.5	3
14JAN75	10.7	10.7	10.7	1	13.2	13.2	13.2	1
15JAN75	7.0	8.1	9.9	3	5.5	8.1	9.5	3
16JAN75	8.5	9.9	11.4	2	6.7	9.1	11.6	2
17JAN75	8.4	9.2	10.1	2	6.0	6.5	7.0	2
18JAN75	8.7	9.9	11.3	3	5.5	6.1	7.2	3
04FEB75	10.5	10.5	10.5	1	2.0	2.0	2.0	1
13FEB75	10.0	10.3	10.7	2	6.3	6.9	7.5	2
19FEB75	12.9	13.4	13.9	2	9.0	12.7	16.4	2
25FEB75	13.6	13.6	13.6	1	6.0	6.0	6.0	1
04MAR75	7.0	9.7	11.3	3	8.8	10.3	12.7	3
11MAR75	12.3	13.9	15.7	3	13.1	13.8	14.8	3
18MAR75	11.7	12.8	14.4	3	10.0	10.3	10.9	3
25MAR75	15.8	17.4	19.4	3	3.7	4.3	4.8	3
01APR75	13.9	14.4	15.1	3	2.5	5.9	10.6	3
08APR75	14.1	14.9	16.1	3	11.0	11.7	12.6	3
15APR75	13.1	15.1	16.5	3	12.1	14.2	16.0	3
25APR75	20.0	20.7	21.2	3	15.0	16.1	18.0	3
29APR75	21.7	22.0	22.4	2	16.4	16.6	16.9	2
06MAY75	22.2	22.6	23.0	3	17.0	19.3	22.0	3
13MAY75	22.0	23.4	24.3	3	19.8	20.7	21.4	3
20MAY75	24.6	24.6	24.6	1	20.7	20.7	20.7	1
27MAY75	26.9	27.3	28.0	3	14.8	16.1	17.0	3
03JUN75	26.7	26.9	27.3	3	16.4	17.2	18.3	3
10JUN75	23.1	24.4	25.6	3	15.2	15.9	17.3	3
17JUN75	26.7	27.1	27.5	2	22.0	22.2	22.4	2
01JUL75	25.7	26.8	28.0	3	23.0	23.3	23.9	3
08JUL75	27.6	27.7	27.9	3	24.0	24.4	24.7	3
15JUL75	26.7	27.3	28.5	3	10.9	14.6	19.2	3
22JUL75	27.8	28.1	28.7	3	2.4	2.6	3.0	3
28JUL75	25.5	28.0	30.1	3	3.4	4.0	4.7	3

Appendix A (CONTINUED)

DATE	WATER TEMPERATURE MIN	MEAN	MAX	N	SALINITY MIN	MEAN	MAX	N
05AUG75	28.9	29.3	29.7	2	15.7	17.0	18.3	2
12AUG75	26.6	28.6	30.7	3	19.6	20.1	20.4	3
19AUG75	28.1	29.1	30.1	2	18.6	19.5	20.5	2
24AUG75	30.0	30.3	30.9	3	21.5	22.1	22.6	3
02SEP75	27.6	28.5	29.3	3	20.9	22.6	23.7	3
09SEP75	25.0	26.7	28.2	3	24.2	25.8	27.5	3
17SEP75	22.4	23.2	24.1	2	22.3	22.3	22.3	2
23SEP75	26.2	26.3	26.5	3	16.8	17.8	18.5	3
30SEP75	23.2	24.0	24.7	3	8.9	10.8	13.6	3
07OCT75	21.5	21.7	22.0	3	11.5	11.8	12.0	3
14OCT75	21.9	22.6	23.4	2	14.1	14.4	14.8	2
21OCT75	15.5	18.0	20.6	2	14.5	15.1	15.8	2
01NOV75	14.9	16.4	17.9	2	18.8	19.0	19.2	2
04NOV75	19.0	20.7	22.4	2	19.1	20.9	22.7	2
11NOV75	19.8	19.8	19.8	1	22.0	22.0	22.0	1
17NOV75	20.0	20.0	20.0	1	15.2	15.2	15.2	1
25NOV75	12.9	12.9	13.0	2	18.6	18.7	18.8	2
02DEC75	11.4	12.4	13.5	2	16.6	20.4	24.3	2
08DEC75	11.9	12.7	13.5	2	19.7	20.2	20.7	2
15DEC75	13.8	13.8	13.8	2	17.1	18.4	19.8	2
23DEC75	5.8	5.8	5.8	1	16.1	16.1	16.1	1
29DEC75	8.4	8.7	9.0	2	9.6	12.3	15.0	2
07JAN76	10.2	10.2	10.2	1	6.0	6.0	6.0	1
13JAN76	9.0	9.2	9.4	2	10.0	11.0	12.0	2
26JAN76	12.7	13.4	14.2	2	11.3	11.6	12.0	2
02FEB76	8.0	8.7	10.0	3	3.3	6.4	12.0	3
09FEB76	6.5	7.8	9.1	3	6.0	6.6	7.4	3
17FEB76	13.0	13.7	14.5	3	11.9	13.6	14.8	3
23FEB76	10.0	11.8	14.0	8	14.7	16.9	19.2	8
02MAR76	17.9	18.7	19.3	3	17.0	17.2	17.5	3
08MAR76	17.4	17.9	18.6	3	16.5	17.5	18.2	3
15MAR76	13.8	14.3	15.0	3	16.3	17.2	18.8	3
29MAR76	14.9	17.4	18.9	3	14.8	16.0	18.3	3
12APR76	15.8	16.6	17.1	3	18.3	18.5	18.7	3
21APR76	22.9	22.9	22.9	1	21.1	21.1	21.1	1
04MAY76	19.6	20.5	21.4	2	22.6	22.7	22.9	2
27MAY76	21.2	21.7	22.2	2	20.8	20.8	20.9	2
02JUN76	25.3	25.6	26.0	2	23.3	23.3	23.3	2
07JUN76	20.6	21.0	21.4	2	15.4	15.4	15.4	2
14JUN76	25.1	25.8	27.1	3	17.8	18.1	18.5	3
21JUN76	24.7	25.2	25.7	3	18.0	18.4	18.8	3
28JUN76	26.1	26.9	27.4	3	8.6	9.0	9.7	3
07JUL76	26.4	26.6	26.9	3	11.6	14.3	17.7	3
13JUL76	28.2	28.5	29.0	3	9.2	10.5	11.6	3

Appendix A (CONTINUED)

DATE	WATER TEMPERATURE MIN	MEAN	MAX	N	SALINITY MIN	MEAN	MAX	N
19JUL76	26.8	28.0	29.0	3	15.0	16.0	16.9	3
27JUL76	28.0	28.0	28.1	2	15.9	16.2	16.5	2
03AUG76	25.7	26.3	26.6	4	20.8	21.5	22.5	4
10AUG76	27.0	28.2	29.1	3	17.1	18.5	19.7	3
17AUG76	26.4	27.0	27.6	2	16.4	17.0	17.7	2
24AUG76	27.3	27.6	28.0	2	13.1	13.6	14.2	2
31AUG76	25.2	25.8	26.1	3	18.9	19.9	20.7	3
07SEP76	26.1	26.2	26.2	3	22.8	22.9	23.2	3
14SEP76	23.8	24.1	24.4	3	24.2	24.5	24.8	3
21SEP76	23.9	24.8	25.7	3	22.6	23.3	24.2	3
28SEP76	25.4	25.6	26.0	3	26.4	26.8	27.5	3
05OCT76	21.5	22.7	23.4	3	26.6	26.9	27.3	3
12OCT76	18.5	19.1	19.8	3	25.5	26.5	27.5	3
18OCT76	15.9	16.6	17.9	3	18.4	20.2	23.7	3
26OCT76	18.0	18.3	18.5	2	23.5	23.6	23.8	2
29NOV76	10.0	10.8	11.5	2	23.0	23.8	24.5	2
08DEC76	7.8	7.8	7.8	2	25.0	25.0	25.0	2
28DEC76	7.2	7.8	8.5	2	12.9	12.9	13.0	2
05JAN77	5.2	6.5	6.9	2	15.5	16.6	17.8	2
10JAN77	7.7	8.3	9.1	3	18.1	18.5	19.0	3
02MAR77	9.6	10.4	11.0	3	14.2	16.4	20.5	3
08MAR77	10.1	11.7	12.7	3	11.7	11.9	12.2	3
16MAR77	15.9	17.0	18.1	2	8.4	9.3	10.2	2
23MAR77	13.5	13.7	14.0	3	6.8	7.0	7.4	3
29MAR77	16.0	16.8	17.6	3	5.1	5.6	6.4	3
05APR77	17.3	18.5	19.7	2	7.2	9.5	11.9	2
12APR77	18.1	18.1	18.1	3	11.1	11.1	11.1	3
19APR77	22.6	22.9	23.3	3	16.5	17.1	17.9	3
26APR77	18.6	21.1	23.3	3	16.4	17.3	18.0	3
02MAY77	21.3	22.1	23.0	2	20.9	21.4	22.0	2
10MAY77	19.0	20.3	22.0	3	24.0	26.3	28.0	3
17MAY77	22.6	23.7	24.6	3	19.8	21.1	22.0	3
24MAY77	22.9	23.7	24.4	3	26.9	27.2	27.6	3
01JUN77	26.2	27.0	27.6	3	18.0	18.8	19.9	3
07JUN77	23.0	25.5	26.7	3	16.6	16.7	16.7	3
14JUN77	25.3	26.4	27.1	3	21.2	21.9	22.8	3
21JUN77	27.5	28.0	28.2	3	24.3	24.3	24.3	3
06JUL77	29.3	29.8	30.5	3	24.5	27.4	29.1	3
09AUG77	30.0	30.0	30.0	2	26.0	26.0	26.0	2
16AUG77	28.0	28.9	29.8	2	30.6	30.7	30.8	2
23AUG77	27.3	27.3	27.3	2	22.0	23.4	24.8	2
30AUG77	27.0	27.0	27.0	2	25.0	25.5	26.0	2
06SEP77	29.2	29.2	29.2	2	24.0	24.0	24.0	2
20SEP77	26.2	26.6	27.0	2	13.8	14.1	14.4	2

Appendix A (CONTINUED)

DATE	WATER TEMPERATURE MIN	MEAN	MAX	N	SALINITY MIN	MEAN	MAX	N
26SEP77	26.8	27.0	27.2	2	20.5	20.5	20.6	2
04OCT77	22.0	22.0	22.0	2	24.0	24.0	24.0	2
11OCT77	20.3	20.3	20.3	2	25.0	25.0	25.0	2
20OCT77	17.5	17.5	17.5	1	22.0	22.0	22.0	1
24OCT77	18.3	18.3	18.3	3	20.8	20.8	20.8	3
01NOV77	18.0	18.0	18.0	2	16.0	16.0	16.0	2
07NOV77	19.0	19.0	19.0	2	14.0	14.5	15.0	2
14NOV77	15.0	15.0	15.0	2	4.0	4.0	4.0	2
20NOV77	13.5	13.8	14.0	2	10.0	10.5	11.0	2
29NOV77	13.0	13.0	13.0	2	14.0	14.5	15.0	2
05DEC77	13.5	13.8	14.0	2	16.0	16.0	16.0	2
12DEC77	6.5	6.8	7.0	2	16.0	16.0	16.0	2
20DEC77	11.5	11.9	12.4	2	17.1	18.1	19.2	2
28DEC77	6.5	6.5	6.5	2	7.0	8.5	10.0	2
09JAN78	7.5	7.8	8.0	3	8.5	13.5	16.0	3
17JAN78	5.2	5.9	6.5	4	2.0	4.9	6.0	4
24JAN78	6.0	6.0	6.0	3	4.0	4.0	4.0	3
20FEB78	4.0	4.5	5.0	2	14.0	14.8	15.5	2
01MAR78	6.0	6.0	6.0	1	20.0	20.0	20.0	1
22MAR78	12.0	12.5	13.0	2	6.0	7.5	9.0	2
10APR78	16.0	16.0	16.0	1	17.0	17.0	17.0	1
18APR78	15.5	[illegible]	16.5	3	14.0	15.3	18.0	3
26APR78	17.5	17.8	18.0	2	18.0	18.5	19.0	2
02MAY78	13.5	13.8	14.0	2	2.0	2.5	3.0	2
08MAY78	16.3	16.6	17.0	2	4.0	4.5	5.0	2
16MAY78	16.0	16.8	17.5	2	1.0	1.5	2.0	2
23MAY78	21.0	21.0	21.0	1	8.0	8.0	8.0	1
30MAY78	21.5	22.1	22.8	2	15.0	15.5	16.0	2
05JUN78	23.0	23.5	24.0	2	20.0	20.0	20.0	2
13JUN78	23.0	23.5	24.0	2	13.0	14.0	15.0	2
19JUN78	24.8	24.8	24.8	5	20.0	20.0	20.0	5
26JUN78	24.5	25.5	26.0	3	24.0	24.3	25.0	3
05JUL78	22.0	23.2	24.2	3	15.0	15.7	16.0	3
10JUL78	22.0	24.5	26.5	3	17.5	18.8	21.0	3
17JUL78	23.5	24.3	25.5	3	18.0	20.0	22.0	3
24JUL78	25.5	26.7	27.5	3	14.0	14.7	15.0	3
09AUG78	28.0	29.2	30.5	3	17.0	17.7	18.0	3
14AUG78	29.5	29.7	29.9	2	10.0	12.0	14.0	2
28AUG78	27.4	28.1	28.5	3	21.0	21.3	22.0	3
05SEP78	27.3	28.1	28.7	3	22.5	23.3	24.0	3
11SEP78	26.5	26.8	27.2	2	20.0	21.0	22.0	2
18SEP78	28.1	28.1	28.2	2	24.0	24.5	25.0	2
25SEP78	25.0	25.8	26.5	2	25.0	25.5	26.0	2
02OCT78	23.0	23.4	23.9	3	27.0	28.0	29.0	3

Appendix A (CONTINUED)

DATE	WATER TEMPERATURE MIN	MEAN	MAX	N	SALINITY MIN	MEAN	MAX	N
09OCT78	20.2	20.9	21.5	3	26.0	27.0	28.0	3
16OCT78	19.5	21.0	22.0	3	29.0	30.3	32.0	3
23OCT78	20.0	20.7	21.0	3	30.0	30.0	30.0	3
30OCT78	18.5	19.5	20.0	3	29.0	30.7	34.0	3
06NOV78	17.4	17.8	18.0	3	30.0	31.3	32.0	3
13NOV78	17.7	18.2	18.8	2	30.0	30.5	31.0	2
20NOV78	17.0	17.7	18.0	3	27.0	28.0	29.0	3
27NOV78	16.0	16.0	16.1	2	27.0	27.5	28.0	2
04DEC78	17.0	17.3	17.8	3	26.0	26.0	26.0	3
11DEC78	12.0	12.8	13.5	3	10.0	11.3	14.0	3
18DEC78	11.0	11.0	11.0	3	15.0	15.7	16.0	3
27DEC78	9.0	10.5	11.5	3	12.0	14.3	16.0	3
02JAN79	9.0	11.3	13.5	2	10.0	10.5	11.0	2
08JAN79	6.5	10.2	12.5	3	8.0	9.5	11.0	2
15JAN79	6.6	7.0	7.5	2	10.0	11.5	13.0	2
23JAN79	8.0	8.0	8.0	1	11.0	11.0	11.0	1
30JAN79	6.0	6.0	6.0	1	6.0	6.0	6.0	1
08FEB79	6.0	6.0	6.0	1	12.0	12.0	12.0	1
13FEB79	5.5	5.5	5.5	1	18.0	18.0	18.0	1
21FEB79	6.0	6.0	6.0	1	16.0	16.0	16.0	1
28FEB79	9.5	9.5	9.5	1	4.0	4.0	4.0	1
07MAR79	12.5	12.5	12.5	1	0.0	0.0	0.0	1
15MAR79	13.5	13.5	13.5	1	2.0	2.0	2.0	1
20MAR79	13.0	13.0	13.0	1	2.0	2.0	2.0	1
30MAR79	16.0	16.0	16.0	1	6.0	6.0	6.0	1
03APR79	18.0	18.0	18.0	1	5.0	5.0	5.0	1
11APR79	17.5	17.5	17.5	1	4.0	4.0	4.0	1
18APR79	17.5	17.5	17.5	1	11.0	11.0	11.0	1
27APR79	20.5	20.5	20.5	1	17.0	17.0	17.0	1
01MAY79	20.0	20.0	20.0	1	12.0	12.0	12.0	1
07MAY79	21.0	21.5	22.0	2	14.0	14.5	15.0	2
15MAY79	23.0	23.5	24.0	2	13.0	13.5	14.0	2
21MAY79	21.5	22.2	22.5	3	6.0	8.0	10.0	3
31MAY79	24.0	24.5	24.5	2	8.0	10.0	12.0	2
14JUN79	22.0	22.7	23.0	3	14.0	14.3	15.0	3
18JUN79	24.0	24.5	25.5	3	12.0	13.3	15.0	3
26JUN79	23.5	23.6	23.7	3	15.0	15.8	16.3	3
02JUL79	25.5	26.3	27.0	3	19.0	19.3	20.0	3
19JUL79	27.5	28.0	28.5	3	23.0	23.0	23.0	3
24JUL79	28.0	28.7	29.0	3	24.0	24.0	24.0	3
31JUL79	29.0	29.5	30.0	3	15.0	16.3	18.0	3
16AUG79	26.0	26.0	26.0	3	25.0	26.3	29.0	3
23AUG79	27.5	28.5	29.0	3	26.0	26.7	28.0	3
30AUG79	28.0	28.8	29.5	3	25.0	26.7	28.0	3

Appendix A (CONTINUED)

DATE	WATER TEMPERATURE MIN	MEAN	MAX	N	SALINITY MIN	MEAN	MAX	N
18SEP79	23.0	23.5	24.0	3	10.0	10.7	12.0	3
25SEP79	22.0	22.3	22.5	3	13.0	13.7	14.0	3
01OCT79	24.0	24.2	24.5	3	12.0	13.3	14.0	3
09OCT79	21.0	21.2	21.5	3	10.0	10.7	12.0	3
15OCT79	18.0	18.0	18.0	3	12.0	13.7	15.0	3
24OCT79	20.0	20.2	20.5	3	18.0	19.5	20.5	3
30OCT79	18.5	19.2	19.5	3	22.0	22.3	23.0	3
05NOV79	14.5	15.8	17.0	2	24.0	24.0	24.0	2
14NOV79	13.5	14.3	15.0	2	11.0	12.5	14.0	2
20NOV79	13.0	14.0	15.0	2	4.0	4.5	5.0	2
28NOV79	15.0	15.8	17.0	3	12.0	13.7	15.0	3
04DEC79	10.0	10.5	11.0	3	10.0	11.7	14.0	3
12DEC79	10.5	11.5	12.5	2	10.0	10.0	10.0	2
18DEC79	9.0	9.7	10.0	3	17.0	18.7	20.0	3
26DEC79	9.5	10.0	10.5	3	13.0	15.7	20.0	3
02JAN80	9.0	9.3	10.0	3	19.0	19.8	20.5	3
09JAN80	8.9	9.4	10.0	2	16.0	17.0	18.0	2
15JAN80	10.0	10.0	10.0	2	14.0	15.0	16.0	2
22JAN80	9.5	10.3	11.0	3	5.0	6.7	8.0	3
29JAN80	8.5	9.5	10.0	3	6.0	8.0	10.0	3
05FEB80	5.2	5.4	5.5	4	12.0	14.3	16.0	4
12FEB80	5.0	5.8	6.5	4	9.0	12.5	16.0	4
19FEB80	7.0	7.0	7.0	4	12.0	13.0	14.0	4
26FEB80	5.5	7.8	9.5	4	10.0	11.3	14.0	4
04MAR80	5.0	5.3	5.8	3	15.0	16.3	19.0	3
11MAR80	9.0	9.5	10.0	2	6.0	8.5	11.0	2
18MAR80	11.0	12.0	13.0	2	4.0	5.0	6.0	2
26MAR80	13.0	13.3	13.5	2	3.0	3.5	4.0	2
01APR80	15.0	15.5	16.0	2	2.0	4.0	6.0	2
08APR80	17.0	17.1	17.3	2	5.0	5.5	6.0	2
17APR80	16.0	16.3	16.5	2	8.0	10.5	13.0	2
23APR80	18.0	18.8	19.5	2	12.0	12.0	12.0	2
30APR80	19.0	19.5	20.0	2	16.0	16.0	16.0	2
05MAY80	20.3	20.9	21.5	2	16.0	16.0	16.0	2
13MAY80	22.5	22.8	23.1	2	21.0	21.0	21.0	2
20MAY80	23.8	23.8	23.8	2	23.0	23.5	24.0	2
27MAY80	23.3	24.0	24.8	2	14.0	15.5	17.0	2
03JUL80	28.9	28.9	28.9	1	19.0	19.0	19.0	1
09JUL80	29.0	29.0	29.0	2	20.0	20.3	20.5	2
15JUL80	27.0	27.8	28.6	2	21.0	21.5	22.0	2
22JUL80	29.0	29.5	30.0	2	22.0	22.0	22.0	2
29JUL80	23.0	24.9	26.9	2	21.0	21.5	22.0	2
07AUG80	30.2	30.8	31.4	2	21.0	21.5	22.0	2
12AUG80	28.9	29.0	29.2	2	25.0	26.3	27.5	2

Appendix A (CONTINUED)

DATE	WATER TEMPERATURE MIN	MEAN	MAX	N	SALINITY MIN	MEAN	MAX	N
19AUG80	27.5	27.8	28.0	2	25.0	25.5	26.0	2
27AUG80	27.0	27.3	27.6	3	31.0	31.7	32.0	3
02SEP80	28.0	28.4	29.2	3	32.0	32.0	32.0	3
09SEP80	26.5	27.0	27.5	2	31.0	31.5	32.0	2
16SEP80	27.3	27.8	28.0	3	30.0	30.7	31.0	3
23SEP80	19.5	24.8	27.5	3	26.0	28.0	29.0	3
30SEP80	22.0	22.7	23.0	3	27.0	28.3	30.0	3
07OCT80	18.3	19.5	20.2	3	24.0	25.7	28.0	3
14OCT80	20.0	20.1	20.2	3	24.5	25.2	26.0	3
21OCT80	21.0	21.5	22.0	2	28.0	28.0	28.0	2
28OCT80	17.9	17.9	18.0	2	30.0	30.0	30.0	2
04NOV80	16.0	16.6	17.0	3	25.5	28.5	31.0	3
11NOV80	13.6	14.4	15.3	2	27.0	27.5	28.0	2
18NOV80	11.9	13.5	15.2	2	28.0	28.0	28.0	2
25NOV80	12.2	13.1	14.0	2	28.0	28.5	29.0	2
02DEC80	11.5	12.5	13.5	2	24.0	25.0	26.0	2
09DEC80	13.0	13.3	13.5	2	27.0	28.5	30.0	2
16DEC80	11.5	11.8	12.1	2	24.0	24.5	25.0	2
23DEC80	7.0	7.3	7.5	2	24.0	25.5	27.0	2
30DEC80	7.8	8.4	9.0	2	20.0	21.0	22.0	2
06JAN81	6.9	7.1	7.2	3	18.0	18.0	18.0	3
14JAN81	5.5	6.3	7.1	4	21.0	24.3	26.0	4
20JAN81	6.0	6.0	6.1	3	25.0	25.3	26.0	3
27JAN81	8.0	8.2	8.8	8	19.0	21.5	24.0	8
03FEB81	5.0	6.0	6.9	5	15.0	18.6	21.0	5
10FEB81	7.0	9.0	11.5	6	19.0	21.3	25.0	6
17FEB81	10.0	10.1	10.2	4	15.0	17.5	20.0	4
24FEB81	9.2	10.2	11.5	5	9.0	12.1	15.0	5
03MAR81	10.8	11.4	12.4	3	15.3	18.4	22.0	3
10MAR81	11.8	12.0	12.2	3	20.0	20.7	22.0	3
17MAR81	11.0	11.3	11.8	4	19.0	20.8	23.0	4
24MAR81	10.8	10.9	11.0	2	20.0	20.0	20.0	2
31MAR81	16.1	17.0	18.0	2	19.0	19.5	20.0	2
07APR81	15.4	16.1	16.9	2	19.0	20.0	21.0	2
14APR81	19.0	19.3	19.5	2	21.0	23.0	25.0	2
21APR81	17.1	17.6	18.1	2	25.0	25.0	25.0	2
28APR81	21.2	22.1	23.0	2	18.0	22.3	26.5	2
05MAY81	21.0	21.5	22.0	2	22.0	26.0	30.0	2
19MAY81	23.2	23.6	24.0	2	26.0	26.5	27.0	2
26MAY81	23.9	24.4	25.0	2	23.0	24.0	25.0	2
03JUN81	27.0	27.1	27.3	2	21.0	21.5	22.0	2
09JUN81	28.0	28.3	28.5	2	20.0	21.0	22.0	2
16JUN81	29.9	30.4	31.0	2	20.0	20.0	20.0	2
23JUN81	28.2	28.9	29.7	2	20.0	20.5	21.0	2

Appendix A (CONTINUED)

DATE	WATER TEMPERATURE MIN	MEAN	MAX	N	SALINITY MIN	MEAN	MAX	N
30JUN81	25.0	26.1	27.2	2	25.0	25.0	25.0	2
07JUL81	27.1	28.0	28.9	2	23.0	24.5	26.0	2
14JUL81	29.0	29.9	30.9	2	23.0	24.0	25.0	2
21JUL81	28.8	29.4	30.0	2	26.0	26.0	26.0	2
28JUL81	29.1	30.0	31.0	2	25.0	27.5	30.0	2
05AUG81	28.0	28.5	29.0	2	22.0	22.0	22.0	2
11AUG81	26.0	28.5	31.0	2	18.0	19.0	20.0	2
18AUG81	25.0	25.5	26.0	2	14.0	14.5	15.0	2
25AUG81	23.0	23.5	24.0	2	6.0	8.0	10.0	2
01SEP81	26.0	26.0	26.0	2	10.0	10.0	10.0	2
08SEP81	26.0	26.0	26.0	2	15.0	17.5	20.0	2
15SEP81	27.0	27.3	27.5	2	18.0	20.0	22.0	2
22SEP81	23.2	23.7	24.3	2	20.0	21.0	22.0	2
29SEP81	21.5	22.3	23.0	2	26.0	26.5	27.0	2
06OCT81	22.0	22.5	23.0	2	25.0	26.5	28.0	2
15OCT81	16.5	16.5	16.5	1	30.0	30.5	31.0	2
20OCT81	16.0	17.0	18.0	2	31.0	31.5	32.0	2
27OCT81	18.0	18.5	19.0	2	30.0	30.0	30.0	2
03NOV81	18.0	18.3	18.5	2	22.0	23.0	24.0	2
10NOV81	16.0	16.5	17.0	2	25.0	26.0	27.0	2
17NOV81	12.0	12.5	13.0	2	28.0	28.5	29.0	2
24NOV81	9.5	10.8	12.0	2	29.0	29.0	29.0	2
01DEC81	12.5	13.0	13.5	2	30.0	30.0	30.0	2
08DEC81	8.2	9.8	11.5	2	26.0	27.0	28.0	2
15DEC81	7.0	8.0	9.0	2	28.0	28.0	28.0	2
22DEC81	8.5	9.3	10.0	2	16.0	18.5	21.0	2
29DEC81	7.0	8.0	9.0	2	15.0	17.5	20.0	2