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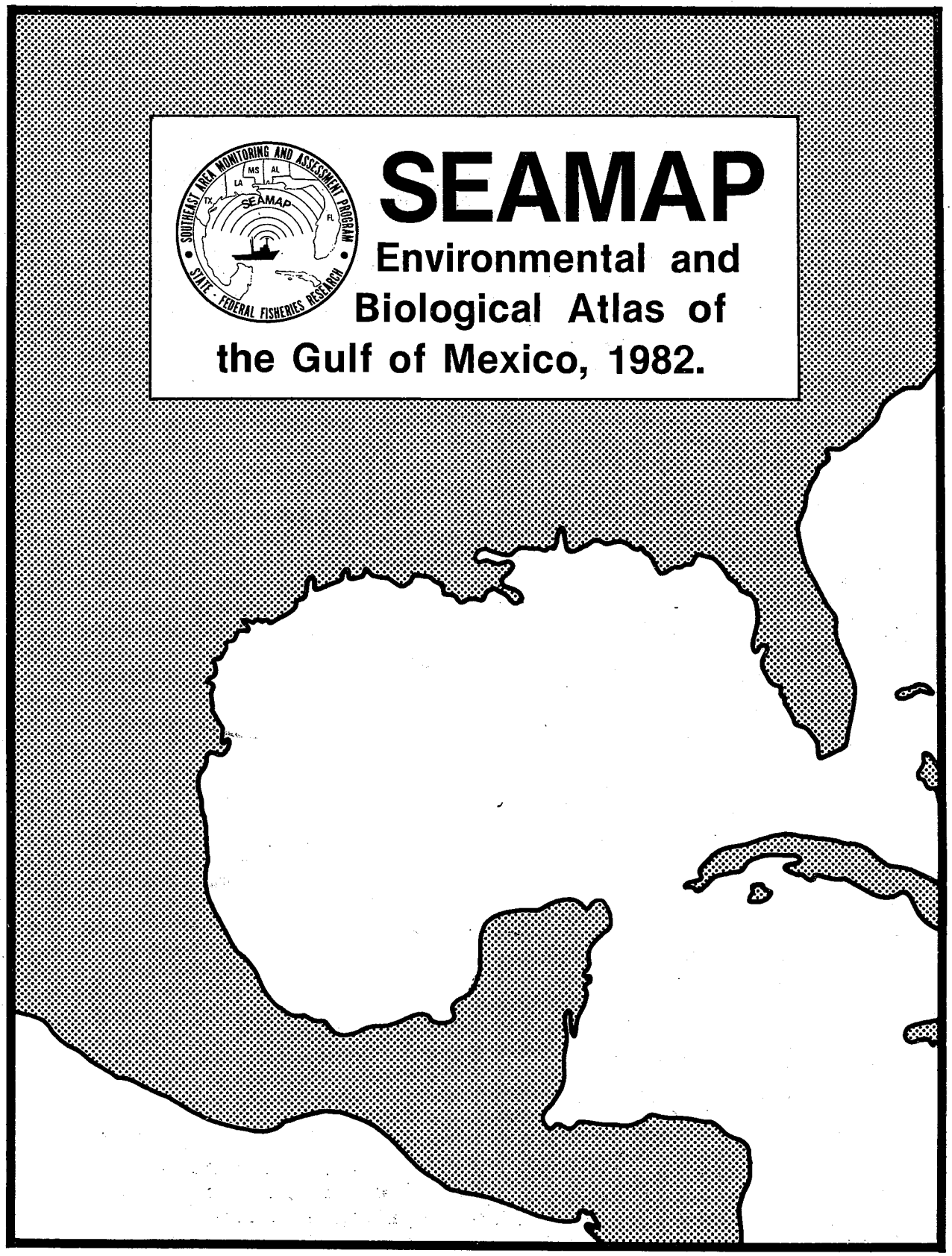

Southeast Area Monitoring and Assessment Program (SEAMAP)
of the Gulf States Marine Fisheries Commission

This project was supported in part by the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, under State/Federal Project Number SF-5-1.

SEAMAP Environmental and Biological Atlas of the Gulf of Mexico, 1982

Prepared

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ACKNOWLEDGMENTS

The development of this Atlas illustrates the outstanding cooperation between the five Gulf states and the NMFS to coordinate research activities in the Gulf of Mexico. The Data Coordinating Work Group would like to thank those individuals and agencies who made the SEAMAP Program possible. Those agencies are as follows: Florida Department of Natural Resources, Alabama Department of Conservation and Natural Resources, Gulf Coast Research Laboratory (representing the State of Mississippi), Louisiana Department of Wildlife and Fisheries, Texas Parks and Wildlife Department and the National Marine Fisheries Service, Southeast Fisheries Center.

INTRODUCTION

The Gulf of Mexico covers approximately 625,000 square miles and includes some of the most productive fishing grounds in the world. Along the Gulf of Mexico, the five Gulf States, Federal government, universities and other marine agencies play a major role in the protection and management of living marine resources and their environment. In the past, individual states, universities and Federal agencies involved with marine fisheries research and management have generally collected scientific data independently.

In January 1981 a new program called the Southeast Area Monitoring and Assessment Program (SEAMAP) was implemented by the National Marine Fisheries Service (NMFS) and the fishery management agencies of the Gulf states. Coordination was through the Gulf States Marine Fisheries Commission. SEAMAP is a state/Federal/university program designed for collection, management, and dissemination of fishery-independent data and information in the Gulf of Mexico. The program's main objectives are to increase the effectiveness of data collection so that management decisions can be based on the best possible scientific information collected for the least possible cost, and to disseminate research data in a timely manner.

The Southeast Fisheries Center (SEFC) developed the initial SEAMAP documention which presented a strategy for the program consisting of statements of goals, procedures and resource requirements. This document was presented to the Technical Coordinating Committee (TCC) of the Gulf States Marine Fisheries Commission (GSMFC) in March 1981. With this document for guidance, the TCC met in December 1981 and organized a SEAMAP Subcommittee which consisted of one member from each marine fisheries management agency (Alabama Department of Conservation and Natural Resources; Florida Department of Natural Resources; Louisiana Department of Wildlife and Fisheries; Mississippi Department of Wildlife Conservation, represented by the Gulf Coast Research Laboratory; and Texas Parks and Wildlife Department), in the five Gulf states and NMFS. The Subcommittee's primary objectives were to organize and act upon the first SEAMAP assessment activities in the Gulf of Mexico for 1982.

In January of 1982, the Subcommittee met and organized three summer Gulf assessment activities which included ichthyoplankton, shrimp and bottomfish and environmental surveys. The objectives of the 1982 surveys were to determine distribution and abundance of ichthyoplankton and trawl-caught organisms and to document the environmental factors that might affect their distribution and abundance. These Gulf-wide fishery-independent surveys were the initial phase of a long-term resource monitoring program to document changes in availability of organisms and the factors that affect this availability. The Texas shrimp closure formed the basis for the shrimp and bottomfish work (see Nichols, S., 1982), while the basis for the ichthyoplankton work was the assessment of tuna eggs and larvae in the open Gulf of Mexico (see Sherman, et al., 1983).

Data from the 1982 surveys were collated on an NMFS computer system. Since one of the main objectives of SEAMAP is dissemination of information, the SEAMAP Subcommittee agreed that data from the three assessment surveys should be integrated into a SEAMAP Atlas. The Atlas would serve as a summary of the 1982 SEAMAP data and would inform interested individuals of the data available and of how, when and where they were collected.

MATERIALS AND METHODS

Sampling was conducted in the Gulf of Mexico. The ichthyoplankton samples covered the entire Gulf (Figure 1). Offshore ichthyoplankton samples were taken in April and May 1982 (Figure 2), while inshore ichthyoplankton and shrimp and bottomfish samples were confined to waters less than 50 fathoms in depth in June and July (Figure 3). Environmental data were collected concurrently with both the ichthyoplankton and trawl samples.

The vessels that participated in the SEAMAP ichthyoplankton survey were the National Oceanic and Atmospheric Administration (NOAA) vessel OREGON II, from 14 April to 14 July; the Florida Department of Natural Resources vessel HERNAN CORTEZ, from 14 April to 5 June; Florida Institute of Technology vessel BELLOWS, from 14 April to 1 May; and the Mexican research vessels ONJUKU and BIP-IX, which operated in Mexican waters from 14 April to 26 May. The vessels that participated in the shrimp and bottomfish survey and also sampled the ichthyoplankton included the OREGON II; the Gulf Coast Research Laboratory vessel TOMMY MUNRO, from 1 June to 4 June; the JEFF AND TINA, under charter to NMFS, from 15 June to 29 June; and Texas Parks and Wildlife Department vessels, the WESTERN GULF and the FLORENCE MAY, under charter to Texas, from 22 June to 14 July. The states of Alabama and Louisiana used several small vessels to collect samples within 5 fm.

Plankton

Ichthyoplankton samples were taken at stations arranged in a systematic grid across the Gulf of Mexico (Figure 1). The sampling period was from 14 April to 25 May, from the 50-fm curve to the limit of the U. S. Fisheries Conservation Zone and in conjunction with the shrimp and bottomfish survey from 1 June to 14 July for those waters inside 50 fm (Figure 3). A systematic grid was chosen because of the large survey area. Stations were set at a minimum of 30-mile (1/2 degree) intervals.

Sampling gear and procedures were similar to those recommended by Kramer et al. (1972), Smith and Richardson (1977), and Posgay and Marak (1980). Plankton sampling gear consisted of standard 61-cm bongos and a 2x1 m neuston net. The bongos were fitted with 0.333 mm mesh nets with either hard (PVC) or soft (0.333 mm mesh net) cod ends. A flowmeter was mounted off center in the mouth of each net to record volume of water filtered. A time-depth recorder was attached to the cable above the bongos to record depth and path of tow. A 100-lb weight was attached approximately 1 m below the bongo frame attachment. The neuston net consisted of a 2x1 m pipe frame fitted with a 0.948-mm mesh net on which the cod end was tied off.

At each plankton station an oblique bongo tow and a surface neuston tow were made. In deep water (more than 95 m), a standard (Smith and Richardson, 1977) oblique bongo tow was made, i.e., to 200 m or to 5 m off the bottom in depths less than 200 m, with a payout speed of 50 m/min, 1-minute setting time, and a retrieval speed of 20 m/min, at a vessel speed of 1.5 knots to maintain a 45° wire angle. In shallow water (less than 95 m), tows were modified to extend tow times to a minimum of 10 min in clear water or 5 min in turbid water to filter enough water for quantitative purposes. This was done by reducing wire payout and retrieval rates, although during each tow, payout and retrieval rates were held constant so that the water column was sampled uniformly. For all bongo tows a 45° wire angle was maintained. Neuston tows were made at the surface with the net half submerged for a duration of 10-min at a vessel speed of 1.5 knots.

Surface 10-min plankton tows were taken by Louisiana inshore vessels. One-half-meter nets with 0.333 mm mesh and hard cod ends were used. Plankton tows were made in conjunction with shrimp and bottomfish samples.

At the NMFS Miami Laboratory, plankton samples were curated and the sampling data computerized. One bongo sample and the neuston sample from each station were transshipped to the Polish Sorting Center (PSC) for sorting and identification. All ichthyoplankton, both eggs and larvae, were removed from each sample and the fish larvae were identified to major groups (families in most cases). All sorted specimens were returned to NMFS, Miami. Selected groups were identified to species, verified, and computerized. Other groups were provided to specialists for identification and analysis. Plankton volumes were determined according to procedures in Smith and Richardson (1977). The second bongo sample from each station was retained in Miami as a backup for those samples transshipped to the PSC.

Following this procedure, the sorted ichthyoplankton samples were transferred to the Florida Department of Natural Resources for long-term storage under museum-like conditions.

Shrimp and Bottomfish

Shrimp and bottomfish sampling was carried out from Perdido Bay, Florida to the Rio Grande River, Texas (Figure 3). East of the Mississippi River samples were taken between 1 June and 10 June, in shrimp statistical areas 10 through 12 (Figure 3). Trawl samples were taken west of the Mississippi to the Texas-Louisiana boundary between 15 June and 22 June, in statistical areas 13 through 17. Waters off Texas (statistical areas 18 to 21) were sampled from 22 June to 14 July.

The sampling strategy and a description of the statistical rationale for the sampling design are described in Appendix 1. Briefly, the strategy was as follows: sample sites were chosen randomly in three areas (east of the Mississippi River, west of the Mississippi River and off Texas) stratified by depth and statistical area (two areas per stratum). In depths of 5 to 25 fm, stations consisted of 1-fm strata; out to 30 fm, stations covered 2.5-fm strata and to 50 fm, stations consisted of 5-fm strata.

Trawls were towed perpendicularly to the shoreline and covered the entire depth stratum on each station. Single trawls were towed a maximum of 30 min and for certain stations, a series of consecutive trawl-tows was necessary to cover a given depth stratum. All of these stations were sampled using a 40-foot shrimp trawl at night (Gutherz and Pellegrin, in press).

The Louisiana Department of Wildlife and Fisheries (LDWF) sampled seven study areas in statistical areas 12 through 17, using vessels under 30 feet in length. Samples were taken along transects with 16-foot shrimp trawls during daylight hours. Five samples were taken each week throughout the survey period in each study area. A sampling station consisted of a 1-fm increment from about 1 to 5 fm. Tows were made perpendicularly to shore. Alabama vessels using 16-foot trawls in daylight hours sampled passes leading from Mobile Bay to the Gulf of Mexico.

All Penaeus spp. shrimp were separated from each trawl catch at each station. Total count and weight by species were recorded for pooled trawls within 1-fm strata. A sample of up to 200 shrimp of each species from each trawl-tow was sexed and measured to obtain length-frequency information. Estimated total numbers were derived from the total weights of those processed. Other species of fish and invertebrates captured were identified and enumerated. The taking of weight and individual measurements on species other than commercial shrimp was optional.

Environmental Data

Environmental data were collected at each station sampled during both the Ichthyoplankton and Shrimp and Bottomfish Surveys (Figure 2 and Figure 3). The parameters sampled were standardized in methodology although the actual parameters measured varied among the vessels participating in the survey. The following parameters were recorded:

Station: Station identifiers varied by state and vessel.
Cruise: Cruise numbers varied by state and vessels.
Date:
Time: Local time and time zone, recorded at the start of sampling.
Latitude/Longitude: Recorded to seconds.
Wind Speed and Direction: Recorded in kilometers per hour with direction recorded in compass degrees from which the wind was blowing.
Wave Height: Estimated visually in meters.
Cloud Cover: Estimated visually in percent cloud cover.
Barometric Pressure: Recorded in millibars.
Secchi Depth: Secchi depth in meters was estimated at each daylight station. Standard oceanographic 50-cm white discs were lowered until no longer visible, then raised until visible. If different depths were recorded, an average was used.

The following parameters were measured at the surface, mid-depth and bottom (for bottom depths greater than 200 m, a maximum depth of 200 m

was recorded):

Water Temperature: Temperatures were measured by a hand-held thermometer onboard ship, in situ electronic sensors and in situ reversing thermometers. There was no attempt to intercalibrate the various instrumentation used by individual vessels although several vessels did sample together for calibration of other sampling gear. Some error can be expected.

Salinity: Salinity samples were collected by Niskin bottles and stored for laboratory analysis with a Plessy salinometer. Conductivity probes and refractometers were used by some vessels.

Chlorophyll: Chlorophyll samples were collected and frozen for later laboratory analysis. The general procedure for shipboard collection of chlorophyll was to collect 3 l sea water. The water sample, to which 1 ml 1% (W/V) suspension of $MgCO_3$ was added, was filtered through GF/C filters. After filtration the filters were wrapped in opaque material and frozen.

Laboratory analyses for chlorophyll a and phaeophytin a (chlorophyll degradation product) were conducted by fluorometry and spectrophotometry. The general extraction procedures prior to measurement were similar. Samples analyzed by spectrophotometer included other chlorophyllous products but have not been included as data in this report. The methodology used is described in Strickland and Parsons (1972) and Jeffrey and Humphrey (1975).

Dissolved oxygen values were measured by electronic probes (depending on the vessel) or by the standard Winkler method. No attempts were made to intercalibrate the methods. When oxygen was measured from samples collected from a Niskin sampler, the oxygen bottles were allowed to overflow a minimum of 10 seconds to eliminate oxygen contamination. The tubing which delivered the water sample was inserted to the bottom of the bottle and withdrawn while the sample was still flowing.

Satellite Images

During the 1982 SEAMAP cruises, six useful images of the Gulf of Mexico were received by the Coastal Zone Color Scanner (CZCS) on the Nimbus-7 satellite. The dates were 6 April, 9 May, 11 May, 14 June, 10 July and 27 July. The CZCS is a scanning radiometer with five visible and near-infrared bands (443, 520, 550, 670, and 750 nanometers) and one thermal infrared (10.5 to 12.5 micrometers) band. It has an active scan width of about 1600 km and a nominal nadir ground resolution of 825 m.

Digital tapes were acquired from the National Aeronautics and Space Administration (NASA), and processed to derived chlorophyll maps on the Fisheries Image Processing System (FIPS) at the NMFS Mississippi Laboratories facility in Slidell, LA. Processing steps consisted of the following:

1. Atmospheric correction for Rayleigh and aerosol scattering were made

by the techniques of Gordon, et al. (1983) and Smith and Wilson (1981).

2. Chlorophyll concentrations were calculated by the bio-optical algorithm of Clark (1981).

3. Images were geographically referenced by a two-dimensional polynomial least squares regression.

4. Images were then resampled to a rectangular, latitude-longitude grid with ground resolution elements of .66 x .66 km.

The derived chlorophyll maps for each image date were plotted for the eastern and western Gulf of Mexico (82° to 90° W. and 90° to 98° W.) from 25° N. to 30.5° N. For plotting purposes, the chlorophyll concentrations were divided into eight representative broad-scale ranges. Absolute sea-surface temperature charts could not be produced from the CZCS data because the thermal sensor was unstable and not accurately calibrated. Instead, thermal data were collected by the Advanced Very High Resolution Radiometers (AVHRR) carried on the NOAA polar orbiter series of satellites. The data were analyzed by the National Environmental Satellite Data and Information Service (NESDIS).

Relative sea-surface temperature charts, as well as larger scale derived chlorophyll charts for specific areas, can be made available to SEAMAP cooperators (see Discussion section).

RESULTS

Plankton

Identified ichthyoplankton samples were returned from the Polish Sorting Center to the NMFS Miami Laboratory in July 1983. The data were verified and incorporated into the SEAMAP data system. Distribution plots by family are incomplete for the Atlas at this time. Plankton station locations (Figure 1) and plots of temperature and salinity taken from shipboard for April and May (Figures 4 to 7) are included here, as are the satellite chlorophyll data (Figures 8 to 12) for this period. The April and May data have been treated separately due to seasonal changes in the environmental parameters, as can be seen in Figures 13 to 29 which show water temperatures measured by satellite at intervals from 6 April to 4 August 1982.

In addition to the samples collected in U. S. waters of the Gulf of Mexico by the SEAMAP participants, the government of Mexico also collected plankton samples. These samples were collected and processed using the same methods and have been returned to Mexico for analysis. Thus the entire Gulf of Mexico was sampled for plankton and larval fishes during April and May 1982. The distribution of catches of carangids (Figure 30), clupeids (Figure 31), sciaenids (Figure 32), and scombrids (Figure 33) is given for completed samples.

Shrimp and Bottomfish

The June and July trawl and/or environmental sampling stations are shown in Figure 3. Environmental data are presented in Figures 34 to 41 for June and July. Satellite chlorophyll data are shown in Figures 42 to 47.

Biological distributions are given in Figures 48 and 89. Contour plots of number/hr are followed by a plot of lb/hr for each species. In the plots of lb/hr, only stations where at least some of the species were caught are shown. Thus a zero value indicates a catch of less than 1 lb/hr. Table 1 is a listing, in order of numerical abundance, of all species caught during trawling operations. The information is given in order of commercial shrimp, finfish and invertebrates. Tables 2a, b and c through 12a, b and c present the environmental and 40-ft trawl biological data from each statistical zone by depth. Tables 13a, b and c include the same variables from 16-foot trawls inside 5 fm.

Quick-Time Data Management

The SEAMAP Subcommittee agreed it was imperative to the success of the SEAMAP Program to distribute data on a quick-time basis to the fishing industry and to persons interested in SEAMAP. To distribute quick-time data, NMFS, in cooperation with NASA, installed a data communications terminal aboard the OREGON II. The terminal was designed to operate through the ATS-3 satellite system located in geostationary orbit over the Pacific Ocean. This enabled personnel aboard the OREGON II to transmit daily catch rates and environmental data to the NMFS computer system through a PDP 11/34 computer, located at the NMFS Mississippi Laboratories, Bay St. Louis, Mississippi. This system was operated in conjunction with a variety of other systems on three other vessels. The R/V TOMMY MUNRO transmitted through the ARGOS satellite and the M/V JEFF AND TINA radioed its data to the NMFS Galveston Laboratory. The system aboard the R/V TOMMY MUNRO was later transferred to the R/V WESTERN GULF.

Summarized data were distributed weekly as computer plots and data listings. These plots showed station locations, brown and white shrimp catches in lb/hr and count/lb, and total finfish catch in lb/hr.

DISCUSSION

The quasisynoptic SEAMAP sampling program and the intended long-term nature of the sampling programs will provide an unparalleled baseline data set for use in many different kinds of studies. As an example, the ichthyoplankton samples will be available to students of taxonomy. The samples provide an opportunity to begin studies of life histories, bioenergetics, age and growth, life tables and ecological interactions and relationships. In addition to having the animals and knowing their relative distribution within the Gulf of Mexico, environmental relationships can be investigated from the data collected at each station. Satellite data from the Coastal Zone Color Scanner (CZCZ) can also be related to the animal distribution. Furthermore, the collections of fish eggs and larvae can be used to develop estimates of spawning populations of the adults.

Similar analyses and investigations can be undertaken with the shrimp and bottomfish data. In addition, the shrimp and bottomfish data can be utilized in management decisions, and because of the ability of the SEAMAP Program to process data quickly, the capability exists to optimize some fisheries on a real-time basis. The long-term data set on all of the species, not just those landed commercially, allows the opportunity to begin looking at the ecological interrelationships of the various fish and invertebrates, with the eventual goal of developing management models that take into account the multi-species nature of most of the fisheries in the Gulf.

The above provides a quick introduction to the value of the SEAMAP Program. There are a great many studies and other uses for these data that are not mentioned here. Some uses already have been made of the SEAMAP data. For example, during the quick-time data transmissions, an area of low dissolved oxygen was found off the Louisiana coast. The presence of this phenomenon and some of the related conditions and biological effects were summarized by Stuntz, et al. (1982). In addition to reporting the low oxygen phenomenon, the SEAMAP data were of use to some of the coastal states in determining the status of shrimp stocks and the whereabouts of the shrimp just as the seasons were to be opened.

SEAMAP data collected during the Shrimp/Bottomfish Survey already have been used extensively for fishery management purposes. In 1981, the Gulf of Mexico Fishery Management Council's (GMFMC) plan for shrimp was implemented (LSU Center for Wetland Resources, 1980). One of the management measures in the plan was the temporary closure of the Fishery Conservation Zone (FCZ) off Texas to shrimping. This closure complemented the traditional closure of the Texas Territorial Sea which normally occurs 1 June through 15 July each year. The purpose of the closure was to increase the yield of shrimp and to eliminate waste by discard of undersized brown shrimp.

The NMFS was charged with evaluating the effects of the closure and several reports were submitted to the GMFMC in December 1982. These reports were subsequently summarized in such publications as Mathews (1982), reporting on size and abundance of commercial shrimp collected by SEAMAP in 1982 as compared to similar data collected off Texas in 1981. Nichols (1982) also evaluated the 1981 and 1982 closures off Texas in terms of impacts on brown shrimp yields. After review of these data and other information the GMFMC voted to continue the closure in 1983.

Data Requests

It is the policy of the SEAMAP Subcommittee that all verified non-confidential SEAMAP data, collected specimens and samples shall be available to all SEAMAP participants, other fishery researchers and management organizations approved by the Subcommittee. This Atlas presents to those individuals interested in the data or specimens a chance to review the data in a summary form.

Data and specimen requests from SEAMAP participants, cooperators, and others will normally be handled on a first-come, first-serve and time-available basis. Because of personnel and funding limitations, however, certain priorities must be assigned to the data and specimen requests. These priorities will be reviewed by the SEAMAP Subcommittee. For further information on SEAMAP data management, see the SEAMAP Operations Plan: 1985-1990 (Gulf States Marine Fishery Commission).

Data requests and inquiries, as well as requests for plankton samples, can be made through the SEAMAP Coordinator by contacting the Gulf States Marine Fisheries Commission office, P. O. Box 726, Ocean Springs, MS 39564.

Table 1. SEAMAP species composition

Genus Species	Total Number Caught	Total Weight Caught (kg)	Number of Tows where Caught	% Frequency of Occurrence
Commercial Shrimp				
Penaeus aztecus	35549	1063.6	262	56.6
Penaeus duorarum	2644	148.6	96	20.7
Penaeus setiferous	232	25.0	44	9.5
Fish				
Micropogonias undulatus	26353	1557.4	132	28.5
Stenotomus caprinus	19326	914.4	183	39.5
Upeneus parvus	16855	421.2	115	24.8
Anchoa mitchilli	11730	31.7	71	15.3
Prionotus rubio	9086	227.0	147	31.7
Trachurus lathami	8575	378.2	101	21.8
Leiostomus xanthurus	6169	480.8	78	16.8
Syacium gunteri	4962	174.7	64	13.8
Diplectrum bivittatum	4730	257.9	113	24.4
Syacium papillosum	4145	180.0	70	15.1
Prionotus stearnsi	4002	94.3	90	19.4
Serranus atrobranchus	3958	85.7	78	16.8
Polydactylus octonemus	3346	70.2	55	11.9
Centropristes philadelphicus	3229	218.7	176	38.0
Saurida brasiliensis	2732	55.9	115	24.8
Sphoeroides parvus	2638	39.5	157	33.9
Cynoscion arenarius	2524	182.1	133	28.7
Stellifer lanceolatus	2171	37.4	33	7.1
Chloroscombrus chrysurus	2143	87.9	74	16.0
Prionotus paralatus	1815	56.1	88	19.0
Synodus foetens	1767	345.4	184	39.7
Anchoa hepsetus	1432	23.4	76	16.4
Porichthys plectrodon	1369	60.5	134	28.9
Lepophidium graellsi	1217	85.0	101	21.8
Bollmannia communis	1125	15.2	71	15.3
Prionotus salmonicolor	1114	99.6	64	13.8
Pristipomoides aquilonaris	1103	96.8	90	19.4
Peprilus burti	1014	90.5	68	14.7
Etropus crossotus	925	31.8	95	20.5
Syacium micrurum	911	31.6	32	6.9
Halieutichthys aculeatus	895	22.1	80	17.3
Lutjanus campechanus	878	251.3	71	15.3

Table 1. SEAMAP species composition (Cont'd)

Genus Species	Total Number Caught	Total Weight Caught (kg)	Number of Tows where Caught	% Frequency of Occurrence
Prionotus tribulus	817	40.0	59	12.7
Mullus auratus	736	29.3	33	7.1
Syacium spp.	612	33.6	25	5.4
Monacanthus hispidus	610	16.9	71	15.3
Scorpaena calcarata	607	21.9	46	9.9
Menticirrhus americanus	582	141.9	46	9.9
Lagocephalus laevigatus	567	45.4	77	16.6
Anchoa nasuta	546	2.2	10	2.2
Trichiurus lepturus	527	31.1	88	19.0
Priacanthus arenatus	523	23.1	53	11.4
Bellator militaris	500	15.0	38	8.2
Selene setapinnis	499	8.8	37	8.0
Lagodon rhomboides	483	49.8	44	9.5
Synodus poeyi	469	12.0	65	14.0
Symphurus plagiusa	460	19.8	90	19.4
Cyclopsetta chittendeni	333	63.6	88	19.0
Prionotus roseus	330	24.3	15	3.2
Citharichthys spilopterus	289	13.1	61	13.2
Chloroscombrus spp.	289	8.3	4	0.9
Cynoscion nothus	285	46.3	31	6.7
Steindachneria argentea	276	6.1	11	2.4
Hoplunnis macrurus	253	12.7	45	9.7
Engyophrys senta	235	5.3	37	8.0
Arius felis	208	28.1	36	7.8
Urophycis floridana	197	34.9	47	10.2
Lutjanus synagris	192	38.5	25	5.4
Haemulon aurolineatum	176	9.8	11	2.4
Anchoa spp.	169	1.6	4	0.9
Centropristis ocyurus	157	14.1	16	3.5
Eucinostomus gula	146	11.8	16	3.5
Orthopristis chrysoptera	143	16.1	20	4.3
Lepophidium graellsi	137	6.0	17	3.7
Larimus fasciatus	135	16.2	21	4.5
Brevoortia patronus	135	20.8	23	5.0
Peprilus alepidotus	127	6.8	32	6.9
Antennarius radiosus	119	4.9	42	9.1
Sphoeroides dorsalis	114	4.1	21	4.5
Caulolatilus intermedius	114	5.9	31	6.7
Ancyclopsetta dilecta	110	9.1	34	7.3
Cynoscion spp.	104	1.6	9	1.9
Prionotus ophryas	103	4.6	23	5.0

Table 1. SEAMAP species composition (Cont'd)

Genus Species	Total Number Caught	Total Weight Caught (kg)	Number of Tows where Caught	% Frequency of Occurrence
Equetus umbrosus	103	8.9	17	3.7
Ogcocephalus spp.	98	6.0	19	4.1
Harengula jaguana	92	9.5	17	3.7
Prionotus scitulus	80	3.7	14	3.0
Diplectrum formosum	80	7.6	12	2.6
Lepophidium spp.	73	6.4	12	2.6
Ogcocephalus spp.	72	2.6	11	2.4
Ophichthus gomesi	69	9.7	13	2.8
Urophycis cirrata	69	5.0	21	4.5
Trachinocephalus myops	66	12.2	14	3.0
Brotula barbata	65	15.0	28	6.0
Ogcocephalus parvus	64	1.2	14	3.0
Hildebrandia flava	63	11.4	22	4.8
Anchoviella perfasciata	59	0.8	6	1.3
Ophidion holbrooki	53	9.9	7	1.5
Ophidion welshi	52	5.9	21	4.5
Balistes capriscus	50	3.4	15	3.2
Gymnachirus texae	48	2.9	25	5.4
Prionotus carolinus	44	4.2	6	1.3
Prionotus spp.	43	0.3	2	0.4
Opisthonema oglinum	42	2.7	9	1.9
Trichopsetta ventralis	41	1.8	12	2.6
Sphoeroides nephelus	40	1.0	10	2.2
Scorpaena brasiliensis	39	2.3	6	1.3
Pagrus pagrus	36	3.3	4	0.9
Sphoeroides spengleri	33	1.2	9	1.9
Paralichthys lethostigma	32	24.4	13	2.8
Ogcocephalus nasutus	32	0.9	5	1.1
Lepophidium jeannae	31	3.5	11	2.4
Serraniculus pumilio	30	0.9	8	1.7
Kathetostoma albigutta	29	1.9	11	2.4
Urophycis regia	26	1.4	2	0.4
Bregmaceros atlanticus	25	1.7	17	3.7
Chaetodipterus faber	24	1.2	12	2.6
Etrumeus teres	21	1.0	6	1.3
Bagre marinus	20	0.8	6	1.3
Eucinostomus argenteus	20	1.7	2	0.4
Coryphaena spp.	19	6.2	1	0.2
Symphurus diomedianus	18	1.1	7	1.5
Aluterus schoepfi	18	1.1	3	0.6
Decapterus punctatus	17	1.6	7	1.5
Bothus spp.	16	0.6	3	0.6

Table 1. SEAMAP species composition (Cont'd)

Genus Species	Total Number Caught	Total Weight Caught (kg)	Number of Tows where Caught	% Frequency of Occurrence
Ophidion grayi	15	1.0	3	0.6
Ancyclopsetta quadrocellata	14	2.5	6	1.3
Citharichthys macrops	14	0.7	4	0.9
Raja texana	14	10.0	7	1.5
Dorosoma petenense	14	0.4	4	0.9
Synodus intermedius	13	1.8	3	0.6
Caranx hippos	13	0.7	8	1.7
Raja eglanteria	12	12.9	7	1.5
Caranx crysos	12	0.6	2	0.4
Ogcocephalus radiatus	12	0.5	6	1.3
Bairdiella chrysoura	12	1.0	9	1.9
Scomberomorus maculatus	11	3.6	9	1.9
Narcine brasiliensis	11	6.6	2	0.4
Pontinus longispinis	10	0.3	3	0.6
Equetus lanceolatus	10	0.9	2	0.4
Symphurus civitatus	10	0.4	3	0.6
Hirundichthys rondeleti	9	0.7	4	0.9
Bothus ocellatus	9	1.2	1	0.2
Trinectes maculatus	9	0.5	6	1.3
Triglidae (unidentified)	9	0.2	1	0.2
Chilomycterus schoepfi	7	1.2	5	1.1
Cypselurus melanurus	7	0.4	2	0.4
Pristigenys alta	7	0.6	3	0.6
Gymnothorax ocellatus	7	2.7	3	0.6
Rhinoptera bonasus	7	113.9	4	0.9
Selar crumenophthalmus	7	1.0	4	0.9
Gymnothorax spp.	6	1.0	1	0.2
Fistularia tabacaria	6	1.0	3	0.6
Monolene sessilicauda	6	0.4	2	0.4
Neomerinthe hemingwayi	6	2.5	3	0.6
Prionotus martis	6	0.3	2	0.4
Peristedion miniatum	6	0.3	3	0.6
Lactophrys quadricornis	5	0.5	2	0.4
Apogon maculatus	5	0.3	3	0.6
Astroscopus y-graecum	5	0.4	5	1.1
Serranus subligarius	5	0.1	2	0.4
Otophidium omostigmum	4	0.2	2	0.2
Gobiidae (unidentified)	4	0.1	1	0.2
Epinephelus flavolimbatus	4	8.5	3	0.6
Anchoa lyolepis	4	0.0	2	0.4
Rhomboplites aurorubens	3	0.2	1	0.2

Table 1. SEAMAP species composition (Cont'd)

Genus Species	Total Number Caught	Total Weight Caught (kg)	Number of Tows where Caught	% Frequency of Occurrence
Monacanthus ciliatus	3	0.1	1	0.2
Aluterus heudeloti	3	0.4	2	0.4
Gymnothorax saxicola	3	1.4	1	0.2
Zalieutes mcgintyi	3	0.2	1	0.2
Aluterus scriptus	3	2.7	2	0.4
Rhizoprionodon terraenovae	3	11.5	3	0.6
Serranus phoebe	3	0.3	2	0.4
Hemanthias leptus	3	0.2	2	0.4
Chaetodon ocellatus	3	0.2	1	0.2
Dasyatis sabina	3	0.7	2	0.4
Archosargus probatocephalus	3	4.5	3	0.6
Achirus lineatus	3	0.1	2	0.4
Bellator spp.	2	0.2	1	0.2
Rypticus maculatus	2	0.1	1	0.2
Scorpaena spp.	2	0.1	1	0.2
Hippocampus spp.	2	0.2	2	0.4
Cyclopsetta fimbriata	2	0.2	2	0.4
Mustelus canis	2	22.5	2	0.4
Gadidae (unidentified)	2	0.1	1	0.2
Calamus leucosteus	2	0.1	1	0.2
Sardinella aurita	2	0.3	2	0.4
Caranx spp.	2	1.4	2	0.4
Trachinocephalus myops	2	0.3	1	0.2
Citharichthys cornutus	2	0.2	2	0.4
Peristedion spp.	2	0.1	1	0.2
Peprilus triacanthus	2	0.2	2	0.4
Selene vomer	2	0.2	2	0.4
Sphyrna lewini	2	1.9	2	0.4
Menticirrhus littoralis	2	0.8	1	0.2
Calamus nodosus	2	0.5	1	0.2
Hoplunnis spp.	1	0.2	1	0.2
Monacanthus spp.	1	0.1	1	0.2
Echiophis spp.	1	0.4	1	0.2
Hemipteronotus novacula	1	0.1	1	0.2
Gastropsetta frontalis	1	0.1	1	0.2
Gymnura micrura	1	1.0	1	0.2
Lutjanidae (unidentified)	1	0.1	1	0.2
Rachycentron canadum	1	4.5	1	0.2
Scombridae (unidentified)	1	0.1	1	0.2
Chondrichthyes (unidentified)	1	50.0	1	0.2
Apogonidae (unidentified)	1	0.1	1	0.2
Monacanthus setifer	1	0.1	1	0.2

Table 1. SEAMAP species composition (Cont'd)

Genus Species	Total Number Caught	Total Weight Caught (kg)	Number of Tows where Caught	% Frequency of Occurrence
Lonchopisthus micrognathus	1	0.1	1	0.2
Ophichthus ocellatus	1	0.5	1	0.2
Prognichthys gibbifrons	1	0.1	1	0.2
Canthidermis sufflamen	1	0.1	1	0.2
Parexocoetus brachypterus	1	0.1	1	0.2
Neobythites gillii	1	0.1	1	0.2
Lophius spp.	1	0.1	1	0.2
Echeneis naucrates	1	1.2	1	0.2
Callionymus agassizi	1	0.1	1	0.2
Syngnathus scovelli	1	0.0	1	0.2
Myrophis punctatus	1	0.1	1	0.2
Caranx latus	1	0.1	1	0.2
Gobionellus boleosoma	1	0.1	1	0.2
Gobionellus hastatus	1	0.0	1	0.2
Scorpaena plumieri	1	0.5	1	0.2
Cynoglossidae (unidentified)	1	0.0	1	0.2
Invertebrates				
Trachypeneus spp.	48934	551.6	187	40.4
Callinectes similis	22587	760.1	185	40.0
Squilla spp.	19253	422.0	115	24.8
Sicyonia dorsalis	14609	100.4	133	28.7
Sicyonia brevirostris	8837	220.0	140	30.2
Loligo pealii	5123	201.8	156	33.7
Squilla empusa	3839	103.3	78	16.8
Portunus spinicarpus	3614	45.7	69	14.9
Portunus gibbesii	3225	63.3	112	24.2
Lolliguncula brevis	1827	39.2	115	24.8
Solenocera spp.	1634	21.7	71	15.3
Parapenaeus spp.	1315	7.0	12	2.6
Amusium papyra	1095	20.6	34	7.3
Callinectes sapidus	849	167.9	86	18.6
Asteroidea (unidentified)	654	10.5	45	9.7
Renilla mulleri	460	10.3	11	2.4
Portunus spinimanus	444	22.9	25	5.4
Squilla chydaea	439	8.6	24	5.2
Illex spp.	394	11.1	6	1.3
Squilla neglecta	310	4.1	17	3.7
Ovalipes spp.	301	2.3	2	0.4
Luidia spp.	215	5.2	7	1.5
Aplysia spp.	214	4.9	6	1.3
Mellita quinquiesperforata	111	0.4	3	0.6

Table 1. SEAMAP species composition (Cont'd)

Genus Species	Total Number Caught	Total Weight Caught (kg)	Number of Tows where Caught	% Frequency of Occurrence
Scyphozoa (unidentified)	103	3.9	5	1.1
Portunus spp.	94	1.1	3	0.6
Solenocera vioscai	90	1.5	4	0.9
Sicyonia stimpsoni	89	0.3	1	0.2
Portunus sayi	84	6.7	17	3.7
Calappa sulcata	75	36.7	39	8.4
Hepatus epheliticus	75	10.6	17	3.7
Acetes americana	72	0.3	3	0.6
Ovalipes guadulapensis	70	1.8	12	2.6
Macoma constricta	61	1.4	4	0.9
Aequipecten spp.	54	1.7	8	1.7
Scutellidae (unidentified)	50	13.4	8	1.7
Astropecten spp.	49	0.2	7	1.5
Anthozoa (unidentified)	38	1.7	9	1.9
Xiphopeneus kroyeri	34	0.8	8	1.7
Sicyonia spp.	33	1.1	11	2.4
Tunicata (unidentified)	32	1.5	6	1.3
Luidia clathrata	32	1.0	4	0.9
Leiolambrus nitidus	29	0.5	5	1.1
Illex illecebrosus	29	1.8	6	1.3
Porifera (unidentified)	25	9.3	5	1.1
Metapenaeopsis goodei	23	0.2	1	0.2
Pennatulidae (unidentified)	23	0.2	1	0.2
Clypeastridae (unidentified)	20	4.1	4	0.9
Persephona aquilonaris	19	2.1	2	0.4
Ophiuroidea (unidentified)	16	0.2	3	0.6
Parthenope spp.	16	0.6	6	1.3
Callinectes danae	16	0.9	9	1.9
Anasimus latus	14	1.2	5	1.1
Scyllarus spp.	14	0.3	3	0.6
Aurelia aurelia	14	2.3	6	1.3
Libinia spp.	14	2.6	7	1.5
Ficus papyracea	12	3.9	1	0.2
Opisthobranchia (unidentified)	12	0.1	1	0.2
Macrobrachium acanthurus	12	0.1	1	0.2
Pitar cordatus	11	0.6	2	0.4
Scyllarides spp.	10	0.3	3	0.6
Persephona mediterranea	10	0.3	2	0.4
Paguridae (unidentified)	9	0.6	6	1.3
Stenorynchus seticornis	8	0.3	5	1.1
Echinoidea (unidentified)	7	0.5	1	0.2
Octopus vulgaris	7	4.5	6	1.3
Libinia emarginata	7	5.5	4	0.9

Table 1. SEAMAP species composition (Cont'd)

Genus Species	Total Number Caught	Total Weight Caught (kg)	Number of Tows where Caught	% Frequency of Occurrence
Raninoides louisiana	6	0.4	4	0.9
Physiculus fulvus	6	0.3	3	0.6
Ascidiacea (unidentified)	6	0.9	2	0.4
Calappa flammea	5	1.9	3	0.6
Barbatia candida	5	0.3	2	0.4
Scyllaridae (unidentified)	5	0.2	2	0.4
Atrina serrata	5	0.2	1	0.2
Cantharus cancellarius	4	0.1	1	0.2
Parthenopidae (unidentified)	4	0.3	3	0.6
Ovalipes ocellatus	4	0.4	1	0.2
Persephona punctata	4	0.2	2	0.4
Loligo plei	4	0.4	1	0.2
Caridea (unidentified)	3	0.1	1	0.2
Chrysaora quinquecirrah	3	0.5	2	0.4
Tonna galea	3	0.4	2	0.4
Lamellaria (unidentified)	3	0.1	1	0.2
Clibanarius vittatus	3	0.3	2	0.6
Polinices duplicatus	3	0.3	1	0.2
Pagurus longicarps	3	0.3	3	0.6
Thais haemas	3	0.2	2	0.4
Podochelidae sidneyi	2	0.1	1	0.2
Muricidae (unidentified)	2	0.2	2	0.4
Parthenope serrata	2	0.2	2	0.4
Clypeaster spp.	2	1.2	1	0.2
Nudibranchia (unidentified)	2	0.1	1	0.2
Octopus spp.	2	2.1	2	0.4
Chione latili	2	0.1	1	0.2
Bryozoa (unidentified)	2	0.2	2	0.4
Aequipecten gibbus	2	0.1	1	0.2
Metoporhaphis calcaratus	2	0.2	2	0.4
Albunea paretii	2	0.2	2	0.4
Panulirus argus	1	2.5	1	0.2
Macrocoeloma spp.	1	0.1	1	0.2
Cassis spp.	1	9.0	1	0.2
Gorgonidae (unidentified)	1	0.1	1	0.2
Scyllarides nodifer	1	1.2	1	0.2
Busycon canaliculatum	1	0.2	1	0.2
Busycon spiratum	1	0.1	1	0.2
Sinum spp.	1	0.1	1	0.2
Majidae (unidentified)	1	0.1	1	0.2
Holothuroidea (unidentified)	1	0.1	1	0.2
Pilumnus dasypodus	1	0.1	1	0.2
Rossia spp.	1	0.1	1	0.2

Table 1. SEAMAP species composition (Cont'd)

Genus Species	Total Number Caught	Total Weight Caught (kg)	Number of Tows where Caught	% Frequency of Occurrence
Distorsio clathrata	1	0.1	1	0.2
Goneplacidae (unidentified)	1	0.1	1	0.2
Dromidia antillensis	1	0.1	1	0.2
Stenocionops spinosissima	1	0.1	1	0.2
Rhithropanopeus harrisii	1	0.1	1	0.2
Menippe mercinaria	1	0.5	1	0.2
Ovalipes floridanus	1	0.0	1	0.2
Arbacia punctatus	1	0.0	1	0.2
Arenaeus cribrarius	1	0.1	1	0.2

Table 2a
Statistical Zone 10
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	0-5 fm					6-10 fm					11-20 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.					0	32.0	31.01	0.22	0.18	4	0	0	0	0	5
Penaeus aztecus					0	2.8	2.75	0.06	0.06	4	1.6	0.98	0.07	0.05	5
Sicyonia dorsalis					0	0	0	0	0	4	0	0	0	0	5
Sicyonia brevirostris					0	54.5	21.86	0.87	0.28	4	400.2	259.95	6.20	4.57	5
Squilla spp.					0	28.8	28.75	0.31	0.31	4	0	0	0	0	5
Callinectes similis					0	8.3	8.25	0.13	0.13	4	0	0	0	0	5
Micropogonias undulatus					0	0	0	0	0	4	0	0	0	0	5
Stenotomus caprinus					0	56.0	34.81	0.57	0.25	4	305.8	238.14	9.76	9.46	5
Upeneus parvus					0	0	0	0	0	4	0	0	0	0	5
Anchoa mitchilli					0	9.5	9.50	0.13	0.13	4	0	0	0	0	5
Prionotus rubio					0	20.5	20.50	0.31	0.31	4	3.2	3.2	0.29	0.29	5
Trachurus lathami					0	0	0	0	0	4	0	0	0	0	5
Leiostomous xanthurus					0	246.5	203.50	17.90	15.60	4	0	0	0	0	5
Syacium gunteri					0	0	0	0	0	4	50.4	38.86	2.82	2.05	5
Squid					0	125.3	60.85	1.78	0.93	4	92.0	57.51	1.56	0.77	5

Table 2b
Statistical Zone 10
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	21-30 fm					31-40 fm					Over 40 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	1.8	1.80	0.08	0.08	5	0	0	0	0	1	0	0	0	0	1
Penaeus aztecus	0	0	0	0	5	0	0	0	0	1	40.0	0	2.36	0	1
Sicyonia dorsalis	0	0	0	0	5	0	0	0	0	1	0	0	0	0	1
Sicyonia brevirostris	68.8	14.25	1.60	0.35	5	197.0	0	3.5	0	1	20.0	0	0.18	0	1
Squilla spp.	6.0	6.00	0.27	0.27	5	0	0	0	0	1	0	0	0	0	1
Callinectes similis	0	0	0	0	5	0	0	0	0	1	0	0	0	0	1
Micropogonias undulatus	0	0	0	0	5	0	0	0	0	1	0	0	0	0	1
Stenotomus caprinus	808.0	508.19	42.63	19.23	5	0	0	0	0	1	168.0	0	7.26	0	1
Upeneus parvus	0	0	0	0	5	0	0	0	0	1	0	0	0	0	1
Anchoa mitchilli	0	0	0	0	5	0	0	0	0	1	0	0	0	0	1
Prionotus rubio	12.0	12.00	0.82	0.82	5	0	0	0	0	1	20.0	0	0.54	0	1
Trachurus lathami	0	0	0	0	5	0	0	0	0	1	4.0	0	0.18	0	1
Leiostomous xanthurus	0	0	0	0	5	0	0	0	0	1	0	0	0	0	1
Syacium gunteri	144.2	82.85	10.62	6.71	5	0	0	0	0	1	0	0	0	0	1
Squid	6.0	6.00	0.54	0.54	5	4.0	0	4.0	0	1	1	0	0	0	1

Table 2c
Statistical Zone 10

Summary of the mean total catch ($\bar{X}$), the standard error of the mean (SEM) and the number of samples taken (n). Catch values in kg, temperature in °C, salinity in PPT, chlorophyll in mg/m^3 and oxygen in PPM.

	0-5 fm			6-10 fm			11-20 fm			21-30 fm			31-40 fm			Over 40 fm		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg			0	37.5	20.76	4	54.8	15.30	5	108.1	9.61	5	50.6	0	1	43.6	0	1
Total Finfish kg			0	29.8	18.35	4	32.5	13.90	5	99.9	8.93	5	46.7	0	1	40.0	0	1
Total Crustacean kg			0	2.8	0.77	4	9.9	4.00	5	4.9	1.15	5	3.9	0	1	3.6	0	1
Total Others kg			0	6.5	2.16	4	12.9	8.50	5	4.7	2.42	5	2.0	0	1	0	0	1
Surface Temperature			0	28.3	0.23	4	29.2	0.34	5	29.2	0.16	5	28.9	0	1	29.8	0	1
Mid Temperature			0	26.1	0.51	4	25.0	0.89	5	23.2	0.19	5	22.9	0	1	21.3	0	1
Max Temperature			0	23.6	0.74	4	21.3	0.40	5	20.6	0.25	5	19.0	0	1	17.6	0	1
Surface Salinity			0	26.3	3.63	4	29.4	0.95	5	29.7	0.57	5	32.3	0	1	28.9	0	1
Mid Salinity			0	31.6	0.64	4	32.4	0.78	5	35.3	0.37	5	35.7	0	1	35.8	0	1
Max Salinity			0	35.1	0.06	4	35.3	0.13	5	35.7	0.17	5	36.1	0	1	36.3	0	1
Surface Chlorophyll			0	0.4	0.18	4	0.2	0.07	4	0.1	0.01	4	0.0	0	1	0.0	0	1
Mid Chlorophyll			0			0	0.3	0	1	0.2	0.04	3			0	0.1	0	1
Max Chlorophyll			0			0			0	0.7	0.17	3			0			0
Surface Oxygen			0	6.9	0.13	4	6.9	0.16	5	6.5	0.20	5	6.6	0	1	5.8	0	1
Mid Oxygen			0	6.9	0.17	4	6.8	0.20	5	6.8	0.23	5	7.3	0	1	6.3	0	1
Max Oxygen			0	6.3	0.71	4	6.5	0.43	5	5.9	0.30	5	6.4	0	1	4.7	0	1

Table 3a
Statistical Zone 11
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	0-5 fm					6-10 fm					11-20 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	239.0	166.57	0.82	0.59	5	470.8	179.97	1.81	0.60	17	481.8	87.95	2.11	0.37	16
Penaeus aztecus	116.2	212.26	1.55	1.30	5	95.4	43.26	1.12	0.44	17	45.9	17.68	0.90	0.28	16
Sicyonia dorsalis	0	0	0	0	5	8.8	5.22	0.05	0.03	17	6.9	1.92	0.06	0.02	16
Sicyonia brevirostris	4.6	4.60	0.08	0.08	5	10.8	6.11	0.10	0.05	17	64.8	42.91	0.73	0.48	16
Squilla spp.	64.2	61.24	0.60	0.53	5	265.6	125.21	2.08	0.93	17	66.2	38.29	0.65	0.33	16
Callinectes similis	13.8	13.80	0.13	0.13	5	149.4	78.74	0.75	0.35	17	22.2	11.80	0.62	0.37	16
Micropogonias undulatus	2.0	1.22	0.29	0.24	5	12.5	5.72	0.82	0.47	17	3.1	1.84	0.75	0.52	16
Stenotomus caprinus	146.8	93.66	1.19	0.58	5	112.2	29.44	0.87	0.23	17	821.4	288.32	12.43	7.37	16
Upeneus parvus	0	0	0	0	5	0	0	0	0	17	1.6	0.92	0.03	0.02	16
Anchoa mitchilli	0	0	0	0	5	71.6	47.10	0.23	0.14	17	0	0	0	0	16
Prionotus rubio	57.2	32.32	0.67	0.35	5	142.4	61.89	0.52	0.16	17	27.4	45.38	0.31	0.11	16
Trachurus lathami	0	0	0	0	5	0.12	0.12	0	0	17	1.1	1.06	0.01	0.01	16
Leiostomous xanthurus	45.8	28.10	3.52	2.16	5	143.4	90.70	14.61	10.23	17	0.3	0.31	0.04	0.04	16
Syacium gunteri	0	0	0	0	5	4.2	1.40	0.14	0.05	17	20.1	9.14	0.29	0.11	16
Squid	16.2	14.98	0.30	0.18	5	4.6	3.49	0.06	0.04	17	12.3	8.12	0.14	0.06	16

Table 3b
Statistical Zone 11
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	21-30 fm					31-40 fm					Over 40 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	446.3	406.91	1.66	1.35	3	0	0	0	0	1					0
Penaeus aztecus	5.3	3.53	0.24	0.16	3	32.0	0	2.00	0	1					0
Sicyonia dorsalis	0	0	0	0	3	0	0	0	0	1					0
Sicyonia brevirostris	279.7	167.14	3.92	2.25	3	24.0	0	0.36	0	1					0
Squilla spp.	87.3	76.59	0.87	0.47	3	0	0	0	0	1					0
Callinectes similis	0	0	0	0	3	0	0	0	0	1					0
Micropogonias undulatus	44.7	37.88	3.48	2.91	3	0	0	0	0	1					0
Stenotomus caprinus	2319.0	1018.03	55.0	19.34	3	1220.0	0	59.93	0	1					0
Upeneus parvus	0	0	0	0	3	0	0	0	0	1					0
Anchoa mitchilli	0	0	0	0	3	0	0	0	0	1					0
Prionotus rubio	52.0	34.08	3.13	1.44	3	164.0	0	5.08	0	1					0
Trachiurus lathami	0	0	0	0	3	12.0	0	0.36	0	1					0
Leiostomous xanthurus	62.0	53.03	6.59	5.42	3	12.0	0	1.09	0	1					0
Syacium gunteri	12.7	7.51	0.39	0.19	3	0	0	0	0	1					0
Squid	10.7	5.81	0.39	0.30	3	0	0	0	0	1					0

Table 3c
Statistical Zone 11

Summary of the mean total catch ($\bar{X}$), the standard error of the mean (SEM) and the number of samples taken (n). Catch values in kg, temperature in °C, salinity in PPT, chlorophyll in mg/m^3 and oxygen in PPM.

	0-5 fm			6-10 fm			11-20 fm			21-30 fm			31-40 fm			Over 40 fm		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg	21.7	7.80	5	38.2	12.72	17	29.8	7.51	16	113.4	0.53	3	94.4	0	1			0
Total Finfish kg	13.7	5.50	5	28.4	13.07	17	20.4	7.49	16	101.2	2.30	3	85.4	0	1			0
Total Crustacean kg	6.2	3.75	5	9.2	2.39	17	8.0	0.92	16	11.3	2.83	3	9.1	0	1			0
Total Others kg	2.9	0.88	5	1.7	0.26	17	2.4	0.73	16	2.8	1.35	3	0	0	1			0
Surface Temperature	30.0	0.56	2	29.7	0.29	6	29.3	0.29	9	28.8	0.42	2	29.4	0	1			0
Mid Temperature	28.9	0.53	2	27.9	0.61	6	25.3	0.74	8	26.1	0	1	21.6	0	1			0
Max Temperature	22.2	0.04	2	21.7	0.17	6	21.9	0.35	9	22.8	0.56	2	18.8	0	1			0
Surface Salinity	25.5	0.39	2	25.0	0.63	6	26.8	1.23	9	26.6	3.82	2	32.2	0	1			0
Mid Salinity	25.6	0.40	2	26.6	1.05	6	34.1	0.89	9	36.0	0.45	2	35.6	0	1			0
Max Salinity	34.2	0.31	2	34.0	0.37	6	35.9	0.14	9	36.2	0.06	2	36.3	0	1			0
Surface Chlorophyll	0.5	0.18	2	0.7	0.21	5	6.2	4.57	9	0.7	0.08	2	0.1	0	1			0
Mid Chlorophyll	0.5	0	1	0.7	0.15	4	0.6	0.24	7	0.3	0.16	2	0.3	0	1			0
Max Chlorophyll	1.5	0	1	2.3	0.57	5	0.9	0.22	5	0.8	0	1			0			0
Surface Oxygen	7.1	0	2	7.1	0.39	6	7.2	0.44	9	7.4	0.55	2	6.3	0	1			0
Mid Oxygen	7.2	0.25	2	7.3	0.36	6	6.5	0.21	9	6.5	0.25	2	7.0	0	1			0
Max Oxygen	1.7	1.05	5	1.7	0.57	17	3.2	0.74	16	3.6	1.78	3	4.8	0	1			0

Table 4a
Statistical Zone 13
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	0-5 fm					6-10 fm					11-20 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	0	0	0	0	1	343.5	343.50	0.62	0.62	2	3970.0	2024.16	17.36	8.74	11
Penaeus aztecus	0	0	0	0	1	57.5	57.50	0.62	0.62	2	31.9	12.27	0.54	0.17	11
Sicyonia dorsalis	0	0	0	0	1	269.5	265.50	0.96	0.77	2	173.3	86.45	0.69	0.29	11
Sicyonia brevirostris	0	0	0	0	1	0	0	0	0	2	69.9	69.91	0.18	0.18	11
Squilla spp.	1.5	0	1.19	0	1	1962.5	1893.50	23.13	22.94	2	3122.6	1446.78	31.37	14.35	11
Callinectes similis	188.0	0	1.70	0	1	1701.0	1675.00	21.64	21.45	2	696.0	145.19	10.41	2.54	11
Micropogonias undulatus	8.0	0	0.34	0	1	278.0	278.00	25.88	25.88	2	55.3	46.33	1.89	1.04	11
Stenotomus caprinus	0	0	0	0	1	0	0	0	0	2	0	0	0	0	11
Upeneus parvus	0	0	0	0	1	0	0	0	0	2	0	0	0	0	11
Anchoa mitchilli	0	0	0	0	1	0	0	0	0	2	0	0	0	0	11
Prionotus rubio	0	0	0	0	1	90.0	90.00	1.74	1.74	2	770.4	460.19	9.84	4.42	11
Trachurus lathami	0	0	0	0	1	0	0	0	0	2	0	0	0	0	11
Leiostomus xanthurus	0	0	0	0	1	13.5	13.50	1.12	1.12	2	7.2	5.85	0.32	0.23	11
Syacium gunteri	0	0	0	0	1	0	0	0	0	2	0.6	0.55	0.03	0.02	11
Squid	0	0	0	0	1	0	0	0	0	2	0	0	0	0	11

Table 4b
Statistical Zone 13
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	21-30 fm					31-40 fm					Over 40 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	1618.1	740.34	9.35	4.89	7	101.0	0	0.29	0	1	0	0	0	0	1
Penaeus aztecus	39.7	25.83	1.01	0.64	7	3.0	0	0.14	0	1	11.0	0	0.25	0	1
Sicyonia dorsalis	284.6	112.59	1.08	0.34	7	0	0	0	0	1	0	0	0	0	1
Sicyonia brevirostris	3.3	2.55	0.09	0.06	7	0	0	0	0	1	0	0	0	0	1
Squilla spp.	2106.4	1358.56	18.08	10.27	7	161.0	0	1.43	0	1	65.0	0	0.50	0	1
Callinectes similis	438.0	167.73	7.09	3.00	7	63.0	0	1.43	0	1	878.0	0	6.19	0	1
Micropogonias undulatus	82.6	45.35	19.99	11.74	7	69.0	0	10.75	0	1	2744.0	0	240.21	0	1
Stenotomus caprinus	54.6	46.00	1.91	1.64	7	28.0	0	0.43	0	1	0	0	0	0	1
Upeneus parvus	0	0	0	0	7	0	0	0	0	1	0	0	0	0	1
Anchoa mitchilli	0	0	0	0	7	0	0	0	0	1	0	0	0	0	1
Prionotus rubio	115.0	80.82	3.47	2.88	7	69.0	0	7.46	0	1	65.0	0	10.15	0	1
Trachurus lathami	0	0	0	0	7	0	0	0	0	1	0	0	0	0	1
Leiostomus xanthurus	3.4	3.43	0.04	0.04	7	0	0	0	0	1	0	0	0	0	1
Syacium gunteri	0	0	0	0	7	0	0	0	0	1	0	0	0	0	1
Squid	4.6	4.57	0.21	0.21	7	0	0	0	0	1	0	0	0	0	1

Table 4c
Statistical Zone 13

Summary of the mean total catch ($\bar{X}$), the standard error of the mean (SEM) and the number of samples taken (n). Catch values in kg, temperature in °C, salinity in PPT, chlorophyll in mg/m^3 and oxygen in PPM.

	0-5 fm			6-10 fm			11-20 fm			21-30 fm			31-40 fm			Over 40 fm		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg	91.9	0	1	127.3	125.32	2	106.8	32.31	11	85.7	26.34	7	50.2	0	1	299.6	0	1
Total Finfish kg	88.5	0	1	80.2	78.27	2	42.6	11.50	11	46.1	17.59	7	44.4	0	1	287.3	0	1
Total Crustacean kg	3.4	0	1	48.0	46.08	2	63.6	23.85	11	39.9	17.38	7	5.7	0	1	12.4	0	1
Total Others kg	0	0	1	0	0	2	0.8	0.48	11	0.7	0.45	7	1.4	0	1	0	0	1
Surface Temperature	31.1	0	1	30.3	1.98	2	29.5	0.39	11	29.3	0.47	7	29.1	0	1	28.9	0	1
Mid Temperature	24.0	0	1	27.0	2.25	2	24.6	0.54	11	23.1	0.36	7	22.5	0	1	20.0	0	1
Max Temperature	23.9	0	1	23.9	1.12	2	20.9	0.59	11	19.5	0.41	7	17.4	0	1	16.7	0	1
Surface Salinity	17.4	0	1	13.2	8.71	2	21.2	1.78	11	18.0	3.25	7	21.6	0	1	15.3	0	1
Mid Salinity	24.9	0	1	31.3	4.50	2	32.7	1.92	11	36.4	0.22	7	36.2	0	1	36.3	0	1
Max Salinity	35.1	0	1	35.4	0.24	2	36.3	0.03	11	36.5	0.20	7	36.3	0	1	36.1	0	1
Surface Chlorophyll	3.1	0	1	6.1	3.26	2	4.5	1.36	11	11.9	6.48	5	12.5	0	1	0.5	0	1
Mid Chlorophyll			0			0			0			0	16.4	0	1			0
Max Chlorophyll			0			0			0			0		0				0
Surface Oxygen			0	9.8	1.05	2	9.0	0.51	11	9.9	0.58	7	6.4	0	1	6.8	0	1
Mid Oxygen	4.9	0	1	6.2	1.30	2	6.4	0.62	11	6.2	0.58	7	5.8	0	1	4.8	0	1
Max Oxygen	4.6	0	1	3.3	1.45	2	4.7	0.49	11	4.9	0.38	7	5.4	0	1	4.5	0	1

Table 5a
Statistical Zone 14
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	0-5 fm					6-10 fm					11-20 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	0	0	0	0	1	6.7	6.67	0.05	0.05	6	3272.0	559.74	15.36	2.39	9
Penaeus aztecus	0	0	0	0	1	0	0	0	0	6	152.4	26.71	3.62	0.65	9
Sicyonia dorsalis	0	0	0	0	1	0	0	0	0	6	202.0	120.45	0.53	0.23	9
Sicyonia brevirostris	0	0	0	0	1	0	0	0	0	6	41.3	16.99	0.41	0.16	9
Squilla spp.	0	0	0	0	1	7.5	5.96	0.13	0.07	6	1178.3	164.61	13.08	1.92	9
Callinectes similis	0	0	0	0	1	20.0	18.81	0.13	0.09	6	265.2	67.91	4.37	1.07	9
Micropogonias undulatus	0	0	0	0	1	46.7	46.67	2.85	2.85	6	67.4	56.54	4.61	3.93	9
Stenotomus caprinus	0	0	0	0	1	0	0	0	0	6	780.6	558.05	5.11	3.91	9
Upeneus parvus	0	0	0	0	1	0	0	0	0	6	0	0	0	0	9
Anchoa mitchilli	0	0	0	0	1	0	0	0	0	6	1.3	1.33	0.03	0.03	9
Prionotus rubio	0	0	0	0	1	61.7	61.67	1.06	1.06	6	864.4	158.29	10.44	1.97	9
Trachurus lathami	0	0	0	0	1	0	0	0	0	6	11.3	11.30	0.24	0.24	9
Leiostomus xanthurus	0	0	0	0	1	0	0	0	0	6	149.1	124.09	19.17	16.15	9
Syacium gunteri	0	0	0	0	1	0	0	0	0	6	0	0	0	0	9
Squid	0	0	0	0	1	0	0	0	0	6	7.2	3.96	0.41	0.24	9

Table 5b
Statistical Zone 14
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	21-30 fm					31-40 fm					Over 40 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	1486.4	348.50	7.96	1.63	8					0	22.5	22.50	0.12	0.12	2
Penaeus aztecus	124.1	26.06	3.75	0.41	8					0	15.5	0.50	1.18	0.06	2
Sicyonia dorsalis	261.3	113.54	1.25	0.45	8					0	25.0	25.00	0.12	0.12	2
Sicyonia brevirostris	124.6	45.88	0.86	0.31	8					0	12.5	12.50	0.12	0.12	2
Squilla spp.	464.1	115.11	5.43	1.45	8					0	7.5	2.50	0.24	0.01	2
Callinectes similis	156.3	80.17	2.77	1.41	8					0	0	0	0	0	2
Micropogonias undulatus	11.9	9.46	1.09	0.92	8					0	5.0	0	0.58	0.33	2
Stenotomus caprinus	161.5	34.15	4.57	1.26	8					0	353.5	93.50	15.93	6.85	2
Upeneus parvus	0	0	0	0	8					0	0	0	0	0	2
Anchoa mitchilli	0	0	0	0	8					0	0	0	0	0	2
Prionotus rubio	169.9	35.32	4.56	0.84	8					0	129.5	20.50	8.82	1.40	2
Truchurus lathami	27.0	24.62	0.61	0.55	8					0	2.5	2.50	0.25	0.25	2
Leiostomus xanthurus	0	0	0	0	8					0	0	0	0	0	2
Syacium gunteri	0	0	0	0	8					0	0	0	0	0	2
Squid	1.34	7.69	1.29	1.11	8					0	5.0	5.00	0.22	0.22	2

Table 5c
Statistical Zone 14

Summary of the mean total catch ($\bar{X}$), the standard error of the mean (SEM) and the number of samples taken (n). Catch values in kg, temperature in °C, salinity in PPT, chlorophyll in mg/m^3 and oxygen in PPM.

	0-5 fm			6-10 fm			11-20 fm			21-30 fm			31-40 fm			Over 40 fm		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg	2.7	0	1	11.9	9.73	6	118.1	17.46	9	76.3	12.46	8			0	68.3	18.37	2
Total Finfish kg	2.7	0	1	10.3	8.85	6	74.3	19.48	9	48.9	11.96	8			0	62.4	19.29	2
Total Crustacean kg	0	0	1	1.8	0.72	6	41.2	4.24	9	25.2	3.72	8			0	2.4	0.11	2
Total Others kg	0	0	0	0.6	0.41	6	2.8	0.96	9	2.8	1.11	8			0	3.5	1.03	2
Surface Temperature	31.1	0	1	31.2	0.21	6	31.1	0.19	9	31.3	0.16	8			0	31.1	0.02	2
Mid Temperature	27.2	0	1	27.6	0.42	6	25.8	0.49	9	25.0	0.22	8			0	23.4	0.24	2
Max Temperature	23.6	0	1	25.2	0.58	6	22.7	0.34	9	20.4	0.29	8			0	17.5	0.37	2
Surface Salinity	20.5	0	1	21.5	0.45	6	29.0	0.97	9	30.7	1.06	8			0	33.2	0.65	2
Mid Salinity	20.9	0	1	26.5	1.40	6	33.6	1.08	9	35.8	0.12	8			0	36.1	0.01	2
Max Salinity	35.3	0	1	35.4	0.12	6	36.1	0.12	9	36.3	0.02	8			0	36.2	0.02	2
Surface Chlorophyll	13.1	0	1	4.6	1.23	5	1.2	0.24	9	0.7	0.21	7			0	0.3	0.08	2
Mid Chlorophyll			0			0			0			0			0			0
Max Chlorophyll			0			0			0			0			0			0
Surface Oxygen	9.7	0	1	10.7	0.74	6	7.8	0.29	9	7.6	0.46	8			0	6.9	0.30	2
Mid Oxygen	10.2	0	1	9.5	0.54	6	6.3	0.49	9	8.1	0.39	8			0	5.3	0.05	2
Max Oxygen	0.3	0	1	2.0	0.63	6	5.7	0.43	9	6.1	0.25	8			0	5.3	0.05	2

Table 6a
Statistical Zone 15
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	0-5 fm					6-10 fm					11-20 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.					0	60.8	36.83	0.26	0.18	4	4625.0		21.11		1
Penaeus aztecus					0	39.5	39.50	1.64	1.19	4	547.7	118.09	4.98	0.76	10
Sicyonia dorsalis					0	2.0	2.00	0.03	0.03	4	560.0	0	1.13	0	1
Sicyonia brevirostris					0	0		0		4	0		0		1
Squilla spp.					0	834.2	481.79	6.18	3.94	4	1465.0	0	17.25	0	1
Callinectes similis					0	7.8	7.80	0.06	0.06	4	775.0	0	10.22	0	1
Micropogonias undulatus					0	0		0		4	0		0	0	1
Stenotomus caprinus					0	0		0		4	485.0	0	1.13	0	1
Upeneus parvus					0	0		0		4	0		0		1
Anchoa mitchilli					0	0		0		4	0		0		1
Prionotus rubio					0	21.5	21.50	0.39	0.39	4	235.0	0	3.18	0	1
Trachurus lathami					0	0		0		4	10.0	0	0.23	0	1
Leiostomus xanthurus					0	0		0		4	0		0		1
Syacium gunteri					0	0		0		4	5.0	0	0.23	0	1
Squid					0	2.2	2.20	0.14	0.14	4	0		0		1

Table 6b
Statistical Zone 15
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	21-30 fm					31-40 fm					Over 40 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	2624.0	0	16.84	0	1	3.5	2.36	0.11	0.06	4					0
Penaeus aztecus	404.0	39.99	5.27	0.83	5	84.6	40.84	4.18	1.07	5					0
Sicyonia dorsalis	2760.0	0	12.13	0	1	6.0	3.67	0.11	0.06	4					0
Sicyonia brevirostris	82.0	0	0.50	0	1	6.5	2.72	0.19	0.08	4					0
Squilla spp.	2040.0	0	13.87	0	1	36.5	24.87	0.26	0.15	4					0
Callinectes similis	1511.0	0	26.50	0	1	2.5	2.50	0.06	0.06	4					0
Micropogonias undulatus	0	0	0	0	1	2.5	2.50	0.17	0.17	4					0
Stenotomus caprinus	82.0	0	0.50	0	1	336.3	223.10	15.98	10.61	4					0
Upeneus parvus	0	0	0	0	1	0	0	0	0	4					0
Anchoa mitchilli	0	0	0	0	1	0	0	0	0	4					0
Prionotus rubio	131.0	0	1.24	0	1	47.5	12.47	3.68	1.32	4					0
Trachurus lathami	0	0	0	0	1	1.0	1.00	0.04	0.04	4					0
Leiostomus xanthurus	0	0	0	0	1	0	0	0	0	4					0
Syacium gunteri	0	0	0	0	1	0	0	0	0	4					0
Squid	0	0	0	0	1	32.0	29.39	0.54	0.43	4					0

Table 6c
Statistical Zone 15

Summary of the mean total catch ($\bar{X}$), the standard of the mean (SEM) and the number of samples taken (n). Catch values in kg, temperature in °C, salinity in PPT, chlorophyll in mg/m^3 and oxygen in PPM.

	0-5 fm			6-10 fm			11-20 fm			21-30 fm			31-40 fm			Over 40 fm		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg			0	90.2	42.62	4	138.3	16.41	10	109.0	0	1	66.3	19.00	4			0
Total Finfish kg			0	30.8	10.08	4	38.7	4.66	10	32.2	0	1	55.4	20.27	4			0
Total Crustacean kg			0	6.7	4.23	4	56.8		10	74.3	0	1	7.2	1.55	4			0
Total Others kg			0	1.0	0.49	4	4.5		10	2.5	0	1	3.7	0.67	4			0
Surface Temperature			0	31.9	0	2	31.8	0	1	31.3	0	1	31.5	0.20	4			0
Mid Temperature			0	29.0	0.69	2	25.2	0	1	26.1	0	1	24.2	0.12	4			0
Max Temperature			0	26.4	1.61	2	23.2	0	1	20.4	0	1	16.7	1.51	4			0
Surface Salinity			0	20.3	0.68	2	22.9	0	1	23.7	0	1	33.3	1.21	4			0
Mid Salinity			0	25.5	0.49	2	35.3	0	1	35.1	0	1	36.0	0.05	4			0
Max Salinity			0	35.4	0.42	2	36.1	0	1	36.2	0	1	36.3	0.02	4			0
Surface Chlorophyll			0	3.0	0.43	2	4.2	0	1	2.4	0	1	0.1	0.03	4			0
Mid Chlorophyll			0			0			0			0			0			0
Max Chlorophyll			0			0			0			0			0			0
Surface Oxygen			0	9.9	0.45	2	9.6	0	1	8.0	0	1	5.6	0.18	4			0
Mid Oxygen			0	8.1	0.50	2	9.0	0	1	7.3	0	1	6.2	0.08	4			0
Max Oxygen			0	1.3	0.80	4	7.7		10	5.2	0	1	5.0	0.36	4			0

Table 7a
Statistical Zone 16
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	0-5 fm					6-10 fm					11-20 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.					0					0					0
Penaeus aztecus					0	147.8	80.45	0.98	0.62	4	457.4	151.16	4.68	1.28	10
Sicyonia dorsalis					0					0					0
Sicyonia brevirostris					0					0					0
Squilla spp.					0					0					0
Callinectes similis					0					0					0
Micropogonias undulatus					0					0					0
Stenotomus caprinus					0					0					0
Upeneus parvus					0					0					0
Anchoa mitchilli					0					0					0
Prionotus rubio					0					0					0
Trachurus lathami					0					0					0
Leiostomus xanthurus					0					0					0
Syacium gunteri					0					0					0
Squid					0					0					0

Table 7b
Statistical Zone 16
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	21-30 fm					31-40 fm					Over 40 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.					0	0	0	0	0	1					0
Penaeus aztecus	252.7	126.29	6.13	2.54	3	41.0	0	2.58	0	1					0
Sicyonia dorsalis					0	0	0	0	0	1					0
Sicyonia brevirostris					0	13.0	0	0.14	0	1					0
Squilla spp.					0	22.0	0	0.14	0	1					0
Callinectes similis					0	0	0	0	0	1					0
Micropogonias undulatus					0	0	0	0	0	1					0
Stenotomus caprinus					0	426.0	0	19.78	0	1					0
Upeneus parvus					0	0	0	0	0	1					0
Anchoa mitchilli					0	0	0	0	0	1					0
Prionotus rubio					0	22.0	0	1.58	0	1					0
Trachurus lathami					0	0	0	0	0	1					0
Leiostomus xanthurus					0	0	0	0	0	1					0
Syacium gunteri					0	0	0	0	0	1					0
Squid					0	0	0	0	0	1					0

Table 7c
Statistical Zone 16

Summary of the mean total catch ($\bar{X}$), the standard error of the mean (SEM) and the number of samples taken (n). Catch values in kg, temperature in °C, salinity in PPT, chlorophyll in mg/m^3 and oxygen in PPM.

	0-5 fm			6-10 fm			11-20 fm			21-30 fms			31-40 fm			Over 40 fm		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg			0	207.3	95.86	4	131.7	20.15	10	109.1	27.90	3	58.8	0	1			0
Total Finfish kg			0	143.8	203.20	4	70.3	8.89	10	60.8	18.20	3	48.8	0	1			0
Total Crustacean kg			0			0			0			0	4.3	0	1			0
Total Others kg			0			0			0			0	5.7	0	1			0
Surface Temperature			0			0			0			0	30.7	0	1			0
Mid Temperature			0			0			0			0	21.7	0	1			0
Max Temperature			0			0			0			0	19.4	0	1			0
Surface Salinity			0			0			0			0	33.8	0	1			0
Mid Salinity			0			0			0			0	36.0	0	1			0
Max Salinity			0			0			0			0	36.3	0	1			0
Surface Chlorophyll			0			0			0			0	0.1	0	1			0
Mid Chlorophyll			0			0			0			0			0			0
Max Chlorophyll			0			0			0			0			0			0
Surface Oxygen			0			0			0			0	7.2	0	1			0
Mid Oxygen			0			0			0			0	8.0	0	1			0
Max Oxygen			0			0			0			0	4.7	0	1			0

Table 8a
Statistical Zone 17
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	0-5 fm					6-10 fm					11-20 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.					0					0	33.3	18.66	0.23	0.02	3
Penaeus aztecus	39.0	24.28	0.19	0.14	14	0		0		3	155.8	64.01	2.74	0.93	11
Sicyonia dorsalis					0					0	0	0	0	0	3
Sicyonia brevirostris					0					0	577.3	161.14	6.06	1.68	3
Squilla spp.					0					0	18.3	12.81	0.15	0.08	3
Callinectes similis					0					0	3.0	1.53	0.14	0.07	3
Micropogonias undulatus					0					0	0	0	0	0	3
Stenotomus caprinus					0					0	277.7	275.17	9.16	9.04	3
Upeneus parvus					0					0	470.3	301.75	2.77	2.51	3
Anchoa mitchilli					0					0	0	0	0	0	3
Prionotus rubio					0					0	0	0	0	0	3
Trachurus lathami					0					0	108.0	108.00	2.09	2.09	3
Leiostomus xanthurus					0					0	0	0	0	0	3
Syacium gunteri					0					0	0	0	0	0	3
Squid					0					0	29.7	10.04	0.74	0.34	3

Table 8b
Statistical Zone 17
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	21-30 fm					31-40 fm					Over 40 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	85.3	44.52	0.43	0.24	3	0	0	0	0	3	16.5	16.50	0.13	0.13	2
Penaeus aztecus	212.1	52.93	5.48	1.08	11	38.0	5.57	2.72	0.51	3	84.5	51.50	4.58	2.35	2
Sicyonia dorsalis	0	0	0	0	3	0	0	0	0	3	0	0	0	0	2
Sicyonia brevirostris	983.3	512.27	7.58	2.53	3	117.7	48.45	2.19	1.09	3	2.5	2.50	0.13	0.13	2
Squilla spp.	23.7	11.84	0.30	0.19	3	1.3	1.33	0.05	0.05	3	32.5	32.50	0.25	0.25	2
Callinectes similis	3.7	3.67	0.16	0.16	3	0	0	0	0	3	0	0	0	0	2
Micropogonias undulatus	0	0	0	0	3	0	0	0	0	3	13.5	13.50	2.48	2.48	2
Stenotomus caprinus	412.0	254.61	16.28	11.75	3	528.7	30.56	23.26	1.57	3	614.0	150.00	28.11	7.06	2
Upeneus parvus	0	0	0	0	3	0	0	0	0	3	0	0	0	0	2
Anchoa mitchilli	0	0	0	0	3	0	0	0	0	3	0	0	0	0	2
Prionotus rubio	6.0	6.00	0.73	0.73	3	1.7	1.67	0.08	0.08	3	0	0	0	0	2
Trachurus lathami	4.0	4.00	0.09	0.09	3	0	0	0	0	3	0	0	0	0	2
Leiostomus xanthurus	0	0	0	0	3	1.7	1.67	0.33	0.33	3	0	0	0	0	2
Syacium gunteri	0	0	0	0	3	2.3	2.33	0.21	0.21	3	0	0	0	0	2
Squid	15.7	10.27	1.01	0.86	3	10.3	5.78	0.98	0.76	3	106.0	90.0	2.23	0.49	2

Table 8c
Statistical Zone 17

Summary of the mean total catch ($\bar{X}$), the standard error of the mean (SEM) and the number of samples taken (n). Catch values in kg, temperature in °C, salinity in PPT, chlorophyll in mg/m^3 and oxygen in PPM.

	0-5 fm			6-10 fm			11-20 fm			21-30 fm			31-40 fm			Over 40 fm		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg	83.6	0	1	64.1	19.30	3	85.1	11.10	11	105.8	13.30	11	74.1	6.44	3	112.7	23.53	2
Total Finfish kg	82.6	0	1	31.0	10.53	3	58.3	8.80	11	66.9	8.91	11	61.1	5.54	3	105.3	26.01	2
Total Crustacean kg			0			0	11.7	2.14	3	26.2	11.73	3	7.8	2.36	3	5.0	2.48	2
Total Others kg			0			0	2.3	0.22	3	2.0	0.36	3	6.0	3.23	3	2.5	0	2
Surface Temperature			0			0	30.0	0.08	3	30.3	0.21	3	30.4	0.27	3	28.9	1.57	2
Mid Temperature			0			0	27.3	0.10	3	25.5	0.96	3	23.8	0.27	3	22.9	0.42	2
Max Temperature			0			0	23.9	0.44	3	22.6	0.95	3	18.5	0.17	3	17.9	0.33	2
Surface Salinity			0			0	31.5	0.18	3	31.3	0.12	3	32.3	0.69	3	32.9	0.09	2
Mid Salinity			0			0	33.8	0.49	3	35.8	0.07	3	35.9	0.06	3	36.1	0	2
Max Salinity			0			0	36.1	0.02	3	36.2	0.08	3	36.3	0.02	3	36.2	0.09	2
Surface Chlorophyll			0			0	0.3	0.07	3	0.3	0.05	3	0.2	0.07	3	0.1	0.38	2
Mid Chlorophyll			0			0	0.2	0	1	0.2	0.02	2	0.1	0.10	2	0.1	0	1
Max Chlorophyll			0			0			0			0			0			0
Surface Oxygen			0			0			0	6.4	0.15	2	7.1	0.12	3	6.7	0.15	2
Mid Oxygen			0			0			0	6.9	0.20	2	7.7	0.44	3	7.2	0.05	2
Max Oxygen			0			0			0	6.3	0.25	2	5.2	0.12	3	5.2	0.35	2

Table 9a
Statistical Zone 18
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	0-5 fm					6-10 fm					11-20 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	0	235.3	149.93	0.89	0.53	4	225.8	54.67	1.61	0.45	12				
Penaeus aztecus	1	717.3	449.14	6.45	3.46	10	291.0	131.69	5.89	2.42	12				
Sicyonia dorsalis	0	2.3	2.25	0.04	0.04	4	72.4	229.80	0.46	0.14	12				
Sicyonia brevirostris	0	81.8	40.96	1.24	0.82	4	445.3	148.45	4.95	1.67	12				
Squilla spp.	0	22.0	17.09	0.22	0.16	4	209.4	75.61	2.69	0.92	12				
Callinectes similis	0	350.5	302.12	6.46	5.76	4	134.2	40.55	4.31	1.55	12				
Micropogonias undulatus	0	10792.3	10792.25	244.98	244.98	4	0	0	0	0	12				
Stenotomus caprinus	0	24.8	24.75	0.51	0.51	4	180.8	47.01	2.41	0.70	12				
Upeneus parvus	0	55.0	31.76	0.32	0.19	4	535.1	224.36	6.69	2.39	12				
Anchoa mitchilli	0	0	0	0	0	4	0	0	0	0	12				
Prionotus rubio	0	0	0	0	0	4	0.7	0.67	0.01	0.01	12				
Trachurus lathami	0	720.8	306.98	15.40	6.48	4	437.8	284.85	9.07	6.54	12				
Leiostomus xanthurus	0	0	0	0	0	4	0	0	0	0	12				
Syacium gunteri	0	0	0	0	0	4	0	0	0	0	12				
Squid	0	170.0	100.78	2.78	1.79	4	116.3	49.47	2.64	1.10	12				

Table 9b
Statistical Zone 18
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	21-30 fm					31-40 fm					Over 40 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	72.1	31.71	0.49	0.22	15	0		0		4	6.0	6.00	0.14	0.14	2
Penaeus aztecus	168.7	27.98	5.03	0.69	15	126.3	66.17	7.46	3.88	4	34.0	14.00	2.00	0.18	2
Sicyonia dorsalis	2.7	1.39	0.03	0.02	15	0		0		4	0	0	0	0	2
Sicyonia brevirostris	410.9	89.03	4.72	0.88	15	8.8	3.68	0.18	0.06	4	0	0	0	0	2
Squilla spp.	9.9	5.97	0.10	0.06	15	1.5	1.50	0.07	0.07	4	0	0	0	0	2
Callinectes similis	33.7	14.81	1.03	0.43	15	0		0		4	0	0	0	0	2
Micropogonias undulatus	0	0	0	0	15	0		0		4	0	0	0	0	2
Stenotomus caprinus	205.4	65.45	9.49	2.95	15	378.8	85.79	11.89	3.75	4	998.5	183.50	50.31	16.71	2
Upeneus parvus	266.1	64.11	3.17	0.61	15	185.0	69.00	3.48	1.74	4	131.0	89.00	3.11	2.57	2
Anchoa mitchilli	0	0	0	0	15	0		0		4	0	0	0	0	2
Prionotus rubio	5.4	2.71	0.29	0.16	15	3.8	2.25	0.18	0.13	4	2.5	2.50	0.12	0.12	2
Trachurus lathami	92.6	64.18	1.71	1.07	15	162.8	142.84	3.08	2.54	4	34.5	10.50	0.48	0.21	2
Leiostomus xanthurus	0.6	0.43	0.05	0.04	15	0		0		4	0	0	0	0	2
Syacium gunteri	0	0	0	0	15	0		0		4	24.0	24.00	0.82	0.82	2
Squid	133.1	32.69	1.49	0.31	15	17.0	4.79	0.73	0.25	4	18.5	6.50	0.73	0.19	2

Table 9c
Statistical Zone 18

Summary of the mean total catch ($\bar{X}$), the standard error of the mean (SEM) and the number of samples taken (n). Catch values in kg, temperature in °C, salinity in PPT, chlorophyll in mg/m^3 and oxygen in PPM.

	0-5 fm			6-10 fm			11-20 fm			21-30 fm			31-40 fm			Over 40 fm		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg	187.0	0	1	305.6	93.89	10	84.5	12.74	12	65.0	6.37	15	90.6	26.35	4	132.3	15.21	2
Total Finfish kg	184.3	0	1	272.3	94.56	10	55.8	9.98	12	48.3	5.89	15	78.4	26.00	4	125.1	13.39	2
Total Crustacean kg			0	15.3	7.43	4	25.7	4.34	12	14.5	1.81	15	9.3	4.34	4	4.8	2.05	2
Total Others kg			0	5.2	1.83	4	3.3	1.03	12	2.4	0.36	15	3.7	0.65	4	2.5	0.23	2
Surface Temperature			0	29.6	0.32	3	29.7	0.13	9	29.3	0.11	12	29.7	0.18	4	29.2	0.56	2
Mid Temperature			0	28.2	0.60	3	28.0	0.33	9	26.2	0.16	12	24.2	0.69	4	23.2	0.75	2
Max Temperature			0	26.0	0.68	3	24.6	0.20	9	21.7	0.36	12	18.9	0.98	4	17.5	1.31	2
Surface Salinity			0	33.7	0.43	3	33.7	0.31	9	34.9	0.22	12	34.9	0.18	4	34.7	0.01	2
Mid Salinity			0	34.3	0.39	3	33.9	0.34	9	35.4	0.12	12	36.0	0.03	4	36.2	0.22	2
Max Salinity			0	34.4	0.71	3	35.8	0.09	9	36.3	0.03	13	36.3	0.02	3	36.2	0.04	2
Surface Chlorophyll			0	0.4	0.17	3	0.3	0.08	8	0.1	0.01	11	0.2	0.02	3	0.1	0	1
Mid Chlorophyll			0			0			0			0			0			0
Max Chlorophyll			0			0			0			0			0			0
Surface Oxygen			0			0			0			0			0			0
Mid Oxygen			0			0			0			0			0			0
Max Oxygen			0			0			0			0			0			0

Table 10a
Statistical Zone 19
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	0-5 fm					6-10 fm					11-20 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	60.0	0	0.27	0	1	3293.0	1277.57	12.78	4.63	3	464.7	240.55	4.84	2.31	15
Penaeus aztecus	6.0	0	0	0	1	3788.3	1955.93	38.08	18.33	3	709.3	215.12	9.32	1.73	15
Sicyonia dorsalis	0	0	0	0	1	135.0	81.63	0.36	0.20	3	579.9	191.99	1.74	0.52	15
Sicyonia brevirostris	0	0	0	0	1	0	0	0	0	3	0	0	0	0	15
Squilla spp.	0	0	0	0	1	143.0	143.00	0.97	0.97	3	0.9	0.64	0.02	0.02	15
Callinectes similis	600.0	0	7.49	0	1	1521.0	121.54	19.62	2.51	3	210.5	54.39	3.46	0.92	15
Micropogonias undulatus	3510.0	0	90.03	0	1	1039.0	1021.00	53.32	51.57	3	0	0	0	0	15
Stenotomus caprinus	0	0	0	0	1	3.0	3.00	0.05	0.05	3	207.7	44.71	1.60	0.33	15
Upeneus parvus	0	0	0	0	1	188.0	170.32	1.59	1.39	3	488.7	130.76	6.15	1.43	15
Anchoa mitchilli	0	0	0	0	1	0	0	0	0	3	0	0	0	0	15
Prionotus rubio	1770.0	0	10.49	0	1	619.0	312.50	3.03	1.44	3	4.7	3.08	0.07	0.04	15
Trachurus lathami	0	0	0	0	1	9.0	5.20	0.18	0.12	3	264.4	115.93	5.71	2.28	15
Leiostomus xanthurus	420.0	0	118.49	0	1	0	0	0	0	3	0	0	0	0	15
Syacium gunteri	90.0	0	0.95	0	1	400.0	215.93	5.45	3.07	3	261.9	120.06	2.84	1.29	15
Squid	0	0	0	0	1	38.0	25.71	0.68	0.49	3	281.3	54.14	4.28	0.74	15

Table 10b
Statistical Zone 19
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	21-30 fm					31-40 fm					Over 40 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	73.5	13.50	0.58	0.04	2					0					0
Penaeus aztecus	68.0	52.00	1.48	1.12	2					0					0
Sicyonia dorsalis	33.0	33.00	0.14	0.14	2					0					0
Sicyonia brevirostris	90.0	76.00	0.84	0.66	2					0					0
Squilla spp.	22.0	22.00	0.19	0.19	2					0					0
Callinectes similis	53.5	33.50	1.34	0.89	2					0					0
Micropogonias undulatus	0	0	0	0	2					0					0
Stenotomus caprinus	6.5	4.50	0.23	0.14	2					0					0
Upeneus parvus	523.5	398.50	6.62	5.01	2					0					0
Anchoa mitchilli	0	0	0	0	2					0					0
Prionotus rubio	0	0	0	0	2					0					0
Trachurus lathami	6.0	6.00	0.09	0.09	2					0					0
Leiostomus xanthurus	0	0	0	0	2					0					0
Syacium gunteri	0	0	0	0	2					0					0
Squid	35.0	21.00	0.97	0.85	2					0					0

Table 10c
Statistical Zone 19

Summary of the mean total catch ($\bar{X}$), the standard error of the mean (SEM) and the number of samples taken (n). Catch values in kg, temperature in °C, salinity in PPT, chlorophyll in mg/m^3 and oxygen in PPM.

	0-5 fm			6-10 fm			11-20 fm			21-30 fm			31-40 fm			Over 40 fm		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg	269.7	0	1	176.6	48.93	3	60.1	60.10	15	26.6	0.62	2			0			0
Total Finfish kg	254.7	0	1	91.7	56.32	3	34.5	4.21	15	20.0	2.69	2			0			0
Total Crustacean kg	12.3	0	1	81.7	27.65	3	21.3	3.78	15	4.5	1.74	2			0			0
Total Others kg	2.7	0	1	4.8	0.68	3	4.4	0.69	15	2.2	0.33	2			0			0
Surface Temperature			0	28.2	0	1	28.3	0.18	5	28.1	0.28	2			0			0
Mid Temperature			0	26.4	0	1	26.7	0.37	5	25.4	0.35	2			0			0
Max Temperature			0	24.2	0	1	21.6	0.78	5	19.9	0.09	2			0			0
Surface Salinity			0	35.3	0	1	36.0	0.06	5	35.9	0.15	2			0			0
Mid Salinity			0	34.8	0	1	36.0	0.06	5	36.0	0.08	2			0			0
Max Salinity			0	35.9	0	1	36.2	0.06	5	36.3	0.00	2			0			0
Surface Chlorophyll			0	3.1	0	1	1.4	1.33	4	0.0	0.02	2			0			0
Mid Chlorophyll			0			0			0			0			0			0
Max Chlorophyll			0			0			0			0			0			0
Surface Oxygen			0			0			0			0			0			0
Mid Oxygen			0			0			0			0			0			0
Max Oxygen			0			0			0			0			0			0

Table 11a
Statistical Zone 20
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	0-5 fm					6-10 fm					11-20 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	295.0	0	0.27	0	1	1638.2	454.42	6.13	1.68	5	1605.2	477.72	7.21	2.15	10
Penaeus aztecus	44.0	0	0.37	0	1	2496.2	879.45	25.81	8.10	5	1019.3	192.48	13.40	3.20	10
Sicyonia dorsalis	85.0	0	0.50	0	1	1717.2	872.12	4.41	2.17	5	858.8	352.39	1.81	0.77	10
Sicyonia brevirostris	0	0	0	0	1	3.2	3.20	0.04	0.04	5	5.3	1.73	0.06	0.02	10
Squilla spp.	0	0	0	0	1	0	0	0	0	5	0	0	0	0	10
Callinectes similis	1931.0	0	2.72	0	1	3010.4	1335.90	36.57	12.84	5	814.3	145.15	12.58	2.27	10
Micropogonias undulatus	4448.0	0	80.70	0	1	732.2	297.80	14.47	5.76	5	52.5	36.96	1.78	1.20	10
Stenotomus caprinus	0	0	0	0	1	1.8	1.80	0.03	0.03	5	128.6	50.24	0.58	0.24	10
Upeneus parvus	0	0	0	0	1	324.8	147.69	2.95	1.31	5	69.3	31.27	0.54	0.27	10
Anchoa mitchilli	0	0	0	0	1	0	0	0	0	5	0	0	0	0	10
Prionotus rubio	755.0	0	5.20	0	1	911.2	331.79	3.34	1.01	5	56.8	32.62	0.36	0.20	10
Trachurus lathami	0	0	0	0	1	3.6	3.60	0.05	0.05	5	35.8	26.48	0.45	0.33	10
Leiostomus xanthurus	2624.0	0	26.25	0	1	235.4	91.14	8.25	3.09	5	20.3	19.75	0.75	0.72	10
Syacium gunteri	125.0	0	2.48	0	1	413.8	156.15	4.29	1.69	5	550.0	66.95	7.09	0.87	10
Squid	0	0	0	0	1	12.8	9.88	0.29	0.24	5	114.1	40.13	1.42	0.43	10

Table 11b
Statistical Zone 20
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	21-30 fm					31-40 fm					Over 40 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	422.7	120.49	2.07	0.49	3	76.0	0	0.74	0	1	0	0	0	0	1
Penaeus aztecus	41.7	10.87	1.18	0.34	3	82.0	0	4.71	0	1	170.0	0	9.08	0	1
Sicyonia dorsalis	469.0	156.32	1.23	0.38	3	0	0	0	0	1	0	0	0	0	1
Sicyonia brevirostris	6.7	6.67	0.04	0.04	3	0	0	0	0	1	0	0	0	0	1
Squilla spp.	0	0	0	0	3	82.0	0	1.73	0	1	0	0	0	0	1
Callinectes similis	776.7	119.49	9.25	3.72	3	267.0	0	4.95	0	1	0	0	0	0	1
Micropogonias undulatus	0	0	0	0	3	0	0	0	0	1	10.0	0	1.82	0	1
Stenotomus caprinus	0	0	0	0	3	0	0	0	0	1	155.0	0	7.94	0	1
Upeneus parvus	3.7	3.67	0.04	0.04	3	16.0	0	0.50	0	1	275.0	0	2.95	0	1
Anchoa mitchilli	0	0	0	0	3	0	0	0	0	1	0	0	0	0	1
Prionotus rubio	0	0	0	0	3	0	0	0	0	1	0	0	0	0	1
Trachurus lathami	11.7	9.74	0.17	0.17	3	11.0	0	0.50	0	1	0	0	0	0	1
Leiostomus xanthurus	0	0	0	0	3	0	0	0	0	1	0	0	0	0	1
Syacium gunteri	168.7	49.05	2.22	0.69	3	0	0	0	0	1	0	0	0	0	1
Squid	60.3	58.34	1.34	1.34	3	0	0	0	0	1	55.0	0	0.68	0	1

Table 11c
Statistical Zone 20

Summary of the mean total catch ($\bar{X}$), the standard error of the mean (SEM) and the number of samples taken (n). Catch values in kg, temperature in °C, salinity in PPT, chlorophyll in mg/m^3 and oxygen in PPM.

	0-5 fm			6-10 fm			11-20 fm			21-30 fm			31-40 fm			Over 40 fm		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg	172.1	0	1	148.7	32.66	5	63.2	6.36	10	27.2	8.71	3	86.7	0	1	59.0	0	1
Total Finfish kg	156.0	0	1	56.7	11.30	5	22.8	3.75	10	10.5	4.51	3	64.4	0	1	47.7	0	1
Total Crustacean kg	136.6	0	1	389.3	21.20	5	38.4	3.93	10	15.4	4.07	3	19.8	0	1	11.4	0	1
Total Others kg	2.5	0	1	3.4	1.30	5	2.3	0.42	10	1.3	1.29	3	2.5	0	1	2.3	0	1
Surface Temperature			0			0			0			0			0			0
Mid Temperature			0			0			0			0			0			0
Max Temperature			0			0			0			0			0			0
Surface Salinity			0			0			0			0			0			0
Mid Salinity			0			0			0			0			0			0
Max Salinity			0			0			0			0			0			0
Surface Chlorophyll			0			0			0			0			0			0
Mid Chlorophyll			0			0			0			0			0			0
Max Chlorophyll			0			0			0			0			0			0
Surface Oxygen			0			0			0			0			0			0
Mid Oxygen			0			0			0			0			0			0
Max Oxygen			0			0			0			0			0			0

Table 12a
Statistical Zone 21
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	0-5 fm					6-10 fm					11-20 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp					0	369.8	134.78	2.61	0.93	9	703.6	178.63	3.68	0.95	16
Penaeus aztecus					0	305.6	157.64	3.44	1.52	9	3564.4	805.56	44.39	9.03	16
Sicyonia dorsalis					0	278.7	152.39	1.10	0.61	9	315.4	106.81	1.01	0.34	16
Sicyonia brevirostris					0	20.6	11.86	0.31	0.18	9	204.0	178.58	1.90	1.66	16
Squilla spp.					0	85.4	38.61	1.29	0.53	9	36.1	22.79	0.43	0.29	16
Callinectes similis					0	558.7	204.26	8.83	3.13	9	940.1	240.72	14.57	4.44	16
Micropogonias undulatus					0	1397.2	497.30	39.35	14.53	9	66.4	29.83	2.75	1.06	16
Stenotomus caprinus					0	10.2	5.49	0.33	0.20	9	828.1	177.05	4.71	0.90	16
Upeneus parvus					0	1417.7	395.46	16.51	4.45	9	1062.8	321.59	8.75	2.17	16
Anchoa mitchilli					0	0	0	0	0	9	0	0	0	0	16
Prionotus rubio					0	139.0	56.89	1.01	0.39	9	205.1	93.07	1.36	0.58	16
Trachurus lathami					0	83.0	30.43	1.92	0.75	9	997.9	649.77	17.82	11.64	16
Leiostomus xanthurus					0	1193.3	460.44	29.47	11.05	9	8.0	8.00	0.18	0.18	16
Syacium gunteri					0	2.7	2.67	0.03	0.03	9	57.6	34.12	0.88	0.52	16
Squid					0	79.8	22.75	1.73	0.54	9	137.3	67.59	2.81	1.36	16

Table 12b
Statistical Zone 21
40-ft trawls

Summary of catch data by depth zone. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that stratum are given.

	21-30 fm					31-40 fm					Over 40 fm				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	1251.7	258.31	6.86	1.10	15					0					0
Penaeus aztecus	170.3	27.08	4.92	0.80	15					0					0
Sicyonia dorsalis	306.9	113.57	1.03	0.32	15					0					0
Sicyonia brevirostris	57.8	18.97	0.72	0.25	15					0					0
Squilla spp.	8.6	5.97	0.09	0.06	15					0					0
Callinectes similis	626.3	191.53	9.00	2.84	15					0					0
Micropogonias undulatus	1.1	0.93	0.12	0.11	15					0					0
Stenotomus caprinus	55.4	18.88	0.44	0.12	15					0					0
Upeneus parvus	359.7	67.23	2.94	0.65	15					0					0
Anchoa mitchilli	0	0	0	0	15					0					0
Prionotus rubio	19.0	6.24	0.26	0.06	15					0					0
Trachurus lathami	46.0	26.26	0.89	0.50	15					0					0
Leiostomus xanthurus	0.9	0.93	0.11	0.11	15					0					0
Syacium gunteri	2.9	2.93	0.05	0.05	15					0					0
Squid	65.7	10.65	1.43	0.27	15					0					0

Table 12c
Statistical Zone 21

Summary of the mean total catch ($\bar{X}$), the standard error of the mean (SEM) and the number of samples taken (n). Catch values in kg, temperature in °C, salinity in PPT, chlorophyll in mg/m^3 and oxygen in PPM.

	0-5 fm			6-10 fm			11-20 fm			21-30 fm			31-40 fm			Over 40 fm		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg			0	152.1	25.99	9	131.8	21.61	16	59.9	6.34	15			0			0
Total Finfish kg			0	113.7	26.53	9	58.7	15.52	16	33.1	4.56	15			0			0
Total Crustacean kg			0	34.7	8.72	9	69.6	12.36	16	25.0	4.51	15			0			0
Total Others kg			0	3.4	0.58	9	3.1	1.35	16	2.0	0.24	15			0			0
Surface Temperature			0	23.5	0.43	4	26.3	0.68	4	26.6	0.53	7			0			0
Mid Temperature			0	20.5	0.37	4	20.3	0.82	4	21.4	0.28	7			0			0
Max Temperature			0	20.3	0.50	4	18.1	0.21	4	17.9	0.28	7			0			0
Surface Salinity			0	36.3	0.02	4	36.3	0.02	5	36.3	0.03	7			0			0
Mid Salinity			0	36.3	0.02	4	36.3	0.01	5	36.3	0.03	7			0			0
Max Salinity			0	36.4	0.04	4	36.3	0.01	5	36.3	0.01	7			0			0
Surface Chlorophyll			0	0.5	0.27	4	0.1	0.02	5	0.1	0.01	6			0			0
Mid Chlorophyll			0			0			0			0			0			0
Max Chlorophyll			0			0			0			0			0			0
Surface Oxygen			0	6.3	0.06	4	6.3	0.11	5	6.5	0.18	7			0			0
Mid Oxygen			0	6.4	0.14	4	6.5	0.06	5	6.8	0.22	7			0			0
Max Oxygen			0	6.2	0.48	4	6.1	0.32	5	5.3	0.26	7			0			0

Table 13a
16-ft trawls

Summary of catch data in the 0-5 fm depth stratum. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that zone are given.

	Statistical Zone 11					Statistical Zone 12					Statistical Zone 13				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	0	0	0	0	15	0	0	0	0	6	0	0	0	0	19
Penaeus aztecus	317.2	139.62	0	0	15	39.0	17.65	0.54	0.27	6	84.6	40.52	0.7	0.30	19
Sicyonia dorsalis	0	0	0	0	15	0	0	0	0	6	0	0	0	0	19
Sicyonia brevirostris	0	0	0	0	15	0	0	0	0	6	0	0	0	0	19
Squilla spp.	0	0	0	0	15	0	0	0	0	6	0	0	0	0	19
Callinectes similis	1.2	1.20	0.02	0.02	15	0	0	0	0	6	7.0	3.90	0.09	0.03	19
Micropogonias undulatus	76.8	48.94	0	0	15	12.0	5.14	0.23	0.08	6	25.0	9.72	0.80	0.30	19
Stenotomus caprinus	0	0	0	0	15	1.0	1.00	0.05	0.05	6	0	0	0	0	19
Upeneus parvus	0	0	0	0	15	0	0	0	0	6	0	0	0	0	19
Anchoa mitchilli	1062.8	469.78	0	0	15	1502.0	511.14	3.31	1.16	6	1027.9	386.18	1.32	0.53	19
Prionotus rubio	0	0	0	0	15	2.0	2.00	0.05	0.05	6	0	0	0	0	19
Trachurus lathami	0	0	0	0	15	0	0	0	0	6	0	0	0	0	19
Leiostomus xanthurus	102.8	60.57	0.04	0.04	15	3.0	3.00	0.09	0.09	6	4.7	2.28	0.13	0.05	19
Syacium gunteri	0	0	0	0	15	0	0	0	0	6	0	0	0	0	19
Squid	32.8	32.80	0.06	0.06	15	0	0	0	0	6	0	0	0	0	19

Table 13b
16-ft trawls

Summary of catch data in the 0-5 fm depth stratum. The number (Num.) of organisms caught, the standard error of the mean (SEM) for numbers, the weight in kg, the SEM of weight and the number (n) of samples taken in that zone are given.

	Statistical Zone 14					Statistical Zone 16					Statistical Zone 17				
Species	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.	Num.	SEM.	Wt.	SEM.	n.
Trachypeneus spp.	0.4	0.4	0.00	0.00	30	0	0	0	0	15	1.9	1.85	0.02	0.02	13
Penaeus aztecus	41.2	18.28	0.40	0.17	30	255.6	91.60	1.27	0.47	15	156.9	25.51	1.11	0.15	13
Sicyonia dorsalis	0	0	0	0	30	0	0	0	0	15	0	0	0	0	13
Sicyonia brevirostris	0	0	0	0	30	0	0	0	0	15	0	0	0	0	13
Squilla spp.	0.2	0.20	0.00	0.00	30	0	0	0	0	15	0	0	0	0	13
Callinectes similis	0	0	0	0	30	30.4	29.55	0.05	0.03	15	0	0	0	0	13
Micropogonias undulatus	72.8	24.38	1.99	0.74	30	41.6	16.83	0.49	0.19	15	339.7	96.43	4.49	1.32	13
Stenotomus caprinus	0	0	0	0	30	0	0	0	0	15	0	0	0	0	13
Upeneus parvus	0	0	0	0	30	0	0	0	0	15	0	0	0	0	13
Anchoa mitchilli	298.2	125.33	0.57	0.25	30	190.0	66.45	0.33	0.08	15	644.3	195.41	0.75	0.17	13
Prionotus rubio	4.4	4.40	0.02	0.02	30	0.0	0.00	0.00	0.00	15	0.0	0.00	0.00	0.00	13
Trachurus lathami	0	0	0	0	30	0	0	0	0	15	0	0	0	0	13
Leiostomus xanthurus	24.0	13.18	0.74	0.38	30	1.6	0.92	0.05	0.03	15	7.9	4.15	0.21	0.09	13
Syacium gunteri	0	0	0	0	30	0	0	0	0	15	0	0	0	0	13
Squid	0	0	0	0	30	0	0	0	0	15	0.9	0.92	0.02	0.02	13

Table 13c
16-ft trawls

Summary of mean total catch ($\bar{X}$) in kg, the standard error of the mean (SEM) and the number (n) of samples taken by statistical zone in the 0-5 fm depth stratum, environmental data are included with 40-ft trawls.

Station #	Statistical Zone 11			Statistical Zone 12			Statistical Zone 13			Statistical Zone 14			Statistical Zone 16			Statistical Zone 17		
Environmental Category	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.	$\bar{X}$	SEM.	n.
Total Catch kg	1.3	0.36	15	6.8	2.08	6	8.5	1.50	19	10.9	2.97	30	6.0	1.39	15	20.5	2.90	13
Total Finfish kg	0.7	0.32	15	6.8	1.36	6	5.2	1.12	19	7.1	1.67	30	2.7	0.46	15	14.3	2.29	13
Total Crustaceans	0.5	0.29	15	0.9	0.57	6	3.7	0.98	19	4.1	1.50	30	3.5	1.05	15	6.3	1.09	13
Total Others kg			0			0			0			0			0			0
Surface Temperature			0			0			0			0			0			0
Mid Temperature			0			0			0			0			0			0
Max Temperature			0			0			0			0			0			0
Surface Salinity			0			0			0			0			0			0
Mid Salinity			0			0			0			0			0			0
Max Salinity			0			0			0			0			0			0
Surface Chlorophyll			0			0			0			0			0			0
Mid Chlorophyll			0			0			0			0			0			0
Max Chlorophyll			0			0			0			0			0			0
Surface Oxygen			0			0			0			0			0			0
Mid Oxygen			0			0			0			0			0			0
Max Oxygen			0			0			0			0			0			0

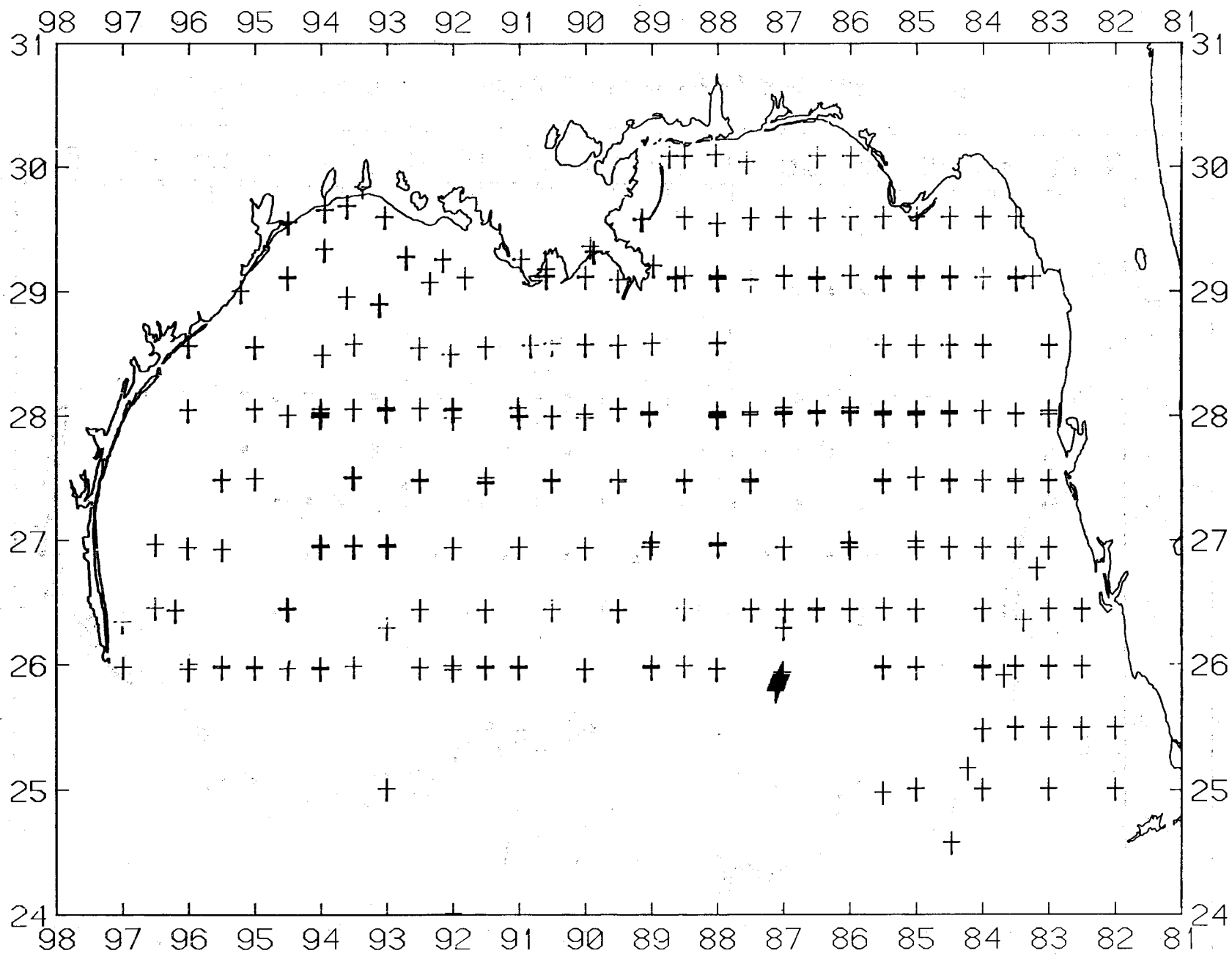

Figure 1. Locations of ichthyoplankton stations. Some locations were sampled repeatedly.

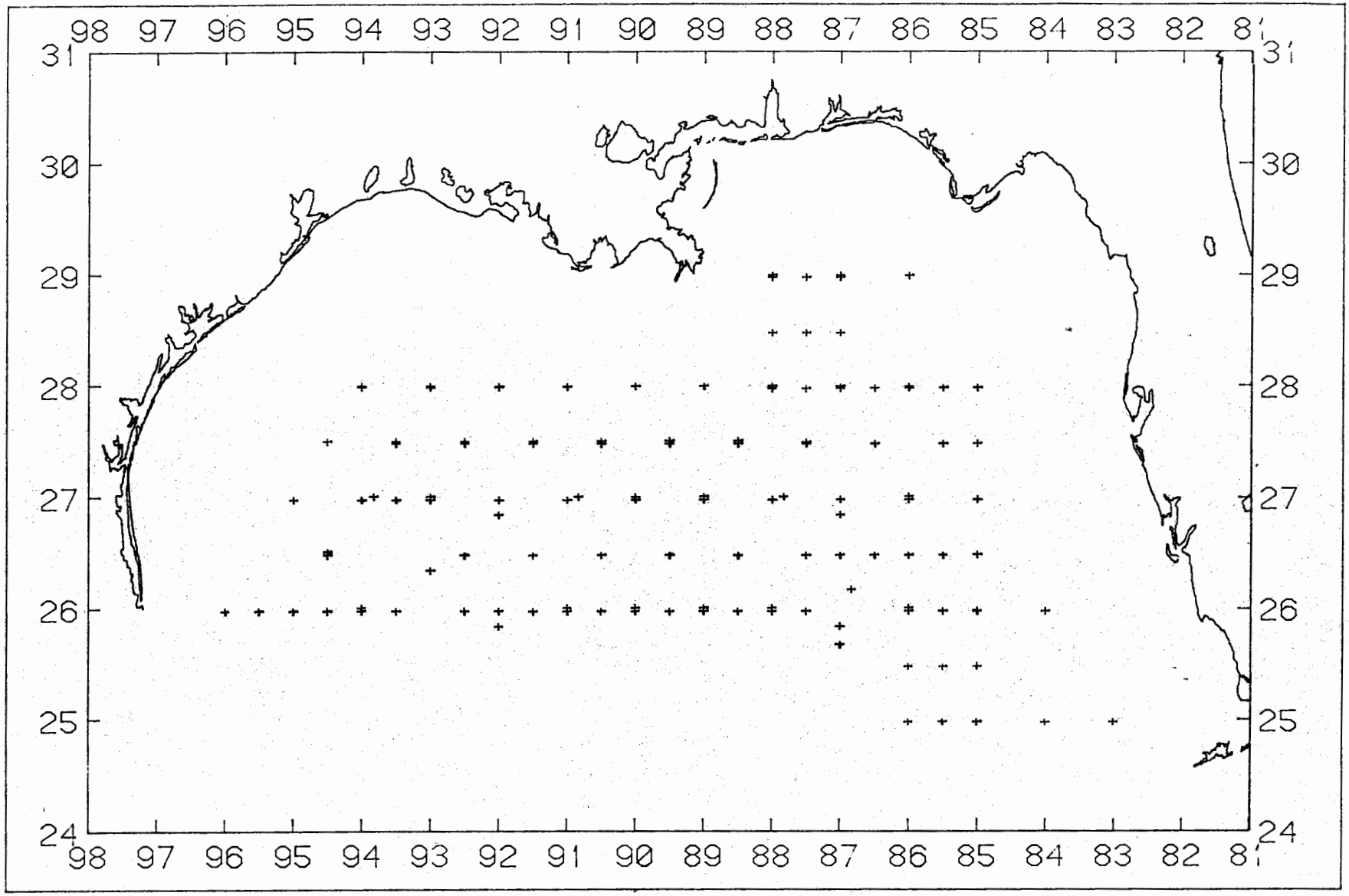

Figure 2. 1982 SEAMAP environmental data stations, April and May 1982.

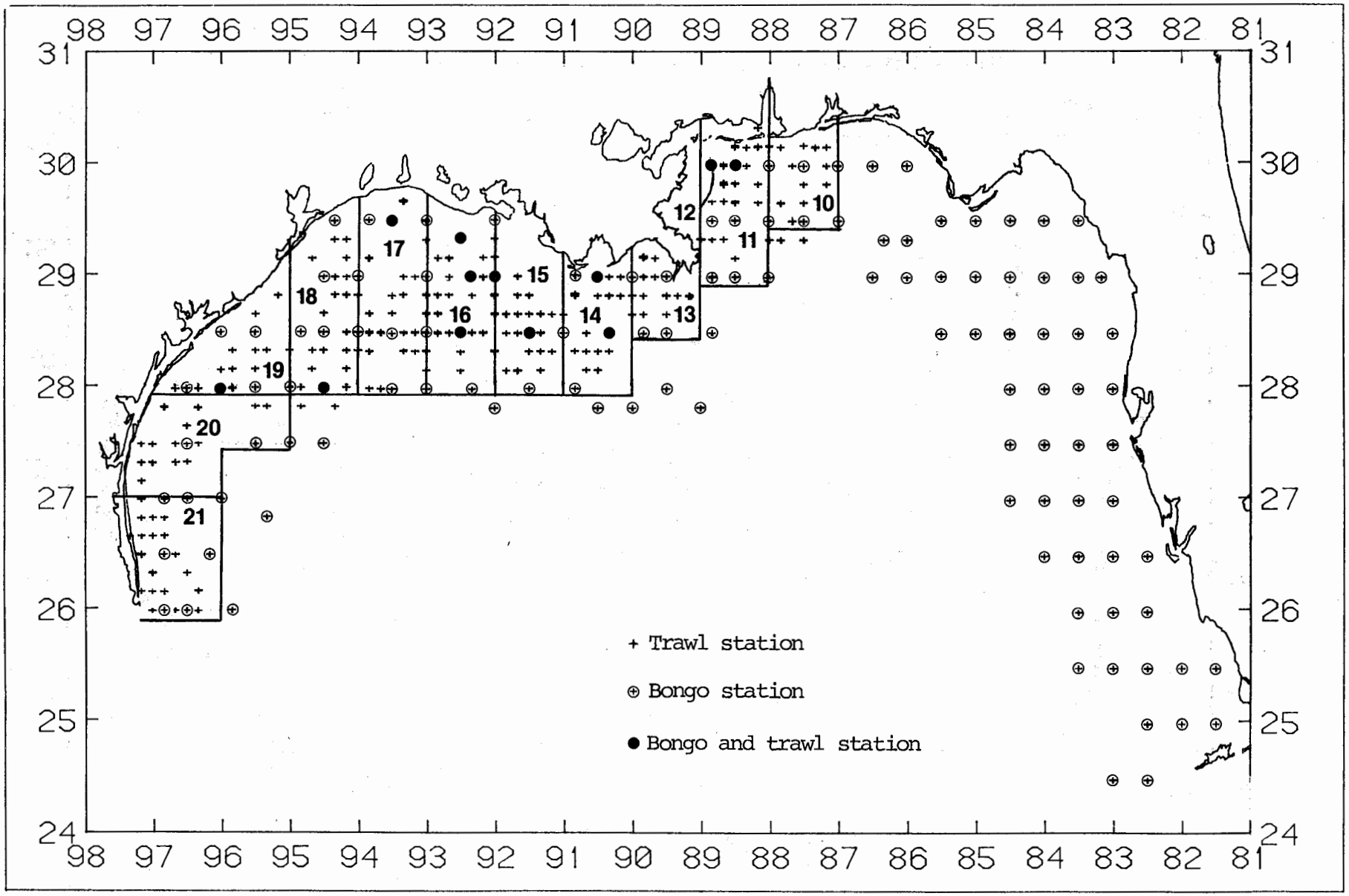

Figure 3. Total trawling, plankton, and environmental stations, June and July 1982; statistical zones 10 through 21 are shown.

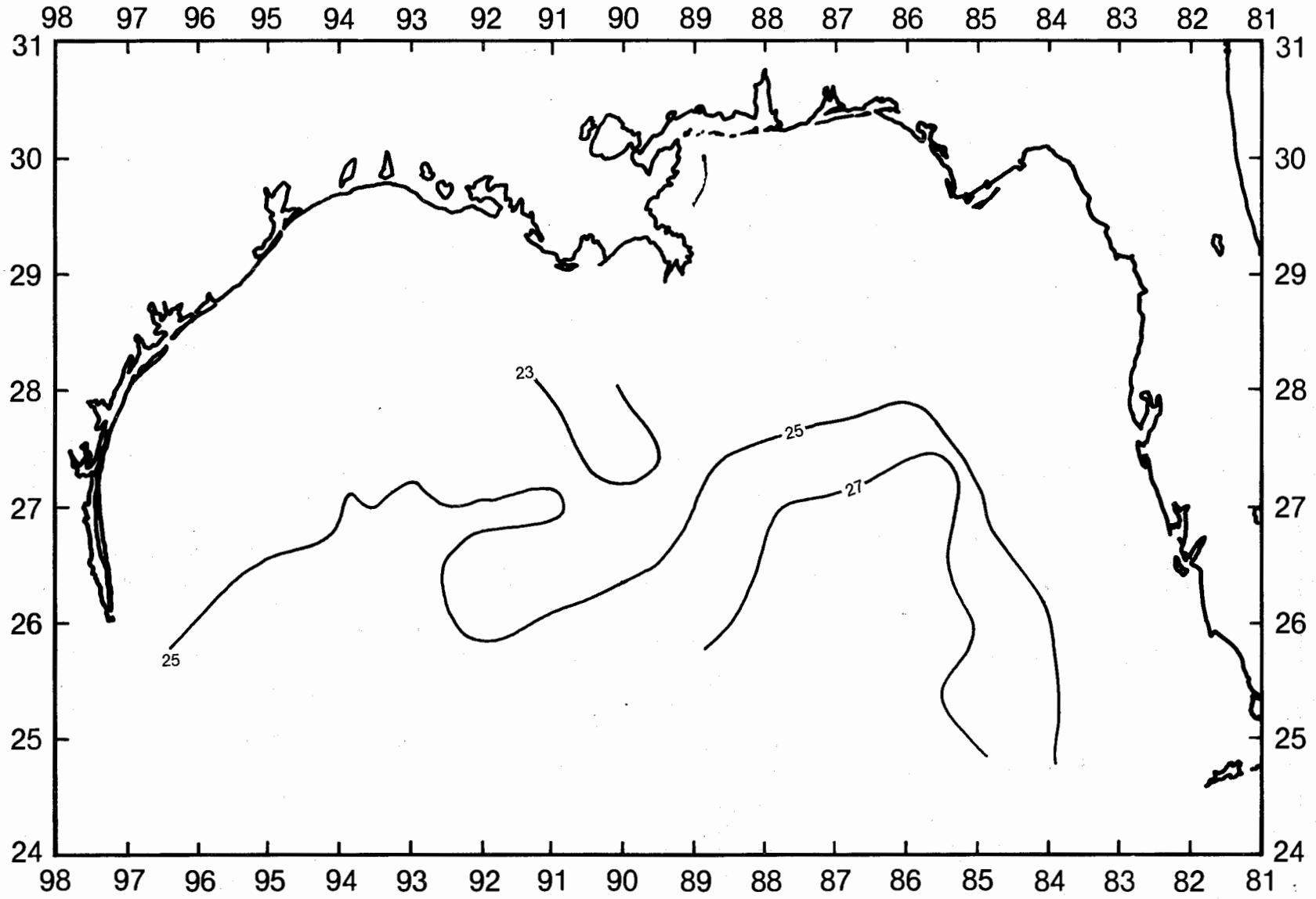

Figure 4. Surface water temperature (°C), April and May 1982.

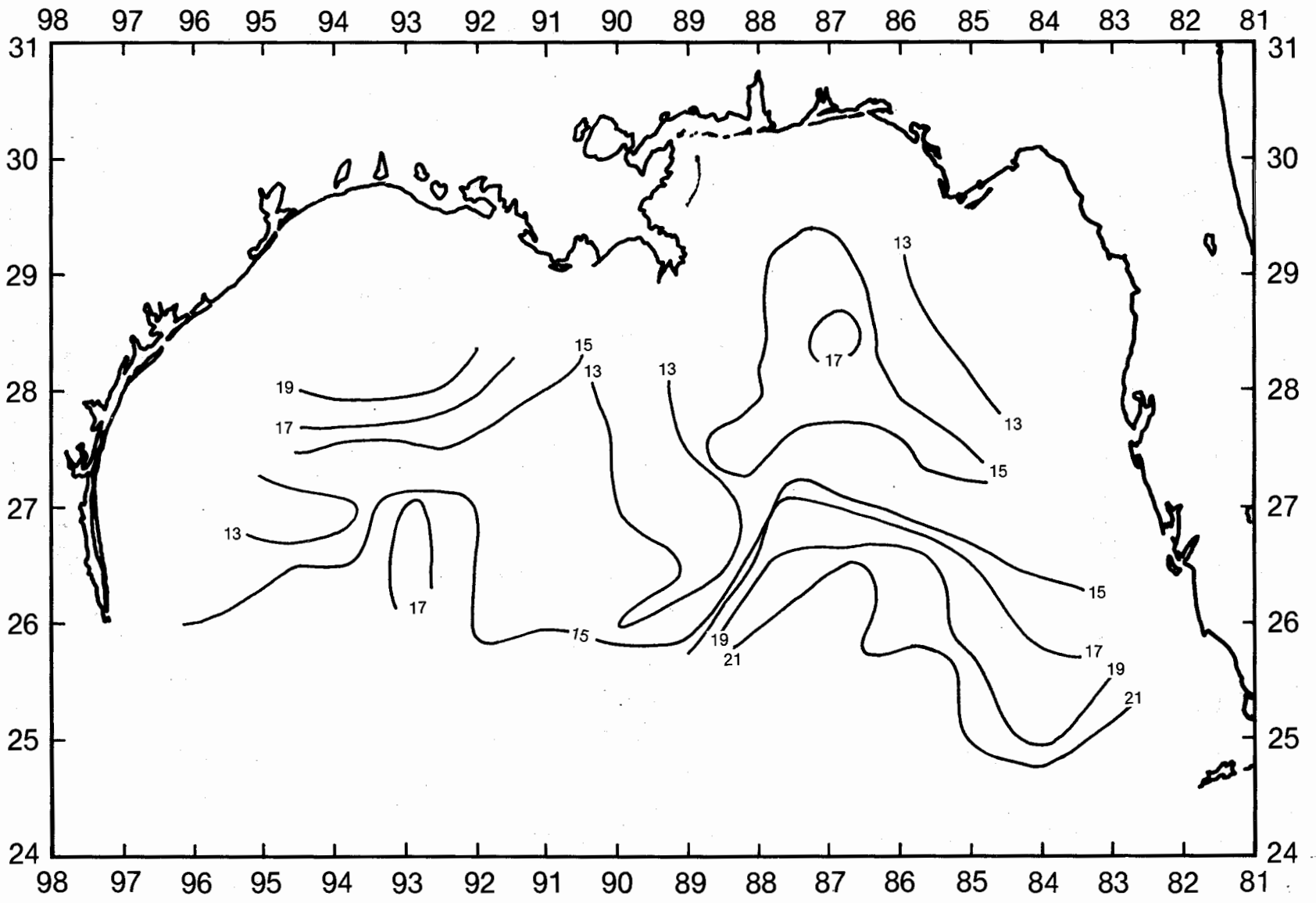

Figure 5. Water temperature (°C) at 200 m during April and May 1982.

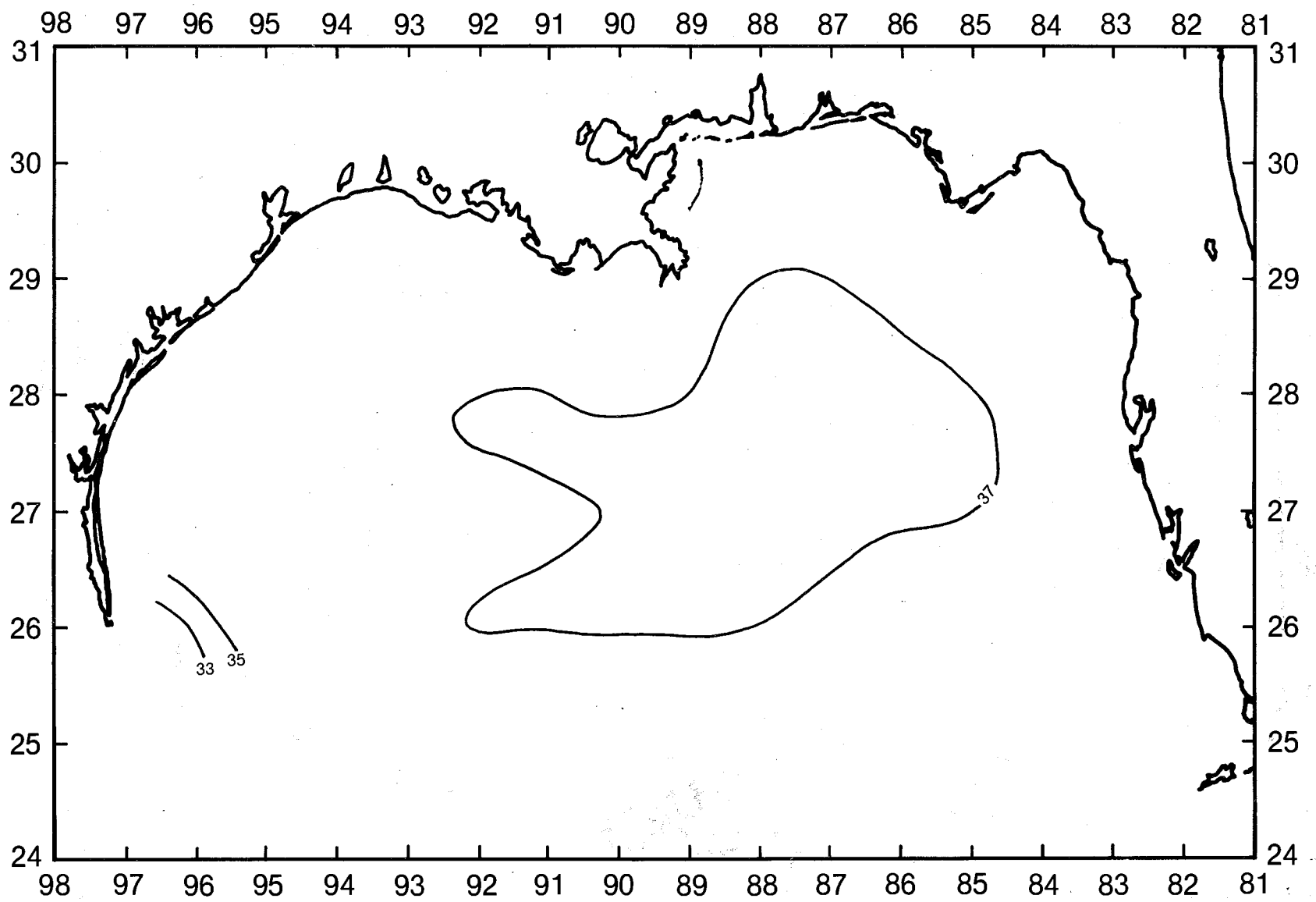

Figure 6. Surface salinity (PPT) for April and May 1982.

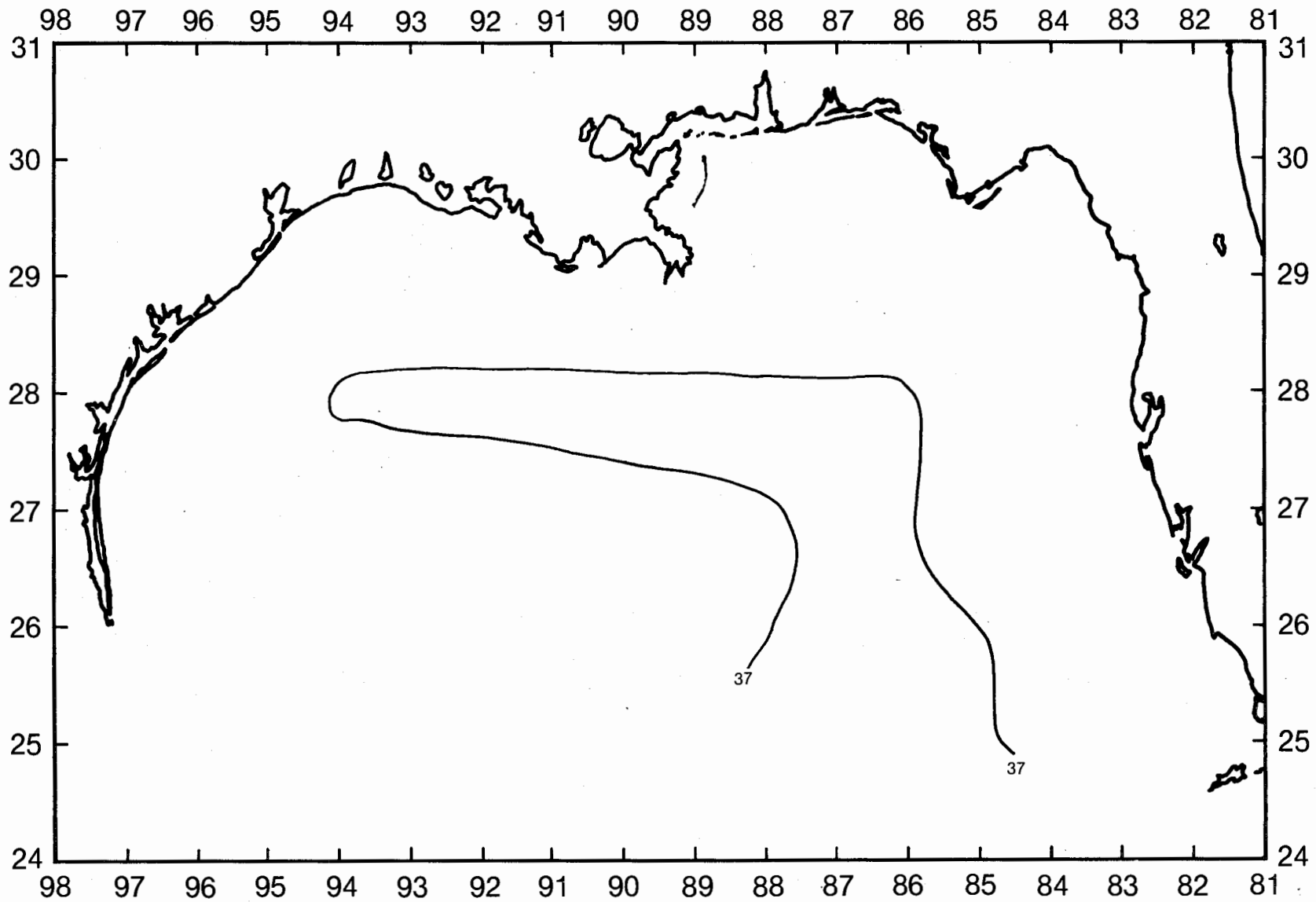

Figure 7. Salinity (PPT) at 200 m April and May 1982.

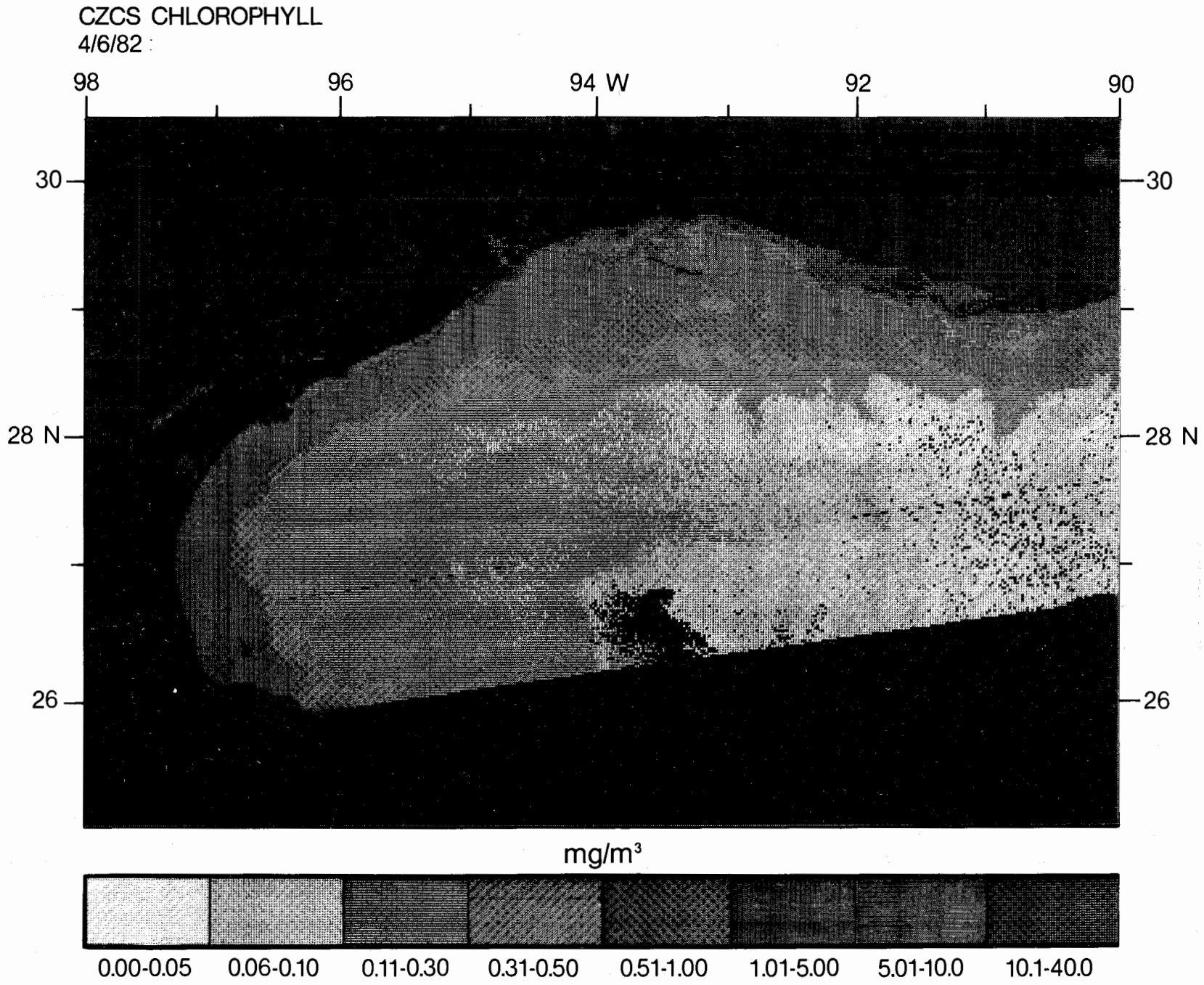

Figure 8. Satellite image (CZCS) of chlorophyll concentrations for 6 April 1982, western Gulf of Mexico.

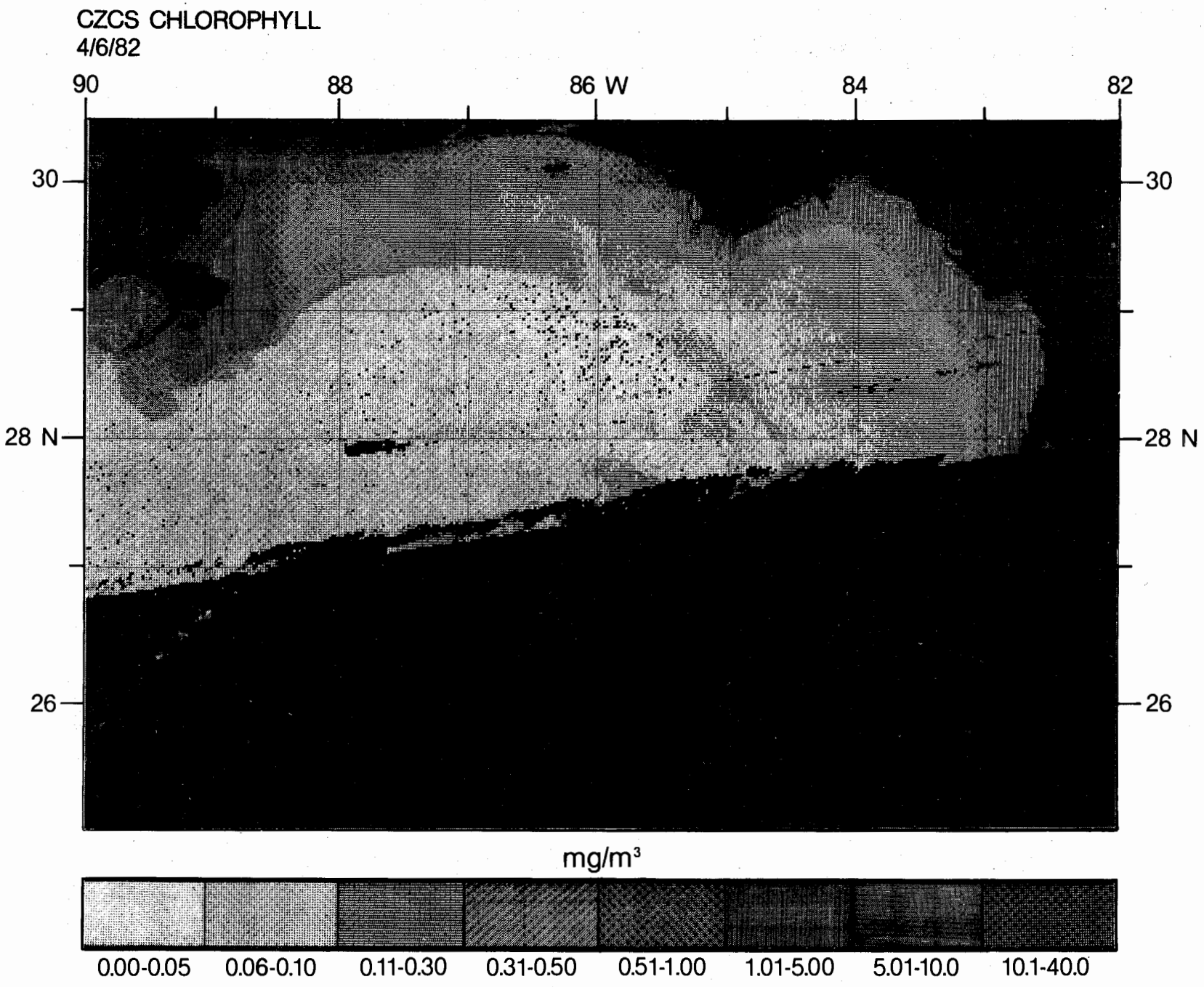

Figure 9. Satellite image (CZCS) of chlorophyll concentrations for 6 April 1982, eastern Gulf of Mexico.

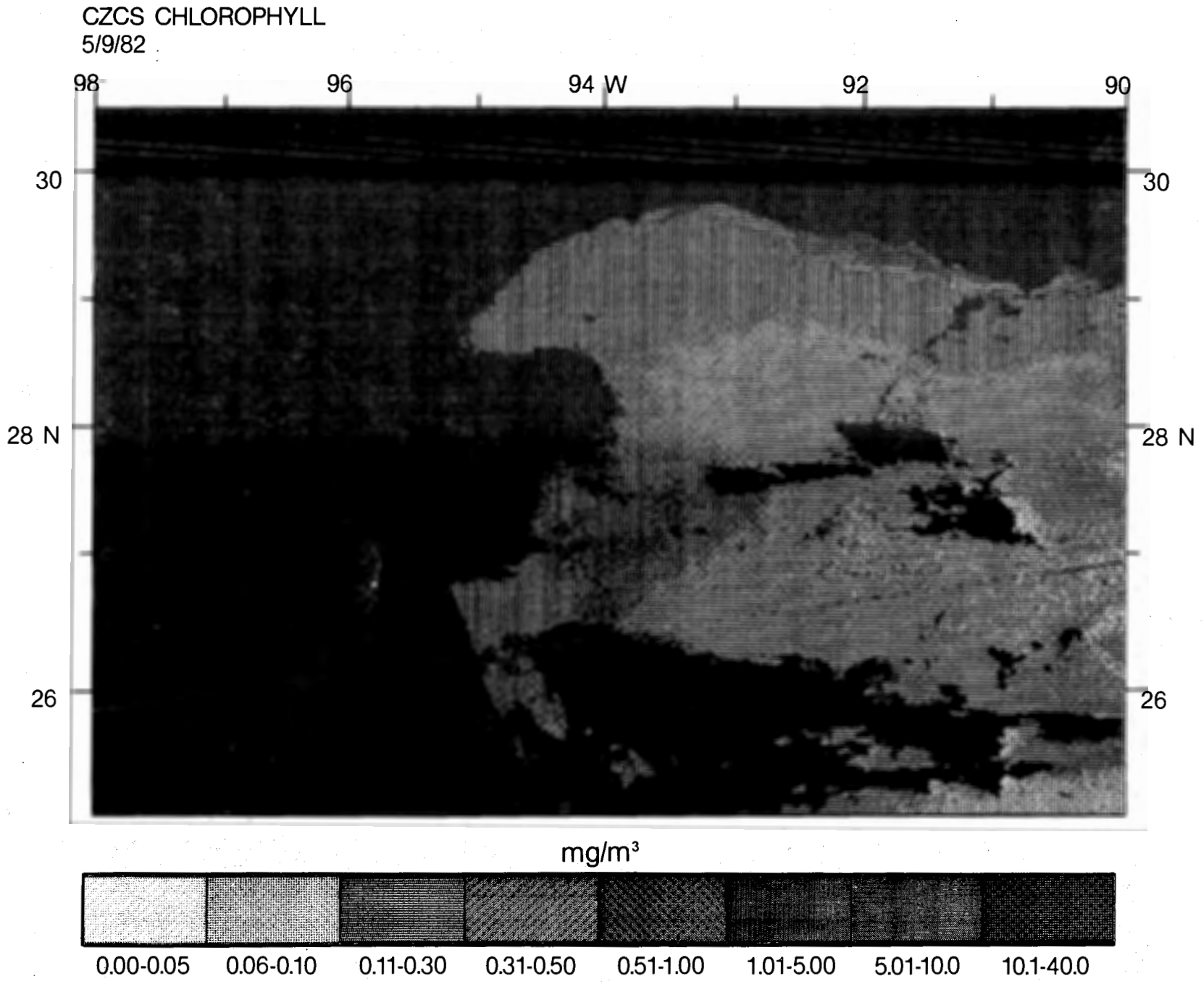

Figure 10. CZCS image of chlorophyll concentrations for 9 May 1982, western Gulf of Mexico.

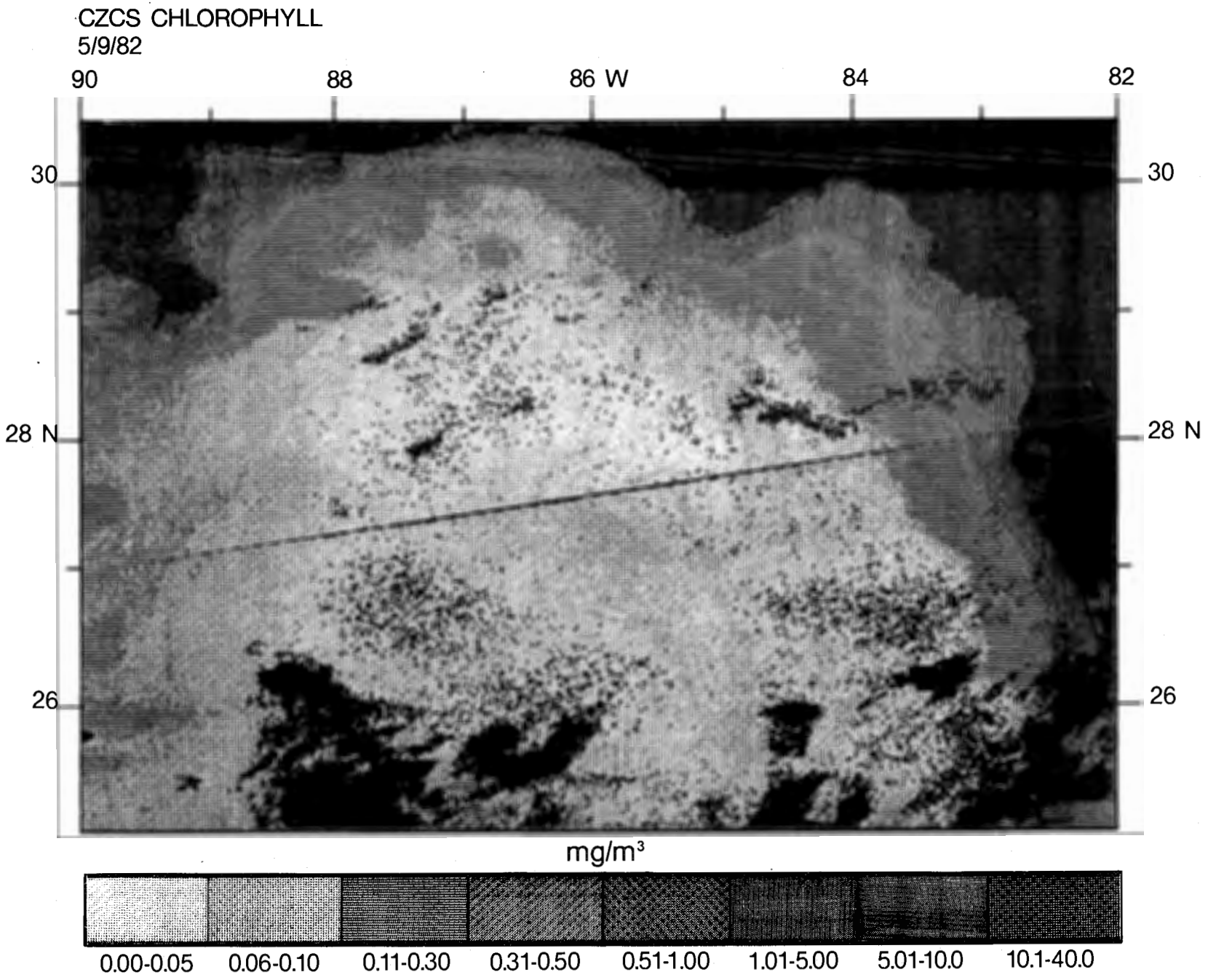

Figure 11. CZCS image of chlorophyll concentrations for 9 May 1982, eastern Gulf of Mexico.

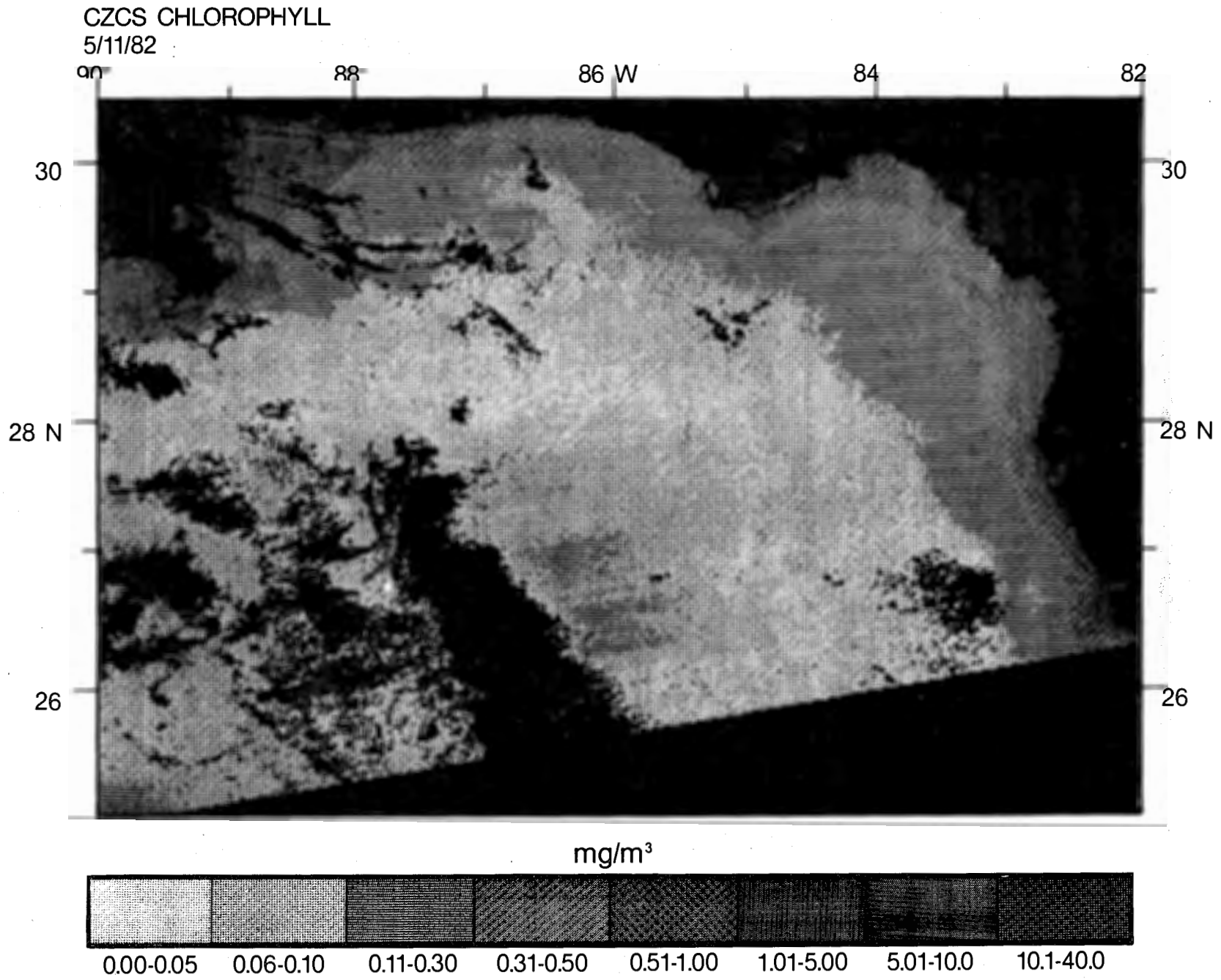

Figure 12. CZCS image of chlorophyll concentrations for 11 May 1982, eastern Gulf of Mexico.

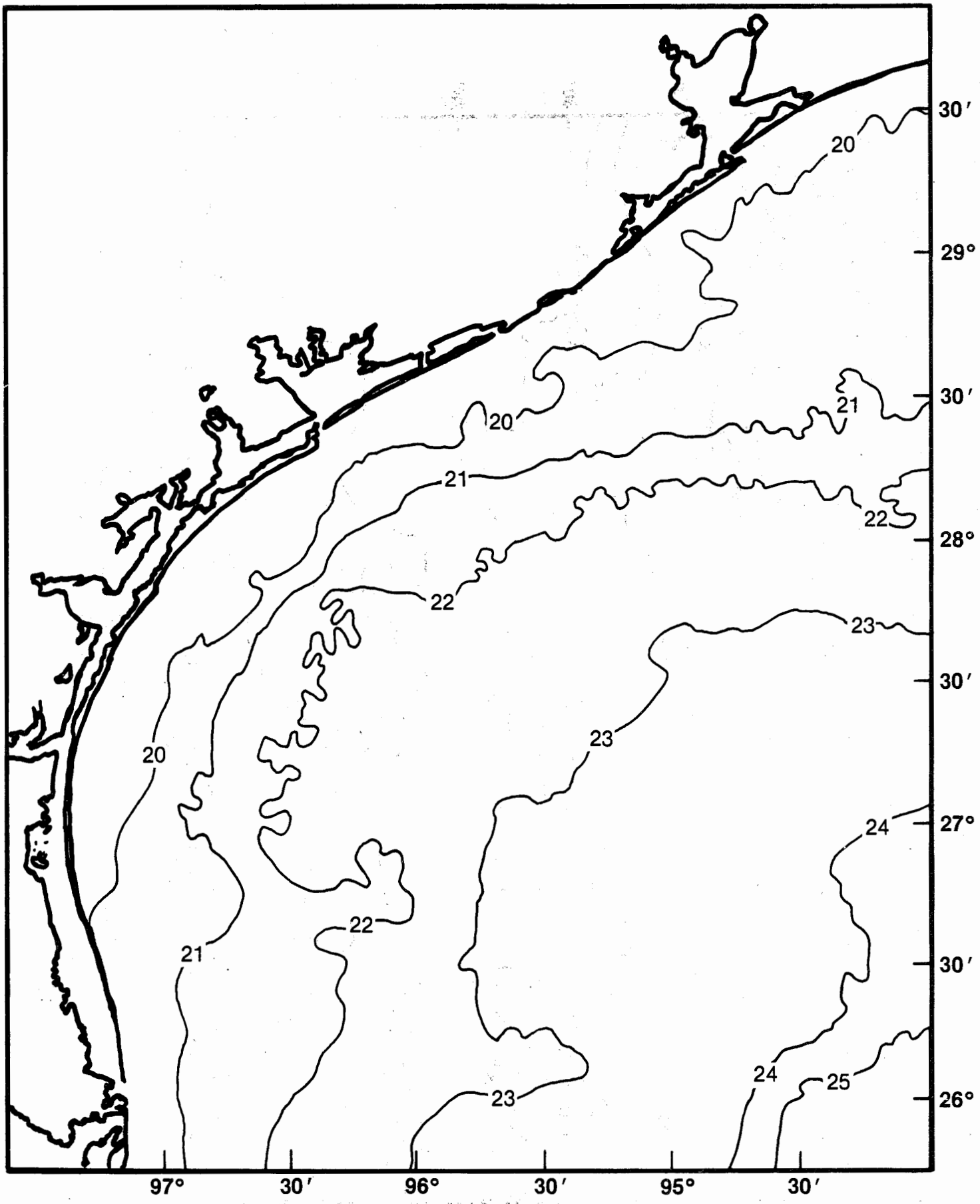

Figure 13. Satellite measurement of surface temperature in the western Gulf of Mexico, 6 April 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

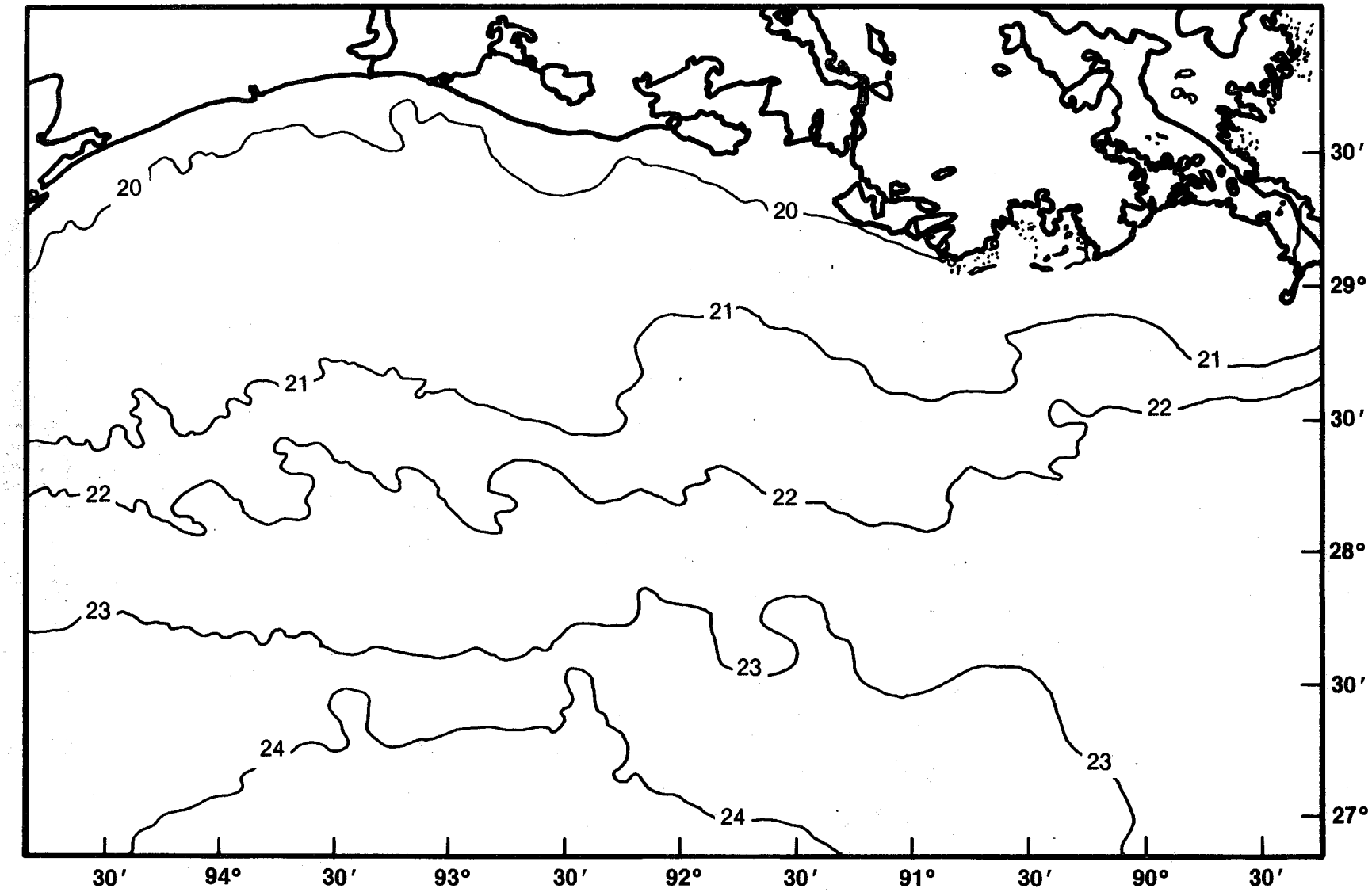

Figure 14. Satellite measurement of surface temperature in the central Gulf of Mexico, 6 April 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

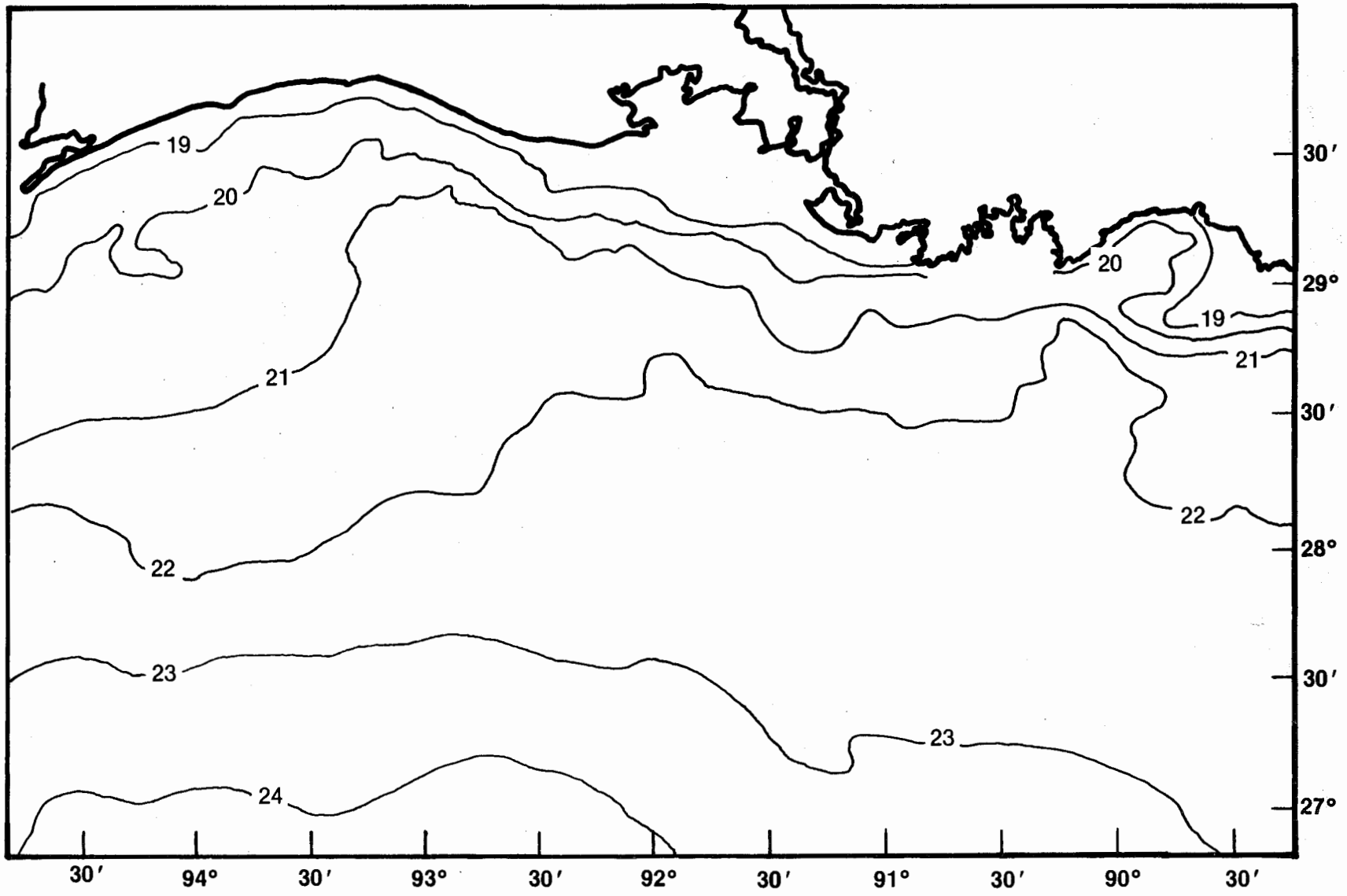

Figure 15. Satellite measurement of surface temperature in the central Gulf of Mexico, 11 April 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

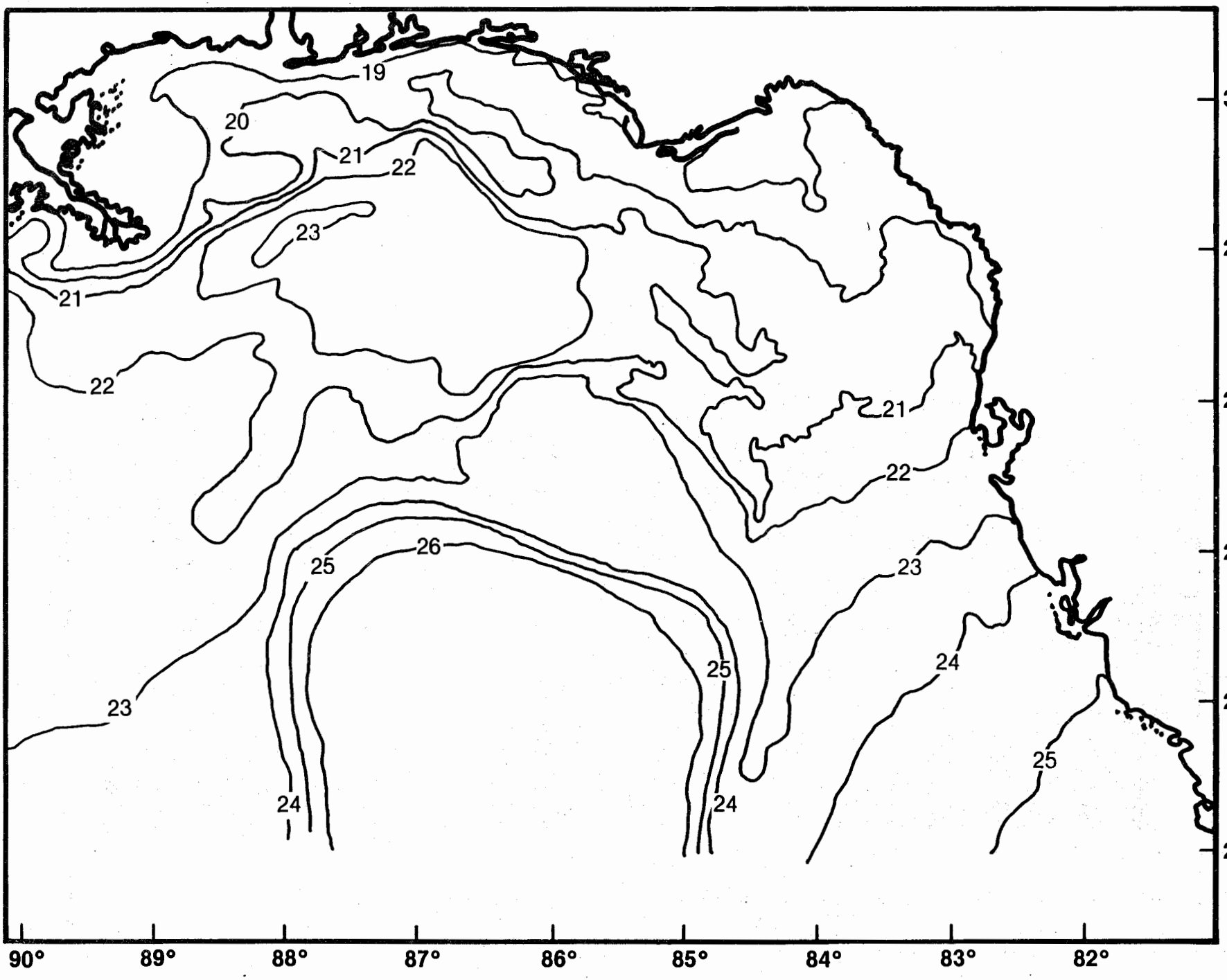

Figure 16. Satellite measurement of surface temperature in the eastern Gulf of Mexico, 11-12 April 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

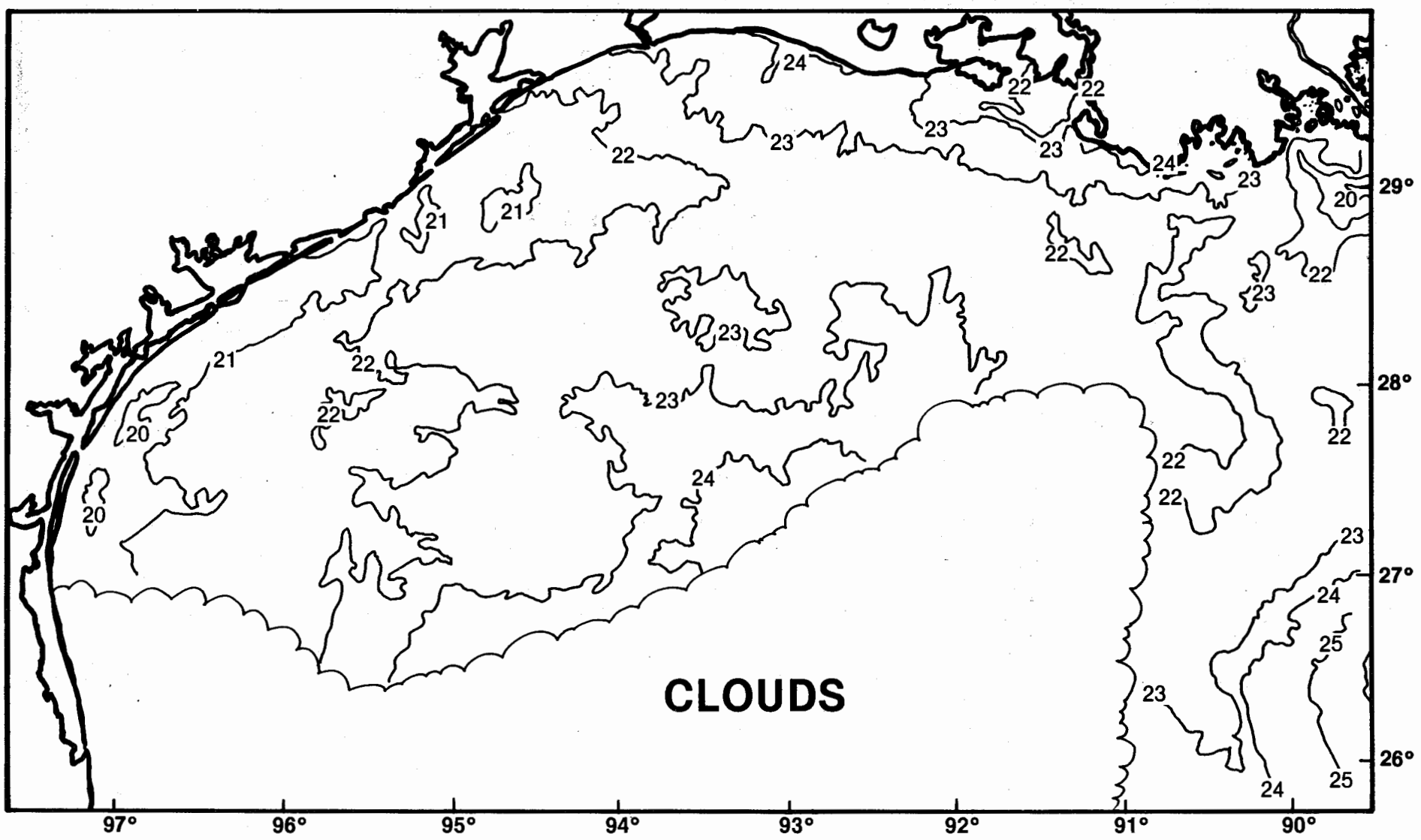

Figure 17. Satellite measurement of surface temperature in the western Gulf of Mexico, 3-4 May 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

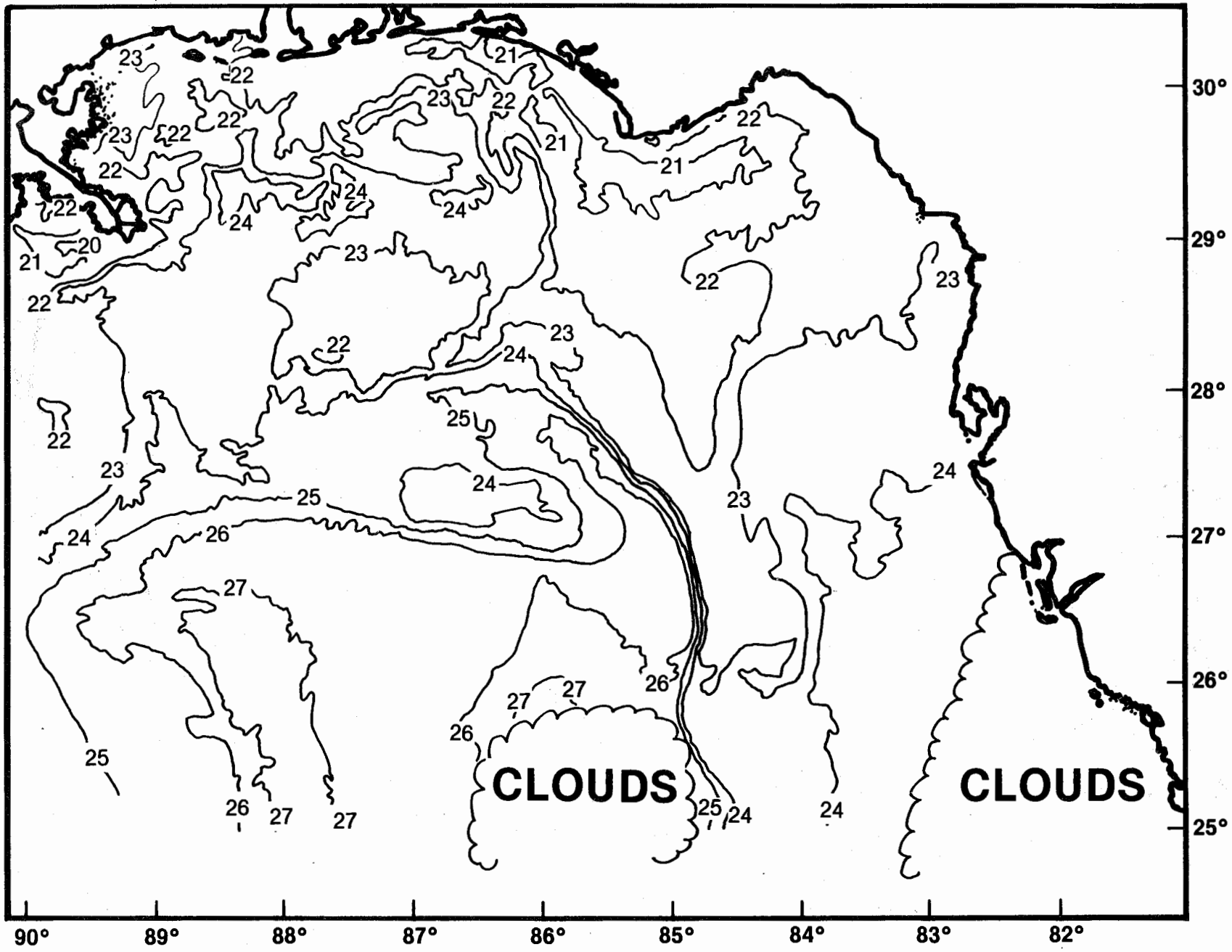

Figure 18. Satellite measurement of surface temperature in the eastern Gulf of Mexico, 3-4 May 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

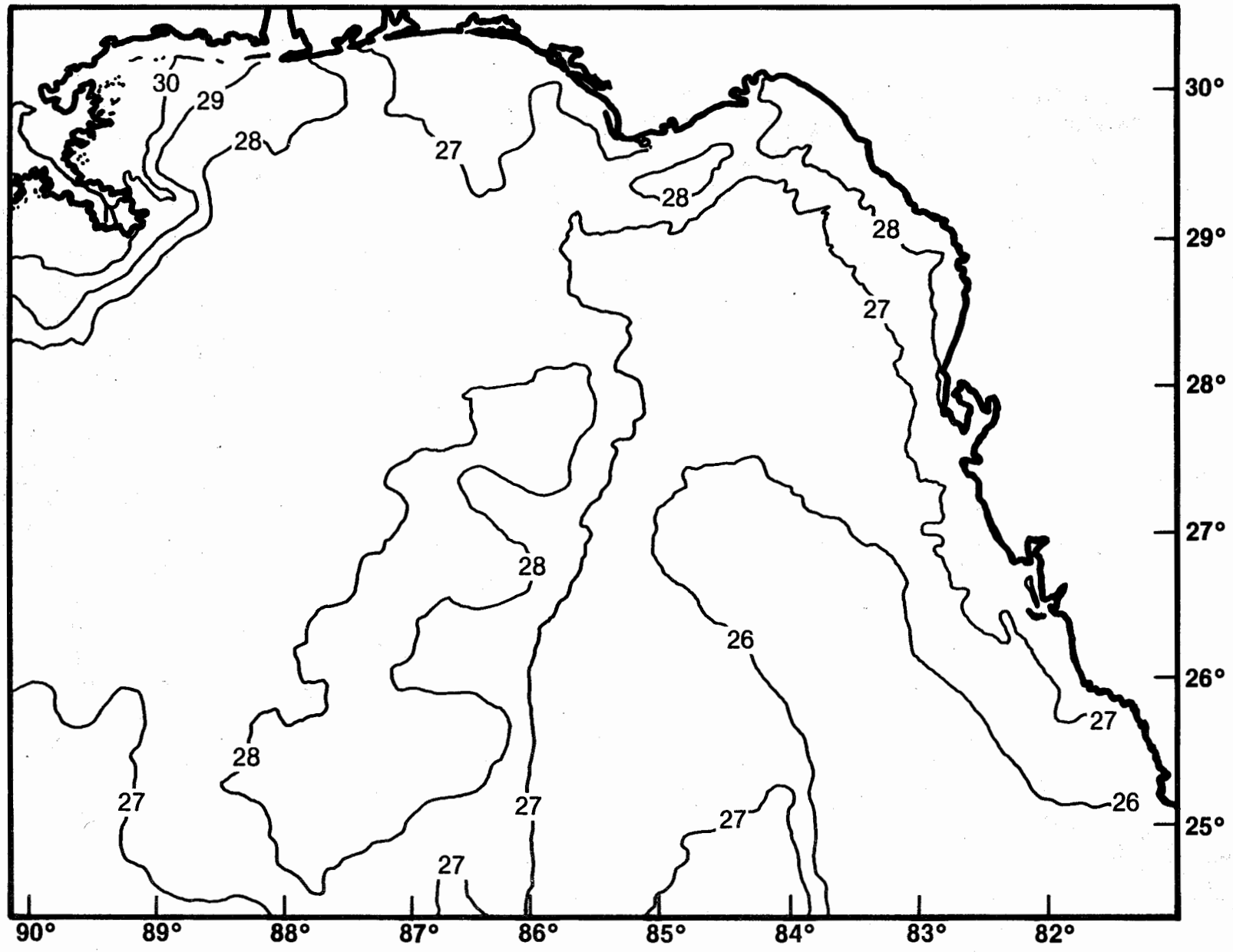

Figure 19. Satellite measurement of surface temperature in the eastern Gulf of Mexico, 7 June 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

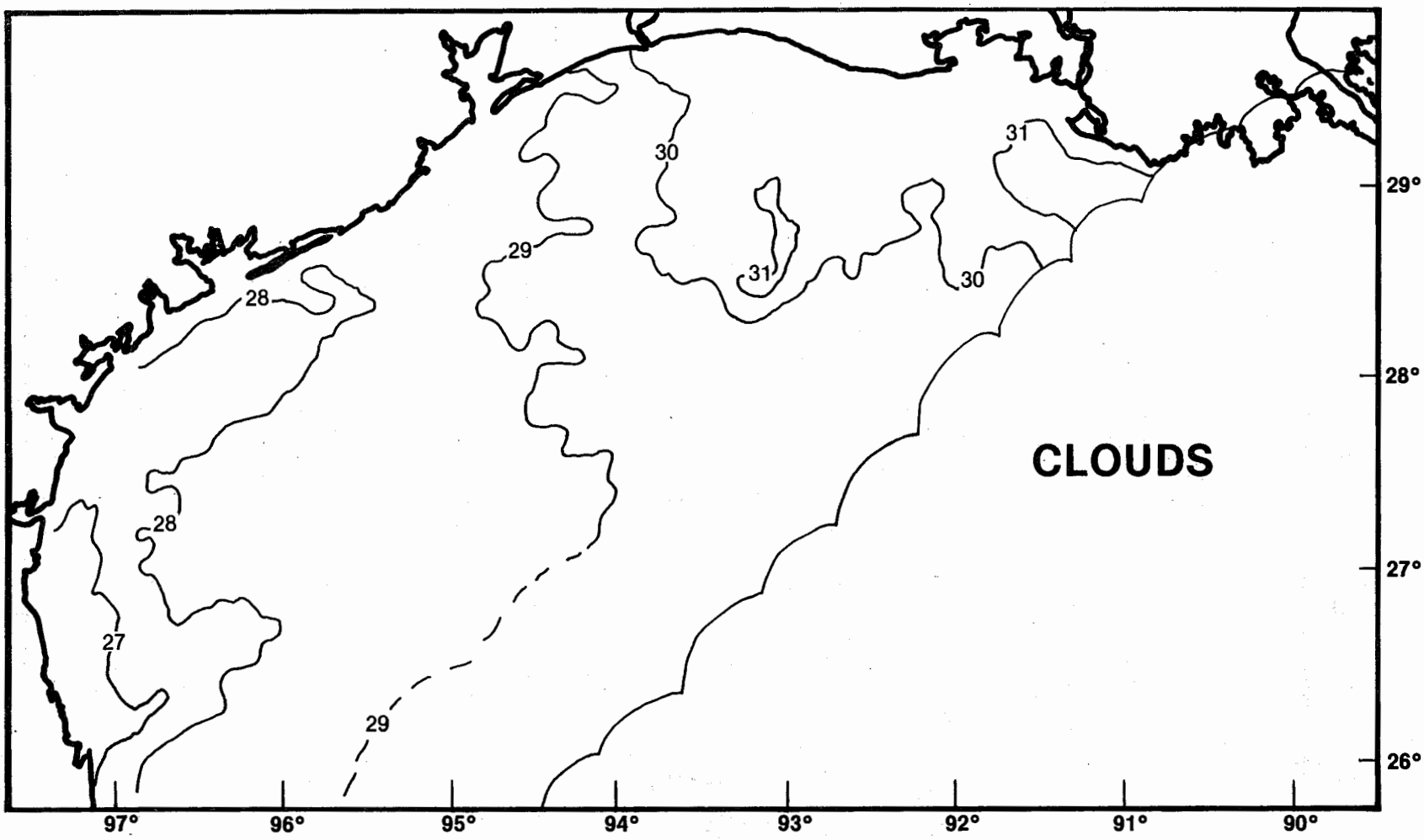

Figure 20. Satellite measurement of surface temperature in the western Gulf of Mexico, 22 June 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

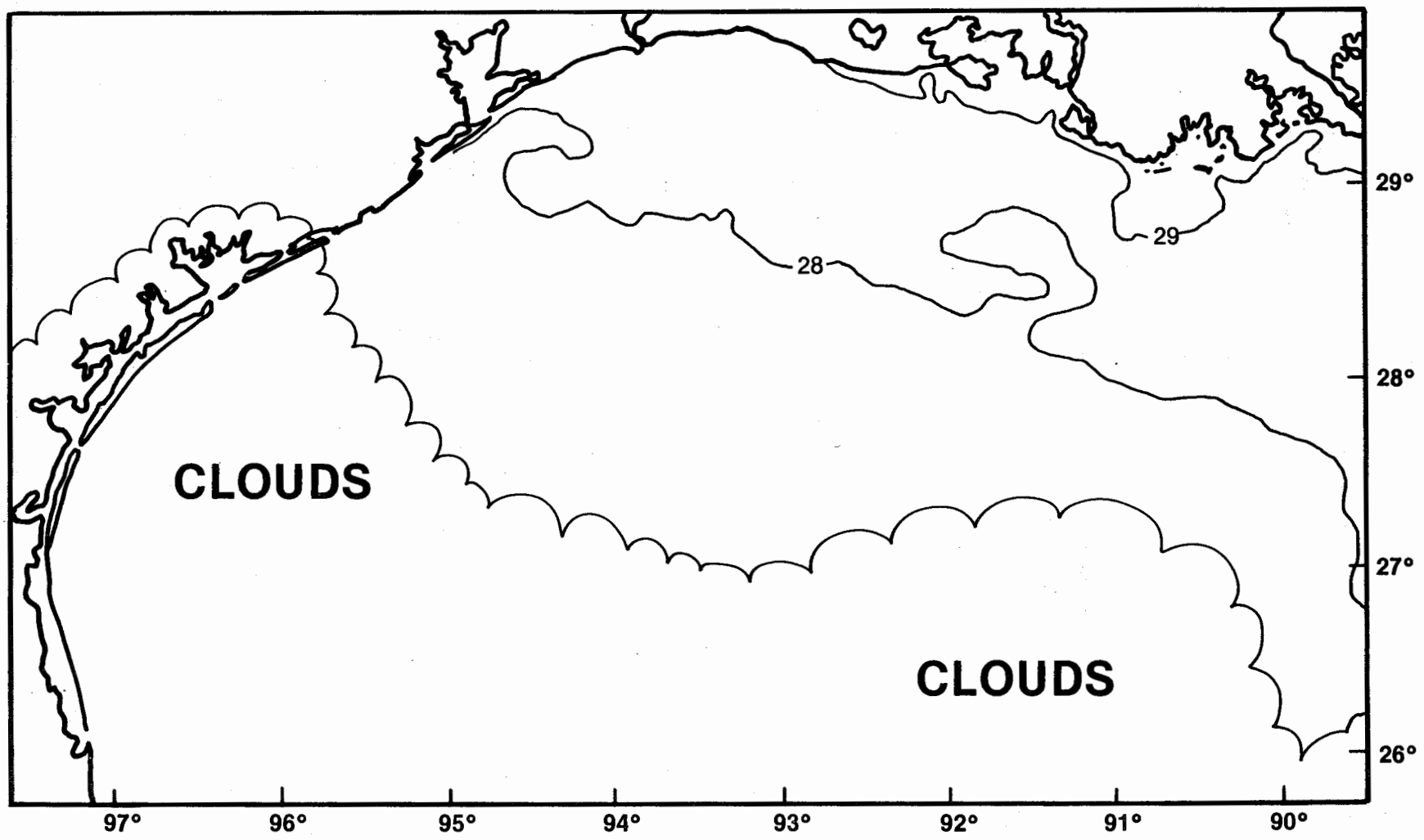

Figure 21. Satellite measurement of surface temperature in the western Gulf of Mexico, 30 June 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

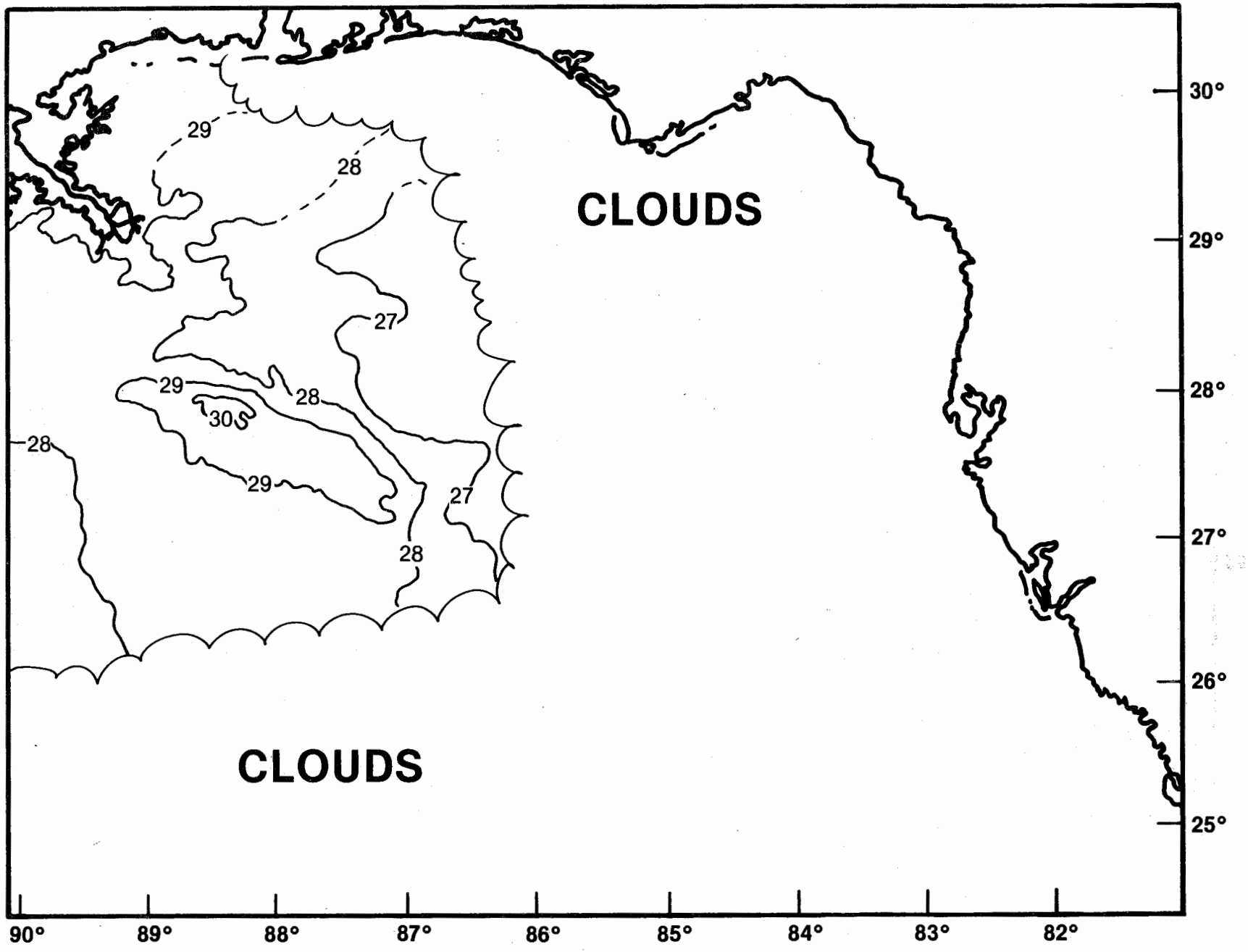

Figure 22. Satellite measurement of surface temperature in the eastern Gulf of Mexico, 30 June 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

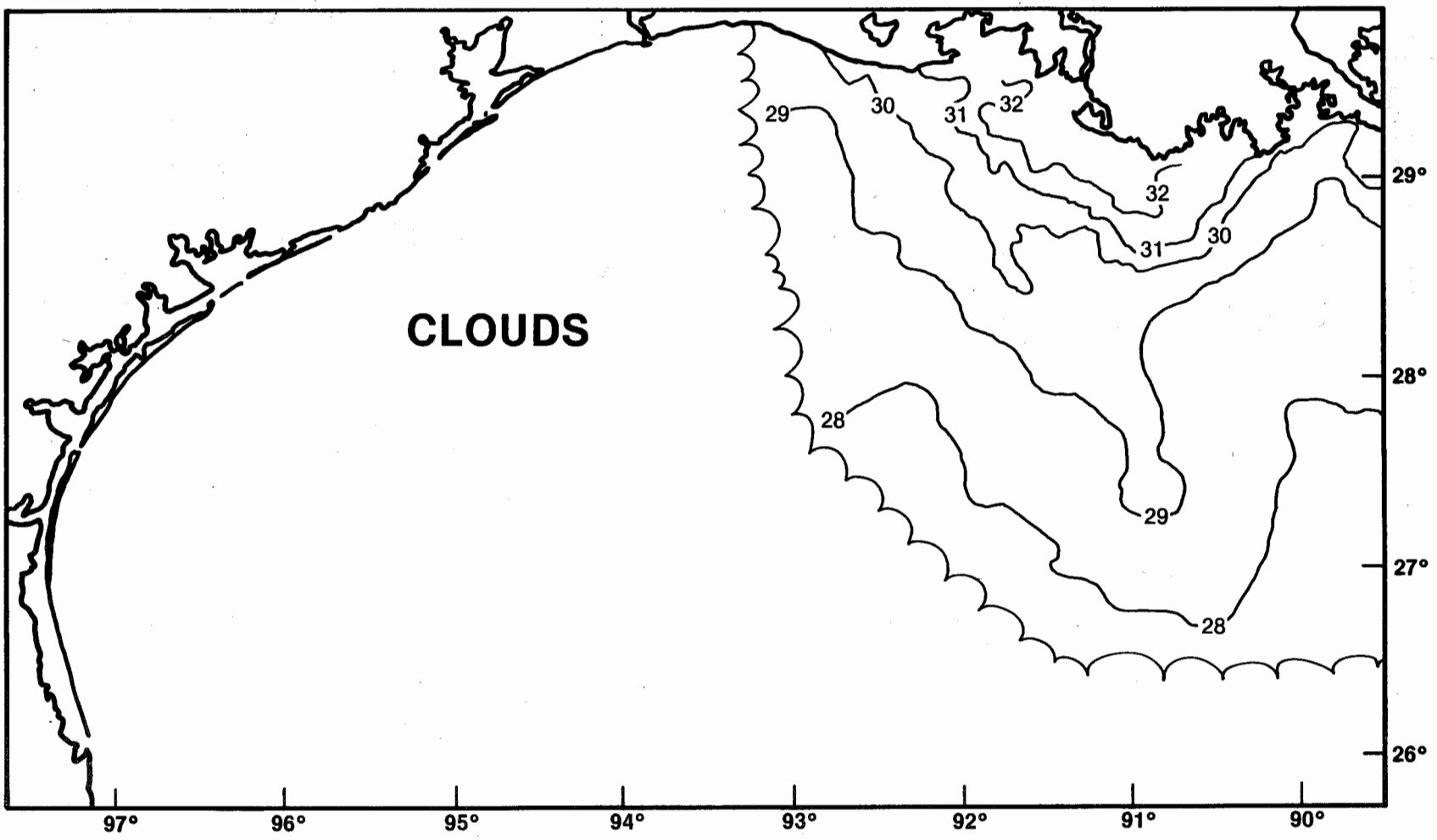

Figure 23. Satellite measurement of surface temperature in the western Gulf of Mexico, 1 July 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

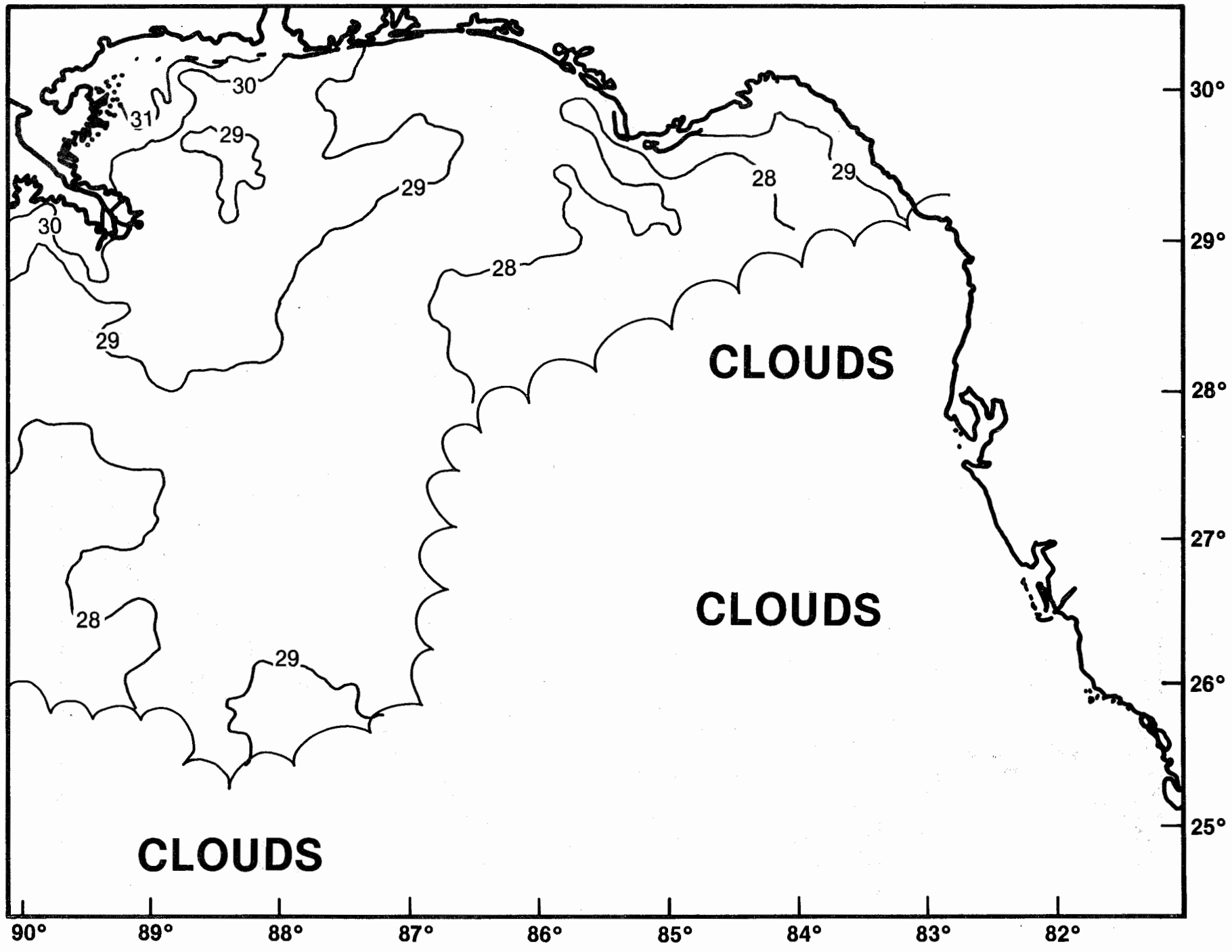

Figure 24. Satellite measurement of surface temperature in the eastern Gulf of Mexico, 1 July 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

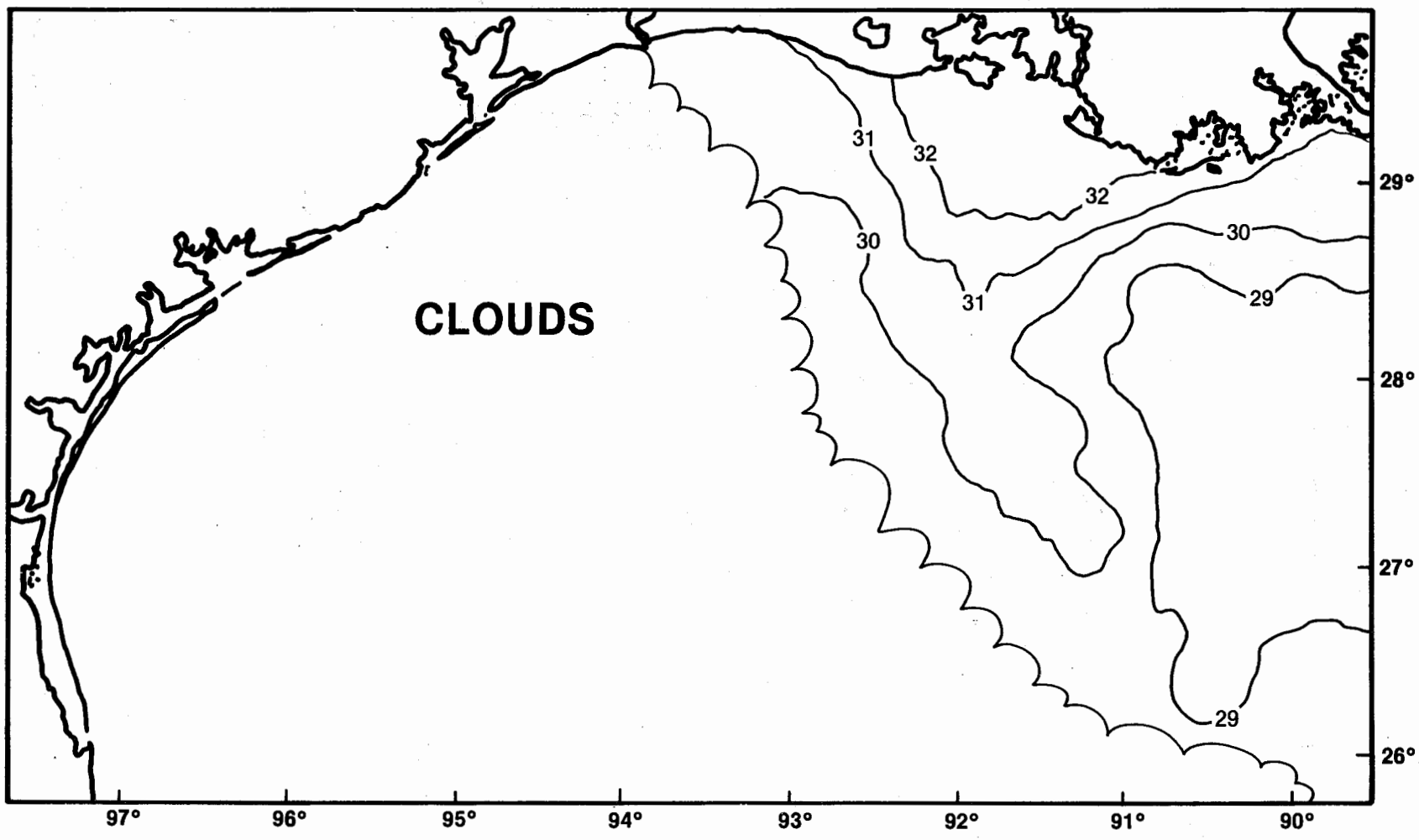

Figure 25. Satellite measurement of surface temperature in the western Gulf of Mexico, 2 July 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

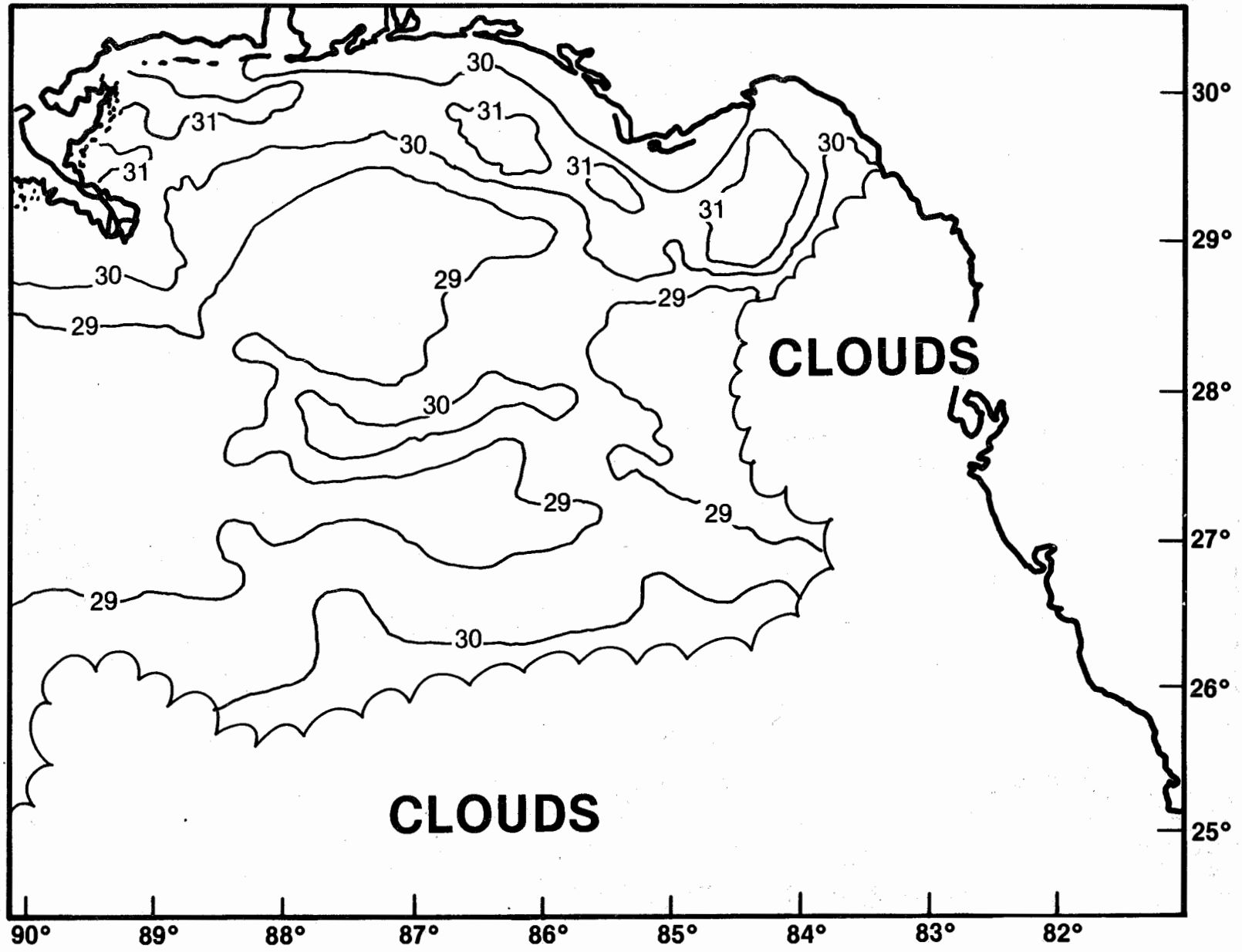

Figure 26. Satellite measurement of surface temperature in the eastern Gulf of Mexico, 2 July 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

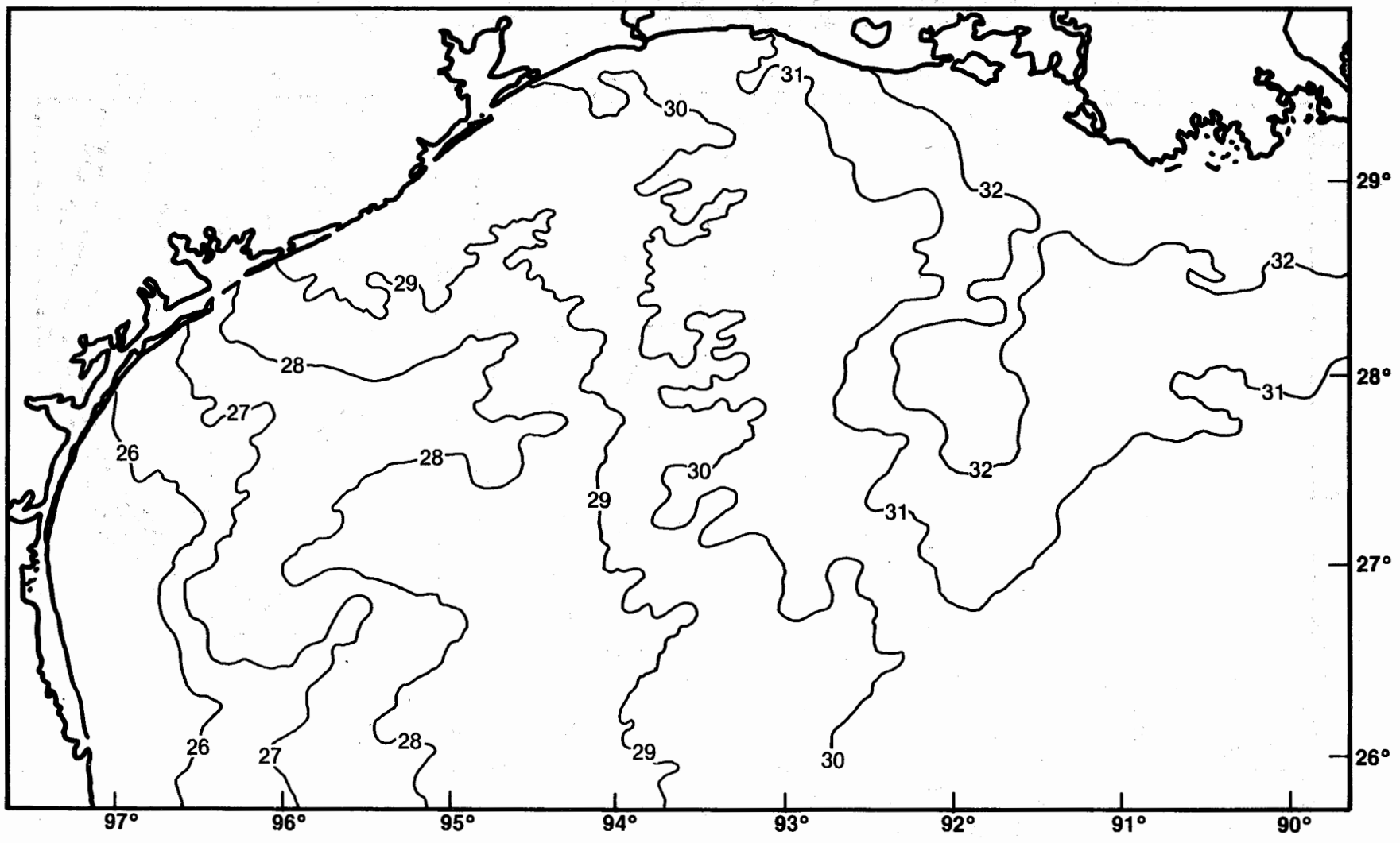

Figure 27. Satellite measurement of surface temperature in the western Gulf of Mexico, 27 July 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

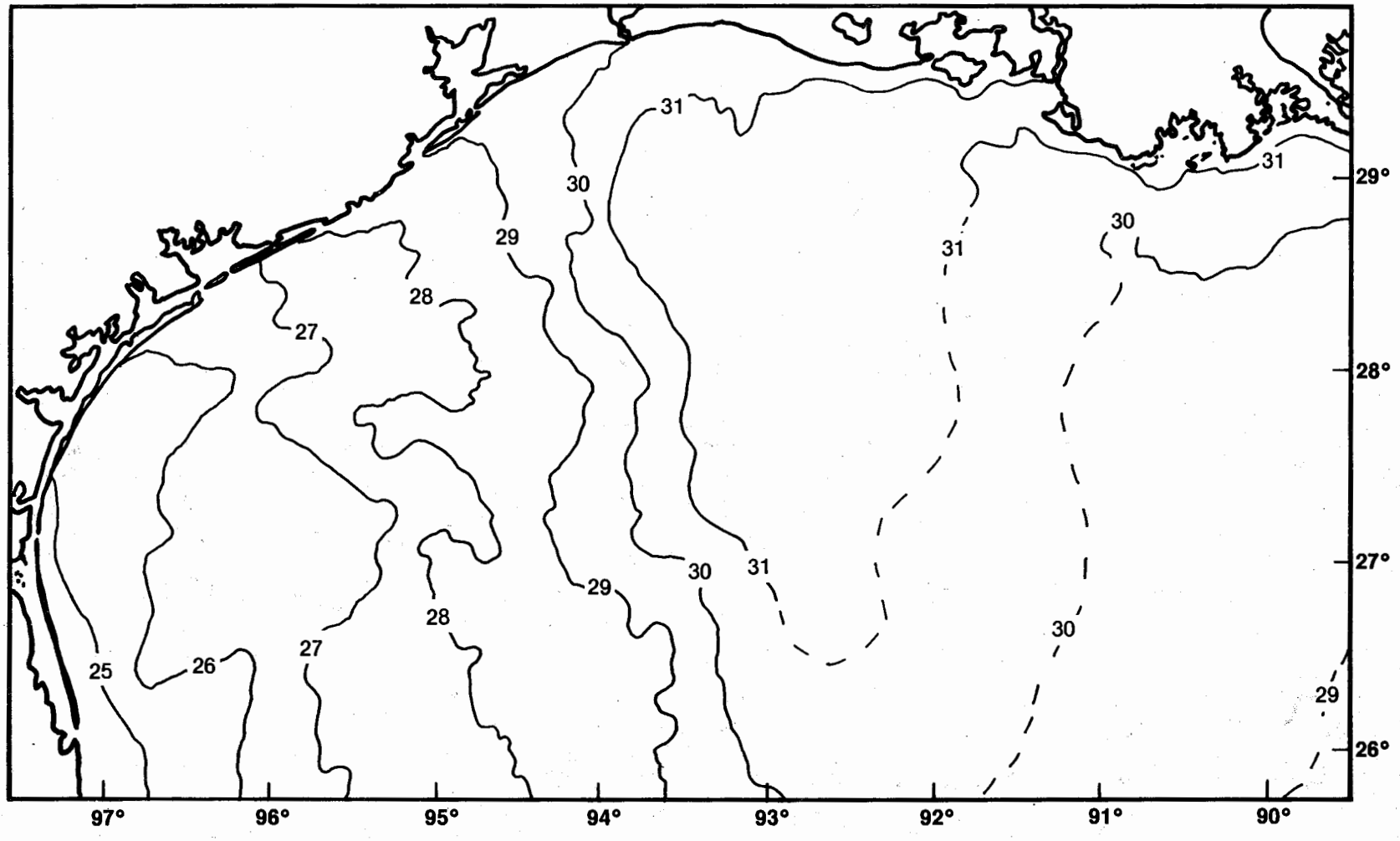

Figure 28. Satellite measurement of surface temperature in the western Gulf of Mexico, 4 August 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

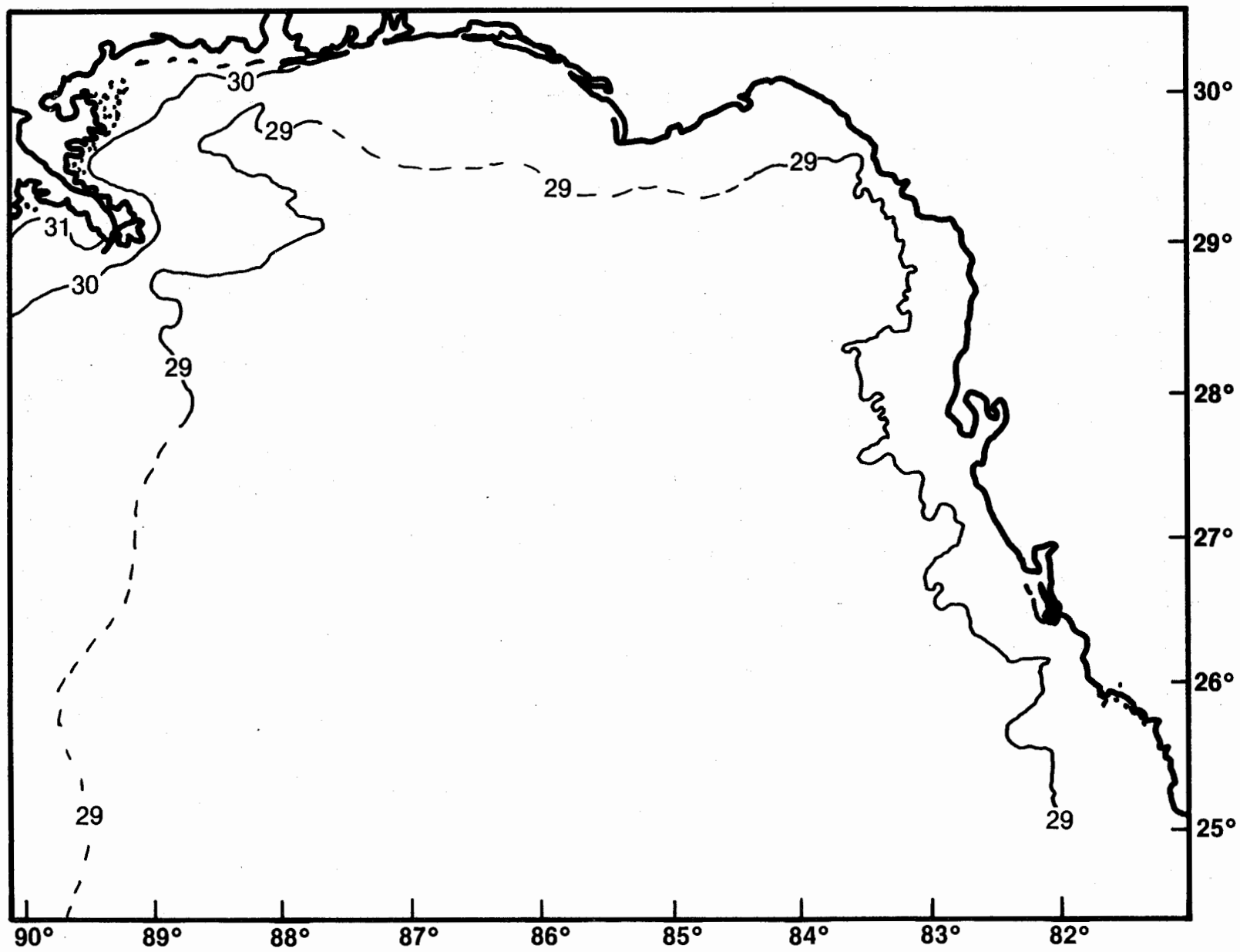

Figure 29. Satellite measurement of surface temperature in the eastern Gulf of Mexico, 4 August 1982. (Modified from NWS/NESDIS Sea Surface Thermal Analysis)

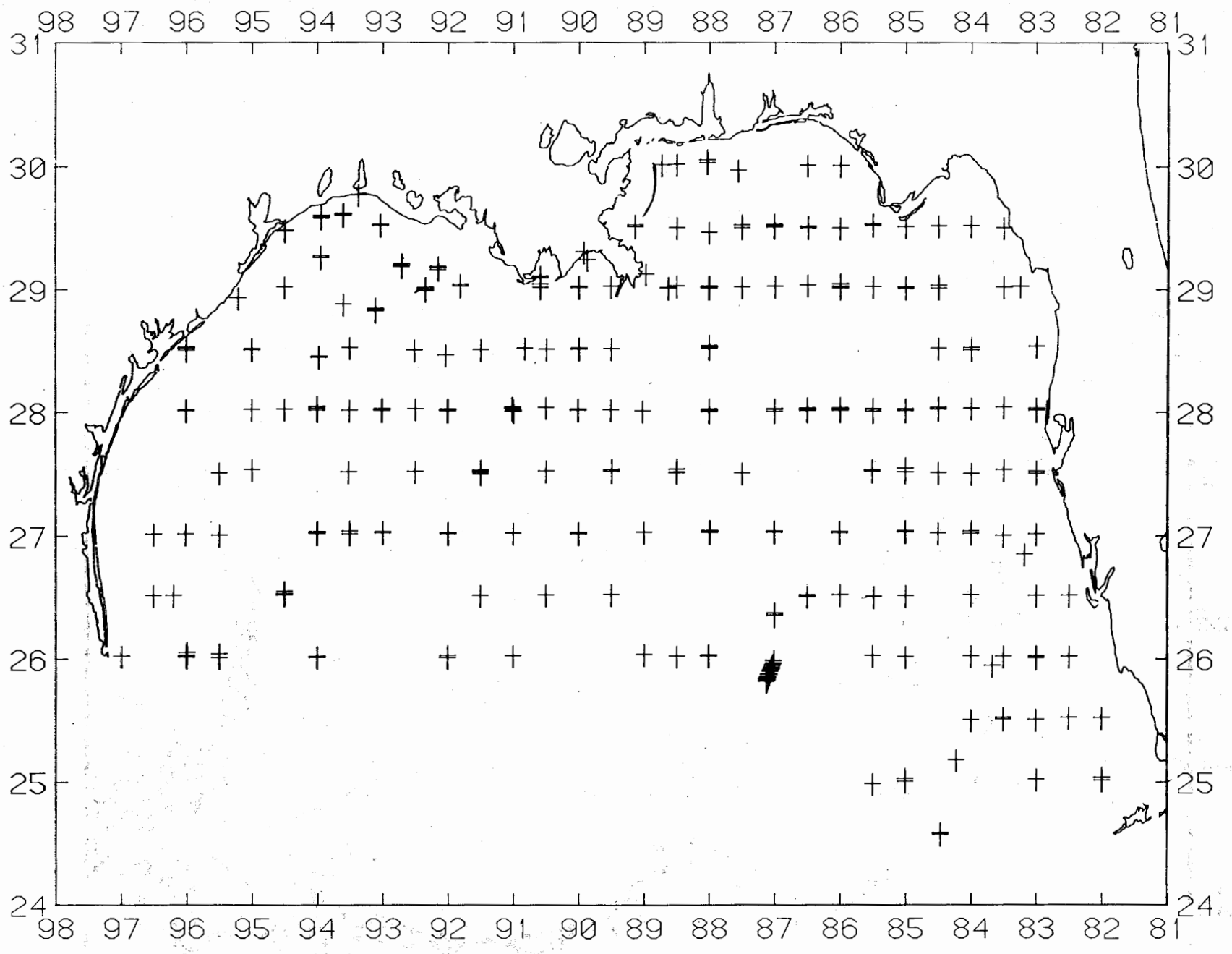

Figure 30. Stations at which carangids were present in ichthyoplankton samples, 1982. Some locations were sampled repeatedly.

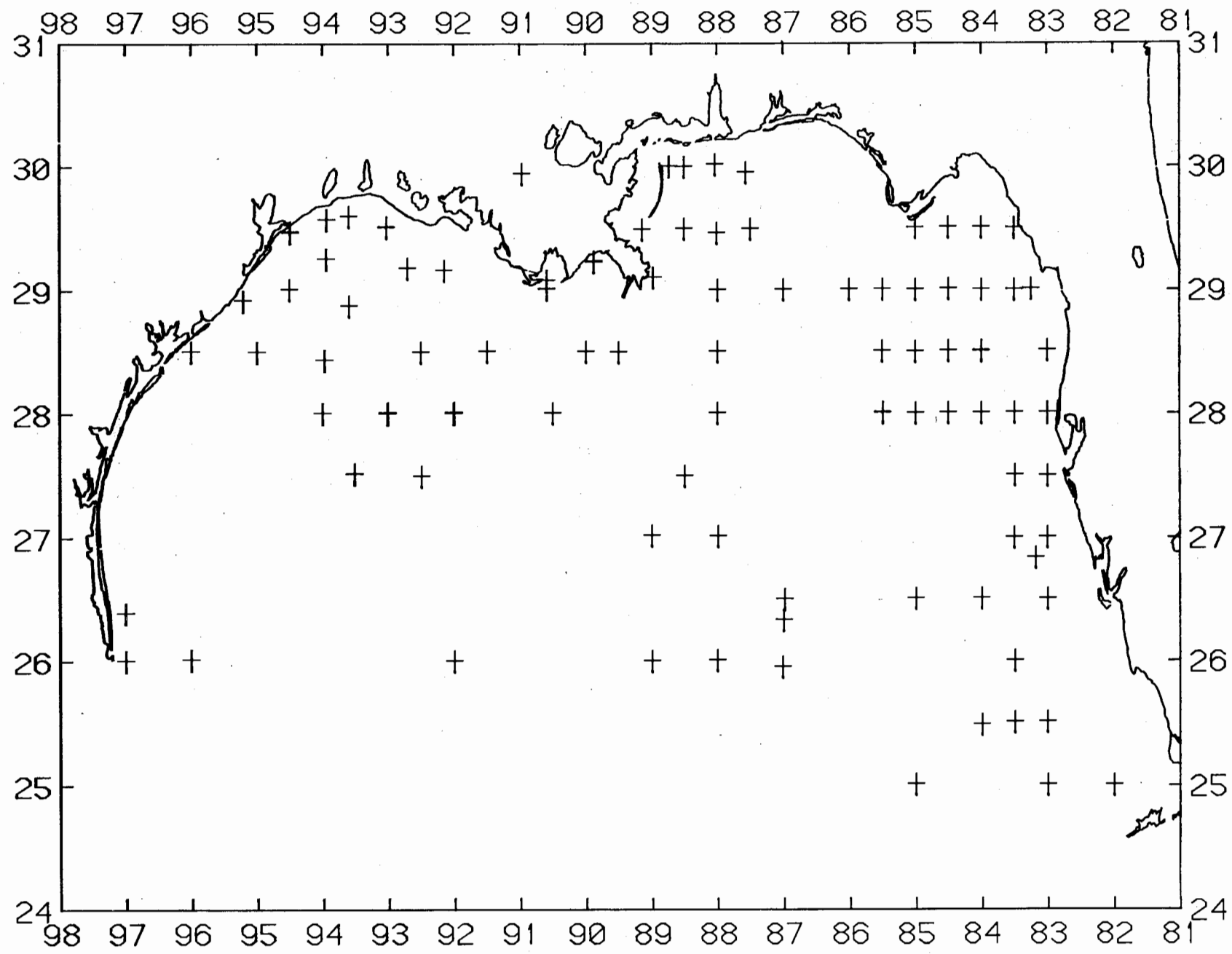

Figure 31. Stations at which clupeids were present in ichthyoplankton samples, 1982. Some locations were sampled repeatedly.

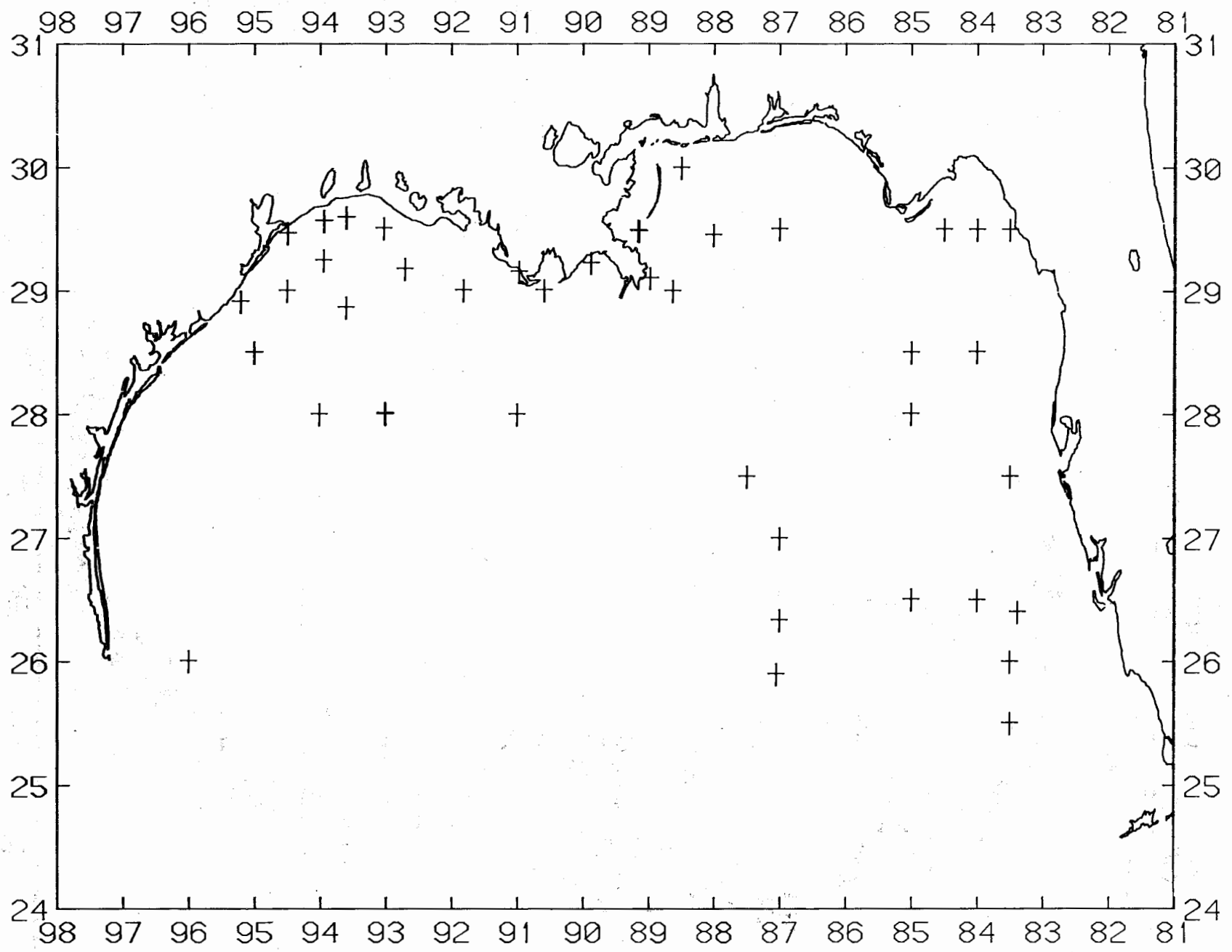

Figure 32. Stations at which sciaenids were present in ichthyoplankton samples, 1982. Some locations were sampled repeatedly.

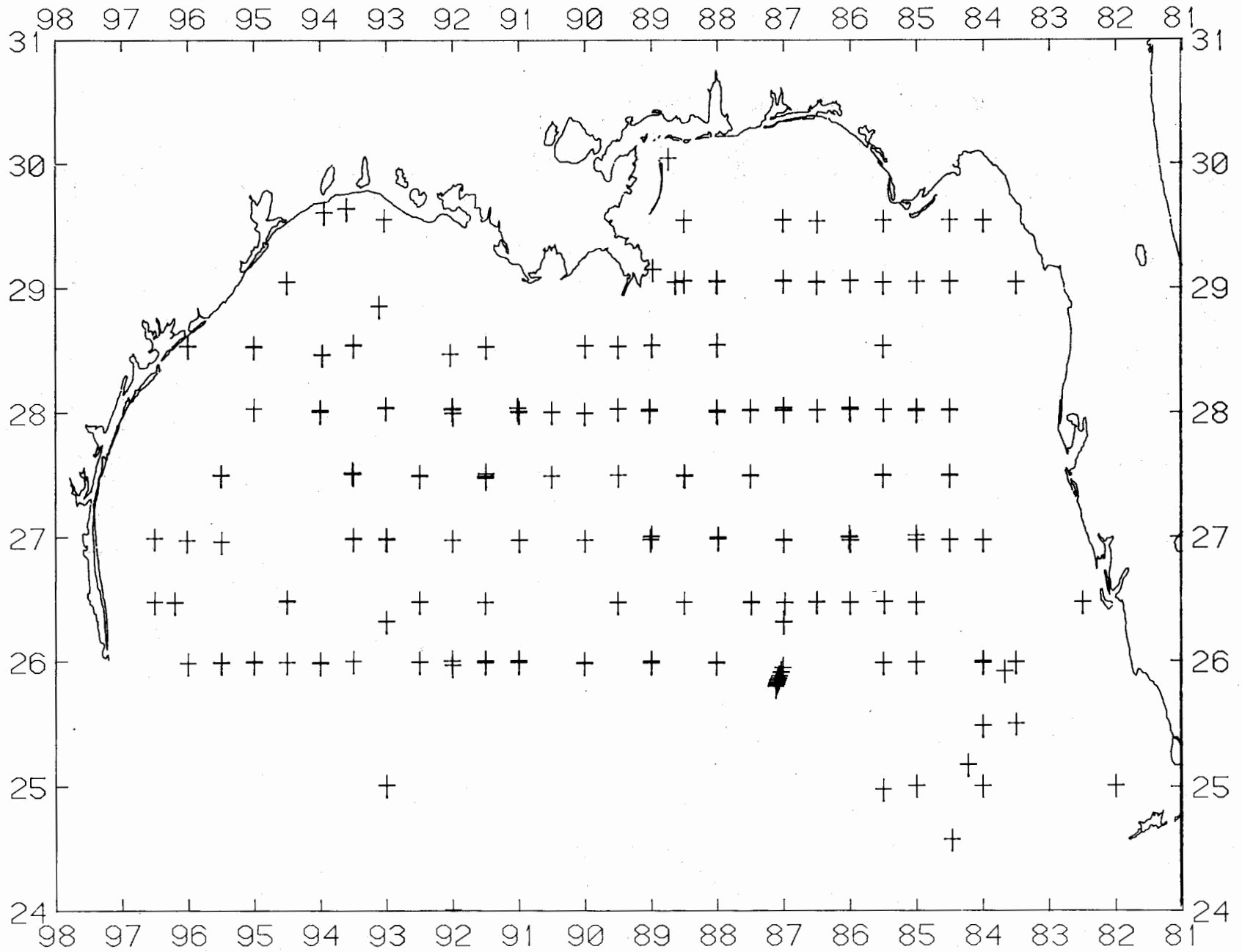

Figure 33. Stations at which scombrids were present in ichthyoplankton samples, 1982. Some locations were sampled repeatedly.

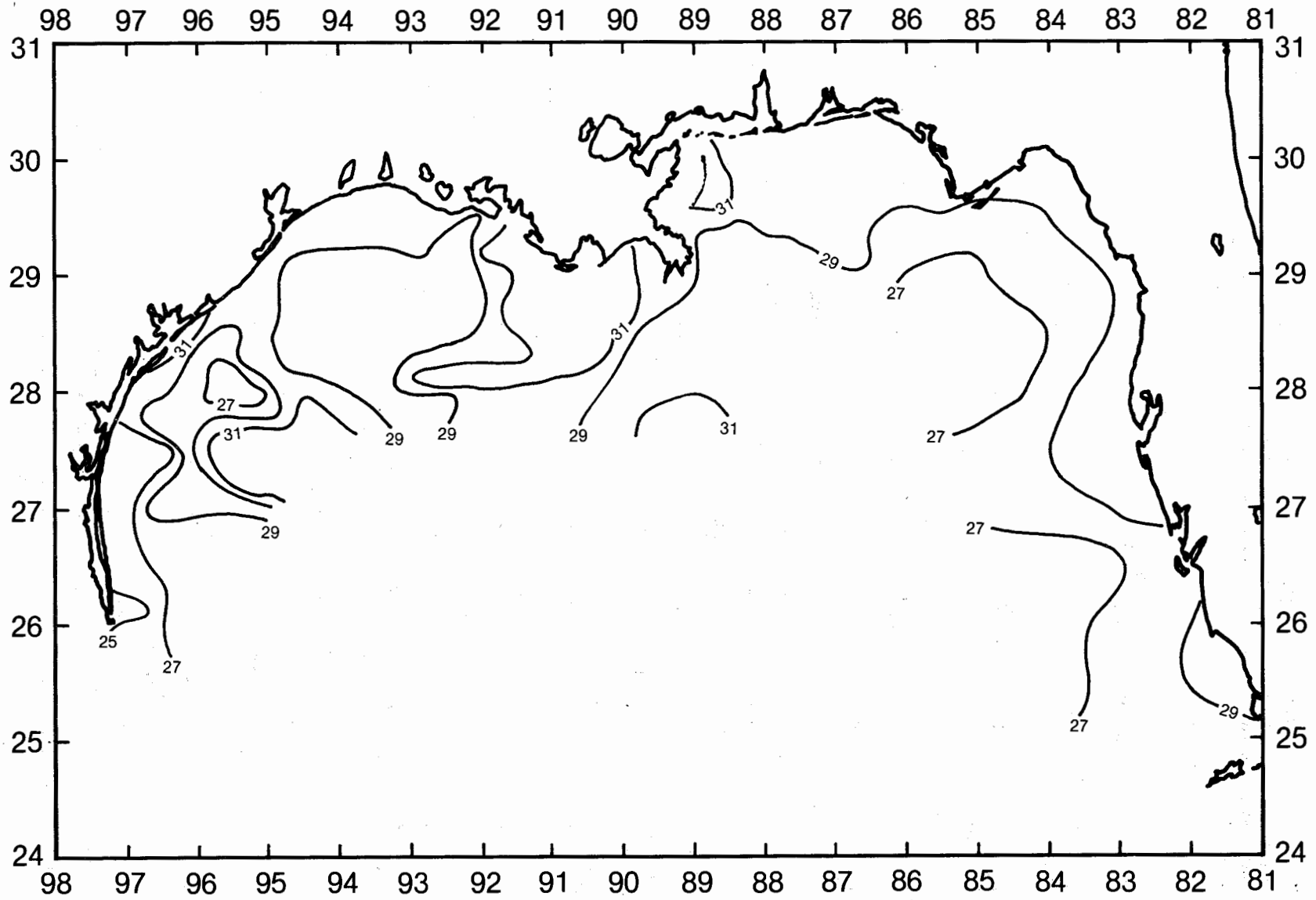

Figure 34. Surface water temperature (°C), June and July 1982.

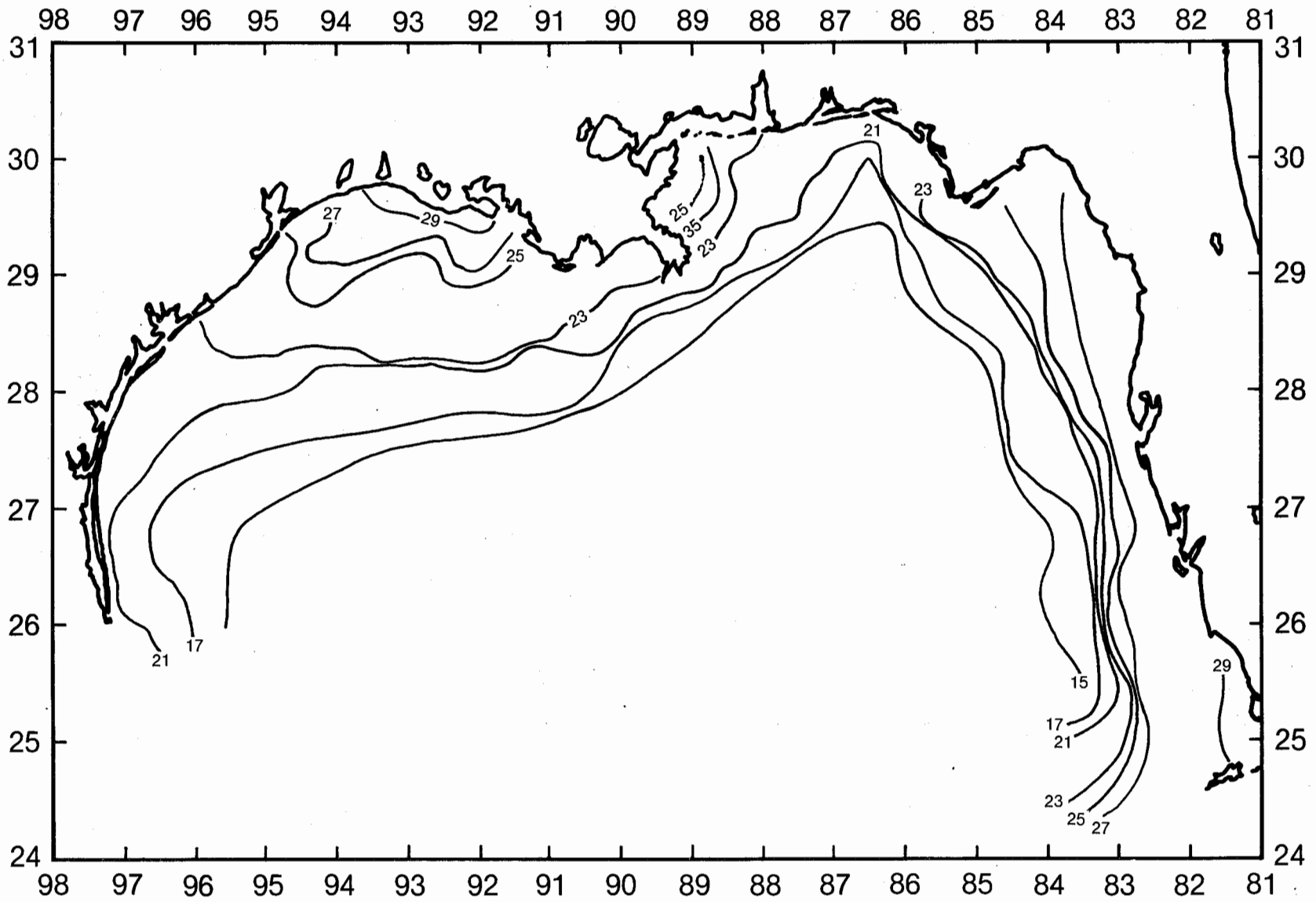

Figure 35. Water temperature (°C) at bottom or 200 m, whichever was shallower, June and July 1982.

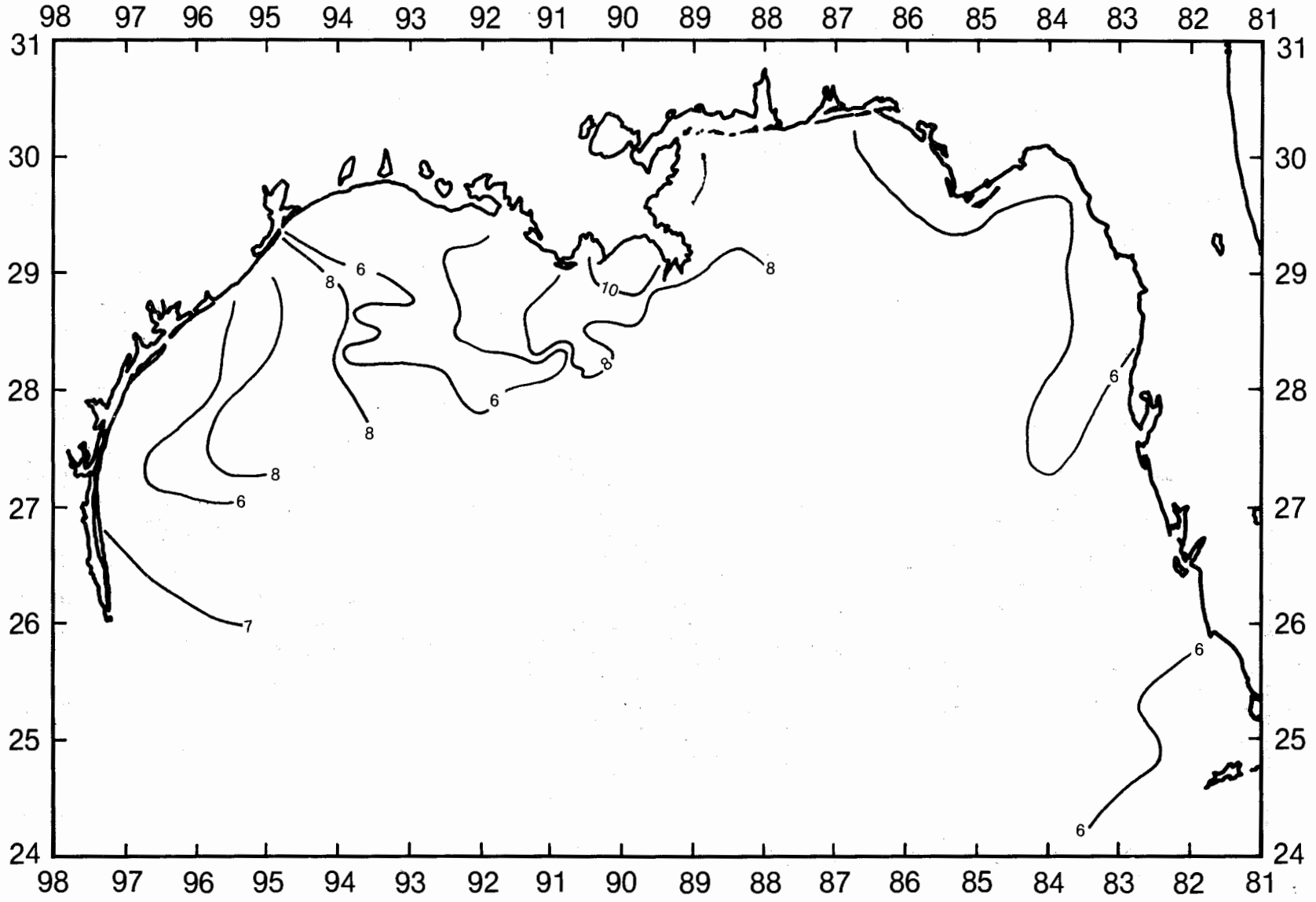

Figure 36. Surface dissolved oxygen (PPM), June and July 1982.

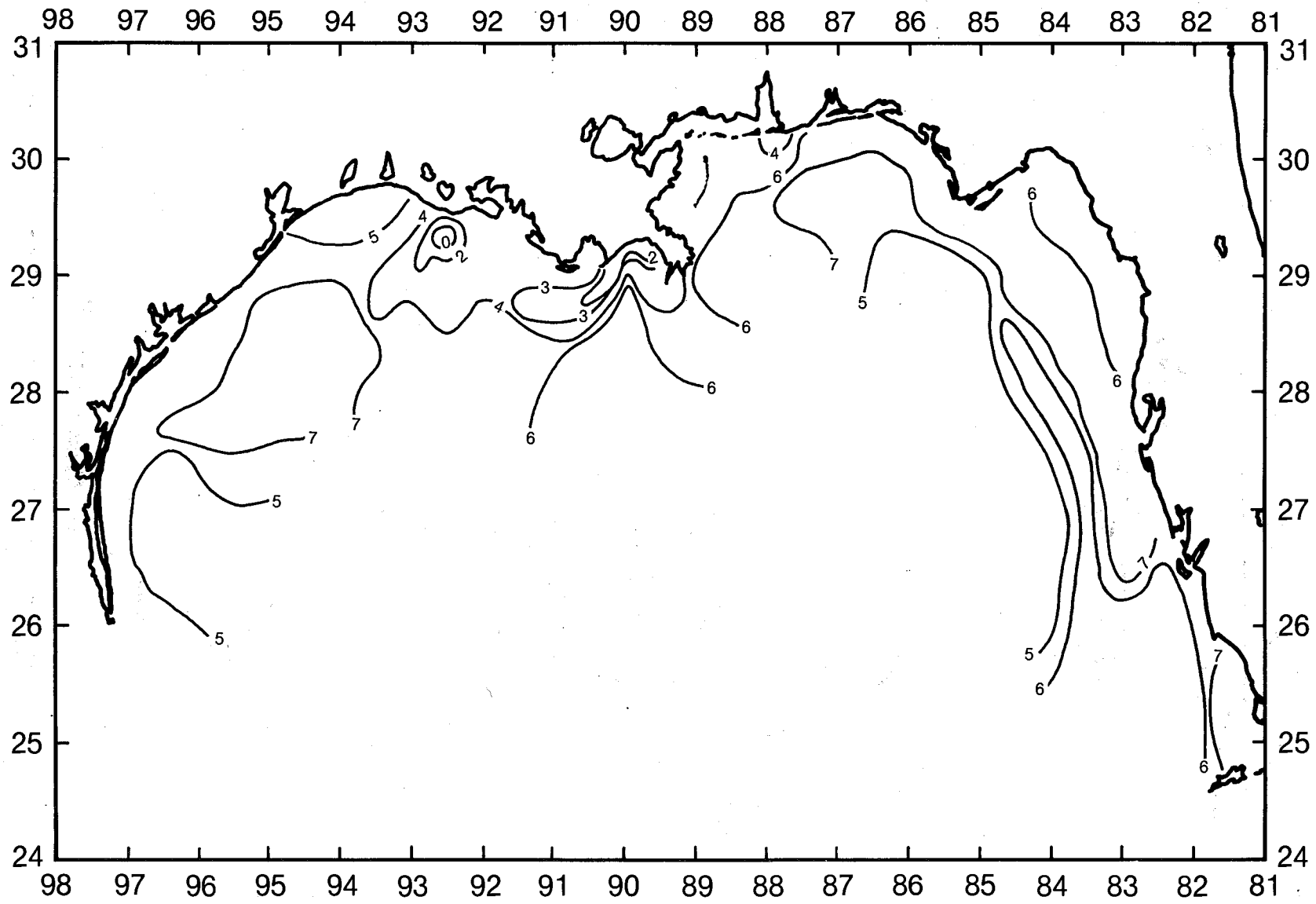

Figure 37. Dissolved oxygen (PPM) at bottom or 200 m, whichever was shallower, June and July 1982.

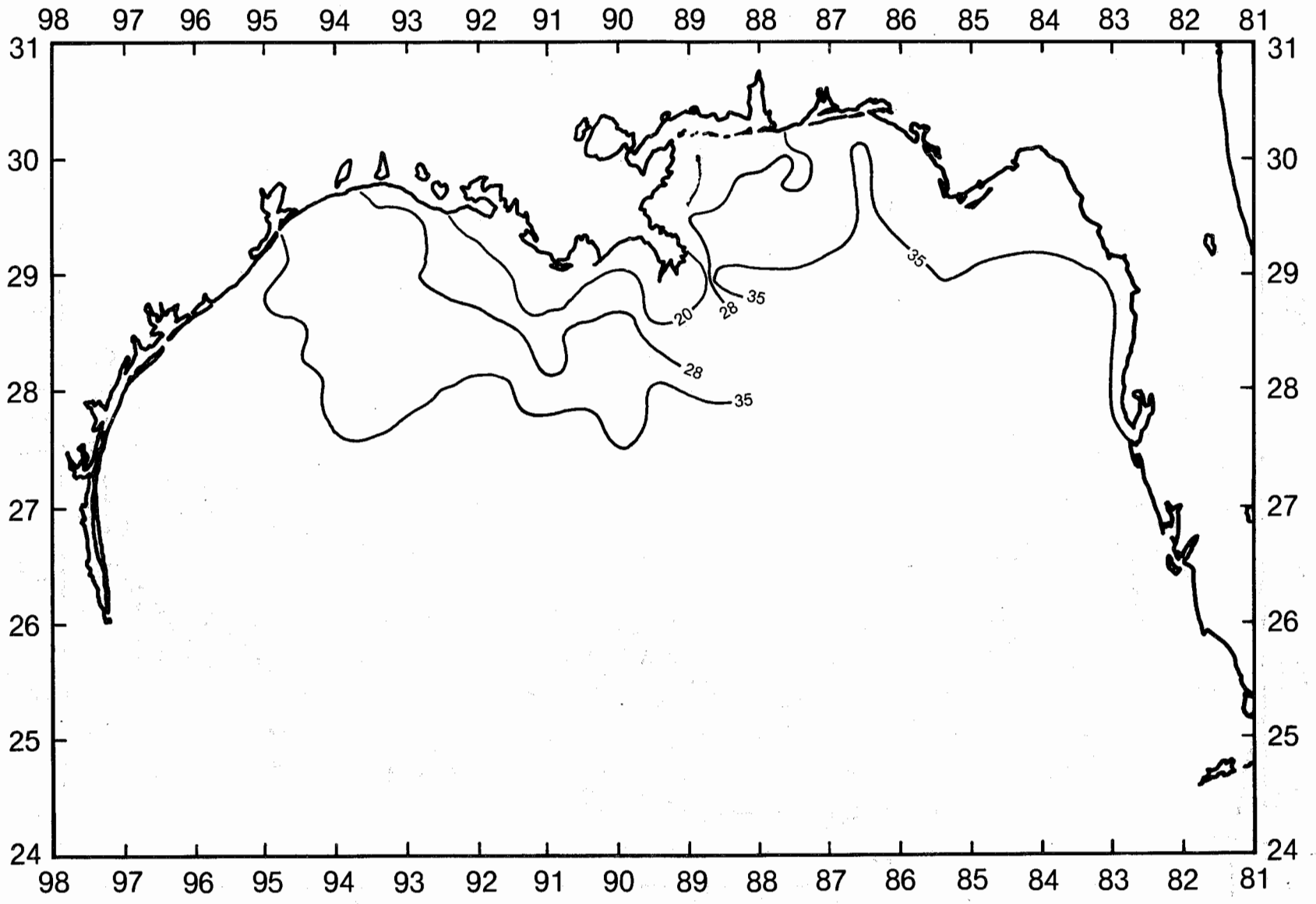

Figure 38. Surface salinity (PPT), June and July 1982.

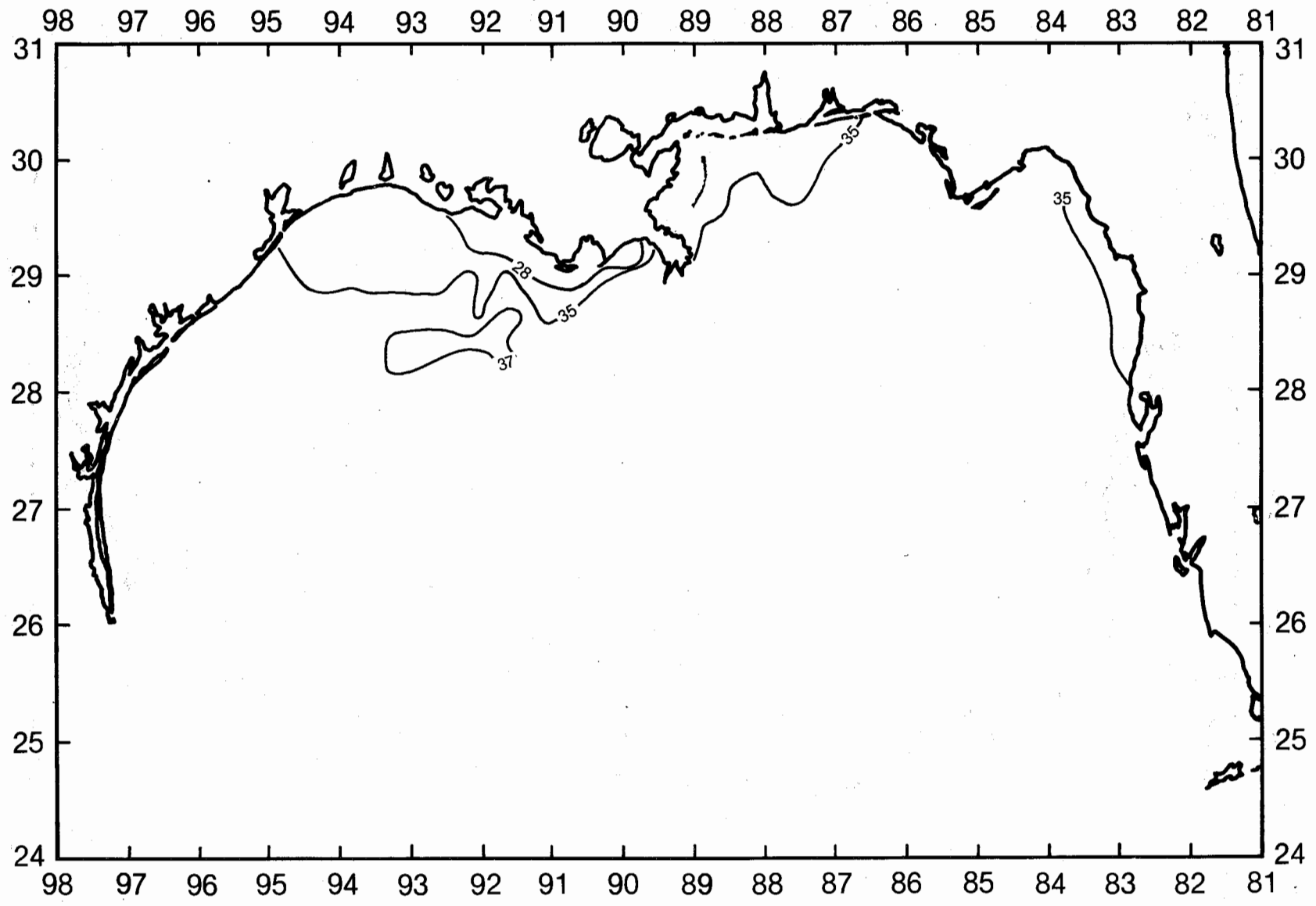

Figure 39. Salinity (PPT) at bottom of 200 m, whichever was shallower, June and July 1982.

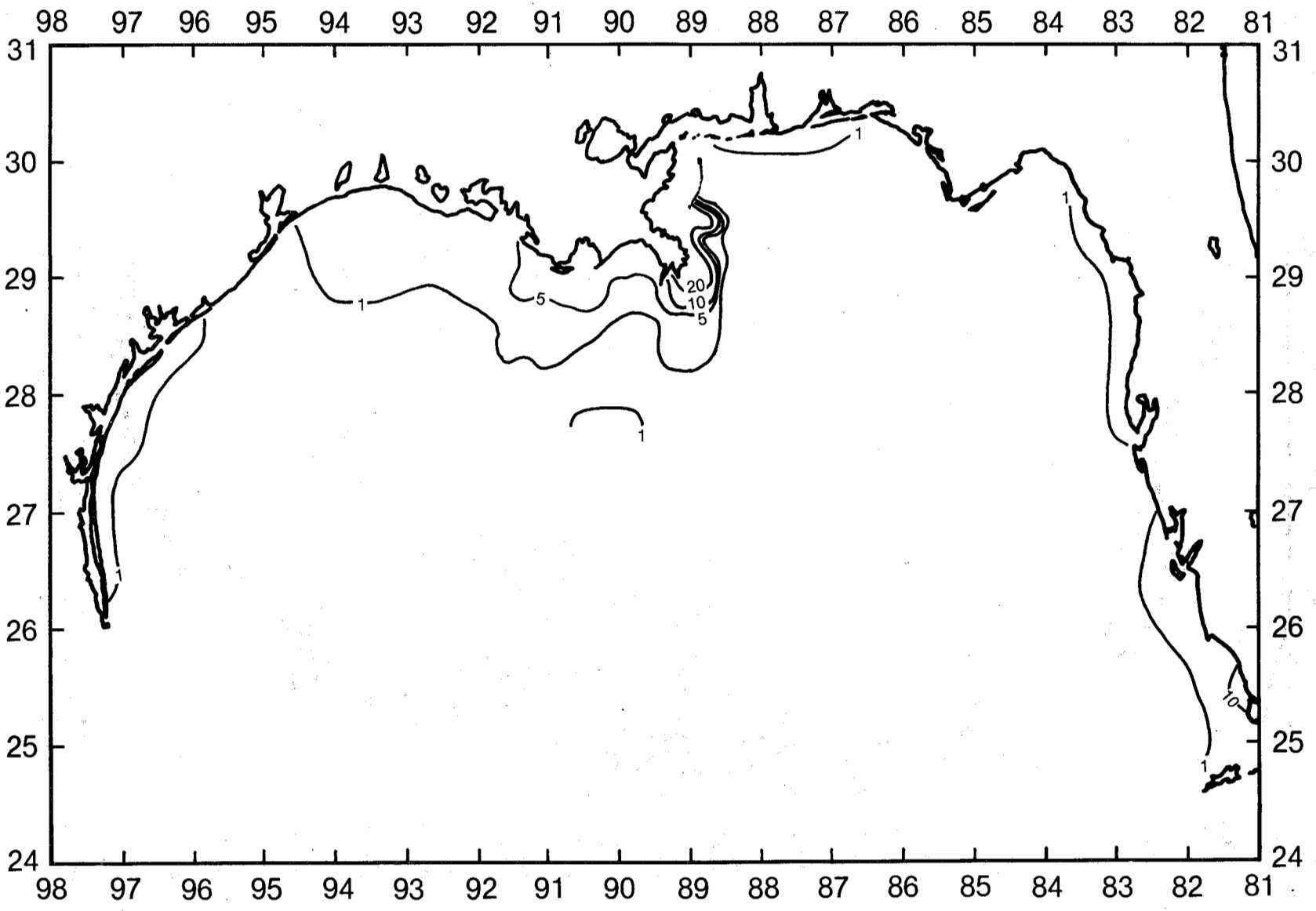

Figure 40. Surface chlorophyll (mg/m^3), June and July 1982.

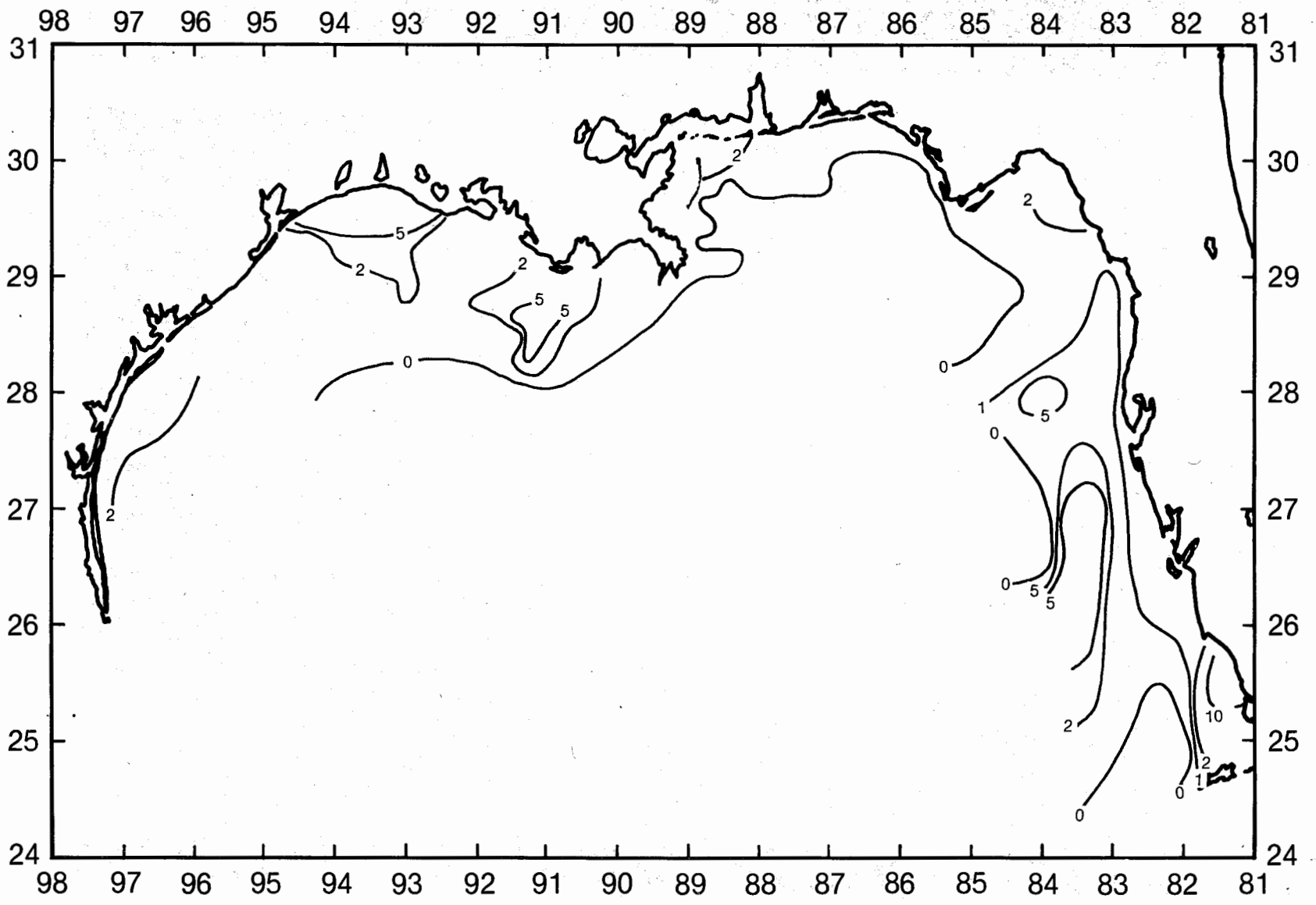

Figure 41. Chlorophyll (mg/m^3) at bottom or 200 m, whichever was shallower, June and July 1982.

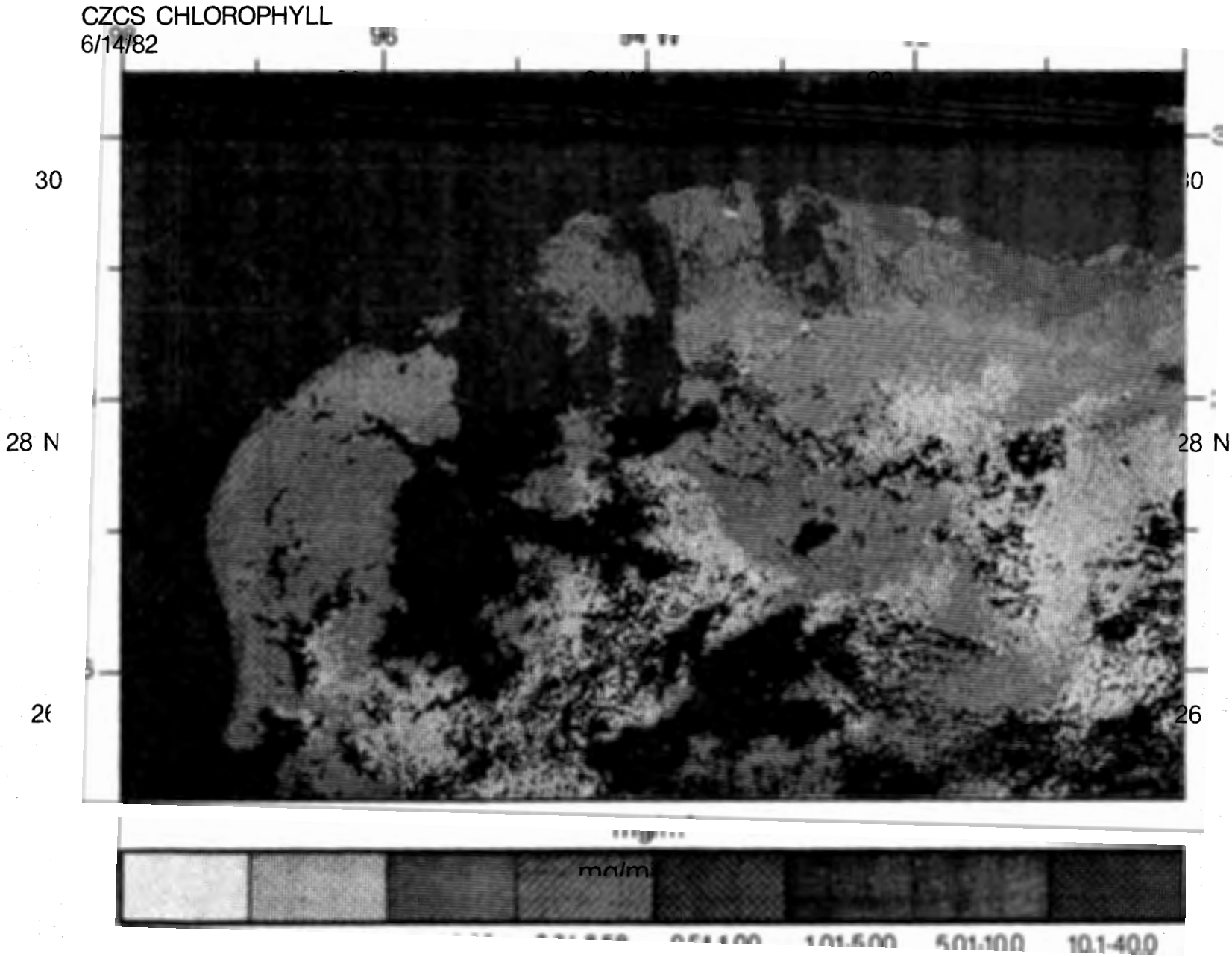

Figure 42. CZCS image of chlorophyll concentrations for 14 June 1982, western Gulf of Mexico.

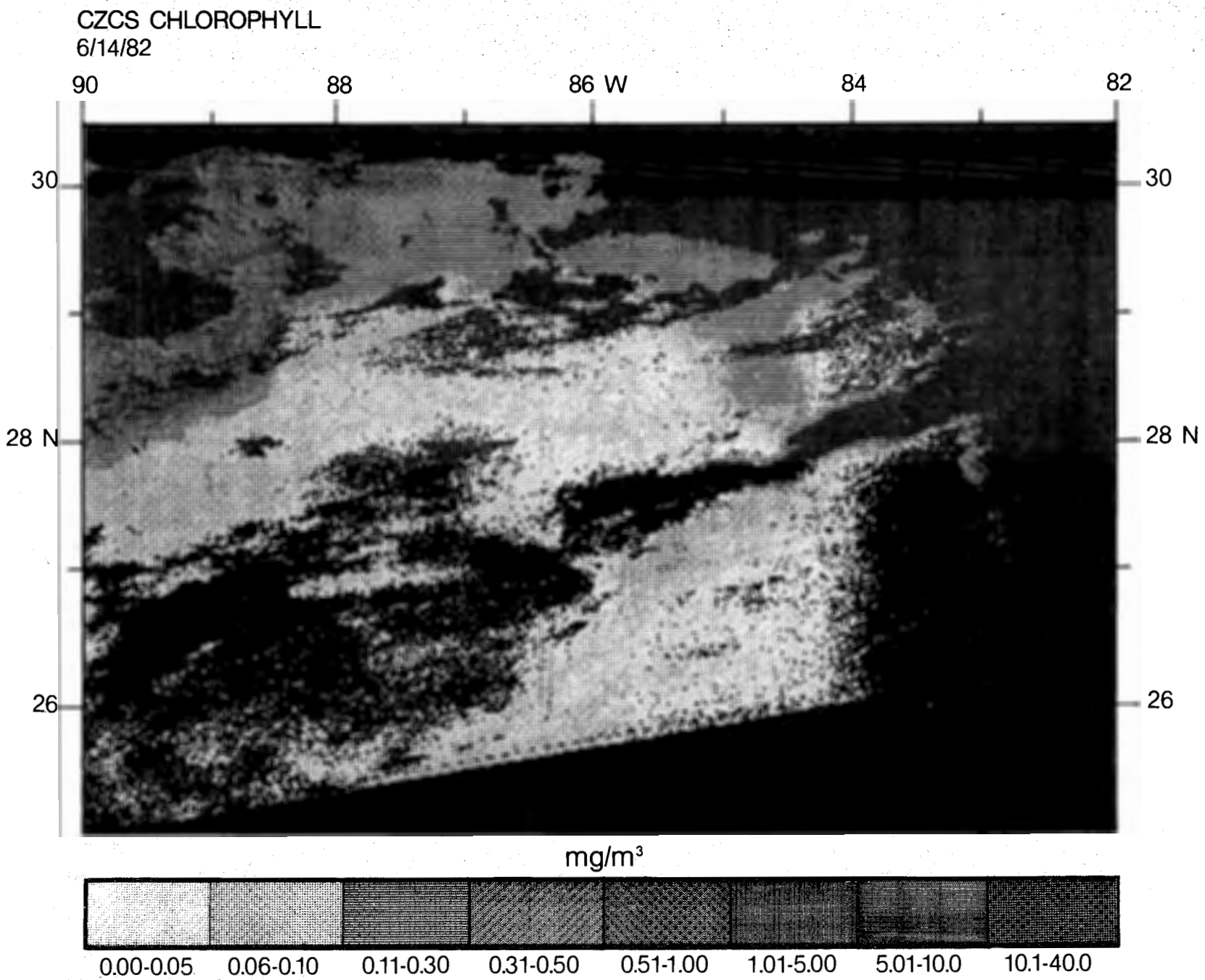

Figure 43. CZCS image of chlorophyll concentrations for 14 June 1982, eastern Gulf of Mexico.

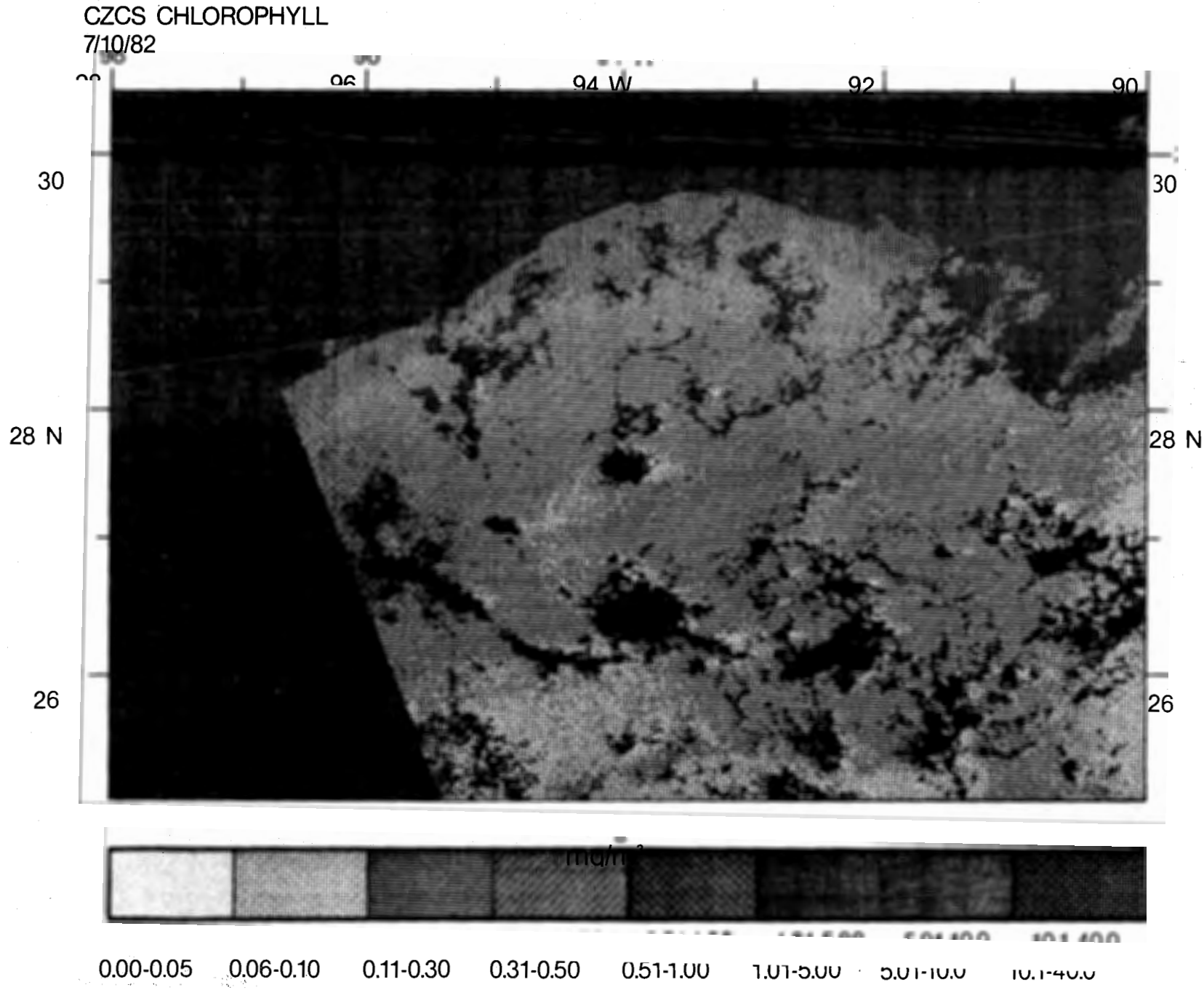

Figure 44. CZCS image of chlorophyll concentrations for 10 July 1982, western Gulf of Mexico.

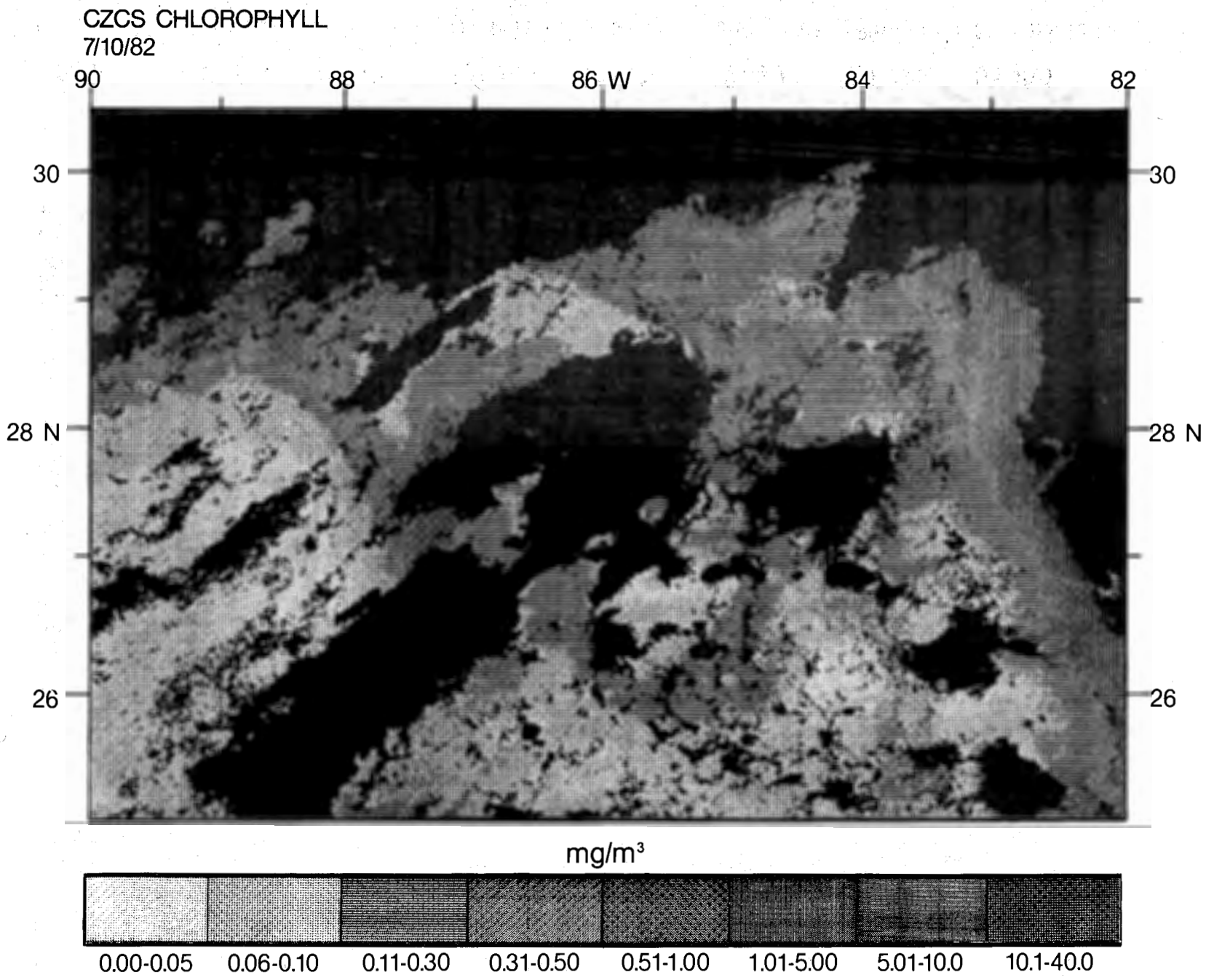

Figure 45. CZCS image of chlorophyll concentrations for 10 July 1982, eastern Gulf of Mexico.

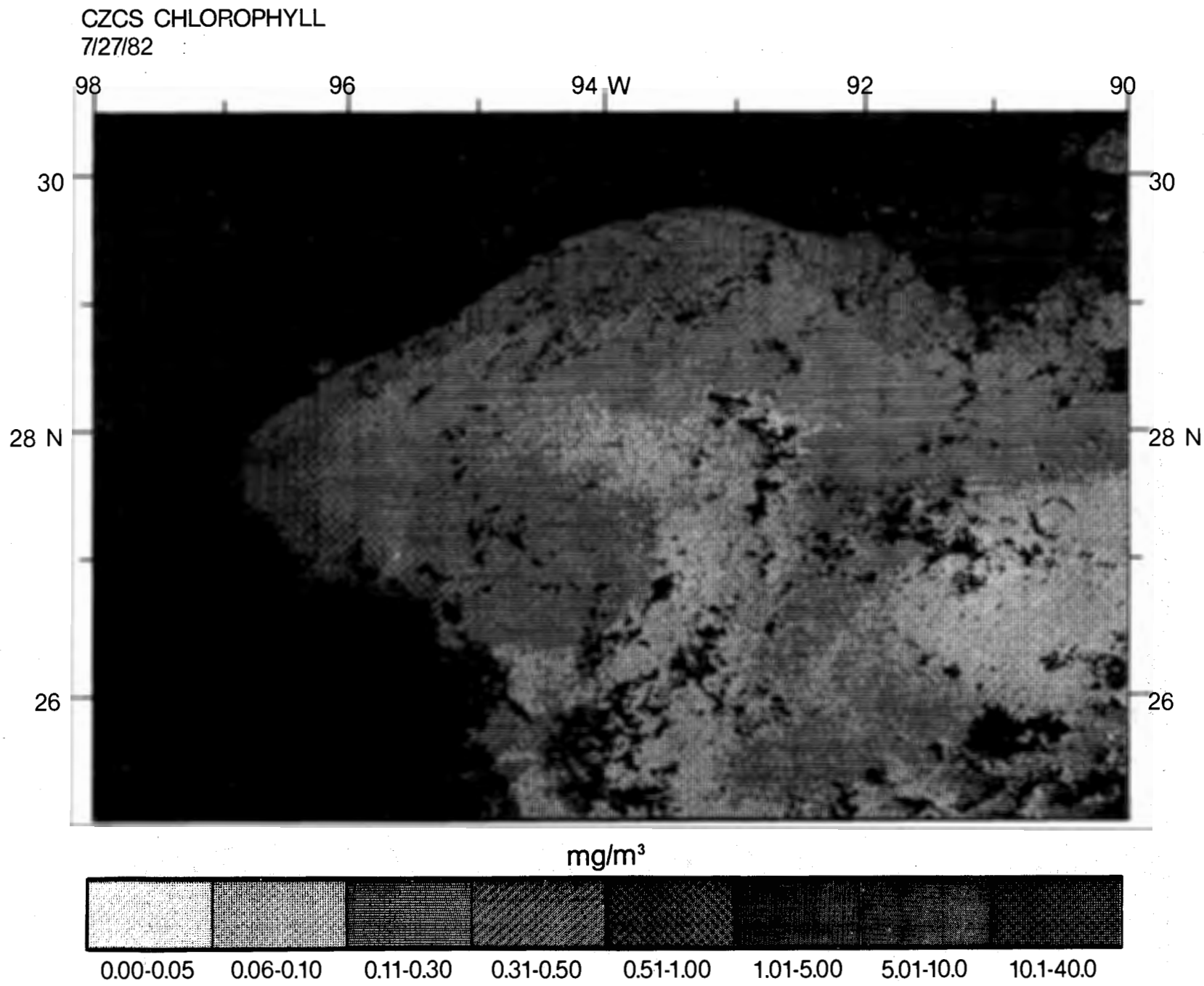

Figure 46. CZCS image of chlorophyll concentrations for 27 July 1982, western Gulf of Mexico.

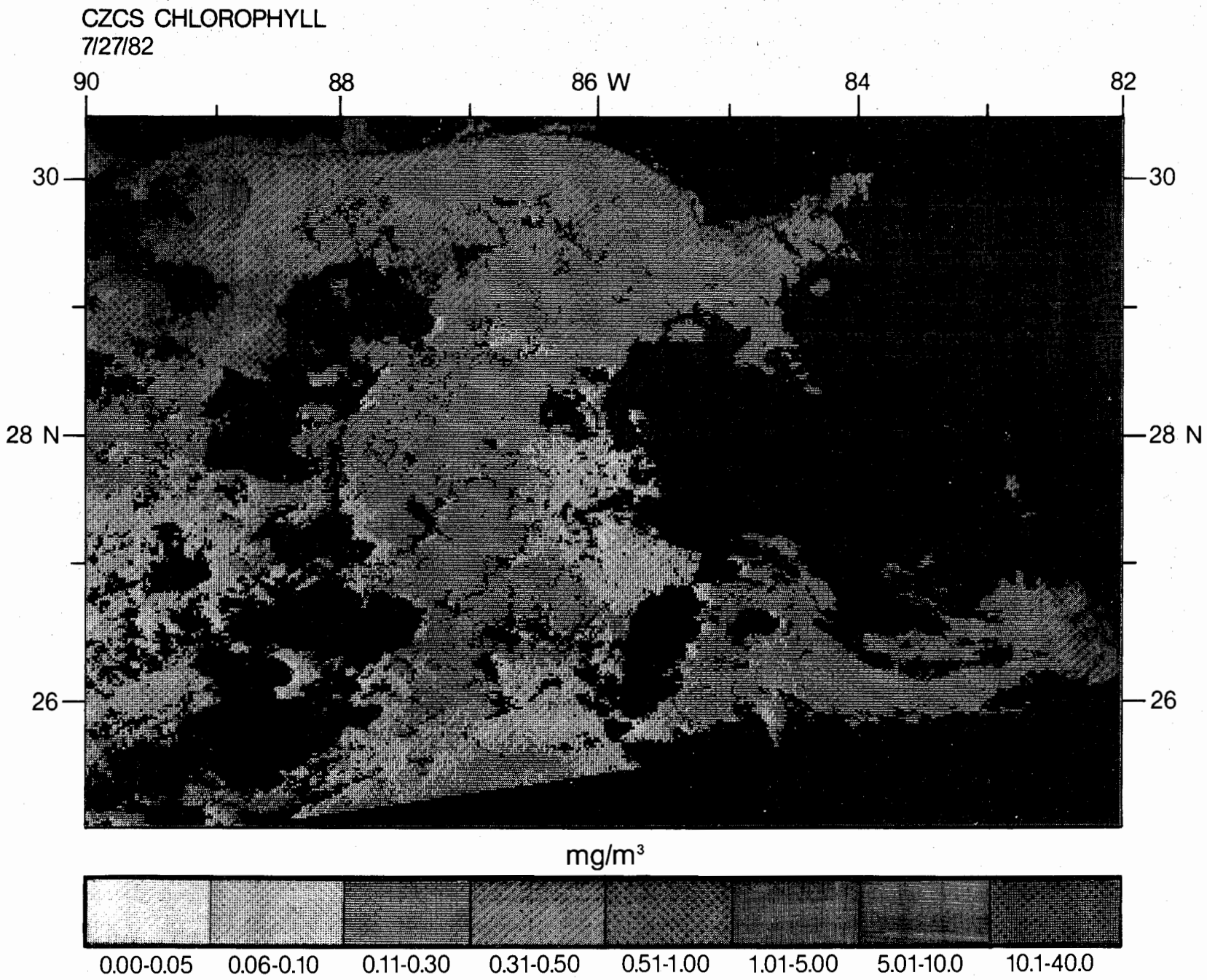

Figure 47. CZCS image of chlorophyll concentrations for 27 July 1982, eastern Gulf of Mexico.

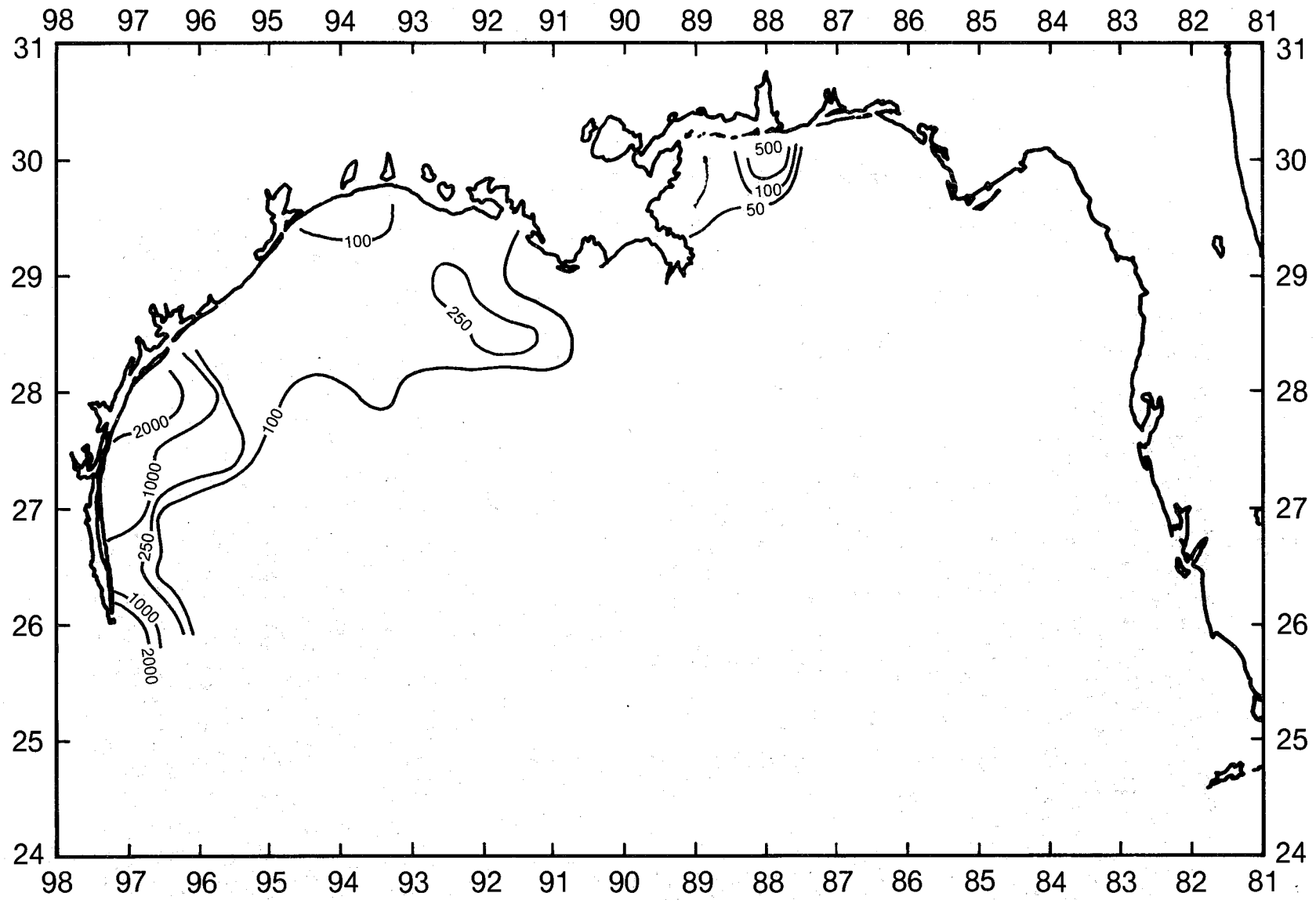

Figure 48. Northern brown shrimp, Penaeus aztecus, number/hour for June and July 1982.

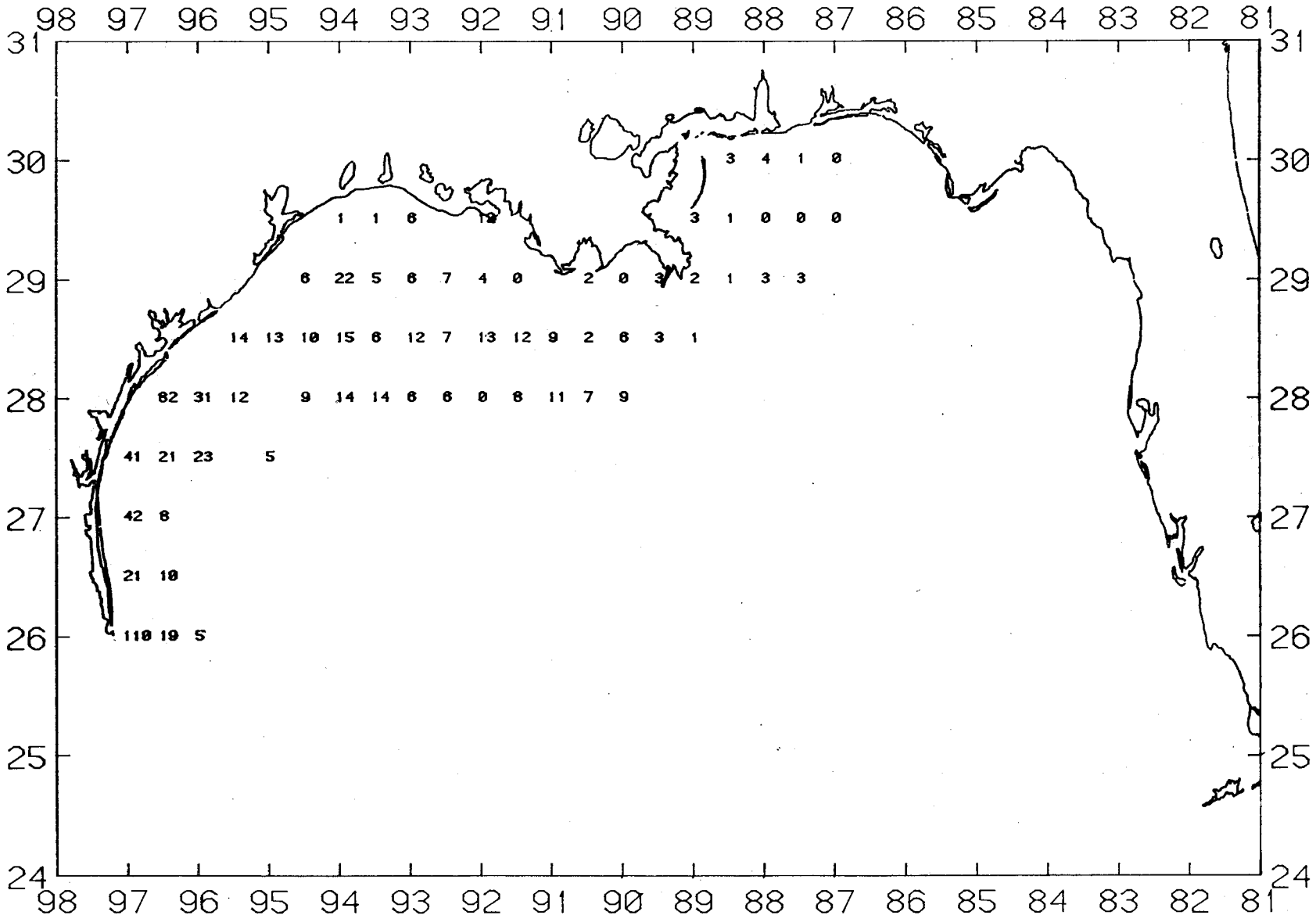

Figure 49. Northern brown shrimp, Penaeus aztecus, lb/hour for June and July 1982.

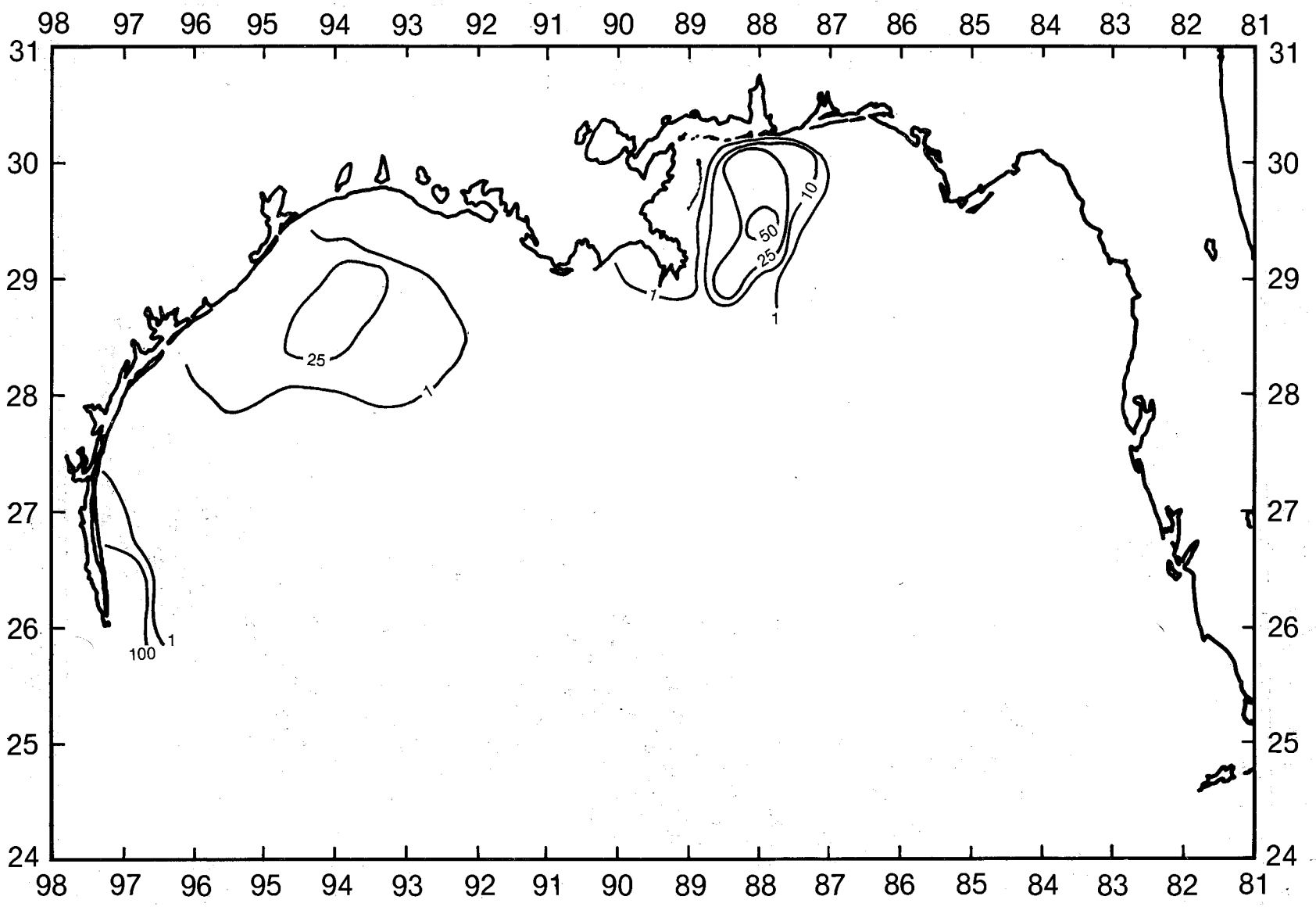

Figure 50. Northern pink shrimp, Penaeus duorarum, number/hour for June and July 1982.

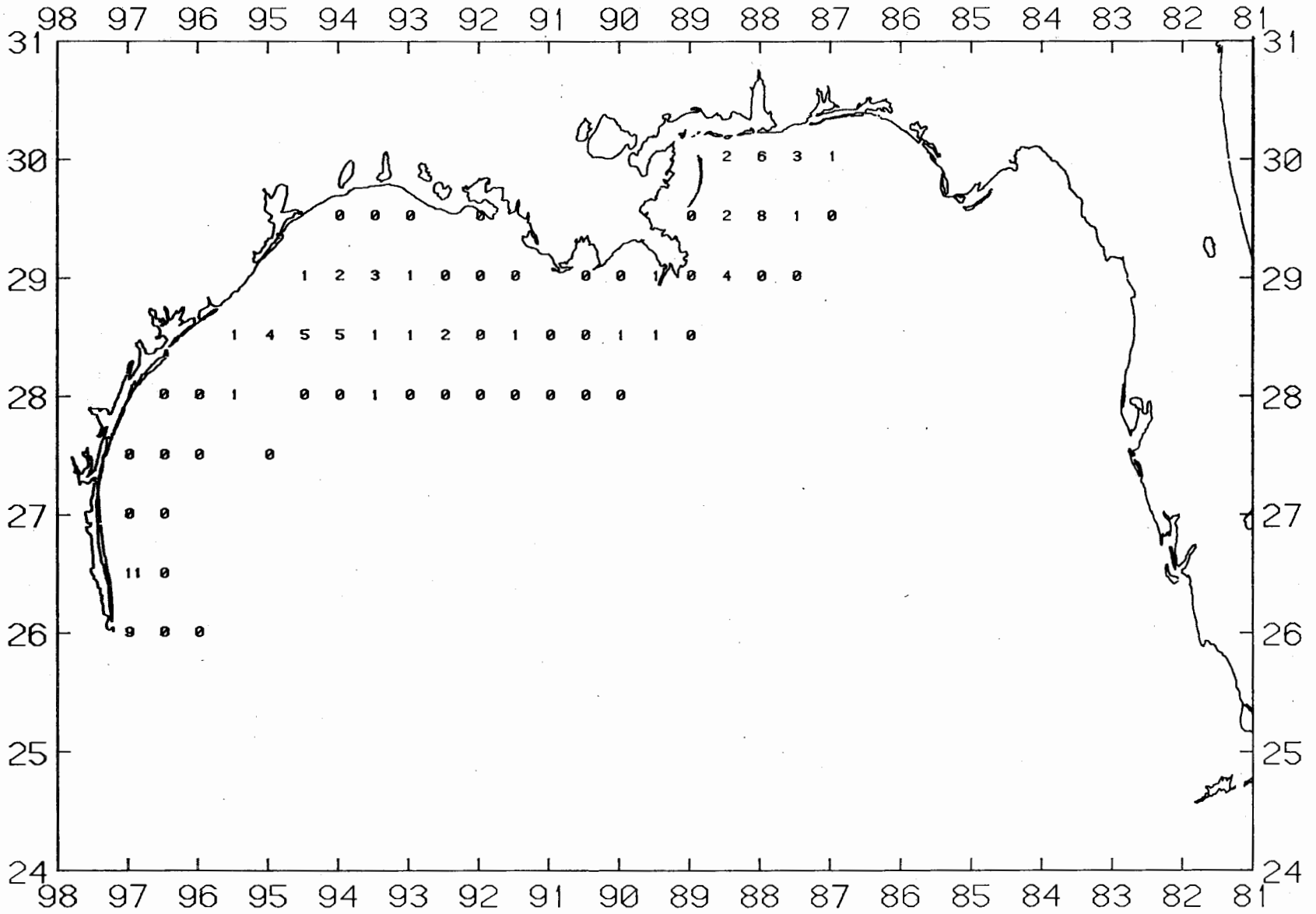

Figure 51. Northern pink shrimp, Penaeus duorarum, lb/hour for June and July 1982.

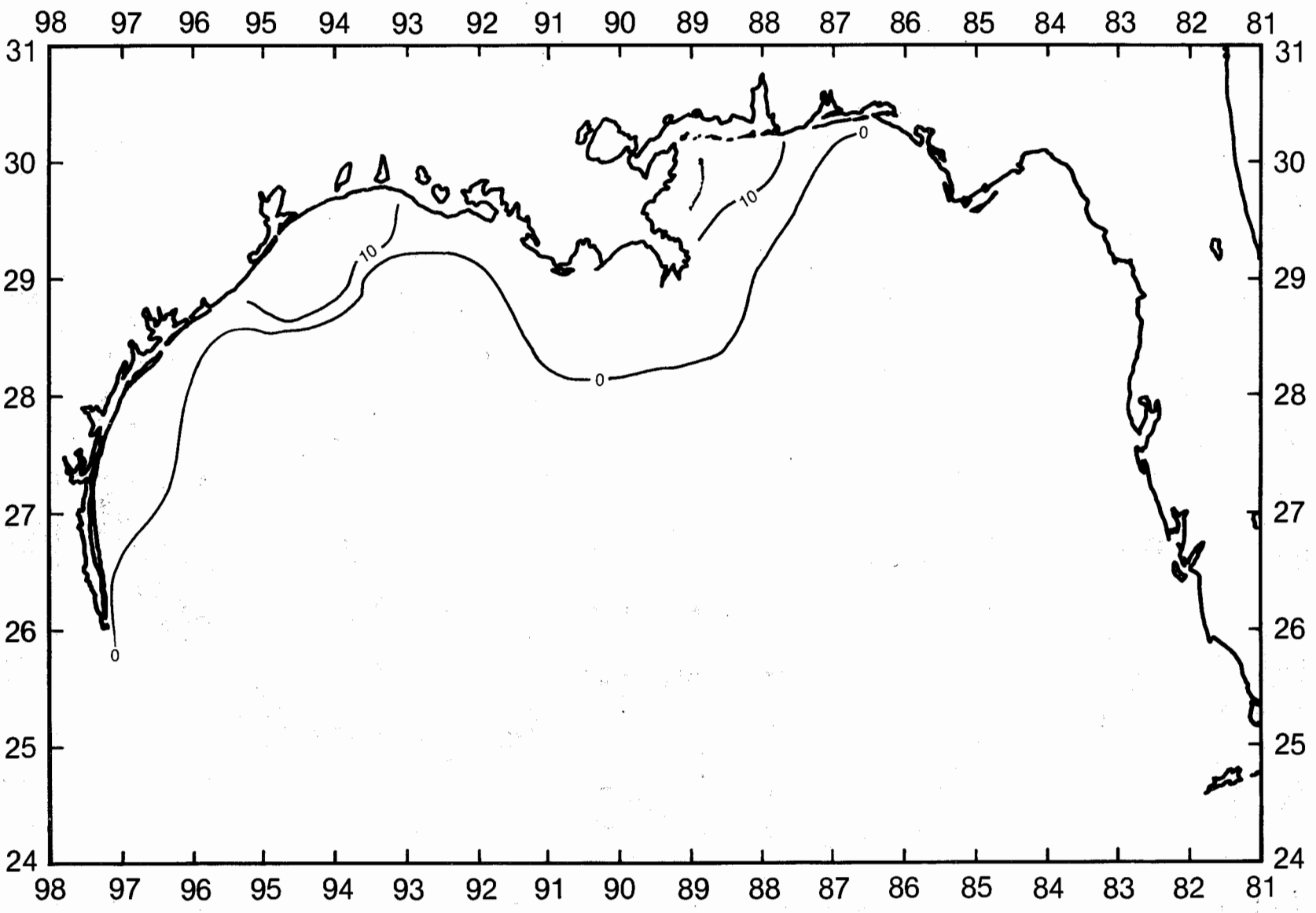

Figure 52. Northern white shrimp, Penaeus setiferus, number/hour for June and July 1982.

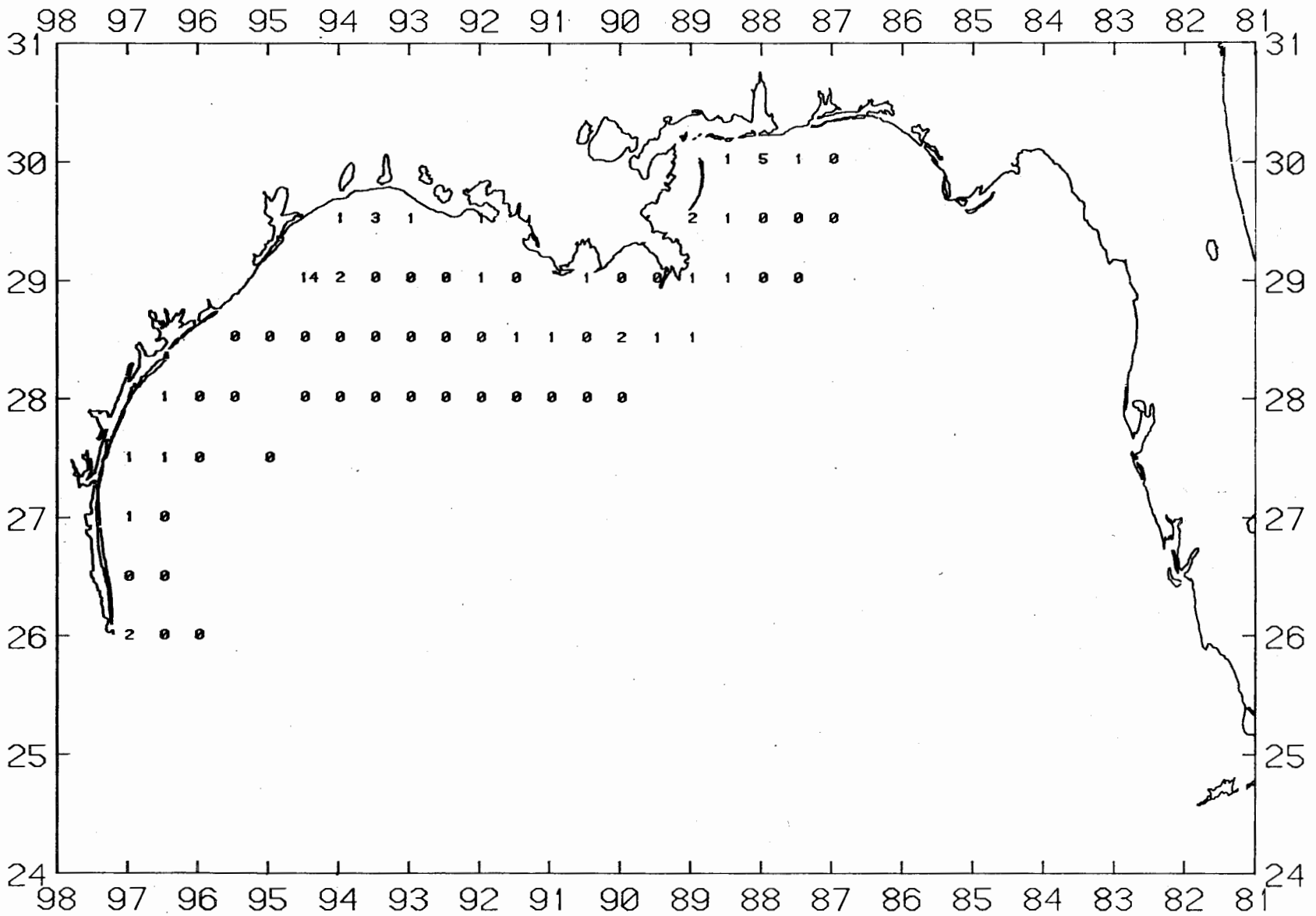

Figure 53. Northern white shrimp, Penaeus setiferus, lb/hour for June and July 1982.

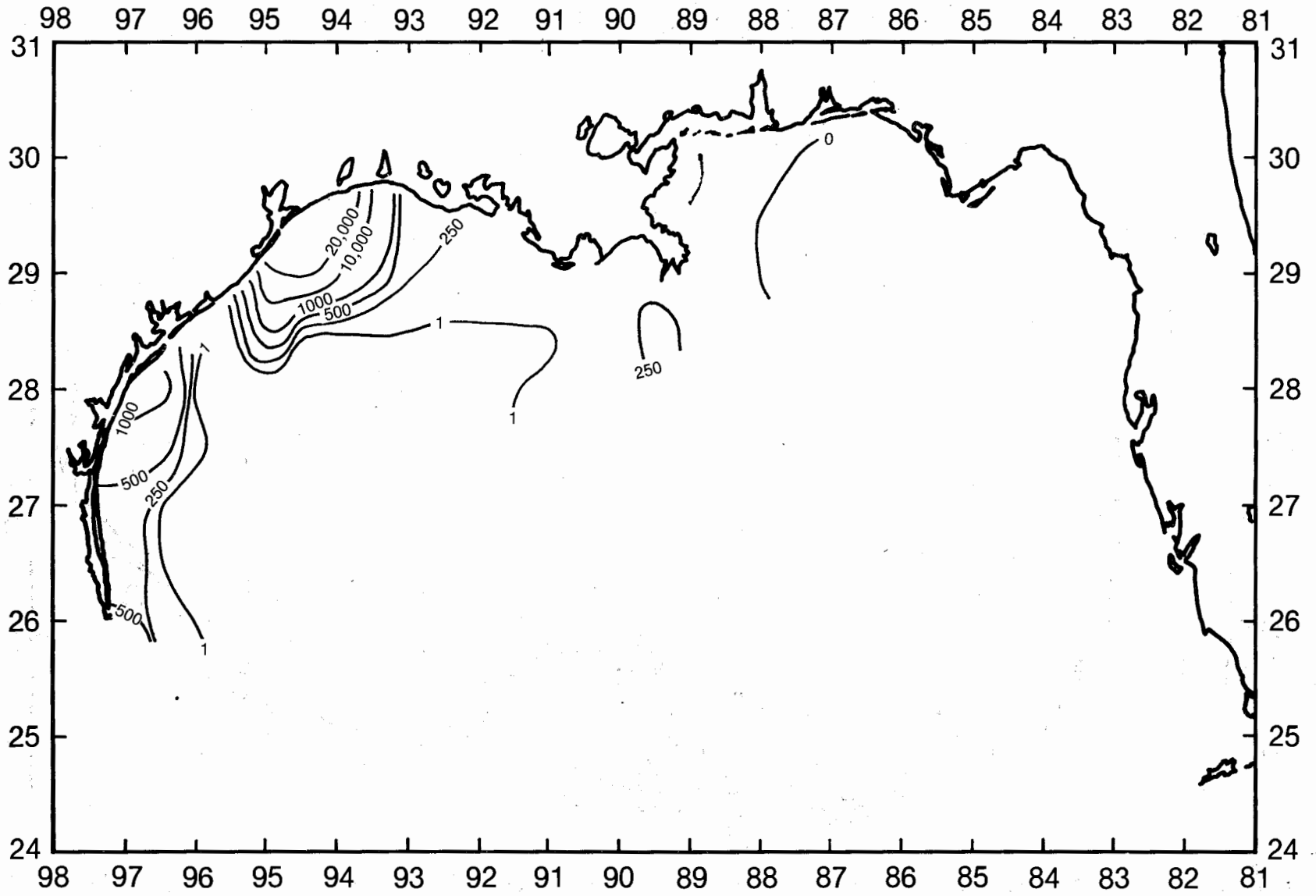

Figure 54. Atlantic croaker, Micropogonias undulatus, number/hour for June and July 1982.

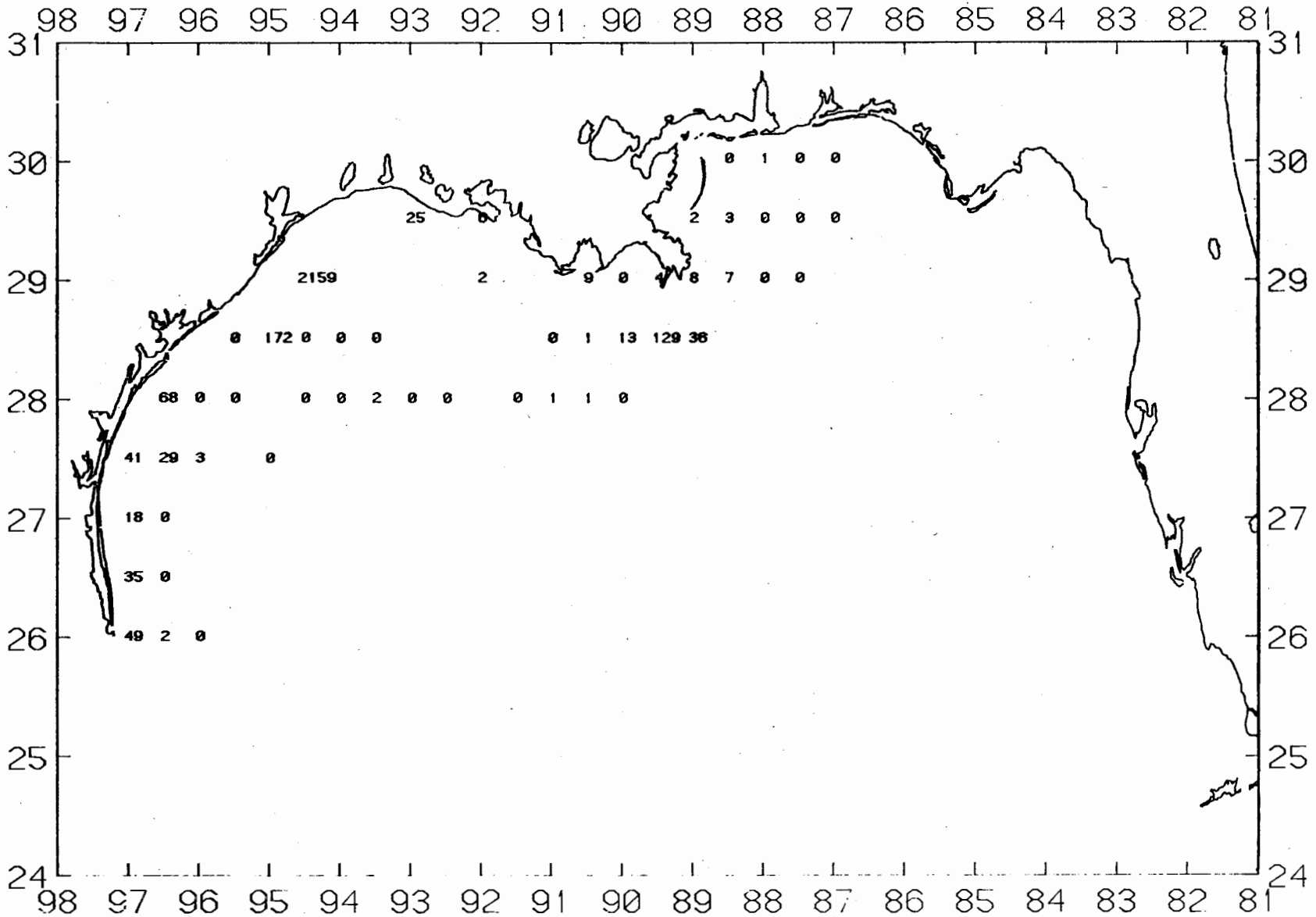

Figure 55. Atlantic croaker, Micropogonias undulatus, lb/hour for June and July 1982.

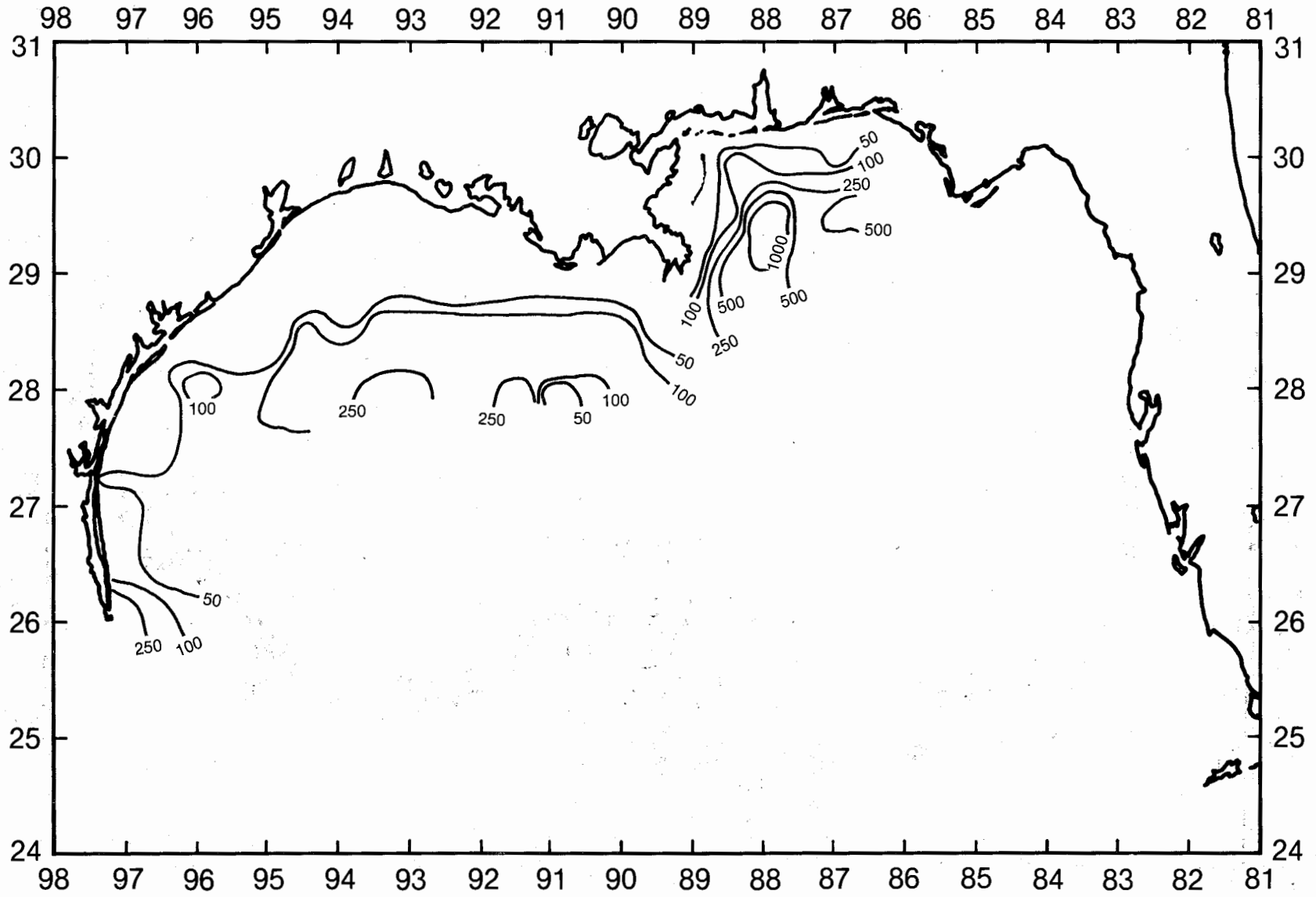

Figure 56. Longspine porgy, Stenotomus caprinus, number/hour for June and July 1982.

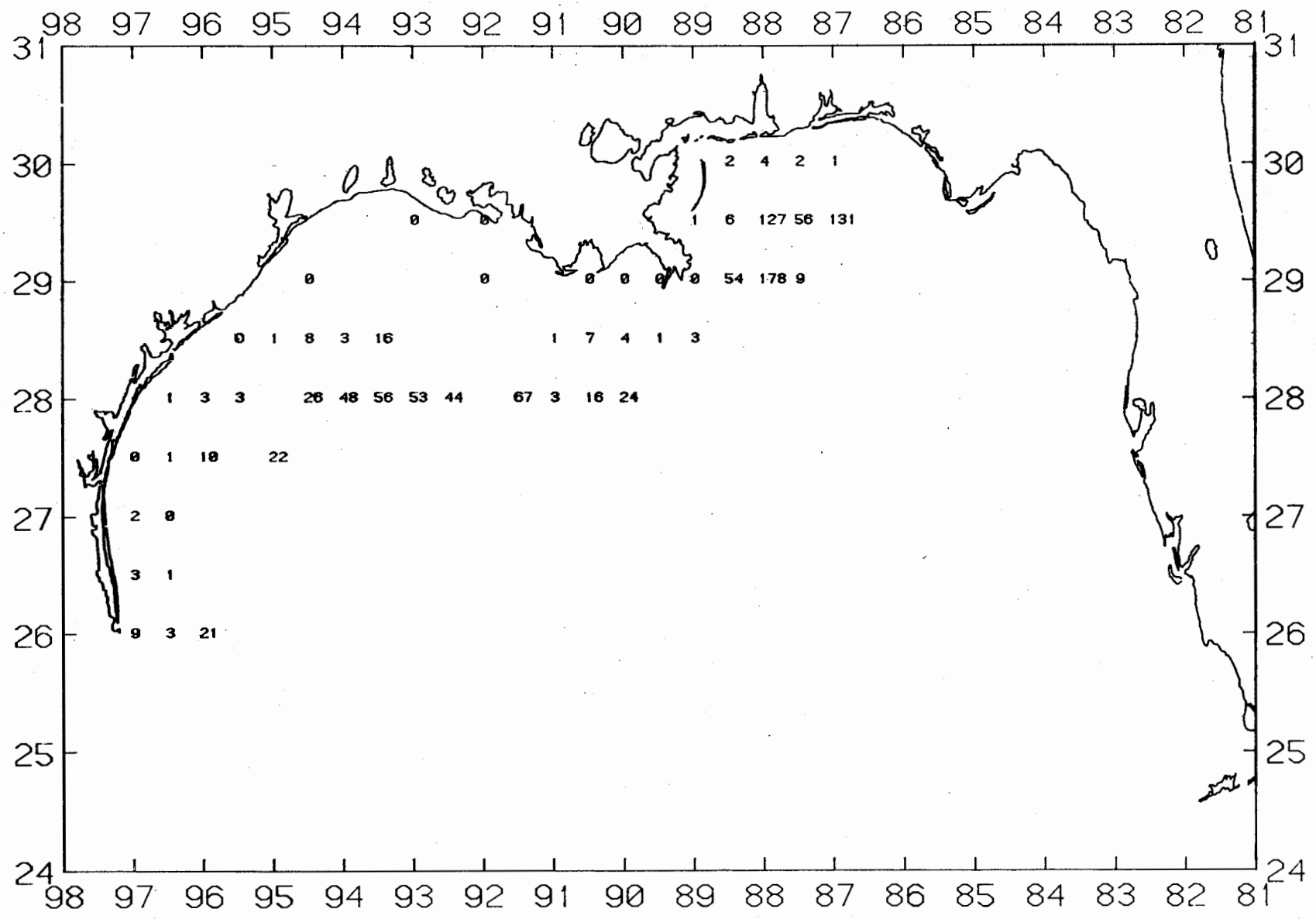

Figure 57. Longspine porgy, Stenotomus caprinus, lb/hour for June and July 1982.

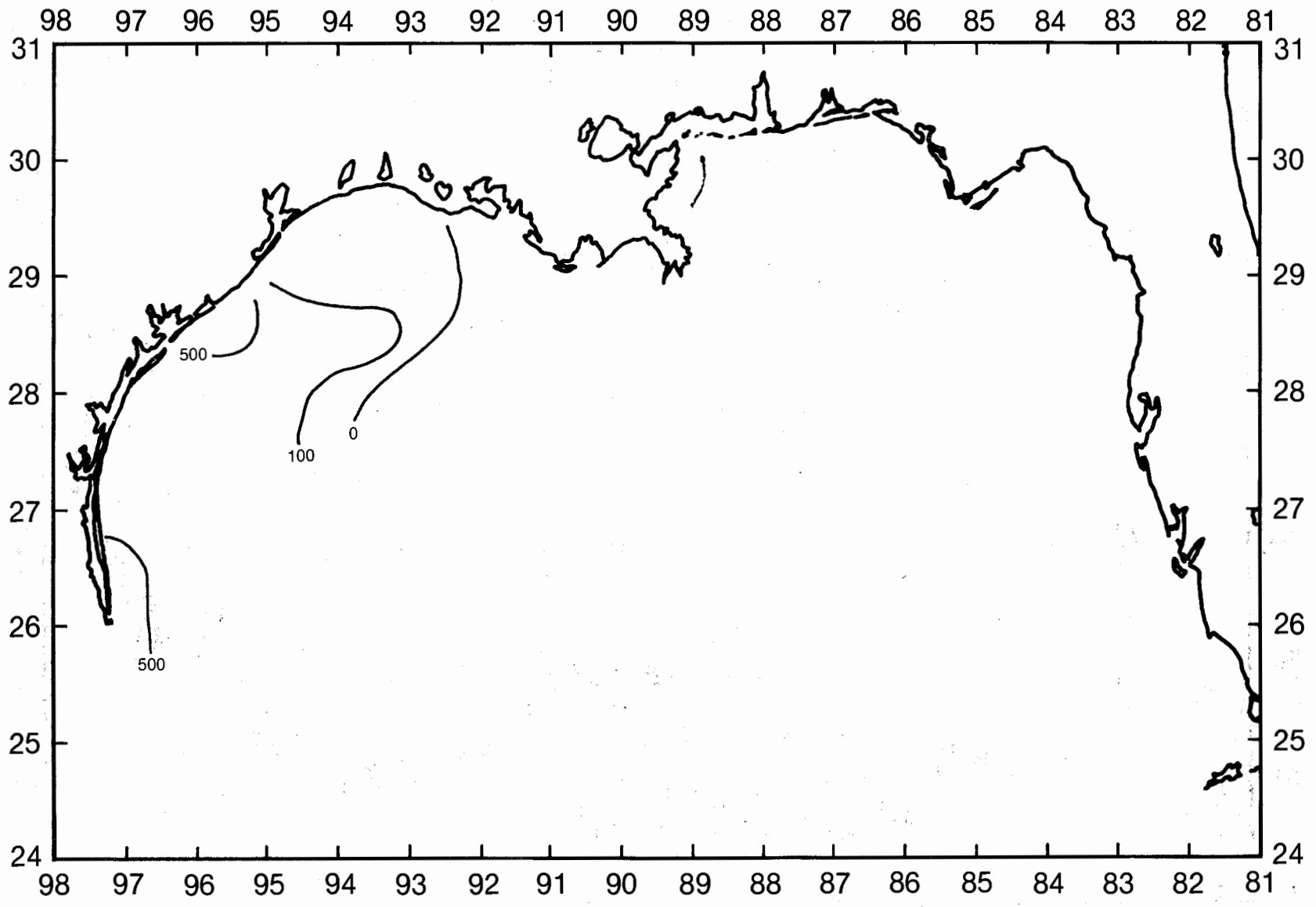

Figure 58. Dwarf goatfish, Upeneus parvus, number/hour for June and July 1982.

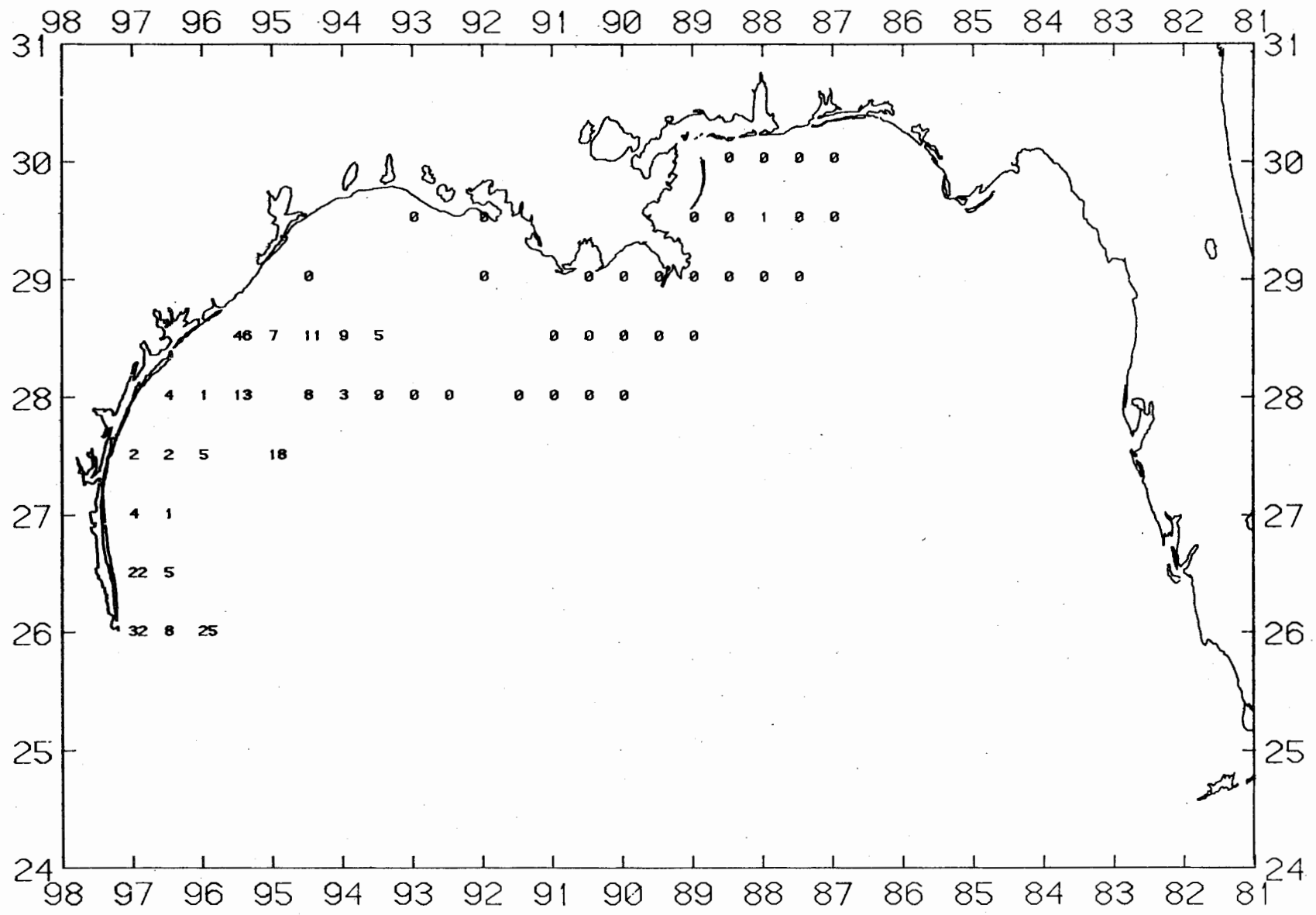

Figure 59. Dwarf goatfish, Upeneus parvus, lb/hr for June and July 1982.

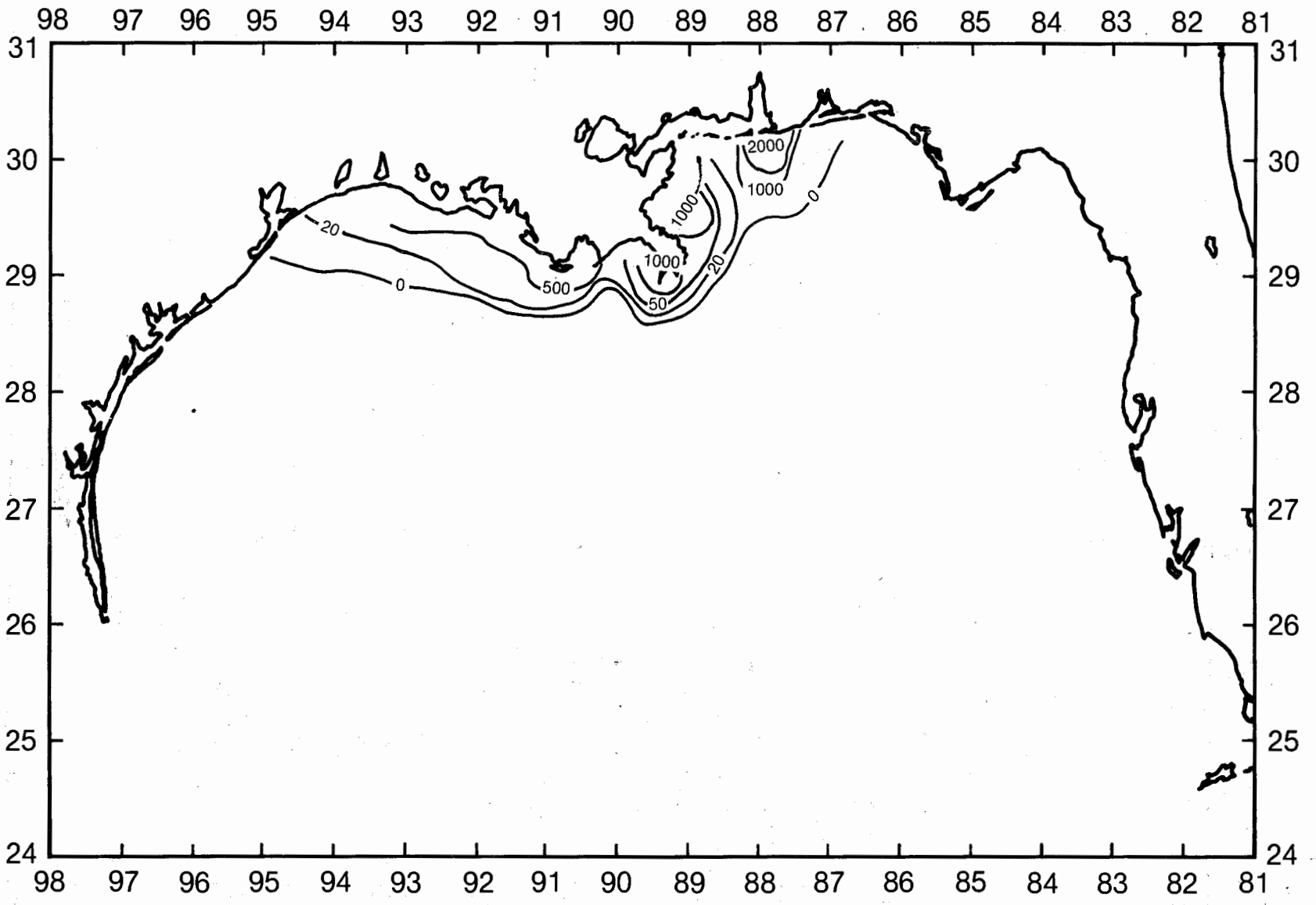

Figure 60. Bay anchovy, Anchoa mitchilli, number/hour for June and July 1982.

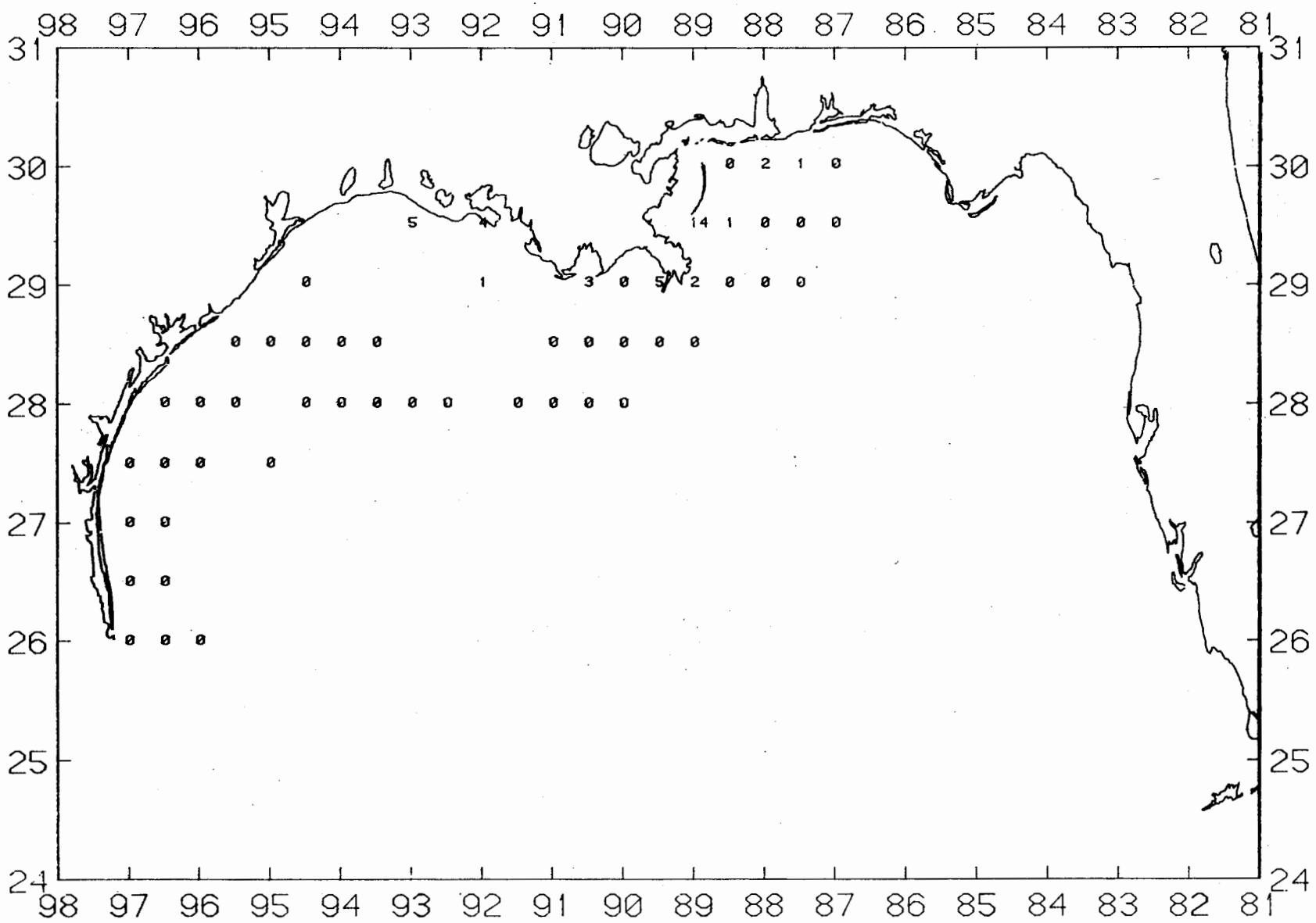

Figure 61. Bay anchovy, Anchoa mitchilli, lb/hour for June and July 1982.

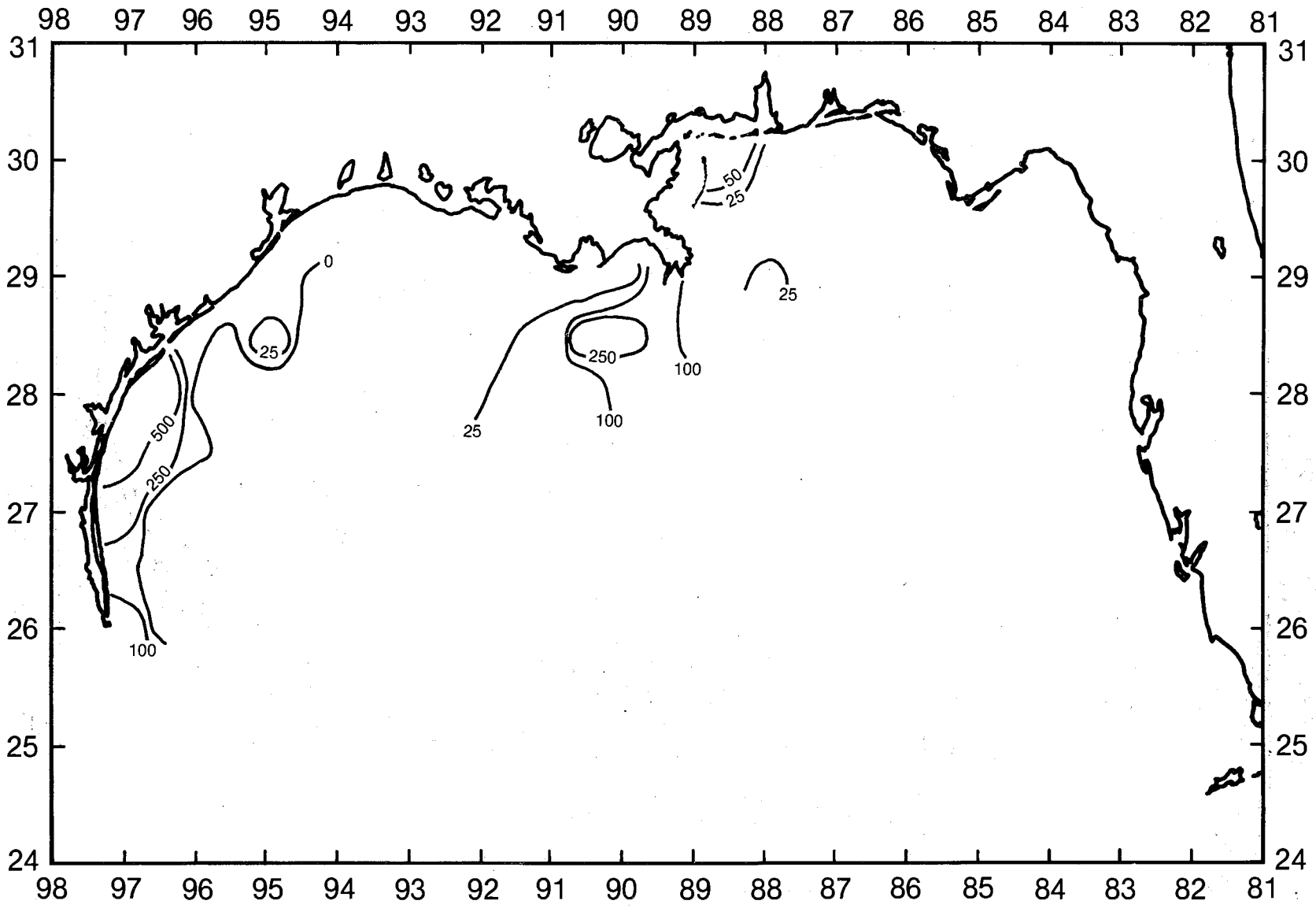

Figure 62. Blackfin sea robin, Prionotus rubio, number/hour for June and July 1982.

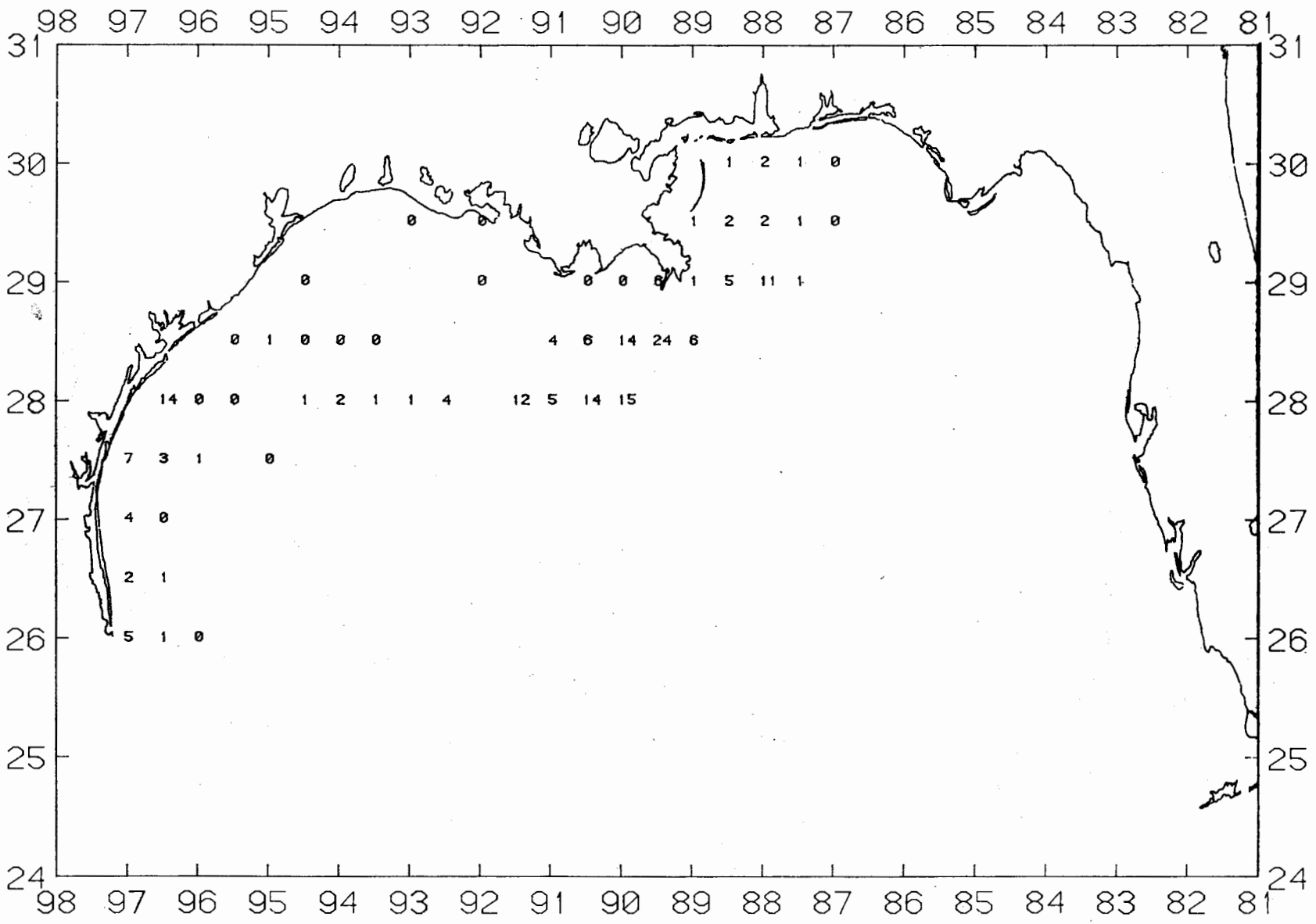

Figure 63. Blackfin sea robin, Prionotus rubio, lb/hour for June and July 1982.

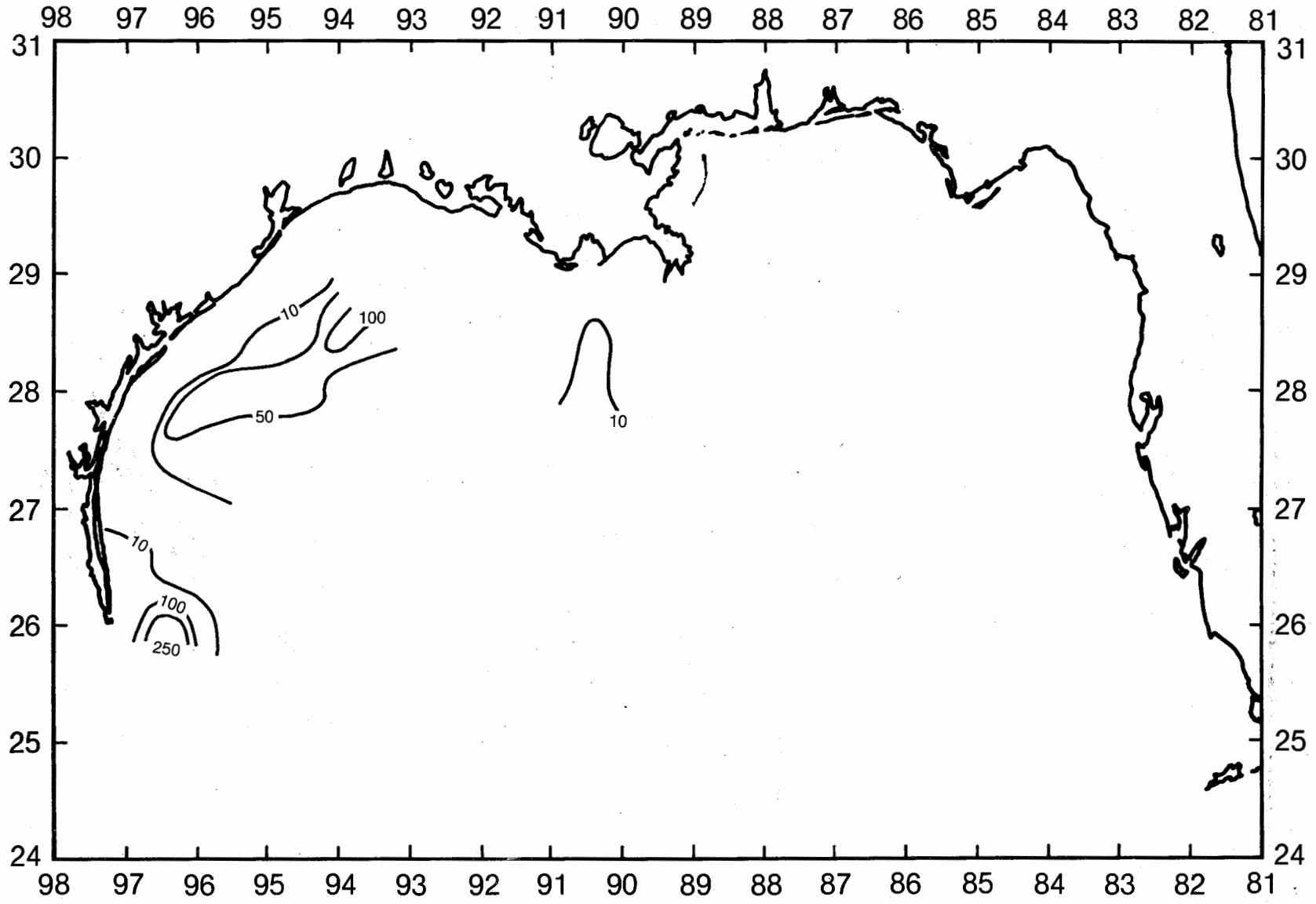

Figure 64. Rough scad, Trachurus lathami, number/hour for June and July 1982.

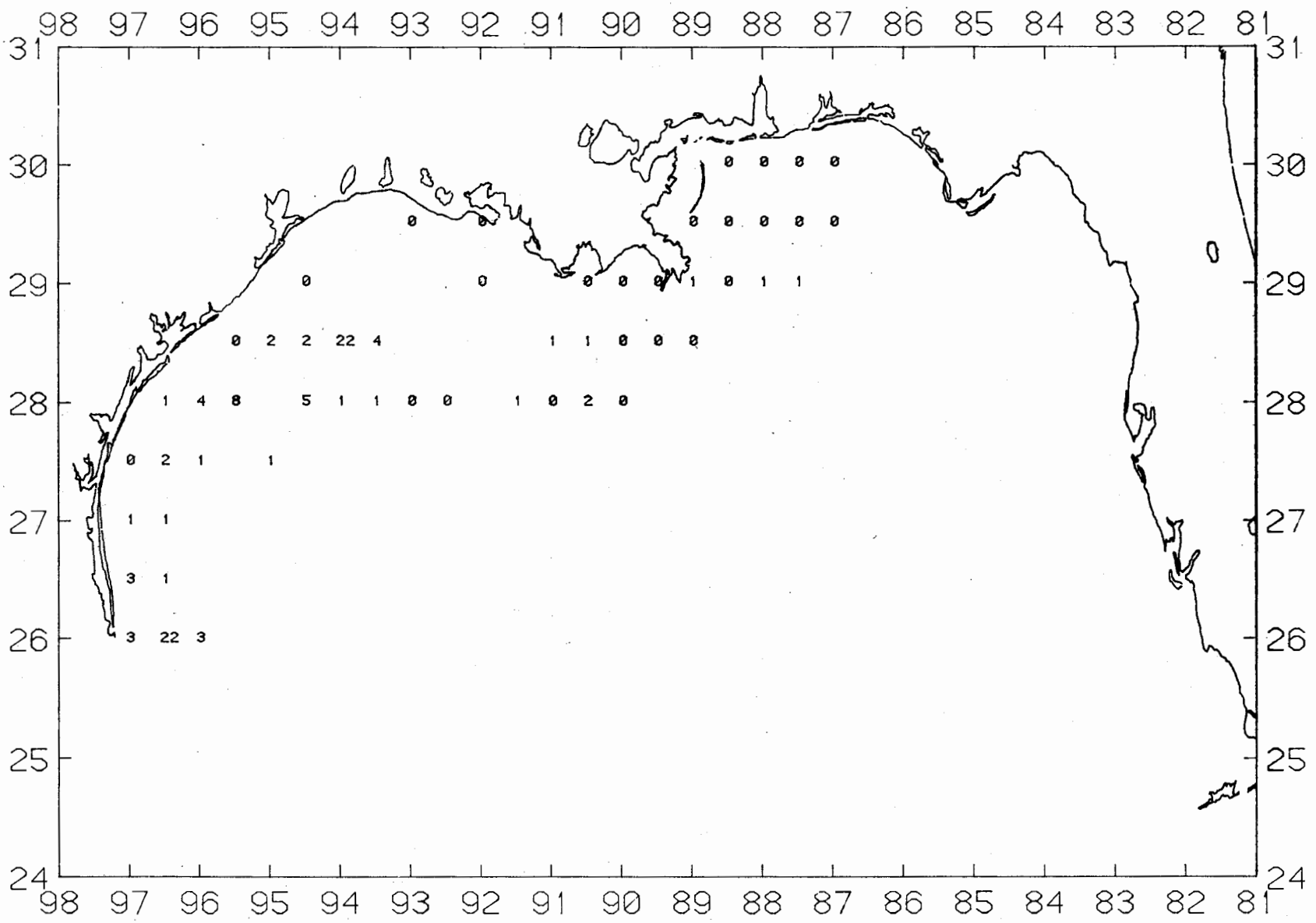

Figure 65. Rough scad, Trachurus lathami, lb/hour for June and July 1982.

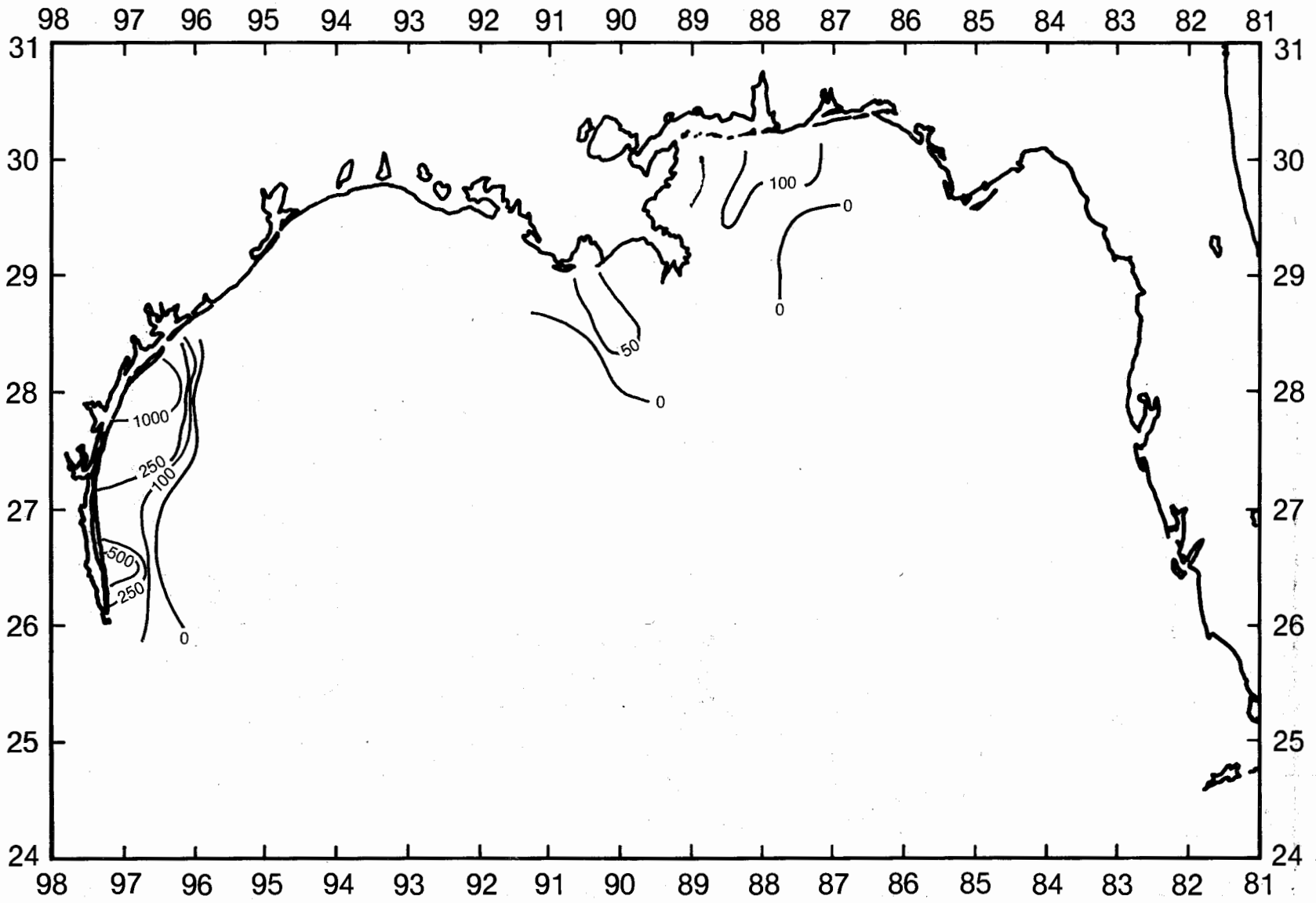

Figure 66. Spot, Leiostomus xanthurus, number/hour for June and July 1982.

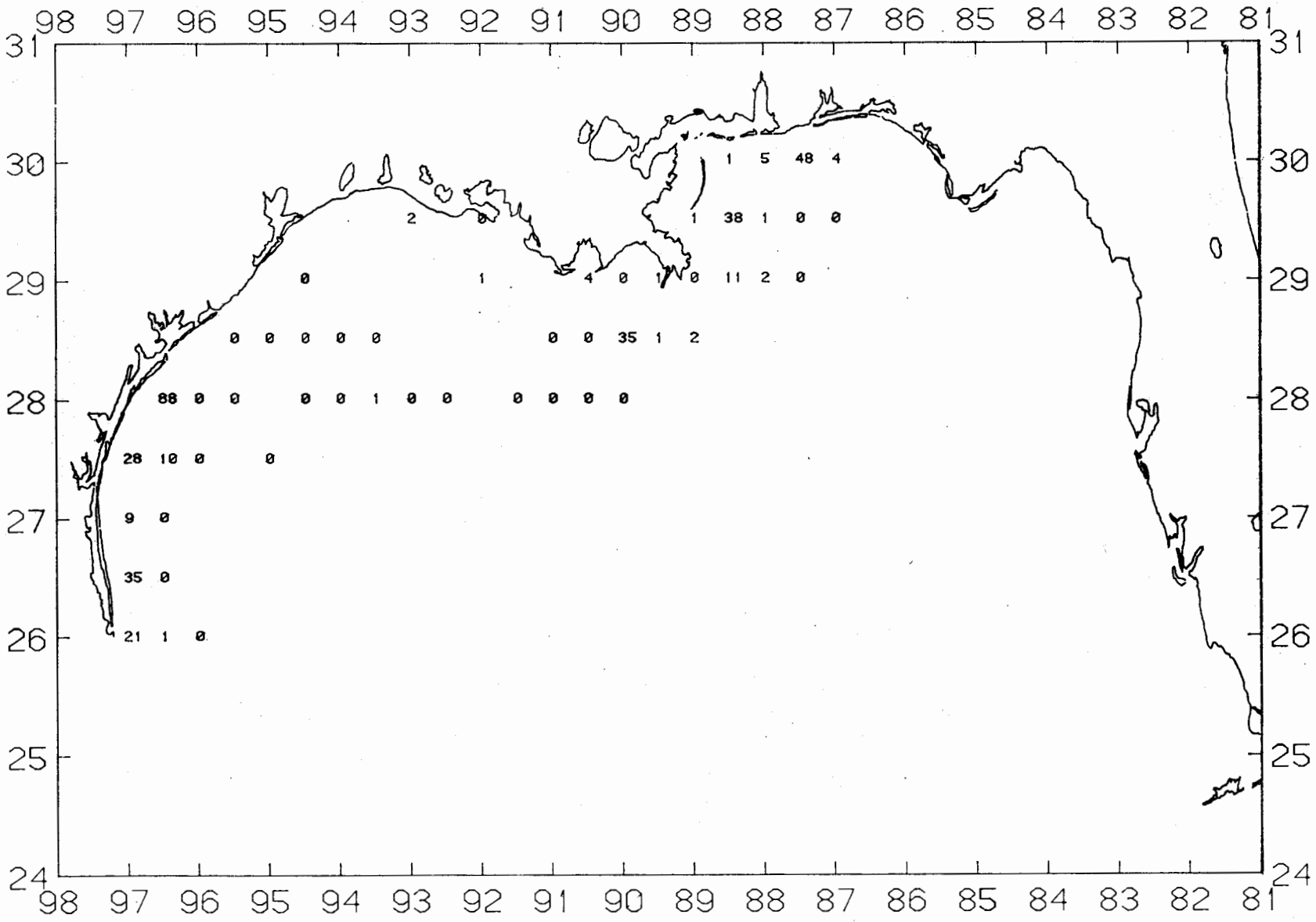

Figure 67. Spot, Leiostomus xanthurus, lb/hour for June and July 1982.

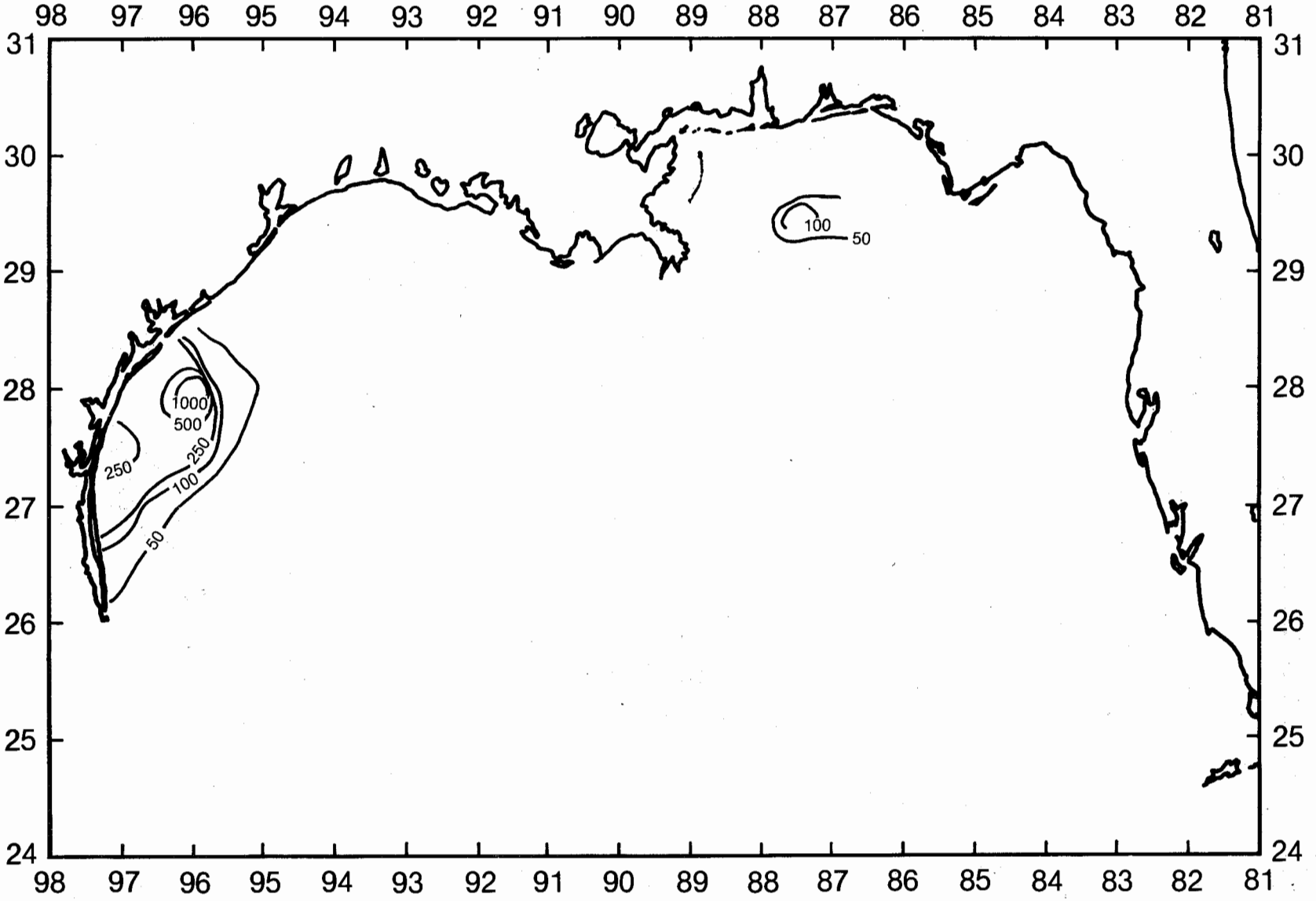

Figure 68. Shoal flounder, Syacium gunteri, number/hour for June and July 1982.

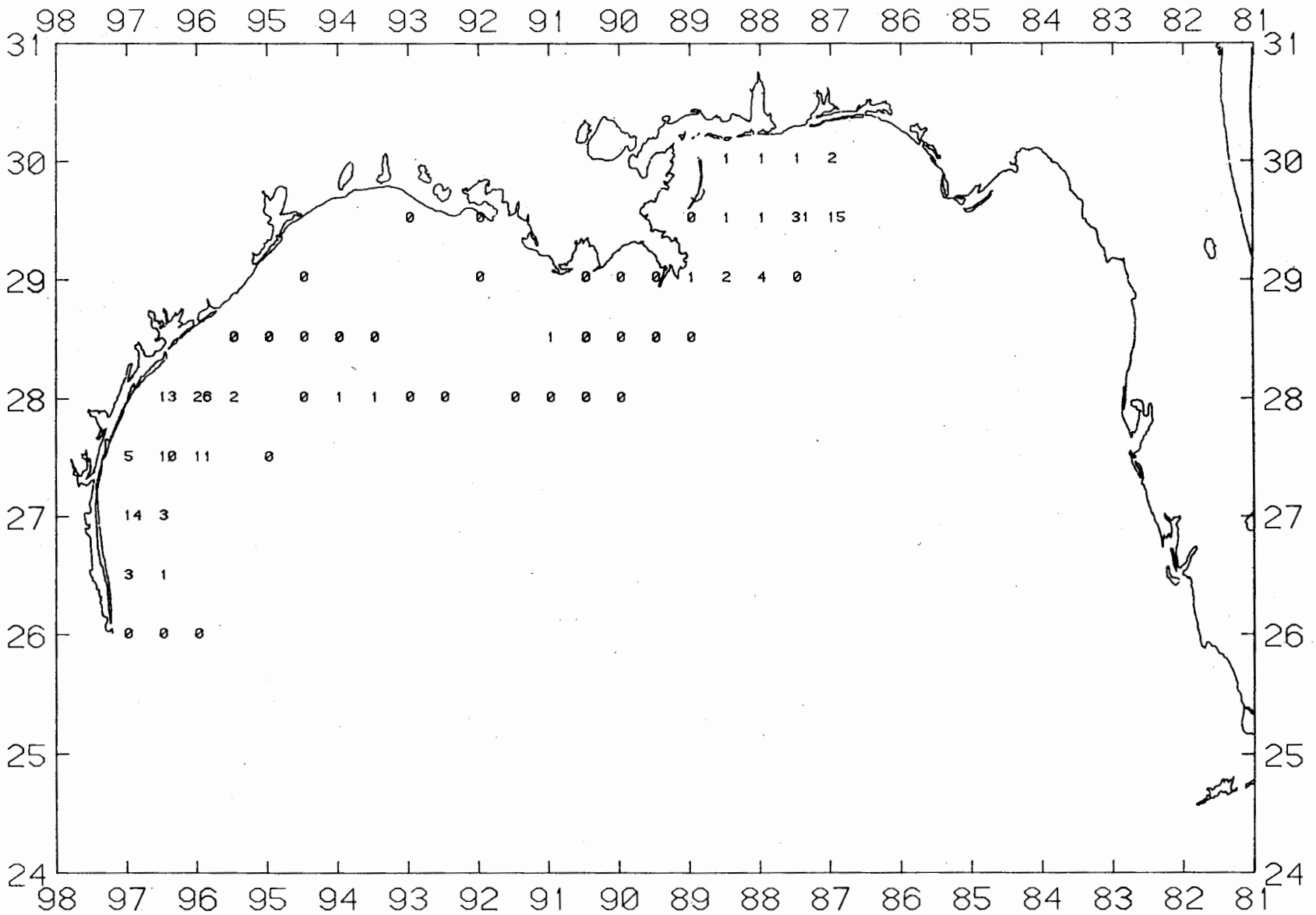

Figure 69. Shoal flounder, Syacium gunteri, lb/hour for June and July 1982.

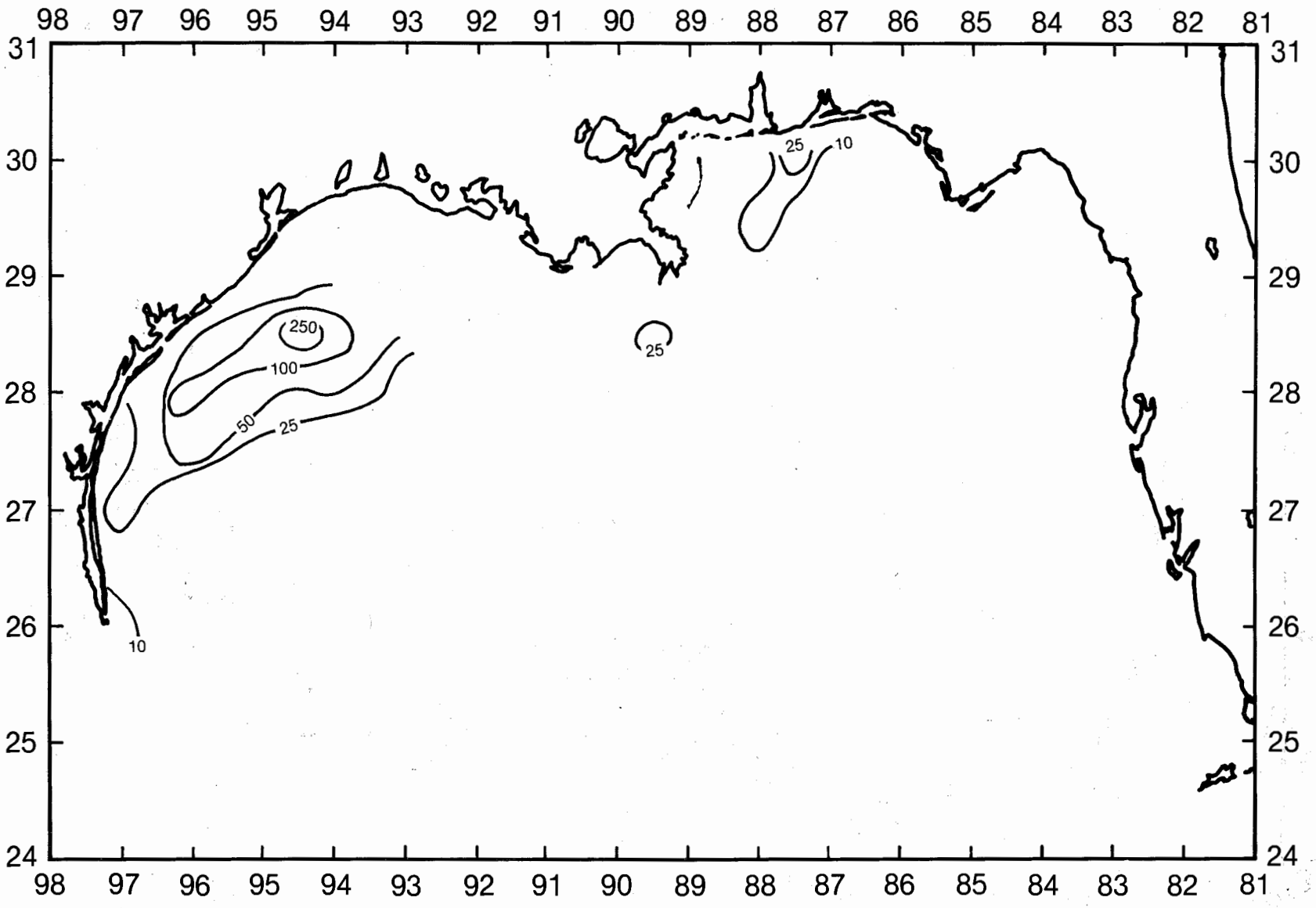

Figure 70. Dwarf sand perch, Diplectrum bivittatum, number/hour for June and July 1982.

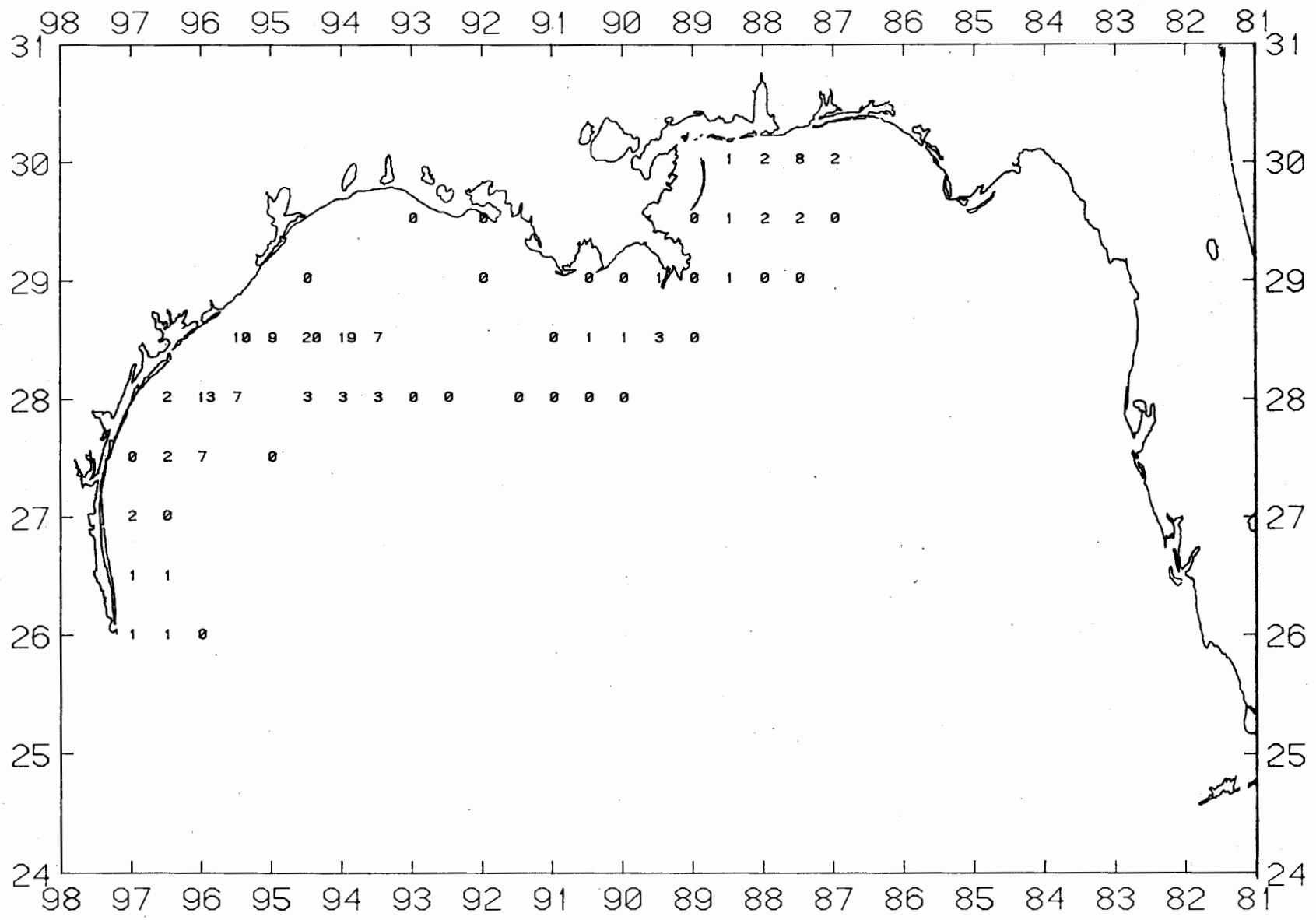

Figure 71. Dwarf sand perch, Diplectrum bivittatum, lb/hour for June and July 1982.

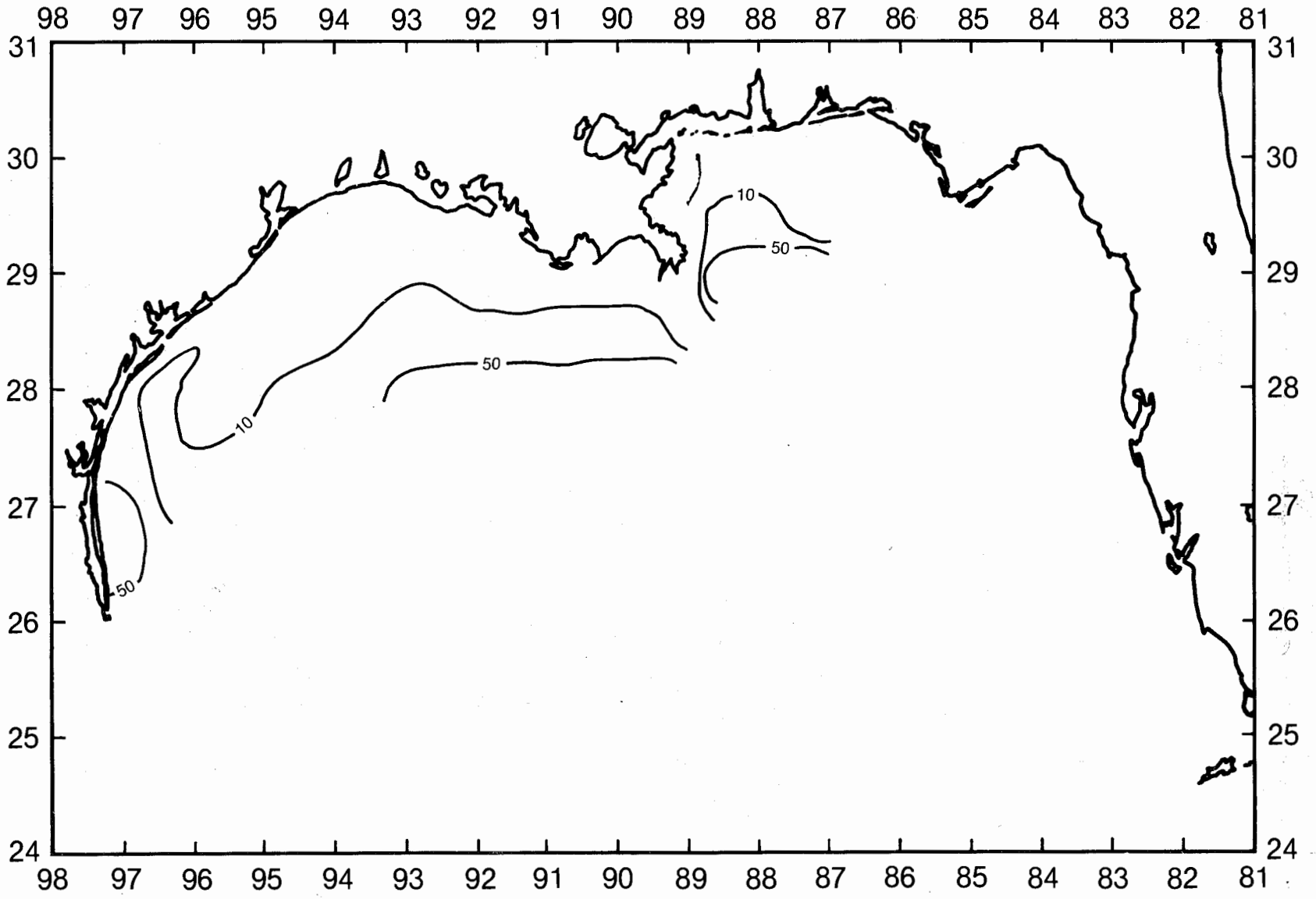

Figure 72. Rock sea bass, Centropristis philadelphica, number/hour for June and July 1982.

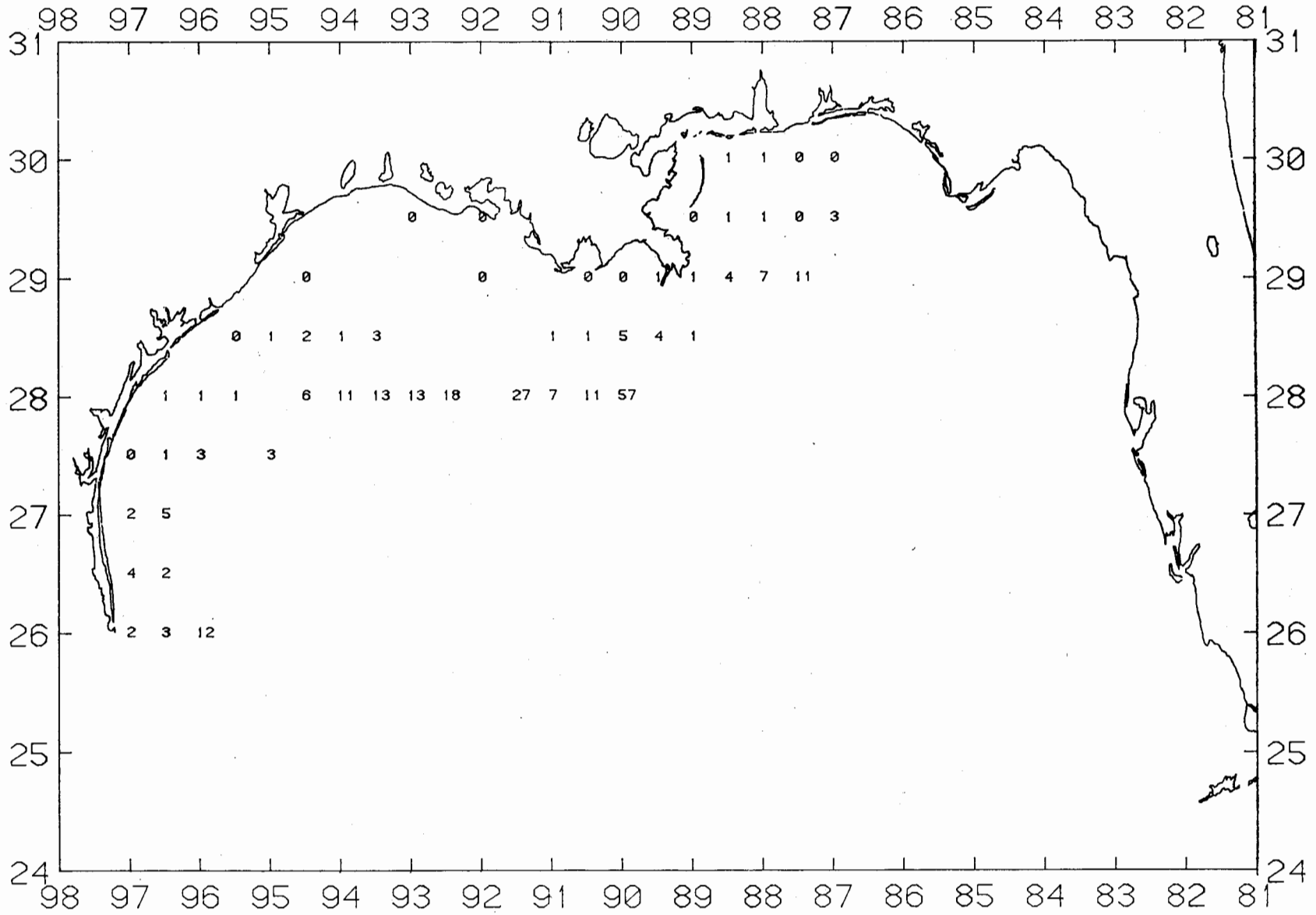

Figure 73. Rock sea bass, Centropristis philadelphica, lb/hour for June and July 1982.

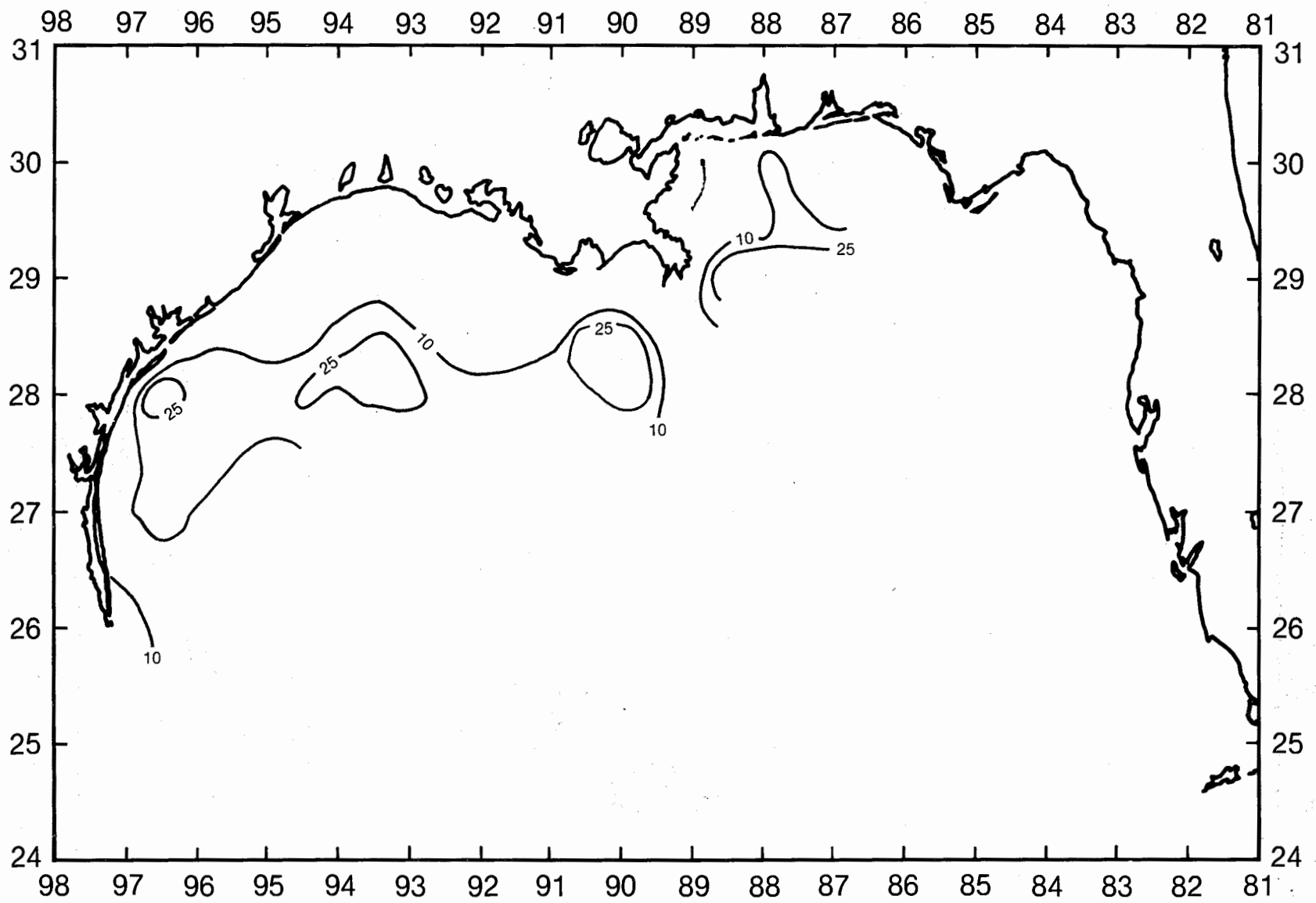

Figure 74. Inshore lizardfish, Synodus foetens, number/hour for June and July 1982.

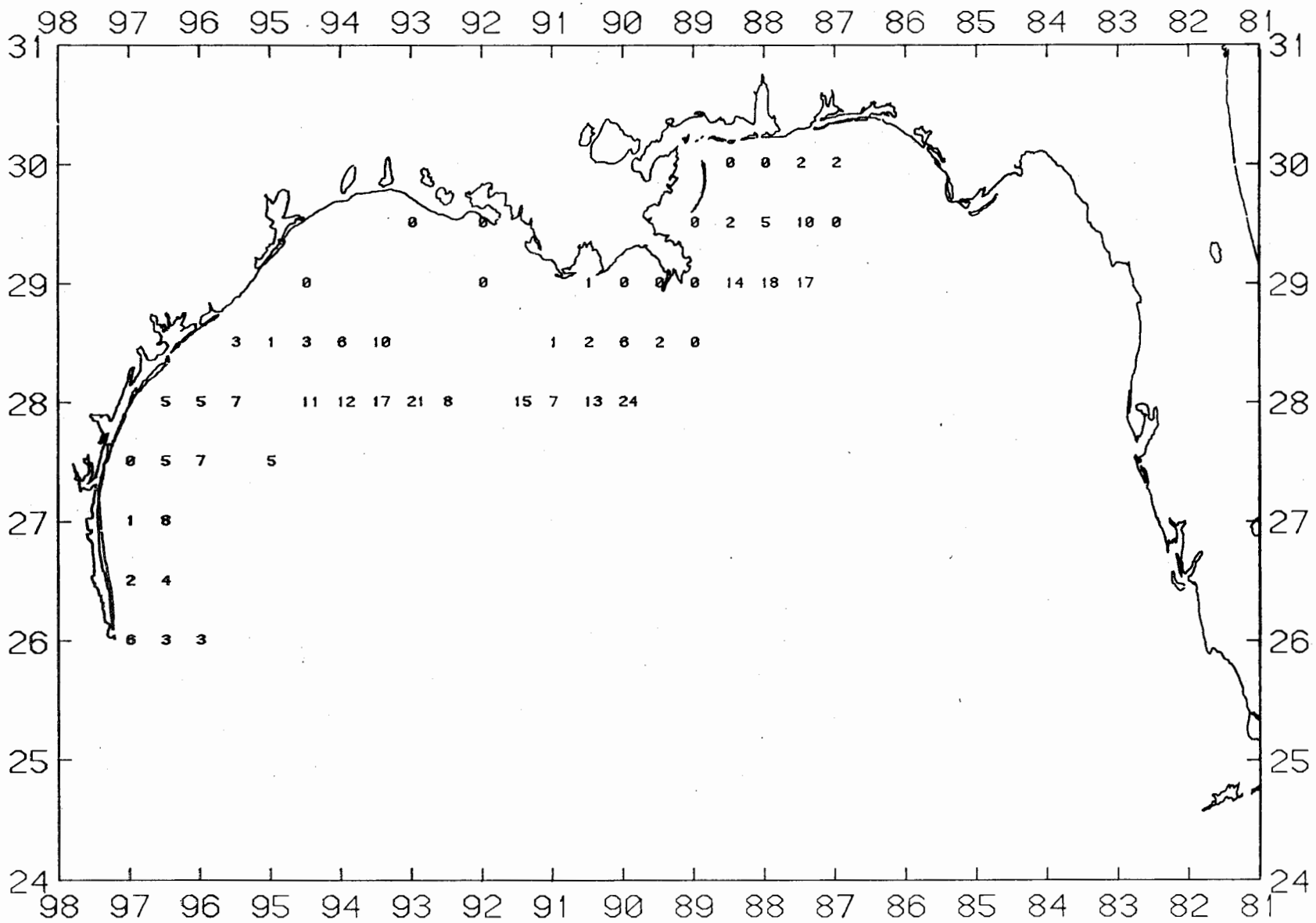

Figure 75. Inshore lizardfish, Synodus foetens, lb/hour for June and July 1982.

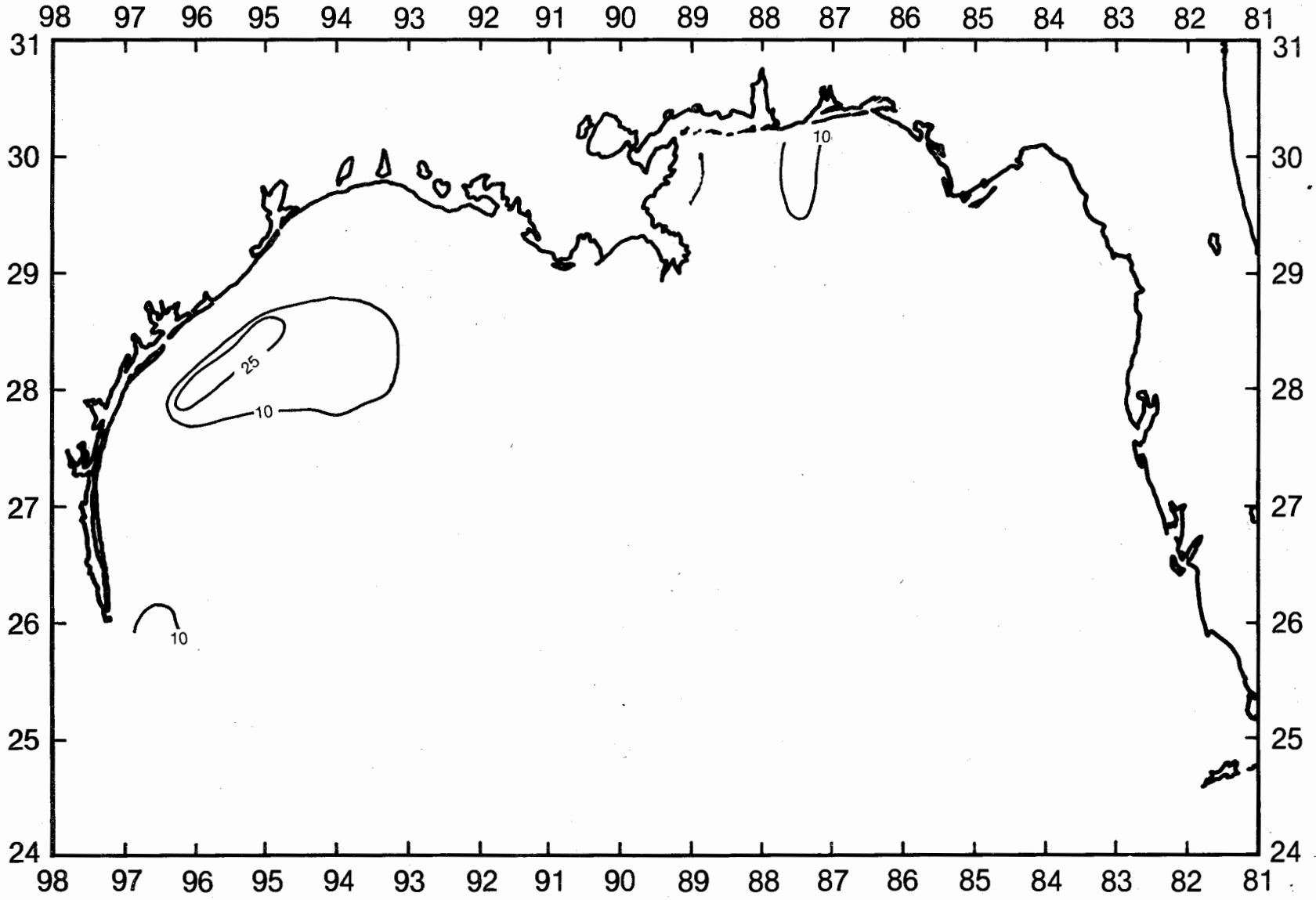

Figure 76. Red snapper, Lutjanus campechanus, number/hour for June and July 1982.

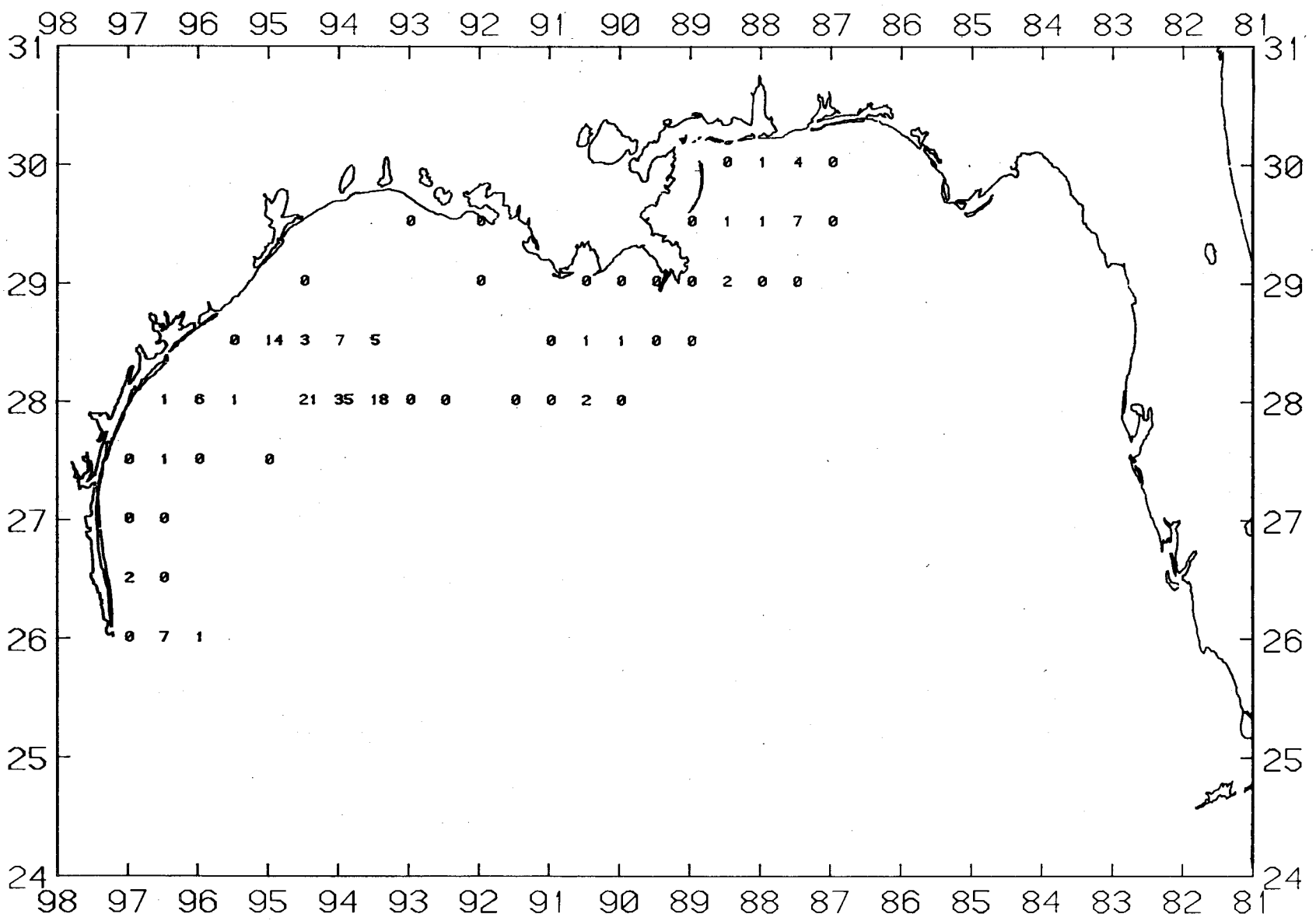

Figure 77. Red snapper, Lutjanus campechanus, lb/hour for June and July 1982.

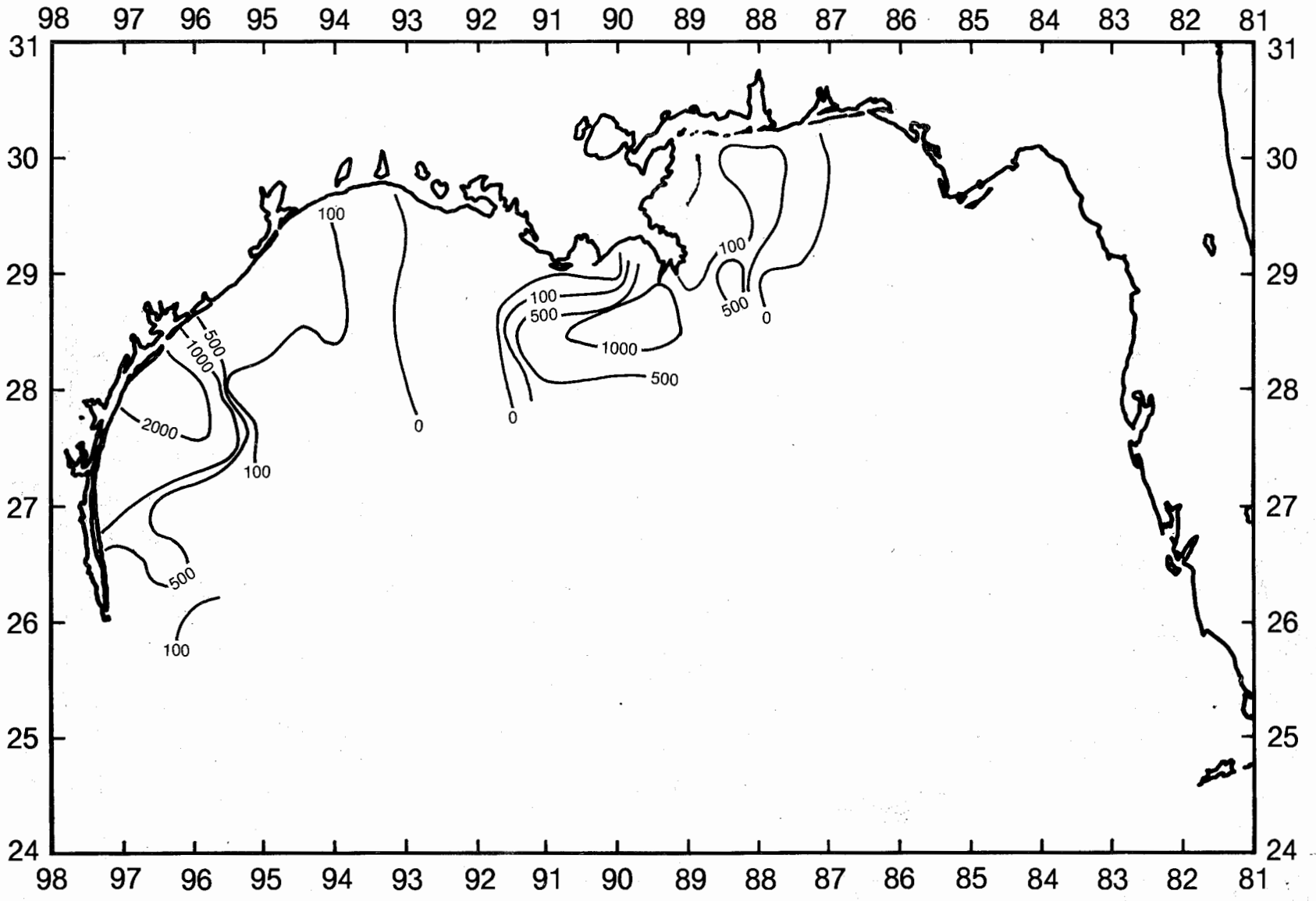

Figure 78. Roughneck shrimp, Trachypenaeus spp., number/hour for June and July 1982.

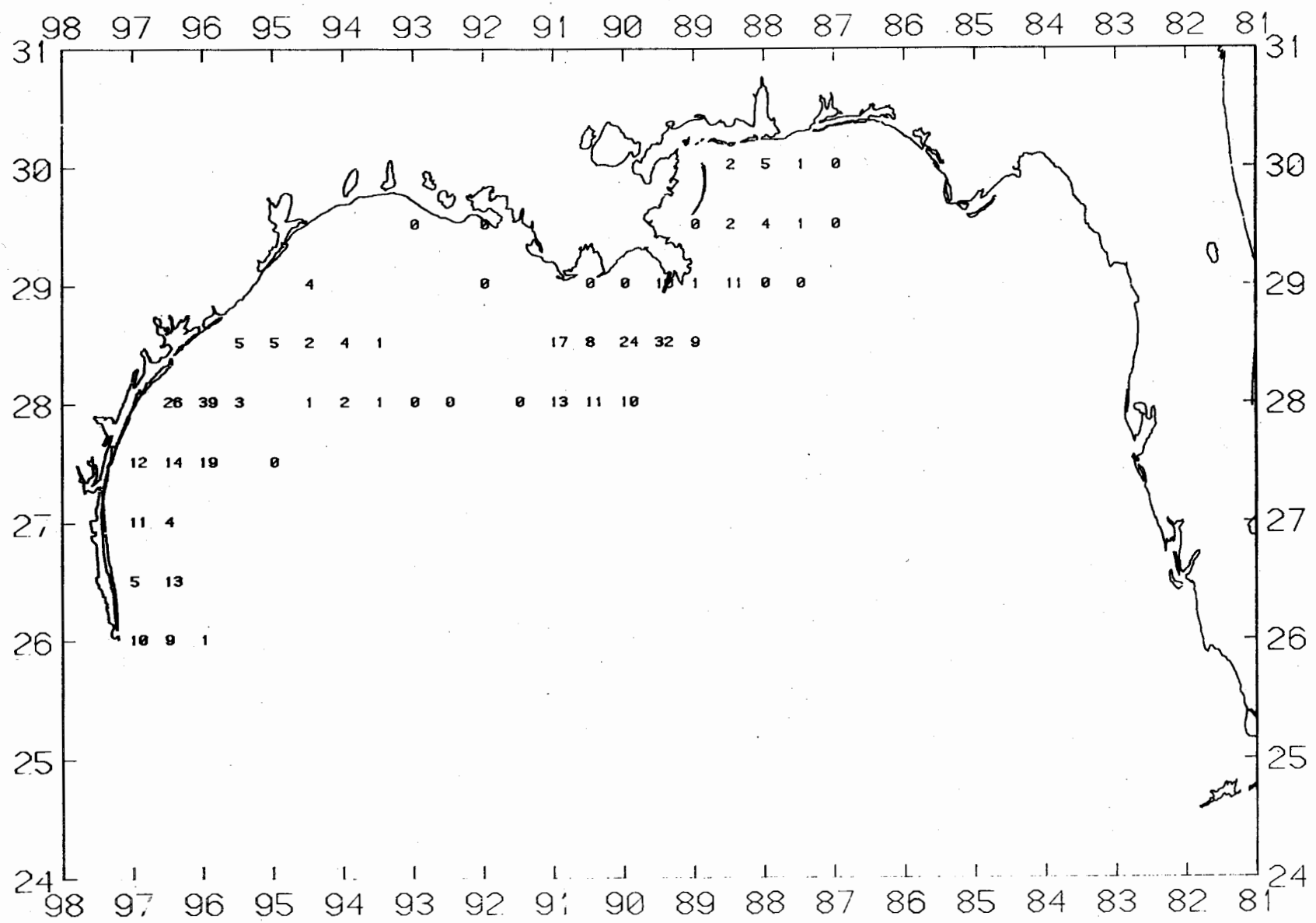

Figure 79. Roughneck shrimp, Trachypenaeus spp., lb/hour for June and July 1982.

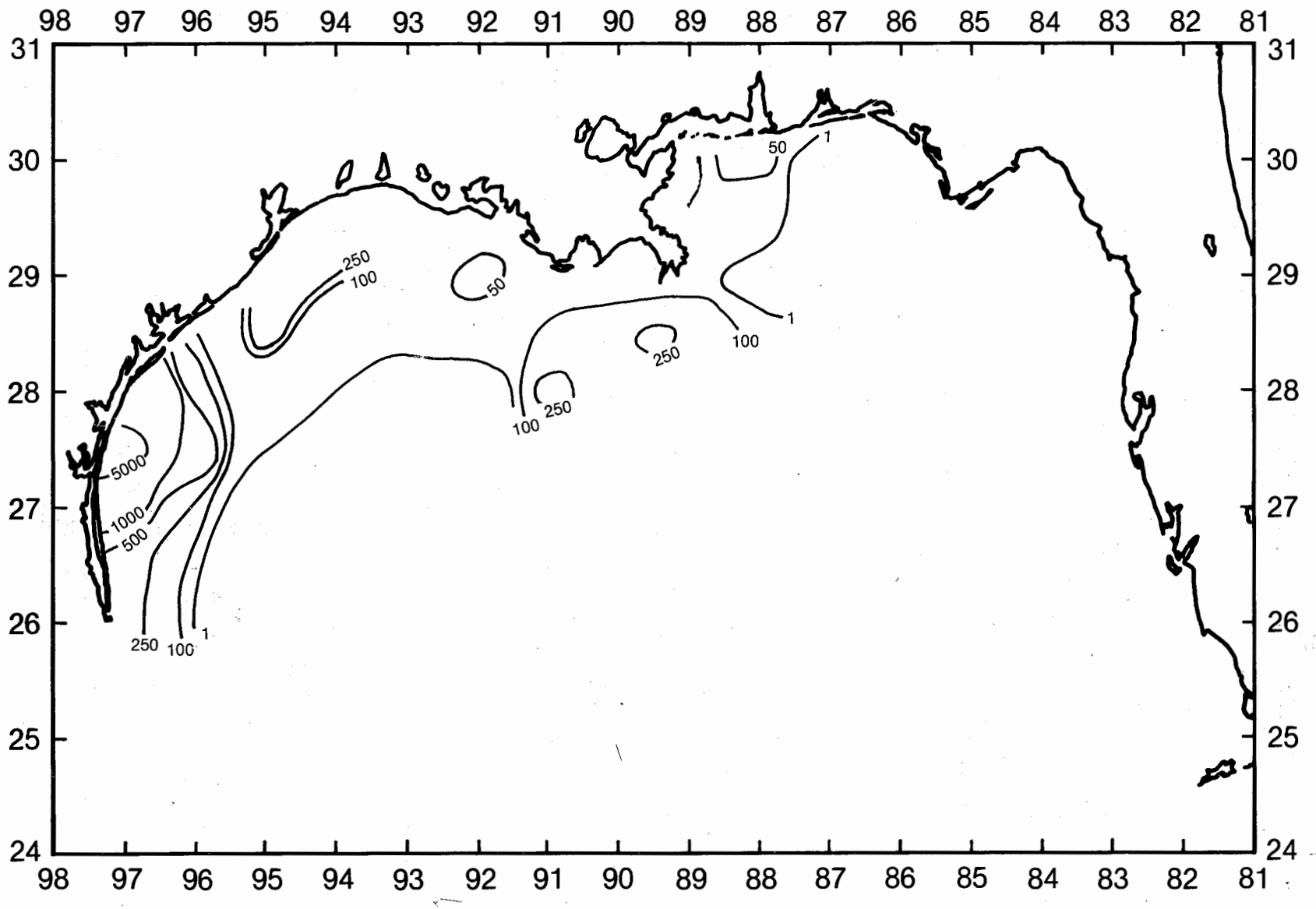

Figure 80. Lesser blue crab, Callinectes similis, number/hour for June and July 1982.

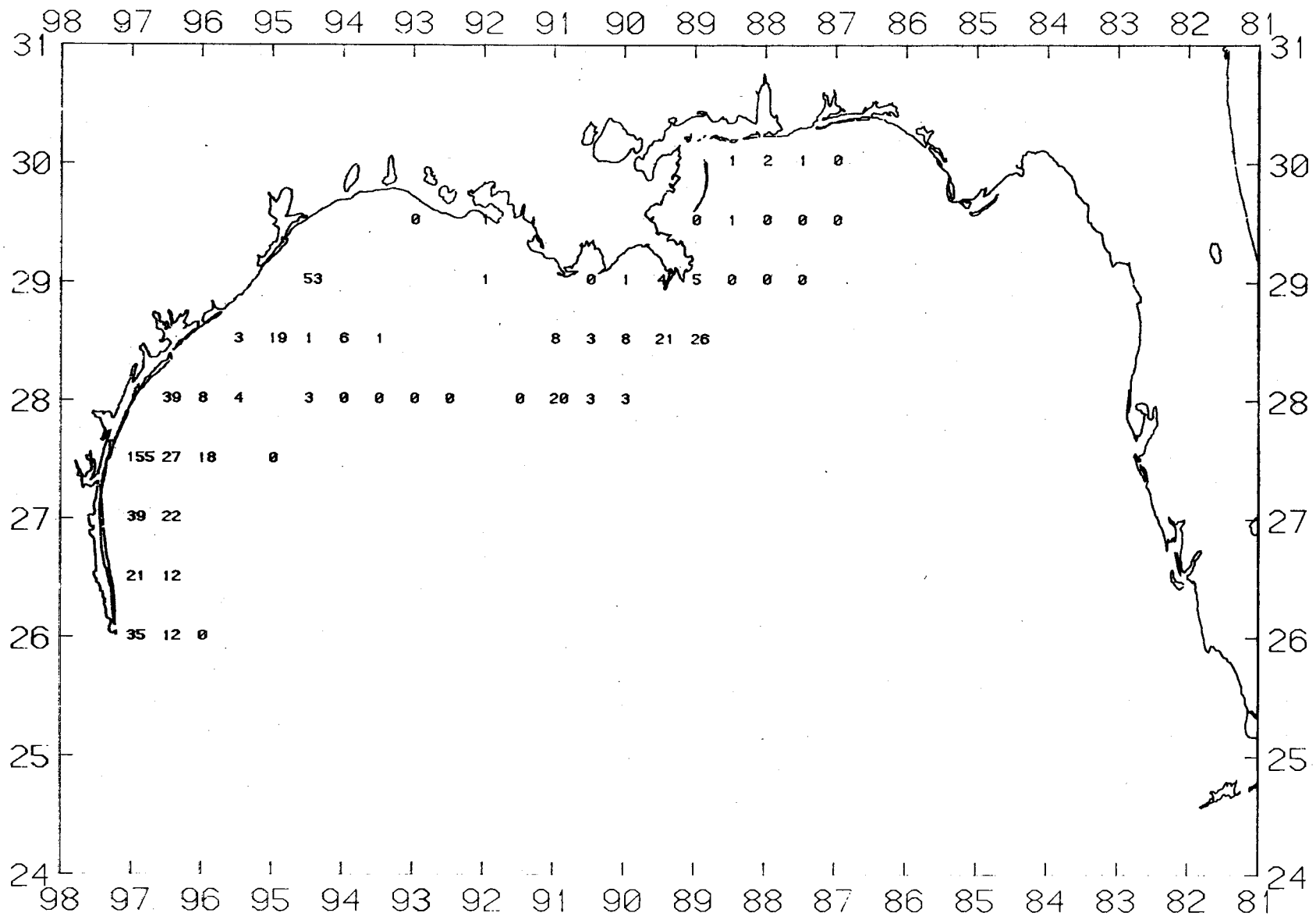

Figure 81. Lesser blue crab, Callinectes similis, lb/hour for June and July 1982.

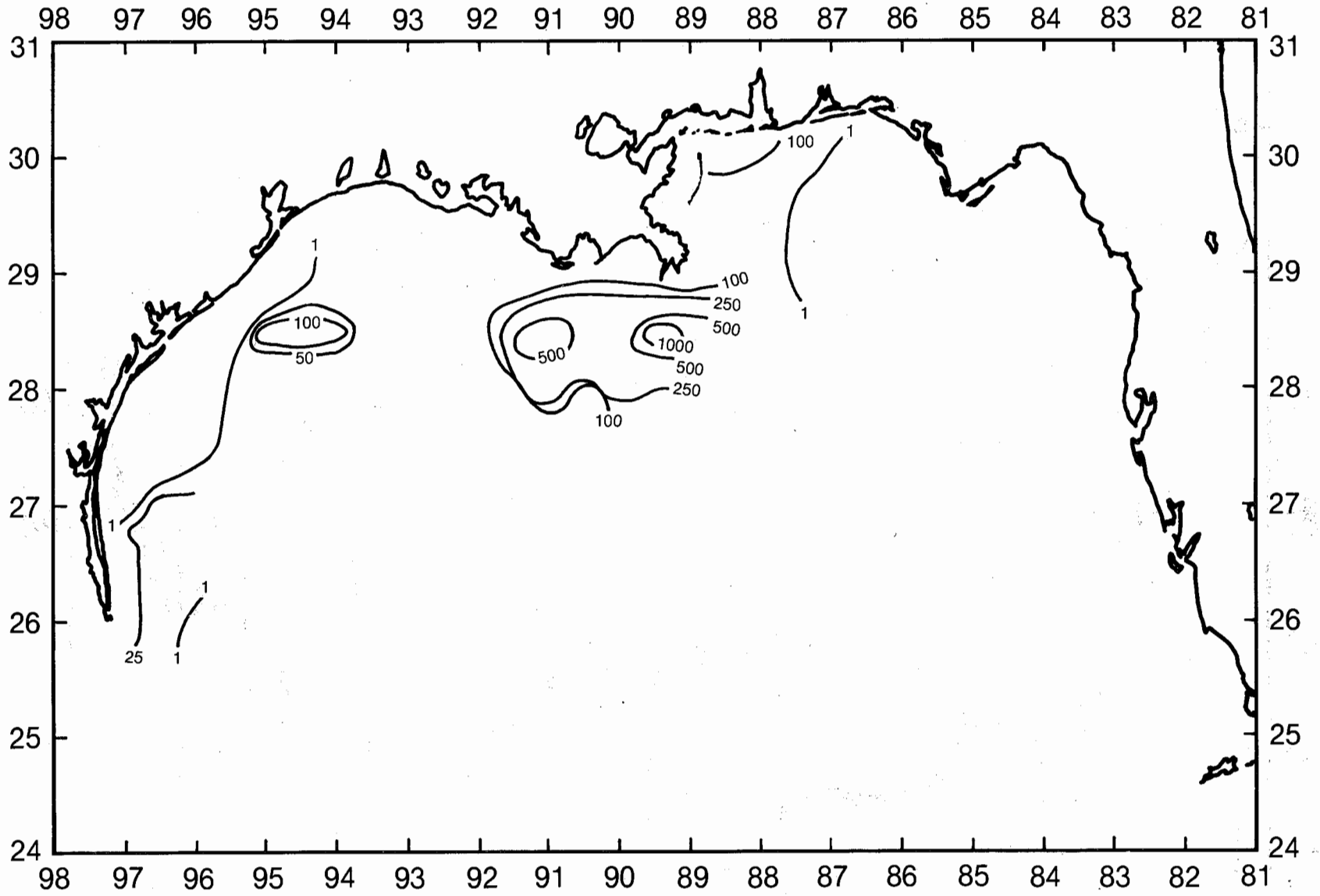

Figure 82. Mantis shrimp, Squilla spp., number/hour for June and July 1982.

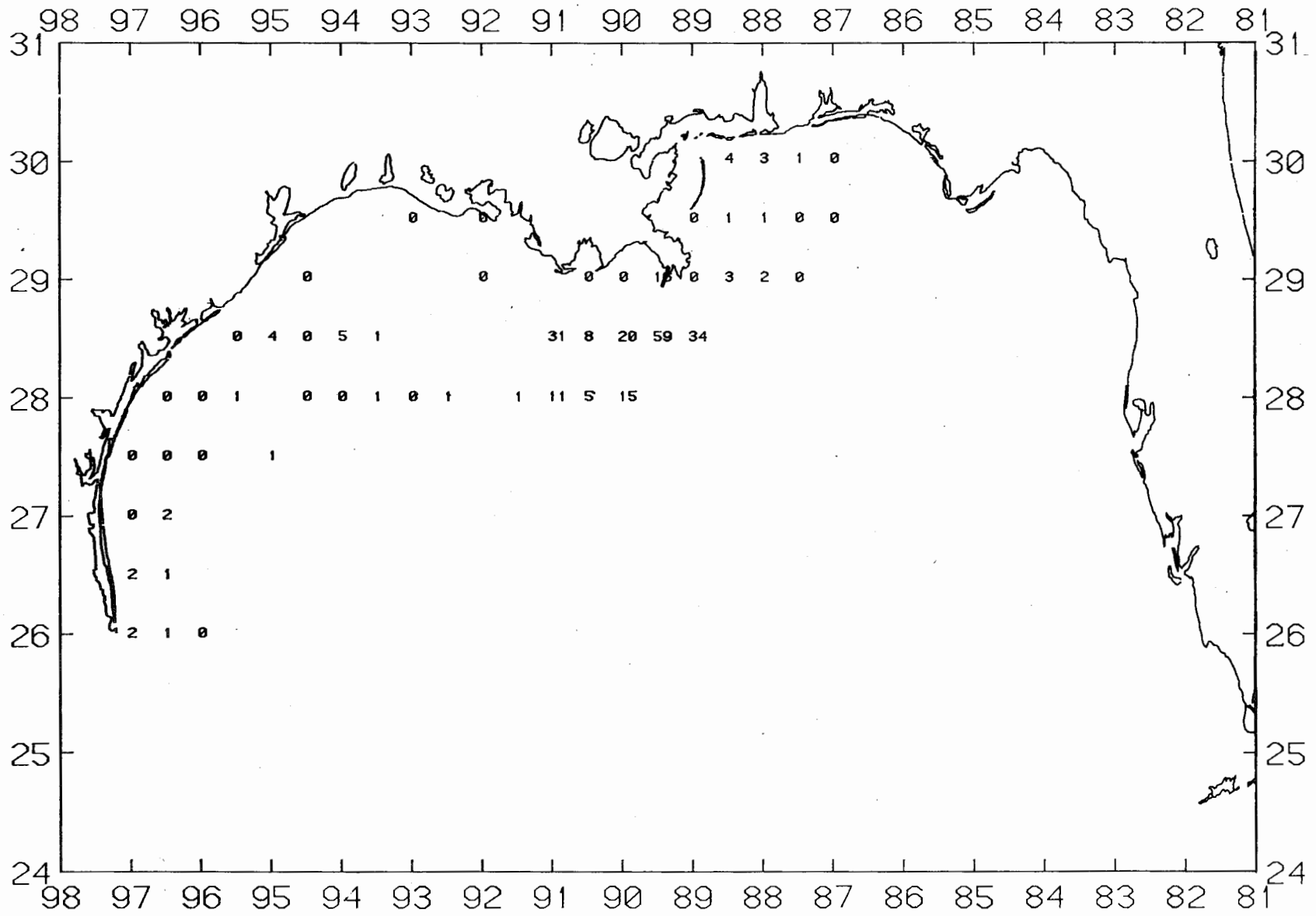

Figure 83. Mantis shrimp, Squilla spp., lb/hour for June and July 1982.

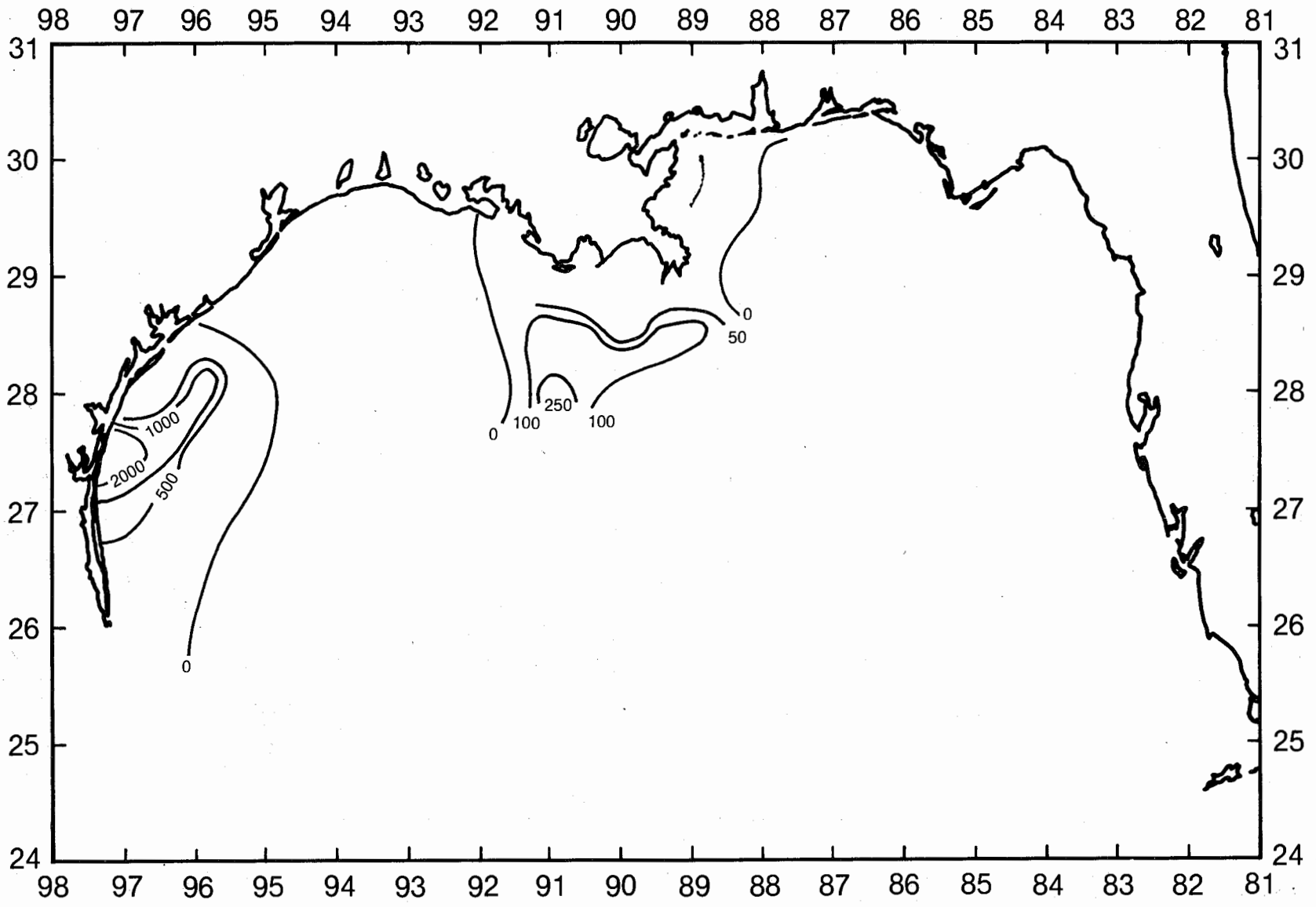

Figure 84. Rock shrimp, Sicyonia dorsalis, number/hour for June and July 1982.

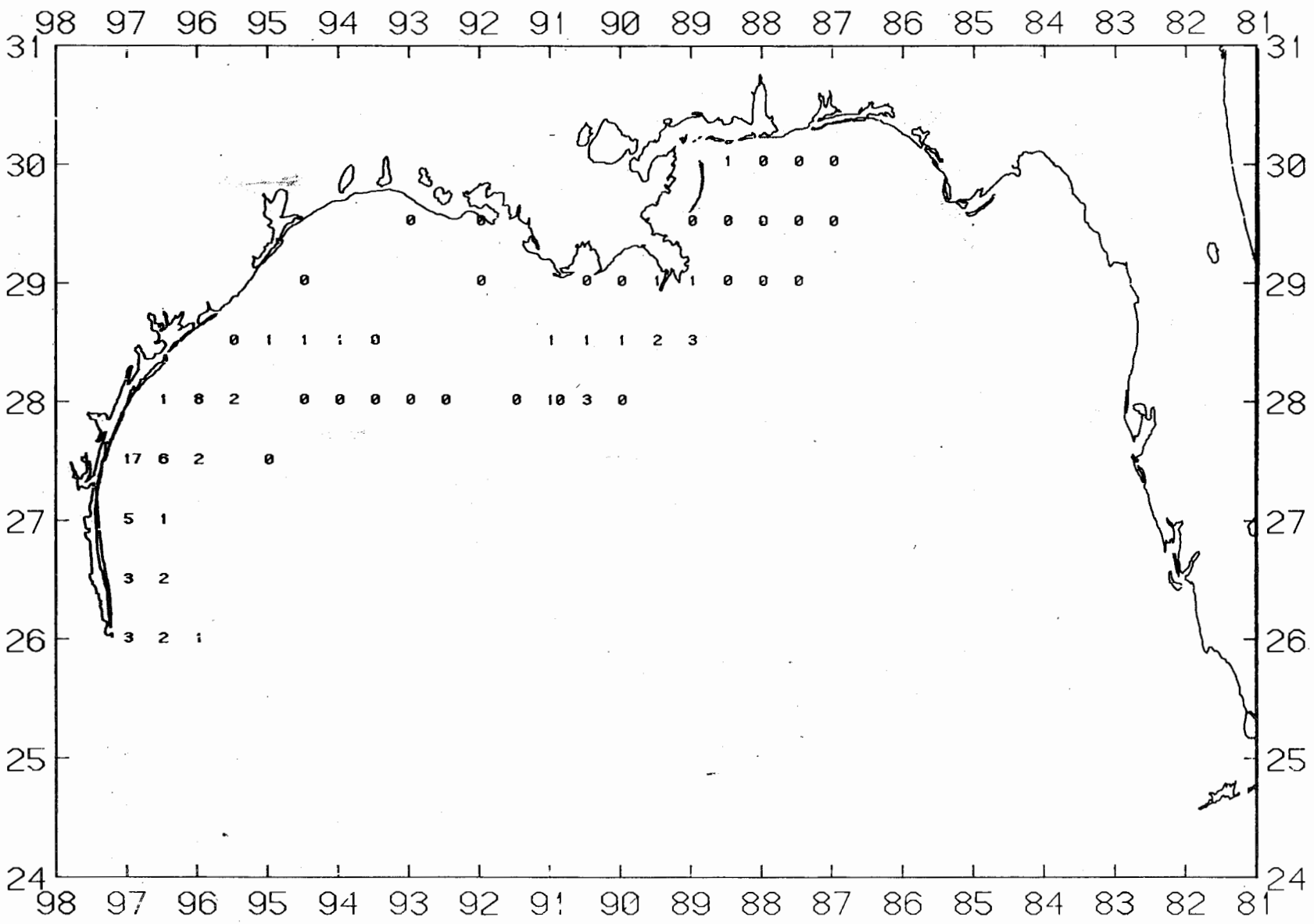

Figure 85. Rock shrimp, Sicyonia dorsalis, lb/hour for June and July 1982.

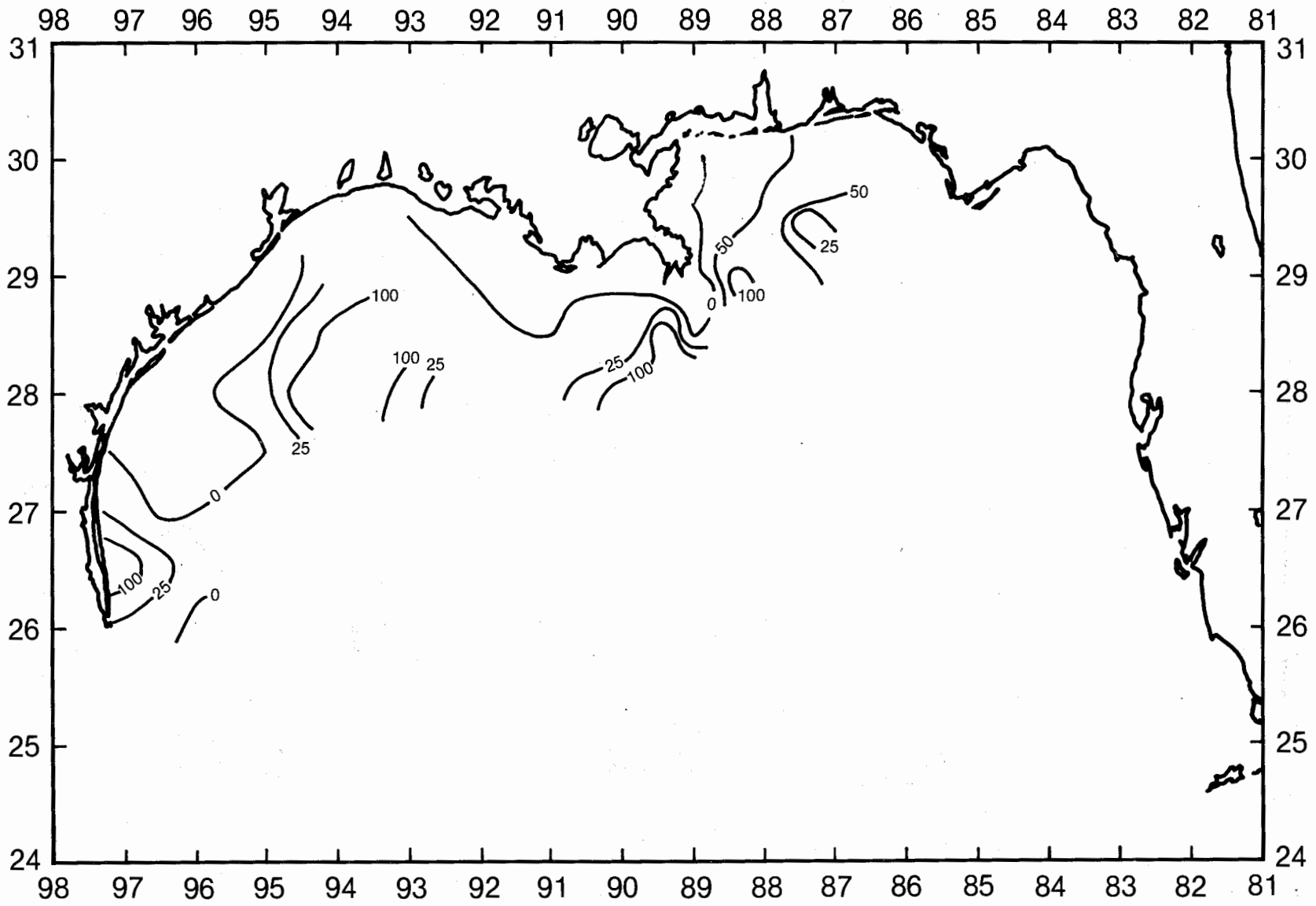

Figure 86. Rock shrimp, Sicyonia brevirostris, number/hour for June and July 1982.

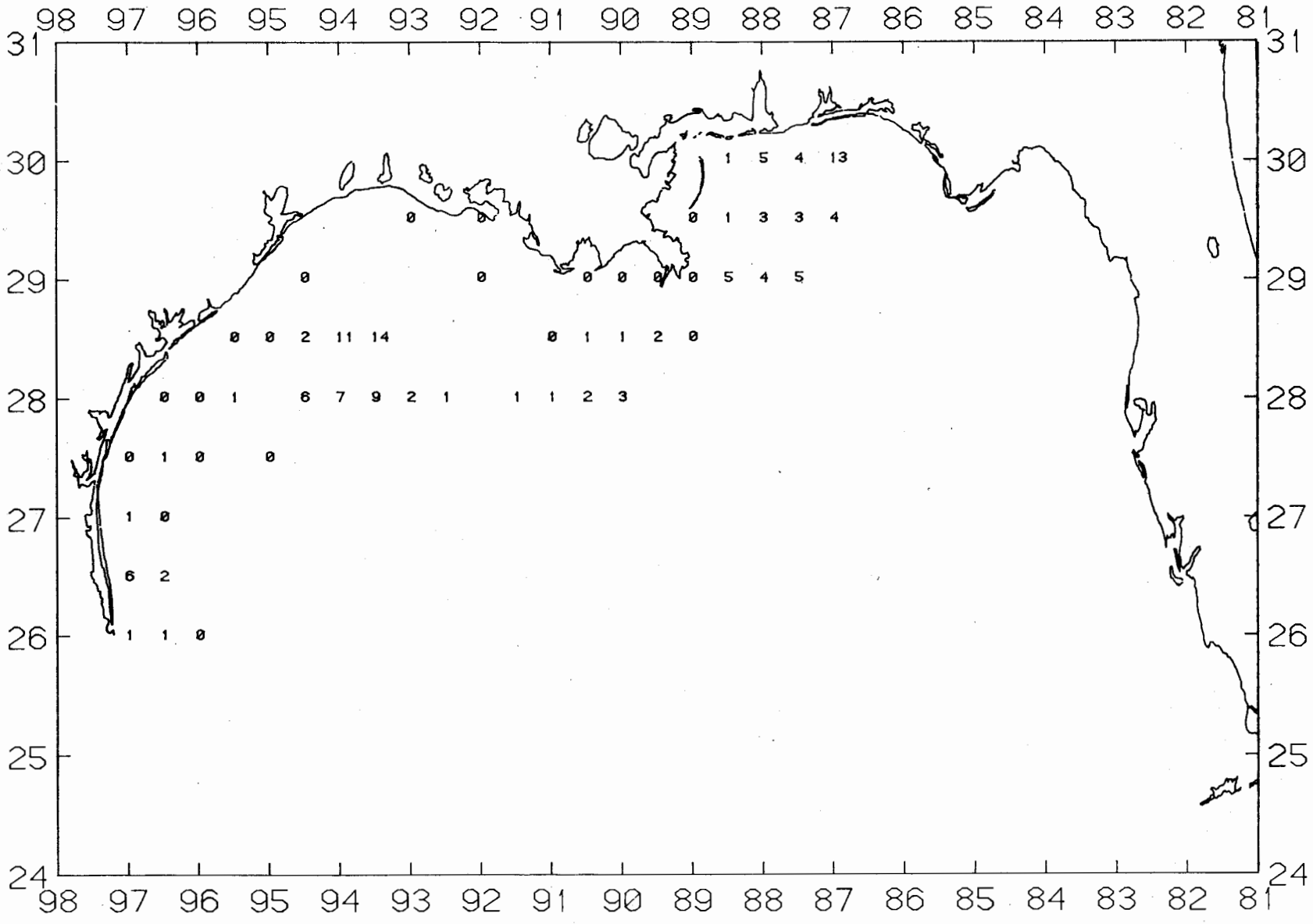

Figure 87. Rock shrimp, Sicyonia brevirostris, lb/hour for June and July 1982.

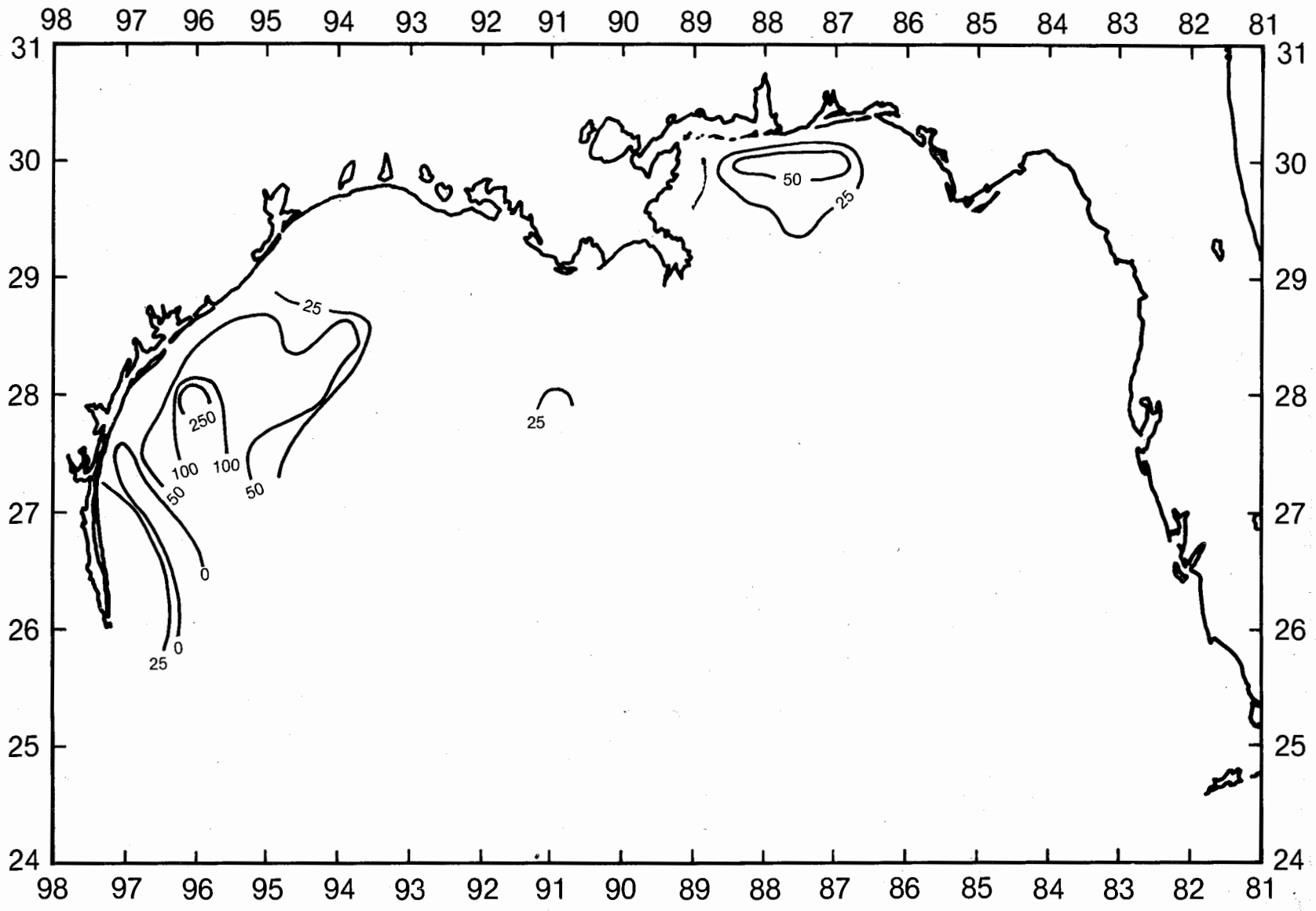

Figure 88. Common squid, Loligo pealei, number/hour for June and July 1982.

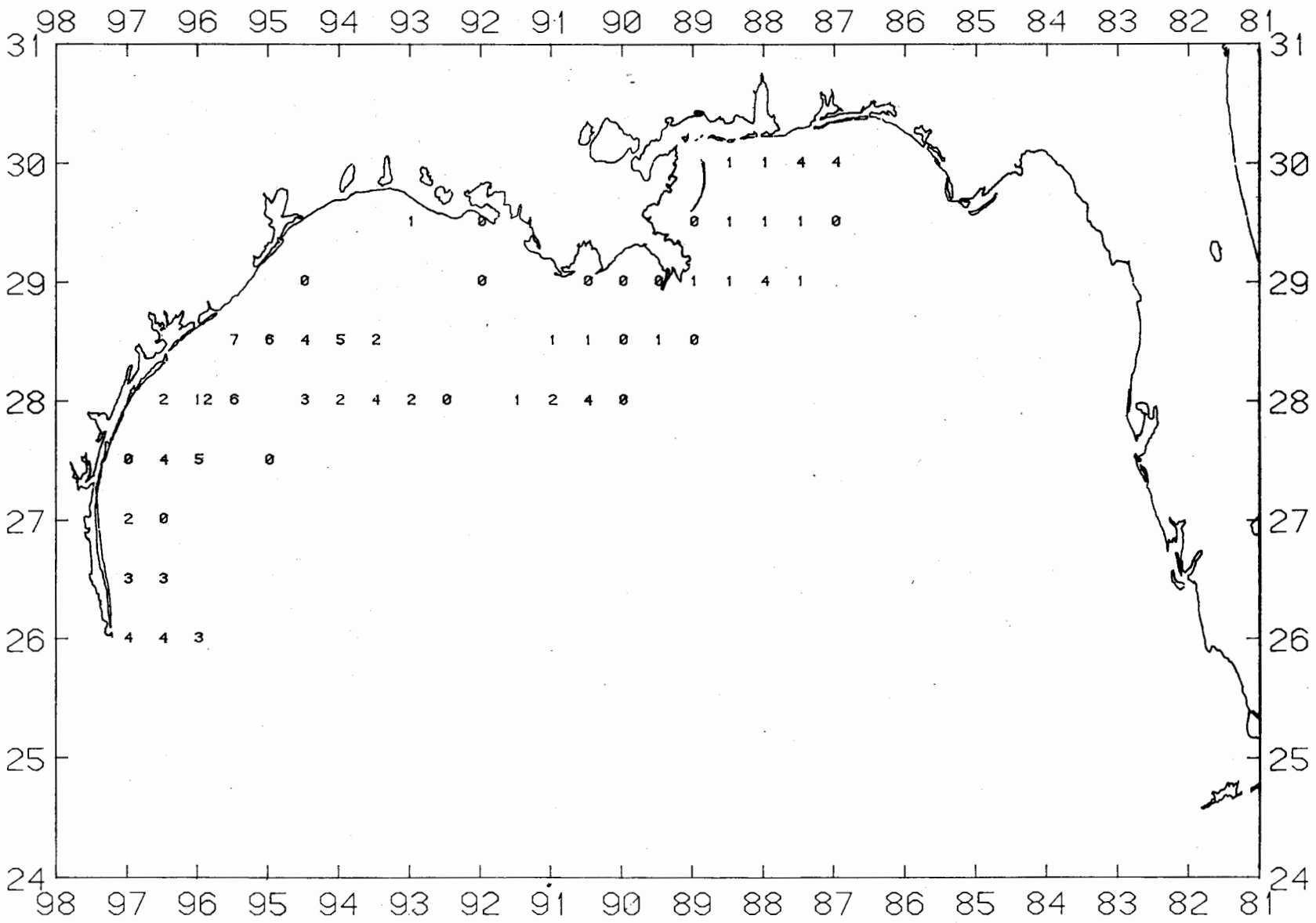

Figure 89. Common squid, Loligo pealei, lb/hour for June and July 1982.

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Appendix 1

DEVELOPMENT OF THE JUNE-JULY TEXAS CLOSURE/STOCK ASSESSMENT SAMPLING PROGRAM FOR BROWN SHRIMP

by

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In 1981, the Southeast Fisheries Center began an offshore sampling program as part of the evaluation of the "Texas Closure". This program was expanded geographically in 1982, in part to develop a fishery-independent data base for assessment purposes. The program is being carried out cooperatively with the states through the SEAMAP subcommittee of the Gulf States Marine Fisheries Commission.

The major scientific objectives of the sampling effort are:

(1) to obtain a synoptic picture of the size and sex composition of that portion of the brown shrimp stock in the Texas FCZ.

(2) to obtain the same size/sex information for the entire brown shrimp stock.

Additional objectives involve obtaining data on the spatial distribution of shrimp, especially mapping areas of high shrimp abundance, and environmental sampling, including investigation of hypoxic conditions. The vessels also serve as platforms for sampling bottomfish distributions, ichthyoplankton distributions, and food habits studies.

Considerable effort was invested in developing a sampling strategy to "get the most" out of the research cruises. The effort involved analyzing existing information that might help guide sampling design. Prior to examining any existing data, however, three "rules" were established:

(1) only a single cruise would be considered (multiple vessels still possible);

(2) the cruise would be as synoptic as possible;

(3) the cruise would take place as close to the end of the closure as possible.

Using two cruises (beginning and end of closure) was considered, but rejected. We believed the growth information already available was adequate, and unlikely to be improved upon by attempting to track size modes by sampling over so wide an area, over so short a time. We recognized that there was no chance of obtaining new mortality information by changes in CPUE, given migration, the area to be covered, and the short time interval of the closure. Scheduling the cruise near the end of closure was done to allow migration to be as complete as possible. Sampling by the state of Texas indicates that wholesale migration to the offshore begins near the beginning of the closure (that is, in fact, the time of the closure is established) and usually peaks shortly thereafter. Modelling all migration as an instantaneous event at the start of closure has been generally accepted as a useful approximation.

The general goal in developing the sampling strategy has been to optimize the precision and accuracy of the size/sex composition information, recognizing that the composition information is expressed as a vector of estimates, not a single statistic, and thus there is no formal, objective way of "maximizing" anything for all categories simultaneously. The procedures followed were to:

(1) identify major sources of variation in size and CPUE, especially predictable or systematic variation in previous research cruise data;

(2) consider patchiness, including guesses about its probable structure;

(3) recognize that the distribution in any given year could depart considerably from past patterns;

(4) be practical.

Considering these factors requires evaluating trade-offs among advantages and disadvantages that cannot be quantified. There are many choices of sampling strategies that would produce useful data; there are probably several choices that would be very efficient. The strategy has evolved to what I believe is the best choice, given the competing concerns.

Existing Information

Extensive sampling of size composition and CPUE for shrimp was conducted by the Gus III from 1961-65. For this evaluation, only May-August samples off Texas were examined. The design was systematic in depth at several transects (repeatedly sampled over time) along the coasts. I do not know how the locations of those transects were established, but they are apparently systematic. Data were available to investigate effects of time of day (as absoulute value of hours from midnight), depth, latitude (as a surrogate for alongshore location), and (calendar) time. Distance from passes was not readily available, but could be calculated from station locations at a future time. Ultimately, we are interested in variation of CPUE by individual size classes, but to examine patterns more quickly, two simpler statistics were examined: total CPUE in numbers and mean size at each station. The primary analytical technique was examination of X-Y plots. Additionally, multiple regression models were fitted to the data. For summary purposes here, the fraction of the "variance explained" (R-squared) of single variable linear regression models (ignoring other effects) are reported in Table 1. The summary observations below generally refer to responses one effect at a time, ignoring other effects, except where noted.

CPUE was highly unpredictable. The major source of variation was the day/night difference - on the average about 10-fold. Depth is the next most important consideration (both in all, and in the night only samples). The

reponse was non-linear, and is depicted schematically in Figure 1. A weak linear trend with calendar date was present in the combined data. In individual years, a more definite response was evident (resembling Figure 1, replacing "depth" with "date"), with a peak that varies in time among years. (Confounding with other effects may be responsible for part of that variability). No continuous gradient in CPUE (i.e. along the entire coast) was evident with alongshore distance. No obvious systematic variations at shorter scales alongshore were noted, although the data were restricted enough that any small-scale systematic variation probably would not be evident.

Variation in mean size was dominated by the effect of depth. The response was clearly curvilinear, although a linear term alone explained 73% of the variation. A weak gradient alongshore (increasing size toward the south was evident. As with CPUE, small-scale alongshore gradients would probably be difficult to detect, and alongshore location in any year was confounded with date and depth. Calendar time alone gave very little response. This is surprising - one might expect to see growth, but the limited time range, the effects of migration, and probable confounding conspire to hide any response. Effects of time of day on size composition appear to be unimportant.

Another set of data was available, taken by Texas Parks and Wildlife (TPW) from 1975 to 1980. These data cover a smaller depth range, and were more restricted alongshore than the Gus III data. For these reasons, and because of time constraints, very little analysis was done with these data. A striking difference in average CPUE was noted between the Gus III and TPW data (TPW data 6x higher) that seems larger than expected due to gear or operation differences and year to year variation. I believe that the TPW transects are aligned with the passes, indicating that predictable variation may exist due to alongshore distance from the passes, at least immediately after migration.

Patchiness is a consideration in establishing sampling strategy, but I presently have no data describing small-scale spatial density structure for shrimp. I will make two assumptions based on experience with patchiness in other organisms, and on indirect evidence:

(1) variance in abundance can be expected to increase steadily with increasing separation among samples;

(2) any spatial structure, on the average, will have a long axis alongshore and a narrow axis in depth.

Distributions following the first assumption have been observed repeatedly in studies of spatial distribution of other organisms, and even non-living particles in the sea. The second assumption is based on the indirect evidence provided by the behavior of the commercial fishery: throughout the Gulf most trawling is conducted alongshore. Although there are operational advantages

to trawling alongshore, I suspect some of the reason that alongshore trawling developed was that once shrimp were located, one was more likely to remain "in" shrimp by trawling alongshore.

In summary, past data on larger-scale shrimp distributions, and indirect inferences about small-scale distributions portray a brown shrimp population "organized" along a depth gradient, with a continuous variation in size and CPUE. Based on this information, a sampling strategy was developed prior to the 1981 sampling. I will outline the general features as they were developed prior to the 1981 sampling, then summarize the problems encountered, and the changes made each year.

Sampling Strategy

Only nighttime sampling would be considered. Because depth so dominates the structure of the population, the best procedure to characterize the stock as a unit is sampling that "integrates" over depth. However, distribution with depth information was also desired, so sampling was stratified by depth. Under this structure, the continuous gradient is "modelled" as a series of discrete steps, homogeneous within each step. However, the strongest systematic source of variation is still with depth within each stratum, so sampling was designed to integrate over depth, by towing completely across each stratum. This strategy is also the most compatible with the assumptions made about patchiness.

Widths of the strata were chosen arbitrarily to be: 1 fathom each from 5 to 30 fm, then 30-35 fm, and 35-50 fm (each as 1 stratum). (Vessel operations were limited to depths greater than 5 fathoms; the 50 fm outer bound is arbitrary.) The choices were made to attain a subjective "compromise" among tow times across strata, expected catch, and level of spatial resolution desired.

Because no systematic alongshore behavior was identified, 1981 sampling was completely random within each depth stratum along the Texas coast. (This strategy was changed with expansion of sampling for 1982 and 1983.) Number of samples were allocated to each stratum based on variation in total CPUE on the Gus III data, and spatial area. (This allocation strategy was really not a good one, and was changed for 1982 and 1983.) Station selection was accomplished using the table of random numbers in the appendices to Snedecor and Cochran (1977) to establish a random fraction (between 0 and 1) of the total distance (alongshore along depth contours). Location of each station was then establised by measuring this distance on a chart with a map wheel. By convention, a station is defined by the intersection of two lines of position - the depth contour of the inner boundary of each stratum, and either the latitude or the longitude (listed to 10 second resolution) as appropriate to the orientation of the depth contours. Each trawl then runs from that point in a direction roughly perpendicular to the depth contours until the outer depth boundary of the stratum is reached.

The bottom off Texas is home to numerous oil rigs, "hangs", and obstructions that the randomization procedure cannot account for. To minimize gear loss and down time, and to increase safety in operations, the randomly selected station locations were compared with known obstructions. If a trawling track expected for a station was found to be too close to an obstruction, the location of that station was arbitrarily moved alongshore the shortest distance necessary to clear the obstruction. Thanks to the many hours of work by D. Emiliani and others at the Galveston Laboratory in this effort, "hang" difficulties have been minimized, with only this minor but necessary compromise to complete randomization.

Three weeks was accepted as the time interval over which sampling could be considered "synoptic" for the purposes intended. This was a purely subjective judgement guided by the response of CPUE to calandar time in the Gus III data. This decision established the sampling density: we believed that approximately 100 stations could be taken off Texas in that period. This density was continued in 1982 and 1983.

Additonal recommendations were that a single, standardized gear be employed, and that a single vessel be used for the 1981 Texas Closure sampling. Because concern was expressed about net overloading, (and this reduced catchability) with continuous trawling across the wider strata, the trawl was to be raised and emptied for data collection, and trawling resumed after some maximum time interval appropriate to the area being sampled.

Results for 1981 and 1982

Sampling in 1981 was generally successful. The original plan called for complete counting and measuring of shrimp, but the astounding catch rates in 1981 necessitated developing subsampling procedures aboard ship. Some problems occurred in implementing cross-stratum (variable time) trawling, in part due to resolution problems with the fathometer. The single sample allocated to the deepest (35-50 fm) strata was not taken as planned, so deep water data taken for other purposes were substituted. Analysts involved in the spatial mapping aspects of the program requested that future sampling consider alongshore stratification to obtain more "uniform" coverage.

For 1982, sampling was extended geographically to approach coverage of the entire brown shrimp stock. Both because of the analytical request for alongshore stratification, and the belief that over the expanded range some improvement in precision would be realized, alongshore stratification was added, using the Gulf Coast Shrimp Data statistical zones as arbitrary but convenient boundaries - two zones per stratum. Depth strata were realigned slightly: 1 fm each 5 to 25 fm, then 25-27.5, 27.5-30, 30-35, 35-40, 40-45, and 45-50. Two samples were allocated to each stratum, allowing the cross-stratum requirement to "self-allocate" by spatial area. Randomization was simplified and computerized (SEFC's Honeywell), by picking (to 10 seconds) a random latitude or longitude line of position for each station. This simplified procedure produced some problems in statistical zone 11, where

the contours curve rapidly: this was corrected for 1983. Because the expanded area could not be sampled synoptically by a single vessel, the single vessel requirement was dropped. At the request of Mississippi, sampling east of the River was conducted in early June (to meet different objectives), so the synoptic part of the sampling was limited to west of the River. Texas joined in the synoptic sampling.

Sampling in 1982 was again successful. The cross-stratum, variable-time trawling was implemented more successfully. Problems arose in sampling near the mouth of the Mississippi with both the extremely narrow depth strata and the heavy traffic. There were also problems in deploying standard gear (different mesh sizes, and absence of a tickler chain for some samples), and using standard trawling speeds. Requests were made for even further alongshore stratification and increased sampling near statistical area 19 to enhance uniformity of coverage for mapping.

Modifications for 1983

Plans for 1983 call for the same depth stratification, and futher stratification alongshore into single statistical areas, with a few exceptions to accommodate safety and to improve the roughly equal allocation of samples per linear distance alongshore. These exceptions are:

Area 13: no sampling east of 89°30' depth stratification modification: 5-7.5, 7.5-10, . . ., 5-30

Area 19: 2 samples per stratum inside 20 fm

Area 20: combine with 19 for strata outside 25 fm

Locations were selected randomly alongshore within each stratum using the SEFC's Burroughs computer. The requirement imposing a maximum tow time before picking up and restarting may be dropped, except where specific problems are anticipated. Capabilities for sampling 2-5 fm, at least along Texas, are being investigated, but sufficient funds may not be available.

Discussion

The strategy previously implemented and planned for this year evolved from the trade-offs among the multiple uses of the data, the expected distribution patterns, uncertainty about what can be expected, and practicality. As such, no single, objective "ideal" can be derived. I believe the strategy developed is the best compromise presently available, compatible with the need to characterize the stock as a unit, both for the annual Texas closure review, and for development of a long term, fishery independent data base for stock assessment purposes.

Most of the concerns voiced to date about the program fall into two areas:

(1) failure to incorporate "distances from pass" information in the design

(2) practical problems in implementing cross-stratum trawling

Distance from the passes may very well be worth incorporating into future designs, but currently I have no data that will be of much assistance in determining whether it would be useful, and how best to incorporate it. Distance may be partitioned into alongshore and offshore components. Particularly with the alongshore stratification presently used, distance and depth are highly correlated, so in that sense distance already is incorporated. In the 1981 sampling without alongshore stratification, or an analyses summarizing distribution by depth, ignoring alongshore variation, depth is probably a better choice than distance: if one seeks say, 31-40 count brown shrimp, commercial statistics indicate these shrimp are found near 15 fathoms throughout the NW gulf regardless of how far offshore the 15 fathom contour is (some deepening is noted in the very narrow zones 13 and 21). Alongshore distance is less well understood, and the available data do not help greatly. With the cruises scheduled several weeks after the peak migration, the systematic variability in abundance and size alongshore may have been reduced so that there is little left to incorporate. This would appear to be a fertile topic for separate research.

Comments on the practical difficulties involve the trade-offs made between theoretical advantages of cross-stratum trawling and operational concerns, and can be summarized by three items:

(1) is the theoretical advantage really that great?

(2) perpendicular trawling, and finding the ends of the strata are difficult in the field.

(3) do the variable trawling times adversely affect performance?

Here I will summarize the questions raised, and respond, indicating why the choices made are believed to be sound.

The theoretical advantage question revolves around the nature of "residual" variability inside a stratum. Because the strata now used average about 60 miles by 1 mile, the question has arisen, "is not the within stratum alongshore variability larger than the variability with depth?" Perhaps, (evidence either way lacking), but the variability with depth is still (on the average) predictable (systematic); the alongshore variability remains unpredictable. The best choice is still to integrate over the systematic variation, and the 1981 and 1982 sampling show it is possible to do so. This choice is also the best, given the assumptions about patchiness.

Problems with determining depth, thus establishing when a station is finished, are recognized. Determination of any line of position at sea is done with error, so uncertainty about depth is fundamentally no different than uncertainty about any other location estimation. However, because of the gentle depth gradient, vertical movement of the vessel, and limited resolution of the equipment, depth is more "uncertain" than, say, a loran location. This uncertainty has been taken into account, and the decision made that the advantages outweighed the concern about uncertainty. Basically, it is as easy to watch a digital fathometer as it is a clock, and as long as actual trawling time is accurately reported, a conscientious decision about when the outer depth boundary is reached will be an acceptable decision. Dropping the requirement for 1982 to raise the nets after a fixed maximum interval should help alleviate pressure to call a station complete when it is in fact a bit short.

Concerns about trawl performance and the effect of variable trawl times are important, and procedures are continually evolving to try to minimize potential problems. Variable trawl times contribute another source of variation to the estimates of composition, but the advantages of "integration" are believed to greatly outweigh this deleterious effect. Real concerns center on possible faulty performance of the gear due to either "too-short" trawls or "too-long" trawls were a problem in statistical area 13, and should now be minimized with the change in stratification there. "Too-long" trawls were eliminated by establishing a maximum tow time interval, and raising and redeploying if the "width" of a stratum exceeded that interval. This procedure may have caused more problems than it solved: both from unnecessary time on station, and "finishing" stations with either "too-short" trawls, or clipping them short. For 1983, the proposed plan will make raising the trawls mid-station discretionary: if net loading is anticipated to be sufficient to hinder trawl operations, or if the greater depth changes in the deeper strata necessitate redeployment.

Some concern has been raised about the number of shrimp expected in the individual trawls. Currently, strata "widths" average about 20 minutes trawling time, and larger samples at individual stations might be attained by either changing the strata to wider intervals, or towing obliquely between the depth limits. Both can be considered for the future. The expected number will vary considerably from year to year due to real variations in abundance. Numbers caught were unnecessarily large in 1981, and a bit light in some areas in 1982. On the average, we may be "about right."

Potential future improvements might be made in several areas. The most serious limitation, at least to objective 2, is that the entire range of the stock is not yet covered. Improving stratification, improving subsampling, and automation at station selection to include "hang" adjustments may be productive. Questions of appropriate station density may also be considered.

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Table 1. Percent of variation explained by the independent variable in a simple linear model. (Note that percent explained will depend on how the samples are arrayed along the range of variation of the independent variable; and that arrangement is not necessarily similar for the four variables.)

Independent Variable	Average Length	Log CPUE in Numbers
Depth	73.0	1.4
Time of Day	0.9	5.7
Date	0.001	1.0
Latitude	7.0	0.2

Figure 1. Schematic picture of relationship between log CPUE and depth.