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Review of the 1985 Texas Closure for the Shrimp Fishery Off Texas and Louisiana

By

**Edward F. Klima, Peter F. Sheridan, K. Neal Baxter,
and Frank J. Patella**

Note: Shrimp catch and effort data in this report extend through August 1985 only.

U.S. Department of Commerce
Malcolm Baldrige, Secretary

National Oceanic and Atmospheric Administration
Anthony J. Calio, Administrator

National Marine Fisheries Service
William G. Gordon, Assistant Administrator for Fisheries

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1985 TEXAS CLOSURE REPORT

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INTRODUCTION

The implementation of the Gulf of Mexico shrimp fishery management plan (FMP) in May 1981 permitted, for the first time, closure of the brown shrimp fishery from the coastline to 200 miles off the Texas coast and was in effect from May 22 to July 15, 1981. The Gulf of Mexico Fishery Management Council (GMFMC) agreed to continue the seasonal closure of the brown shrimp fishery off the Texas coast in 1982, 1983, 1984 and again in 1985. The 1985 Texas closure was implemented from May 10 to July 8.

The Texas Parks and Wildlife Department sets the closing and opening dates for the fishery by assessing abundance, size, and growth rate of shrimp in Texas waters during April and June (Bryan, 1985). Prior to the FMP, Texas law closed the territorial sea from the shoreline out 9 nautical miles for 45 days during mid-May to mid-July 1960-1980 (60 days in 1976). Texas's objective was to insure that a substantial proportion (>50%) of shrimp in Gulf waters had reached 65 tails/lb or 112 mm total length by season's opening. The 1981-1985 closures have all exceeded the historical 45-day closure by 5-10 days. The objectives of the present Texas closure management measure are to increase the yield of shrimp and to eliminate waste caused by discarding undersized shrimp in the fishery conservation zone (FCZ). According to the FMP, shrimp yield would be increased by protecting shrimp from fishing during the period when they are predominantly small and are growing rapidly. Discards would be reduced by eliminating the count restriction in order to allow all shrimp caught to be landed.

The purpose of this report is to provide information to determine how well the objectives of the Texas closure regulations were achieved in 1984 and 1985. This report reviews and analyzes the characteristics of the Texas and Louisiana fisheries west of the Mississippi River and describes the catch, fishing effort, relative abundance and recruitment to the offshore fishery from June 1984 to August 1985.

MATERIALS AND METHODS

Fisheries Statistics

A collection of detailed catch statistics describing the U.S. Gulf of Mexico shrimp fishery (since 1956) is available and the procedures used to collect them are described by Klima (1980). The monthly statistics compiled by the Southeast Fisheries Center (SEFC), Economics and Statistics Office (ESO), consist of catch, effort (in 24 hrs of fishing time expressed as days fished, and in number of trips), and size composition of the catch data by statistical subareas (Fig. 1). These data were used to analyze the effects of the Texas closure. Only commercial catch statistics from areas west of the Mississippi River (statistical subareas 13-21) were examined.

Locations and amount of fishing effort expended in 24-hr fishing days were obtained by interviewing fishing vessel captains at the termination of trips. All catch data were recorded as pounds of shrimp (heads-off) by species, size category, statistical subarea, depth zone, and month. Catch and effort data from 1980 to the present are on file at the SEFC/ESO office where they are available for inspection. These data were used to compute catch per unit effort (CPUE) as pounds per 24 hours of fishing and as pounds per trip. The number of shrimp caught was estimated by multiplying the pounds caught in each size category by the mid-point of the size category, and in the case of <15 and >116 categories, by 15 and 116, respectively. Starting in May 1982, ESO recorded pounds caught in size categories larger than 68 count as follows: 68-80, 81-100, 101-115 and 116 count or greater. Orman Farley¹ and Tom Dawley² provided specific information concerning

¹Dept. of Commerce, NOAA, NMFS, SEFC, Galveston Laboratory, 4700 Avenue U, Galveston, Texas 77550

²Dept. of Commerce, NOAA, NMFS, SEFC, Room 1000, 600 South St., New Orleans, Louisiana 70130

the Texas and Louisiana inshore and offshore shrimp fisheries relative to fleet activities, changes in the fleet, number of trips, discards and specifics of catch and effort for the fishing area during 1984 and 1985.

Information on the size of shrimp at sea during and immediately preceding the Texas Closure was obtained from routine SEAMAP sampling by the NOAA ship OREGON II, from sampling by the University of Texas research vessel LONGHORN, which was under charter to NMFS for shrimp tagging studies, and from State of Texas vessels operating in the territorial sea. Sampling procedures are described in SEAMAP documentation. For the first time, two efforts were made to obtain an estimate of shrimp biomass and value lost by discarding along the Texas coast. The first was NMFS port agent interviews of vessels returning to port and NMFS log-books kept by vessel captains. Captains were asked whether or not discarding took place during each trip and the estimated poundage of shrimp discarded. In addition, two NMFS observers were carried by commercial vessels immediately after the end of the Texas closure, and collected size information and amounts of shrimp discarded. Information was also collected on the size of shrimp emigrating from Galveston Bay, Aransas Pass, and Brazos-Santiago Pass by sampling the bait shrimp fisheries in each area and by butterfly net sampling at the Galveston Bay entrance. Size information was used to determine size of emigrating shrimp during the closure and immediately upon the opening, using recently developed growth equations for brown shrimp (Scott Nichols³).

Statistical Treatment

Catch data frequently follow skewed distributions, show heteroscedasticity and have non-additive components. Transformations applied to the original data are often able to alleviate

³Dept. of Commerce, NOAA, NMFS, SEFC, 75 Virginia Beach Dr., Miami, Florida 33149.

these problems and permit valid statistical analyses of the data employing t-tests and 2-way analysis of variance (ANOVA) (Sokal and Rohlf, 1969). Taylor's (1961) test analyzing relationships between means and variances was applied to the brown shrimp fishing data. It showed that catch data should be transformed to their logarithms, fishing effort data did not need to be transformed, and CPUE data should be transformed to their square roots. The analyses of these transformed data provided statistical support to what the untransformed data showed. The summaries are presented here with untransformed data.

The commercial catch data were grouped into biological years May-April since brown shrimp are recruited to the fishery in May of each year. The first and last biological years identified are May 1960-April 1961 and May 1984-April 1985.

Mean monthly catch, mean monthly fishing effort and mean monthly CPUEs for the 1960-1979⁴ period were compared with the May 1984-April 1985 monthly data via 2-way ANOVA using paired observations. Additional comparisons between the May-August monthly means of the fisheries data for statistical subareas 13-17 and 18-21 for the historical time series (1960-1979) and the five latest years prior to the closures (1975-1979⁴) were compared with the 1985 monthly data from May-August, using paired observations in a 2-way ANOVA and in t-tests. The shrimp size distributions for each month were compared with the historical data set and 1984 and 1985 monthly size distributions by graphical analyses. Unless otherwise stated, tests of significance were performed at the 95% level ($P = 0.05$).

⁴Does not include 1980 data because this data file has not been reconciled at this time.

RESULTS

1984 TEXAS CLOSURE

The 1984 offshore brown shrimp fishery from the mouth of the Mississippi River to the U.S./Mexican border yielded 42.7 million pounds (i.e., May 1984-April 1985). Louisiana produced 18.4 million pounds and Texas produced 24.3 million pounds, nearly 11% below the historical average production of 27.3 million pounds for Texas. Total brown shrimp production in this area amounted to 64.0 million pounds, of which 14.7 and 7.1 million pounds were harvested from the inshore waters of Louisiana and Texas, respectively. The combined yield since 1976 averaged 67.1 million pounds.

Klima et al. (1985) reported on the 1984 closure for the months of July and August and showed that the catch and CPUE off the Texas coast (statistical subareas 18-21) were greater than the catch and CPUE off Louisiana (statistical areas 13-17) during the same period, but were not significantly different from the historical catch, effort and CPUE for Texas. The September-December 1984 landings off Texas were 6.8 million pounds with 14,300 days of effort, whereas the landings off Louisiana (subareas 13-17) were 2.7 million pounds and only 4,800 days of fishing effort (Figs. 2 and 3). The CPUE's off Texas decreased from a high of 565 lbs per day in September to a low of 357 lbs per day in December. Off Louisiana the CPUE's were appreciably higher with a low of 458 lbs per day in September to a high of near 700 lbs per day for the October through December 1984. Historically the January-April fishery contributes less than 10% to the annual production, and the January-April 1985 fishery was no exception, as only 1.9 and 1.3 million pounds of brown shrimp were produced off Louisiana and Texas, respectively. Fishing effort and CPUE were low for each state during January-April 1985 (Table 1). The monthly landings, effort and CPUE from September 1984 thru April 1985 for Texas and

Louisiana offshore waters were compared in 2-way ANOVA's. The landings and fishing effort in Texas and Louisiana offshore waters during this period were not significantly different. CPUE was significantly lower off Texas than off Louisiana for this period (Figs. 2 and 3; Table 2).

Catch, fishing effort and CPUE for each month from July 1984 thru April 1985 were compared with the respective historical data (1960-1979) for the same months for the Texas coast (statistical subareas 18-21). Results of t-tests revealed no significant differences between recent and historical catches and effort. CPUE was only different from the historical data in April (Fig. 4; Table 3). Although there are large differences between some recent months' catches and their respective historical means, the large year-to-year differences in catches for these months make detection of statistically significant differences unlikely. July is a perfect example of this.

We also examined the differences in the catch, fishing effort and CPUE from July 1984 to April 1985 with the means for the same months from 1975 through 1979 off Texas. This comparison was made because there have been some changes in the fishing patterns since 1979 compared to the historical 20-year data set. Results of t-tests in the catch, fishing effort and CPUE showed no significant differences with only two exceptions (Table 4). The effort in April 1985 (879 days) was significantly below the 1975-79 mean (1,739 days) and the CPUE in April 1985 (465 lbs/day) was significantly greater than the 1975-79 mean (234 lbs/day). We have noted in previous reports (Klima et al., 1985) that fishing effort has decreased slightly from January to April in the last few years, and 1984 followed that pattern.

VESSEL MOBILITY/ACTIVITY

Commercial shrimp statistics including inshore and offshore production are recorded with a given state and can be traced to the location of capture. We have utilized these data to depict the percent of each state's landings and its location of capture from June through August 1985 (Table 5a and Table 5b.).

Shrimp landings of 21.9 million pounds in the State of Texas during the peak summer production period, June through August, were caught off Louisiana and Texas. In June almost 40% of the 3.4 million pounds landed were caught off Louisiana, whereas in July and August the majority of the shrimp were caught off Texas (Table 5a). Louisiana landings of 24.2 million pounds on the other hand were caught off Louisiana from June through August. During the latter part of July 21% of the 3.3 million pounds landed were caught off Texas.

Mississippi landed 5.4 million pounds from June through August 1985. The majority of the shrimp were caught off Louisiana. Over 5.2 million pounds of shrimp were landed in Alabama from June through August. The Alabama fleet appears to be mobile as shrimp were caught off all states except Florida. Most of Florida landings were caught off Florida with the exception of about 38 thousand pounds caught off Texas and landed in Florida in late July.

Commercial shrimp statistics, excluding inshore production values, are recorded by state in Table 5b. During the summer months (June-August) almost 17.1 million pounds of shrimp were landed in Texas ports. Of the 1.5 million pounds landed in June, 90% were caught off Louisiana. Through July and August most of the shrimp poundage landed in Texas was caught off the Texas coast. Most of the offshore shrimp landed in Louisiana ports during the June-August period were caught off Louisiana, during the last 2 weeks of July, however, when about 25% of the landed shrimp were

caught off Texas.

Mississippi landed only 0.6 million pounds during the summer, with about 85% of it being caught in its own offshore waters. Alabama fared slightly better with 2.7 million pounds of offshore shrimp landed during the same period. Close to 100% of the shrimp landed in Alabama during June and early July were caught off that state. Fleet mobility increased in late July, with 43% of the landed shrimp being caught off Texas and 15% being caught off Louisiana. During August, fleet mobility decreased again and almost 70% of the shrimp landed were caught off Alabama.

Almost 90% of the shrimp landed in Florida were taken from waters off that state. Shrimp caught off Mississippi and Alabama accounted for the other 10% during June, and shrimp from waters off Texas contributed to the catch in late July and August.

Home Port

We have further been able to identify home port vessels from the states of Louisiana and Texas and have made a determination of the percent and pounds landed from June 1 through August 31, 1985. Generally, from June 1 to 30, shrimp landed in Louisiana were caught by Louisiana home port vessels. Over 78% of the 13.2 million pounds landed in Louisiana were caught off Louisiana by Louisiana home port vessels and 15% by unknown groups (Table 6a). Only 2% of this catch were made by Texas home port vessels. During the same period, over 3.4 million pounds were landed in Texas. Of that, over 62% were caught by Texas home port vessels and less than 2% were caught by Louisiana vessels. The unknown category is a conglomerate of information from consolidated schedules and, as a result, most probably comprises catches from boats fishing inshore waters and home ports boats from their respective states. Therefore, about 92% of Texas landings probably were caught by Texas vessels or boats. During the July 1 to July 15 period, 2.7 million pounds of shrimp were landed in Louisiana,

of which 68% were from home port Louisiana vessels and 21% were unknown, resulting in 89% from Louisiana vessels or boats and only 3% from Texas vessels. The other categories are state vessels not specifically identified; however, they comprise only 5% of the landings in Louisiana. For the July 1 to July 15 period, only 2.7 million pounds of shrimp were landed in Texas. Of these, over 59% were made by Texas vessels and only 2% by Louisiana home port vessels.

For the July 16 through 31 period, Louisiana landed 3.3 million pounds, of which 57% were from Louisiana vessels and 29% from unknown vessels, which we believed to be inshore Louisiana boats, thus comprising a total of 86% of the landings in Louisiana. Texas caught only 3% of these landings and 9% were taken by unknown vessels from other states. Further, 11% of the landings in Louisiana were made by Louisiana vessels landing in Louisiana but fishing off Texas.

Texas landings during the same period amounted to 7.6 million pounds during this period, of which 59% were from Texas vessels, 18% were unknown, and only 15% were from vessels from other states.

In the August 1-31 period, over 87% of the 5.0 million pounds were landed by Louisiana vessels in Louisiana (26% were from the unknown category) and only 2% from Texas vessels. During the same period, Texas landings amounted to 8.7 million pounds of which 84% were made by Texas vessels (20% by the unknown category) and 13% were caught by Louisiana or other vessels.

Table 6b depicts the same time period as Table 6a, but excludes all inshore production. These values give a better indication of fleet mobility, since little or no fishing is done by out-of-state vessels in inshore waters.

1985 TEXAS CLOSURE

In 1985, the FCZ of the United States and the territorial sea of the State of Texas were closed to all shrimp fishing from May 20 to July 8, except for a daytime nearshore fishery directed at white shrimp.

Recruitment

Louisiana

As in past years, Louisiana Department of Wildlife and Fisheries monitored the winter and spring hydrological and environmental conditions in coastal Louisiana to indicate the potential productivity for the brown shrimp fishery. Winter and spring hydrological conditions in 1985 were positive when compared to 1984 and suggested that the brown shrimp production would be higher than the previous year. Bowman⁵ indicated that there were approximately 2 million acres of optimum brown shrimp nursery grounds available in Louisiana in 1985 compared to 1.6 million acres in 1984, 1 million acres in 1983, and 3 million acres in 1981. However, he also indicated that the number of hours during which the water temperature was below 20°C after April 8 decreased from 80 observed in 1984 to 60 in 1985. This parameter has been shown to exhibit an inverse relationship to brown shrimp production, i.e., the fewer hours below 20°C, the better the conditions for growth and survival of brown shrimp postlarvae. Overall, conditions indicated that brown shrimp production would be higher in Louisiana than in the previous year. The total Louisiana catch from May to August 1985

⁵Bowman, Phillip, Louisiana Department of Wildlife and Fisheries, P. O. Box 15570, Baton Rouge, Louisiana, pers. commun.

was 25.7 million pounds, which was lower than the 28.5 million pounds for the same period in 1984, but higher than the 20.9 million pounds in 1983. It was 38.3 million pounds in 1981 and 28.8 million pounds in 1982.

Catch information from Louisiana inshore and offshore fisheries in May was also used as an indication of total production for Louisiana for the May through April period. Although we have not used this forecasting method previously, we have examined this method in detail and believe that it provides reliable means of estimating shrimp crops off Louisiana. Using preliminary catch information estimated to be 12.5 million pounds in May, we predicted for the Louisiana portion of the coast west of the Mississippi River a total inshore-offshore production of 48 ± 11 million pounds. Revised catch estimates for May of 9.9 million pounds changed our prediction to 40.4 ± 9.2 million pounds for the May 1985-April 1986 period. Brown shrimp production since 1960 for this area averaged 26 million pounds with a low of 7.3 million pounds in 1962 and a high of 49 million pounds in 1973.

Texas

Estimates of the potential yield from the spring 1981 and 1982 brown shrimp crops were made by the National Marine Fisheries Service and the Texas Parks and Wildlife Department (TPWD)⁶. Both estimates indicated that the 1981 crop was projected to be slightly better than average (Klima et al., 1982). NMFS estimated a yield of approximately 29 million pounds (± 2.7 million pounds at the 95%

⁶Bryan, C. E., Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, TX 78744, pers. commun.

confidence level); however, more than 40 million pounds of brown shrimp were caught in offshore Texas waters from July 1981 to May 1982. The difference in the projected estimates and actual higher catch was attributed to the Texas closure (Klima et al., 1982).

The most reliable means of predicting the brown shrimp season is the NMFS bait shrimp index based on the relative abundance of brown shrimp caught by the Galveston Bay bait shrimp fishery. Indices of postlarval and juvenile abundances for 1985 were based on information collected from Galveston Bay from February through June 10, 1985. We feel these also provide reasonable forecast adjustments for the entire Texas coast brown shrimp fishery.

Bait Shrimp Index - Galveston Bay

Our best estimate of the relative magnitude of the brown shrimp crop comes from data collected from the Galveston Bay bait shrimp fishery during May and early June (Table 7). This year's altered index was slightly above average, and we predict a total catch from July 1985 to June 1986 of 29.0 million pounds with a range between 19.0 and 39.0 million pounds. Average offshore brown shrimp production (July-June) off Texas from 1960 through 1983 was 27.4 million pounds.

Postlarval Brown Shrimp Index - Galveston Bay

Mass movements of postlarval brown shrimp into nursery areas usually occur after water temperatures reach 60°F. This year, bay waters were generally above 60°F in February, 67.4°F in March and 72.2°F in April. Extremely high catches of postlarval brown shrimp averaged 396 per tow (March-April) in 1985 and were higher than the 197 per tow 15-year average index for Galveston Bay. The 1984 postlarval shrimp catch averaged 500 per tow for March-April. Unfortunately, the 1984 water levels were dramatically lowered by two northers, one in late February and another in

March, preventing postlarval and juvenile shrimp from using the extensive marsh grass for several days. This year, weather conditions were favorable for postlarval survival.

Juvenile Brown Shrimp Indices - Galveston Bay

Sampling of juvenile shrimp in a salt marsh on Galveston Island provides a measure of brown shrimp abundance that we feel may be a good prediction of year class strength.

This year's estimate of 7,100 shrimp per acre was similar to the 1970 estimate of 6,900 shrimp per acre. The 1970 annual harvest was 30.7 million pounds. Using the abundance measures of juvenile shrimp estimated from salt marshes on Galveston Island, we provided an early forecast of the annual yield to be 31.0 million pounds. This estimate was revised in June using the altered bait shrimp index to 29.0 million pounds.

Texas Inshore Bay Fishery

Catch rates for the Texas inshore commercial fishery were relatively high this spring, ranging from 100 to 150 pounds per hour for the lower Texas bay systems to a low of 35 pounds per hour for the Galveston Bay system. The low rates in the upper bay systems are attributed to a slightly retarded season; although small shrimp were abundant in Galveston Bay, fishing was curtailed due to poor prices (as low as 10¢/lb) received by commercial fishermen for small shrimp. Throughout most of the Texas bay systems, shrimp this year appeared to be relatively small compared with last year.

Early Offshore Fishery Production

Another indicator of annual production is the offshore catch in July and August in statistical subareas 18-21. Historically, the July-August brown shrimp catch averages 47% of the annual production from July to June. With the inception of the

first closure in 1981, the July-August catch averages 60% of the annual production. The offshore catch in July-August 1985 from subareas 18-21 amounted to 14.0 million pounds or an estimated annual production of 29.8 or 23.3 million pounds for the 47% or 60%, respectively.

Discards

The first large-scale attempt to estimate discards off Texas was made in 1985, even though discarding probably has occurred to an unknown degree since 1960.

Offshore Shrimp Size

Butterfly net sampling at the Galveston Bay entrance on the night of June 5, 1985 collected 57-113 mm brown shrimp (mean = 74 mm; 1,260 shrimp) recruiting offshore. That night was chosen because of the occurrence of strong ebb tides needed to operate the butterfly net. Using growth equations developed in 1981 by the SEFC, males would have reached 84-126 mm in length and females 92-135 mm by the July 8, 1985 opening. Assuming a 1:1 sex ratio in that sample, projected length frequencies indicated only 12% by number of the offshore stocks recruited on this date would have reached 112 mm by July 8. Had the opening been delayed until July 15, an estimated 27% by number of these recruits would have reached 112 mm. The 112-mm benchmark represents the old Texas legal size limit.

Brown shrimp tagging operations at Aransas Pass during June 18-21, 1985 found bait shrimp near the pass averaging 81 mm for males (52-110 mm range) and 85 mm for females (56-122 mm range). Had these shrimp moved offshore on June 21, males would have reached 71-118 mm and females 79-133 mm by July 8 with an estimated 8% by number of these recruitments >112 mm. By July 15, 16% by number of these recruits would have been > 112 mm. In com-

parison, bait shrimp collected near Brazos-Santiago Pass during June 22-28, 1985 had a mean size of 67 mm (both sexes; range = 42-118 mm), indicating that much smaller shrimp were moving through Texas' southmost pass.

Offshore shrimp tagging operations were conducted between Aransas Pass and Mansfield Pass in 12-15 fm between June 27-July 2, 1985. Just south of Aransas Pass, the shrimp size range was 72-179 mm and some 50% by number of the shrimp were >112 mm. In the Mansfield Pass area, however, shrimp as small as 63 mm were collected and only 20% by number of the shrimp were >112 mm in length. On July 9-11, operations near Aransas Pass again found 40-50% of the shrimp were >112 mm.

SEAMAP sampling off Texas was conducted between June 15 and July 5, 1985. Length frequency analysis indicated that during June 12-22, 26% of the total number of shrimp caught were > 112 mm (subareas 19-20; 10-22 fathoms); during June 23-30, 40% of the shrimp were at least 112 mm (subareas 18-21; 3-30 fathoms); and by July 1-5, 56% of the shrimp were >112 mm (subareas 20-21; 3-45 fathoms).

Direct Observation of Discarding

When the season opened on July 8, 1985, the Galveston Laboratory sent observers out on two vessels (PROMISES and ROSA) to record fishing success. Both vessels worked south of Aransas Pass in 14-18 fm for 2-3 nights, where PROMISES discarded 17% by weight of its catch and ROSA discarded 26% by weight. PROMISES moved east of Aransas Pass in 15-16 fm for 9 nights where discards dropped to 7% by weight, for an overall total of 11% by weight discarded. ROSA fished south of Freeport-Galveston in 8-24 fm for 12 nights with virtually no discarding, leading to an overall 8% by weight discarded. Using length frequencies of landings and discards, PROMISES landed an estimated 331,700 shrimp and discarded 99,400 shrimp (23% by number) while ROSA landed 308,800 shrimp and

discarded 62,800 shrimp (17% by number). Heavy discarding was discontinued as vessel captains realized some catch was more profitable than no catch at all. Landings from these two vessels indicated that 43/50 count and 51/55 count shrimp were most abundant.

Preliminary catch information from ESO port agents corroborated the observer data. Coastwide, verbal reports of discards by the 1,574 vessel fleet (not including 600 smaller boats) were thought to have averaged 18% by weight of the catches during July 8-16, 1985, but dropped to 1% by weight with the 20¢/lb price rise on July 17-18, 1985. If data from the two observer vessels were proportional to that of the 1,574-vessel fleet, then an estimated 128 million shrimp (1.6-2.0 million pounds at 65-80 count) could have been discarded during the first two weeks of the season.

Estimate of Discarding from Interview and Log Book Data

ESO port agents were asked to collect information on shrimp discards along with regular landings interview data. There were three types of fishing trip records: 1) 575 complete interviews, in which the captain reported landings and discards (including zero discards), 2) 1,162 incomplete interviews, in which only landings data were collected from captains (either captains were not asked about discards, or discards were not recorded), and 3) 2,443 dealer records, in which captains were not interviewed at all. Thus, of the 4,180 reported fishing trips in Texas waters for the six weeks after the closure, 1,737 or 42% of those trips were interviewed but only 575 or 13.8% of all trips provided discard data. The following table illustrates the coverage of vessel trips by ESO interviews and the distribution of interviews with discard data:

<u>Subarea</u>	<u>Total</u>	<u>Trips Interviewed</u>		<u>Interviews with Discard Data</u>	
	<u>Trips</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
18	985	186	18.9	51	27.4
19	1,533	518	33.8	203	39.2
20	963	479	49.7	246	51.4
21	699	554	79.3	75	13.5
18-21	4,180	1,737	41.6	575	33.1

There was excellent interview coverage of trips but poor reporting of discarding in subarea 21. Interview coverage of trips to subareas 18 and 19 was low but responses to discard questions were relatively high. These data most probably reflect the discarding activities on trips by the Port Aransas - Aransas Pass fleet (subarea 20), of which about half were interviewed with half the interviews giving discard data.

Several standard procedures were employed in examining data on interview forms and in daily log books (special forms kept voluntarily by some captains). If several depths or statistical subareas were fished, discards were divided in proportion to the hours fished in each since interviews usually reported only total discards (this method is used by ESO in apportioning landings). When an interview was accompanied by log book entries, discards were apportioned by log entries whenever possible. Comments describing discards as "little," "some," "few," etc., were assigned 1% of the total catch. If a small range in discards was noted, then the lower bound was used (e.g., "15-20% discarded" was treated as 15%); however, midpoints were used when large ranges were given (e.g., "30-50% discarded" was treated as 40%). The proportion of the catch that was discarded was assumed to mean a proportion of the landed, heads-off weight.

Based on the 575 interviews with discard information, a summary of the weekly brown shrimp catch and discard by statistical subarea, unloading date, and depth zone (in 5-fm increments, with

zone 1 = 1-5 fm) is presented in Table 8. Over the six weeks covered by this survey (July 8-August 18), the highest proportions of shrimp discards were made in the first three weeks, and discards were minimal by week five. In all likelihood, most of the discards were made in the first 14 days of the season but were only reported when the shrimpers landed (lengthy trips usually did not specify discard dates). Maximum overall proportional discards were found in subarea 18, depth zone 4 (7.2%); subarea 19, depth zones 4 (11.4%) and 9 & 10 (14.9%), subarea 20, depth zone 1 & 2 (27.8%); and subarea 21, depth zone 6 (46.3%). Discard weights were highest in: subarea 18, depth zone 4 (2,185 pounds); subarea 19, depth zone 4 (12,286 pounds); subarea 20, depth zone 5 (22,417 pounds); and subarea 21, depth zone 4 (8,030 pounds). Discarding occurred primarily in the FCZ.

Weekly and cumulative summaries of landings and discards by fishing area are presented in Table 9. Discarding of undersized shrimp primarily occurred in subarea 18 in week 2, subarea 19 in weeks 1-3, and subarea 20 in weeks 1-4. Discarding was prominent in subarea 21 in weeks 1-3, after which response to the discard question declined. In all, 575 interviews mentioned discarding, of which 424 (74%) did not discard any shrimp and some (26%) discarded some small shrimp. Weekly total discard over all subareas fell rapidly from 19.9% in week 1 to 2.7% by week 4 to 0.1% by week 6. For the whole six week period, landings were 891,143 pounds and discards were 97,921 pounds for discard rate of 9.9% among shrimpers reporting discards.

Weekly and cumulative landings from incomplete interviews and dealer records are summarized in Table 10. There were 1,162 trips interviewed over the six week period that did not include discard data and that landed 5.3 million pounds of shrimp. An additional 2,443 trips with 5.3 million pounds landed were recorded by shrimp dealers but not interviewed. Total landings were thus 11.5 million pounds for the six weeks.

The total discard by shrimp vessels off Texas can be estimated from these data. If it is assumed that all discards were reported, then the total discard would be 97,921 pounds with 11.5 million pounds landed, or 0.85% discards. However, it is more likely that the activities of the 575 trip interviews were reflective of the whole fleet, i.e., on one quarter of all 4,180 trips some small shrimp were discarded. Thus, the discard rate of 9.9% from the 575 interviews was applied to the total landings of 11.5 million pounds for an estimated total discard of 1.1 million pounds. Data from observers on shrimp vessels indicated that discarded shrimp ranged between 80 and 105 tails/pound for an estimated discard of 88 million to 116 million shrimp. Even at 65 tails/pound (the old Texas legal size limit of 112 mm), this total discard biomass represents a possible discard of 72 million shrimp.

Inshore Fisheries

Inshore shrimp fisheries of Texas and Louisiana are managed by the respective states. Specific regulations concerning fishing activities are in force for both states, limiting the time of fishing during the day, size of fishing gear, fishing areas and seasons.

Louisiana

The inshore Louisiana brown shrimp fishery averaged 10.9 million pounds \pm 4.0 million pounds standard deviation from 1960 to 1982 (Fig. 5). Peak production in Louisiana appears to be cyclic in that low production was observed from 1960 to 1966 and above average production on all other years except in 1973-1975 and 1979-1980. Historically, the Louisiana inshore fishery is concentrated from May through August, with peak production in May and June.

The May-August 1985 catch in Louisiana for inshore waters amounted to 8.9 million pounds, with peak production in May and June. This year's inshore production was lower than the 14.9, 12.1, 15.1 and 15.2 million pounds for 1984, 1983, 1982 and 1981, respectively. In 1985, May inshore production was 3.0 million pounds, June production was 4.8 million pounds, dropping to slightly under 1.1 million pounds by July, and was only .095 million pounds by August. The May inshore catch was relatively small in 1985 as compared to the average catch of 5.3 million pounds since 1981, but the offshore catch was 6.9 million pounds, considerably above the 3.0 million pound average production for May. This difference is attributed to early migration into offshore waters where most of the production occurred, unlike other years where most of the May catch occurred in inshore waters.

The size composition of the Louisiana catch in 1981 during the peak months was dominated by 68-count or smaller shrimp. In 1982, ESO agents collected specific size information of shrimp

smaller than 68-count; the May-August 1982, 1983, and 1984 data revealed that the size composition in Louisiana was predominantly 116-count or larger size group (Klima et al., 1985). The May-August 1985 catch was also predominantly composed of shrimp in the 116-count size group (Table 11).

Texas

Landings for the Texas inshore brown shrimp fishery have been increasing for the past several years. The average catch over the 23-year period (1960-1982) is 2.0 million pounds \pm 1.6 million pounds standard deviation (Fig. 6). The landings in 1979, 1980, 1981, 1982, 1983, and 1984 were 4.2, 5.0, 4.3, 4.3, 5.9 and 7.1 million pounds, respectively. These are well above the 23-year average.

The inshore brown shrimp fishery takes place from late April through August. Peak production in Texas waters occurs in June. The total inshore catch for Texas in 1985 was 5.4 million pounds, down from the 7.1 million pounds in 1984 but well above the historical average of 2.0 million pounds. Specifically, the catch in 1985 peaked in May and June, with a production of about 1.9 million pounds each month. Aransas Bay had the major inshore production from May-July this year, whereas, in the past, Galveston Bay was one of the major producing bays. This year, only 0.7 million pounds, or 15% of the total inshore catch, was caught from Galveston Bay from May-July. In 1981, 1982, 1983, and 1984, Galveston Bay produced 29%, 24%, 15%, and 23% of the inshore crop, respectively. Of note, Galveston Bay produced 290,000 pounds of brown shrimp in August, of which over 65% were larger size than 68 count. Production from all other Texas bays amounted to only 60,000 pounds in August.

The size composition of the inshore catch from May through August is dominated by 68-count or smaller size shrimp. In 1982, ESO statistical agents collected information on the specific size

categories larger than 68-count. These data indicated that the catch was composed primarily of 116-count shrimp or larger size groups in May and June of 1982, 1983 and 1984 (Klima et al., 1985). The 1985 catch in May and June was also predominantly of shrimp in the 116-count size group (Table 12).

Size Distribution

The inshore size distribution of brown shrimp caught in Louisiana and Texas is remarkably the same for both states from May through August. Generally in 1985, the average count in May was 114 and 110 shrimp/pound in Texas and Louisiana, respectively, whereas in June the average count in Texas and Louisiana was about 108. These data indicate that commercially caught shrimp were smaller in 1985 than 1984 in Texas inshore waters. In July, the average count dropped to approximately 80-88 shrimp/pound in both states, and by August, when the fishery drops drastically, the average count dropped to less than 56 shrimp/pound in Texas. No size class information was available from Louisiana for the month of August.

Offshore Fisheries

Louisiana

Annual production of brown shrimp from May to April in Louisiana offshore water averaged 15.0 million pounds \pm 8.1 million pounds standard deviation from 1960 to 1983. The annual yield was low in the early 1960's and increased to about 18 million pounds by 1967 and remained near this level through 1972 (Fig. 8). The yield dropped to about 10 million pounds from 1973 through 1975. Thereafter the yield was above the historical average of 15.0 million pounds, with yields topping about 30 million pounds in 1977 and 1978.

In 1984 (May 1984-April 1985) the Louisiana offshore

fishery produced 18.4 million pounds of brown shrimp. Total offshore brown shrimp production of the 1985 year class from May through August in statistical subareas 13-17 was 16.9 million pounds from 20.8 thousand days of fishing effort with an average CPUE of about 803 pounds per day. The 1984 catch from May-August was 13.6 million pounds from 21 thousand days of effort and an average CPUE of about 647 pounds per day (Table 13).

In May 1985, the fishery off Louisiana produced 6.9 million pounds of brown shrimp and occurred primarily in the shallow waters of statistical subareas 13 and 14. The 1984 offshore production was only 2.6 million pounds. Little production was realized from other fishing zones (Figs. 8, 9, 10). Fishing effort was relatively high (over 2,000 days fished) in both statistical areas 13 and 14 but very low (about a total of 1,100 days fished) in areas 15-17. The CPUE of 1,400 pounds per day in statistical areas 13 and 14 was high but 400 pounds per day in statistical areas 15-17 was very low. The unusually large offshore catch in May is attributed to early offshore migration which restricted inshore production.

In June, the fishery off Louisiana produced 4.0 million pounds of brown shrimp with fishing effort of over 5,400 days and an average CPUE of 732 lbs/day. The highest CPUEs of 1,077 and 795 lbs/day were recorded off statistical subareas 13 and 14, respectively. The CPUE in all other areas was about 500 lbs/day (Fig. 11).

During June, Texas vessels did not fish off the Texas coast for brown shrimp but concentrated their activities primarily in western Louisiana in statistical subareas 14-17. Approximately 0.9 million pounds of brown shrimp and 0.3 million pounds of white shrimp were landed by vessels that returned to Texas ports. A total of 1,521 trips was recorded for Texas vessels fishing in Louisiana waters with 2,200 days of fishing effort expended. About 23% of the brown shrimp and 32% of the white shrimp caught in sta-

tistical subareas 14-17 were landed in Texas. The total catch of brown shrimp and white shrimp in June from statistical subareas 13-17 was 5.2 million pounds, of which 1.3 million pounds were caught by vessels that returned to Texas ports to unload. Therefore, 25% of the offshore catch in those areas was caught by Texas fishermen.

The July fishery in statistical subareas 13-17 produced 3.6 million pounds of brown shrimp with 6,000 fishing days. Relative abundance averaged 591 pounds/day, with the highest CPUE observed off statistical subarea 13 (865 lbs/day) and the lowest CPUE (460 lbs/day) in statistical subarea 16 (Fig. 12). Maximum production occurred inside of 10 fathoms.

In August, the Louisiana offshore fishery produced approximately 2.5 million pounds of brown shrimp with an average CPUE of 682 pounds/day. Similar values were observed in the amount caught, fishing effort and CPUE among all statistical subareas (Fig. 13).

Texas

The average annual brown shrimp yield from May to April in Texas offshore waters from 1960 to 1983 is 26.9 million pounds \pm 7.8 million pounds standard deviation (Fig. 14). Peak production occurred in 1967 and 1981 with a yield of 48 and 41 million pounds, respectively.

The 1985 production from May through August amounted to 14.6 million pounds with 14.0 million pounds being produced in July and August. Production in July and August was 24.9, 13.1, 9.8 and 15.3 million pounds in 1981, 1982, 1983 and 1984, respectively. The decrease in the July-August 1985 yield compared to 1984 is attributed to less fishing effort and smaller size shrimp harvested in the offshore fishery (Table 1). In July through August 1985, a total of 15,200 days of effort was expended, compared to 14,800, 15,700, 10,300 and 15,200 days in 1981, 1982, 1983 and 1984,

respectively (Table 1). The average CPUE during July-August was 918 pounds/day in 1985, up from the 819 pounds/day in 1984, but lower than the 1895 lbs/day, 922 lbs/day and 962 lbs/day in 1981, 1982 and 1983, respectively.

The May fishery off the Texas coast was not concentrated on either white or brown shrimp as almost equal amounts of about 600,000 lbs were landed. The dominant size group was 31-40 count brown shrimp. Major brown shrimp fishing zones were in statistical subareas 20 and 21, which produced over 70% of the brown shrimp catch (Fig. 15).

No fishing for brown shrimp was permitted from May 20 to July 8, 1985. A daytime fishery from the beach to 4 fathoms for white shrimp was permitted along the entire coast during this period. The total landed catch in June for the daytime fishery was about 42,000 lbs of brown shrimp and 100,000 lbs of white shrimp.

The white shrimp fishery off Texas was not very productive in May and June, with catches of 487,000 and 116,000 lbs, respectively. The July fishery amounted to about 440,000 lbs of predominantly 15-20 and under count shrimp, taken primarily in statistical subarea 18. Few white shrimp were caught in statistical subarea 19, and almost none were caught in areas 20 and 21 during July. The August white shrimp fishery was substantial with approximately 560,000 lbs of predominantly 31-40 count shrimp landed. The fishery was concentrated in statistical subarea 19.

With the opening of the offshore brown shrimp season on 8 July, 8.3 million pounds were taken in July off Texas with 6,800 days of effort, giving a CPUE of 1,223 pounds/day. The highest CPUE (1,353 lbs/day) was observed in statistical subarea 21; however, the CPUE was similar along the entire Texas coast, exceeding 1,100 lbs/day in all areas (Fig. 12). Peak production came from the 6-15 fathom depth zone in statistical subarea 19 (Fig. 15). Production from subareas 18-21 amounted to 1.6, 2.4, 2.0 and 2.4 million pounds, respectively.

In August, the Texas catch was 5.7 million pounds with a fishing effort of 8,400 days. CPUE averaged 672 pounds/day, ranging from a high of 712 pounds/day in subarea 20 to a low of 578 pounds/day in subarea 21 (Fig. 13). The August peak production expanded to 6-25 fathoms in subarea 19 (Fig. 15). High production also occurred in subareas 18, 20, and 21 from 15 fathoms seaward. Limited production occurred in all areas inside 10 fathoms.

Size Distribution - Inshore

The size of shrimp in Texas bays and estuaries appeared to be significantly smaller this year than in recent years. The average size of shrimp in the bait shrimp fishery of Galveston Bay for the month of June 1985 was 194-count per pound, whereas in comparison it was 136-, 152-, 129-, and 148-count per pound in 1984, 1983, 1982, and 1981, respectively. We feel that the average size as reflected in the bait shrimp fishery is indicative of the size of shrimp in the secondary and fringing areas in Galveston Bay, whereas the size of brown shrimp in June caught by the bay commercial fishery reflects the size in the primary bay and near the passes prior to offshore migration.

Further, in looking at the average size of shrimp caught by the inshore Texas bay fishery in recent years, the 1985 catch during the month of June was 120-count per pound, whereas in 1984 it was 114-count per pound. The major differences between 1985 and 1984 reflect the smaller shrimp found in Galveston Bay of approximately 130 per pound and in San Antonio and Aransas Bays of 126- and 130-count per pound, respectively. In fact, the shrimp fishery in June produced such small shrimp that the price dropped to 10 cents per pound in Galveston Bay and many shrimpers refused to fish because of the low price.

We have also related the average size of shrimp caught in the Galveston Bay bait shrimp fishery in June with the average offshore commercial size produced in July in statistical areas

18-21. These data clearly indicate a correlation (correlation coefficient = 0.946 with 4 degrees of freedom) from 1981 through 1985. If large shrimp are produced in the Galveston Bay bait shrimp fishery, then relatively large shrimp are produced offshore. In 1985 very small shrimp were produced in the Galveston Bay bait fishery and relatively small shrimp (46 count) were produced offshore in July. The correlation for 1963-1980 is not high (correlation coefficient = 0.248 with 16 degrees of freedom). Since 1981, the offshore size in July ranged from 40 to 43 count. In 1985, the size jumped to 46-count per pound, indicating that the fishery was working predominantly on smaller shrimp than it had in other closure years. We further compared the 1984 and 1985 size distributions by G-tests which showed that both in July and August there were significant differences in the size distributions of shrimp caught off Texas (Table 14). Basically, the 1985 production was on the smaller end of the size range as compared with 1984. There were no significant differences between 1985 and 1981, 1982, or 1983, but in July 1985, far more 41-50s and 51-67s were caught than in any previous closure year except 1983 (Table 14). From 1976-1980, prior to the Texas Closure off Texas, the size of shrimp caught in July averaged 46.3 count per pound, almost identical to the average size of 46.0 in 1985. All of the data collected from the bays and the offshore areas indicated that the size of shrimp available to the commercial fishery during July and August of this year were much smaller than in other closure years.

Size Distribution - Offshore

The size composition of the 1985 commercial offshore catch of brown shrimp from statistical subareas 13-17 from May to August 1985 was dominated by 68-count and smaller shrimp in May, June and July (Fig. 16). In August, the catch was more uniformly distributed among the size groups ranging between 31-40's and larger size groups (Fig. 17). The average number of brown shrimp/pound caught

in statistical subareas 13-17 in Louisiana from May-August decreased from about 120-count to approximately 44-count. The May 1985 offshore catch averaged 120 per pound but was only 102 per pound in 1984. Little or no difference was observed between 1984 and 1985 in June, July and August average size.

The monthly size distribution for the catch of brown shrimp from subareas 18-21 from May to August 1985 was different from that observed off Louisiana. In May, the catch was composed of nearly equal amounts of size categories larger than 15-20's. In June, the average size was about 50 per pound with less than 50,000 pounds landed. In July, the 31-40 count was the predominant modal group, but with large numbers of small shrimp landed (Fig. 17). The dominant modal group in August was 31-40 count. The 31-40 size class was the dominant modal group of brown shrimp caught in July-August 1981, 1982 and 1983 off Texas (Klima et al., 1982, 1983 and 1984). No difference was observed between the May, July and August 1981, 1982, 1983 and 1984 average number of shrimp/pound caught off Texas (Klima et al. 1985).

In western Louisiana, the average size count for the offshore fishery was 120 in May, 80 in June, 58 in July and 44 in August, whereas for the Texas coast, the average size count was 30 in May, 50 in June, 46 in July and 39 in August (Fig. 16). The average size count was appreciably smaller in 1985 than any other closure year (Table 14). Major differences in size composition between Texas and Louisiana offshore catches occurred from May through August.

Number of Shrimp

In addition to describing the pounds landed by size count, we have converted the size category into estimated numbers of shrimp caught in Texas and Louisiana, both for offshore and inshore waters. Large numbers of shrimp were caught in Louisiana inshore waters in May and June but the catch decreased drastically in July

and August (Fig. 18). The Louisiana inshore and offshore fisheries caught about 2.5 billion shrimp from May through August. Substantially more shrimp were caught offshore than inshore in May, but vice versa in June. About 1.2 billion shrimp were caught in Texas waters from May through August 1985, with the inshore fishery harvesting over 581 million shrimp (Fig. 18).

In comparing the total number of shrimp landed, it is evident that in 1985 Louisiana produced more shrimp than did Texas (2.5 billion versus 1.2 billion, respectively) (Fig. 18). However, total production in Texas was 20.0 million pounds compared to 25.3 million pounds in Louisiana for the May-August period. Texas offshore production during this period was less than off Louisiana (14.6 and 16.5 million pounds, respectively). Louisiana inshore waters produced 8.8 million pounds, whereas Texas only produced 5.4 million pounds.

The inshore fisheries of both Louisiana and Texas accounted for the majority of the number of shrimp landed from May to August. In Louisiana, 1.0 billion shrimp were caught in inshore waters and almost 0.6 billion shrimp were caught in Texas inshore waters. Almost 75% of the shrimp caught by the inshore fisheries of Louisiana and Texas were shrimp 100-count size or larger.

DISCUSSION

1984 Fishery

The tone of the 1984 fishery was set by the recruitment to the offshore stocks in both Texas and Louisiana. Recruitment appeared to be much higher than that observed in 1982 and 1983 and significantly lower than that observed in 1981. The total offshore-inshore fishery from the Mississippi River to the U.S.-Mexico border yielded 64.0 million pounds from May 1984 through April 1985, slightly below the historical (1976-1984) average production of 67.1 million pounds. Louisiana produced 33.4 million

pounds and Texas produced 31.7 million pounds, of which 14.7 and 7.1 million pounds were harvested from the inshore waters of Louisiana and Texas respectively.

Overall, the fishery was below average. This in part is due to either average or slightly below average recruitment as adequate effort was expended throughout all areas to harvest substantially more shrimp than were produced. The fishery produced 80% of the yield from May through August. The fishery for the remaining portion of the year was approximately similar to that from 1960 to 1979. There appeared to be no difference between the catch, fishing effort, and CPUE from September through April 1985, and the historical fishery from 1960 to 1979.

1985 Fishery

Louisiana

The Louisiana fishery was forecast to produce slightly more shrimp in 1985 than in recent years. Louisiana Department of Wildlife and Fisheries personnel indicated that approximately 2 million acres of optimum brown shrimp nursery habitat would be available in 1985. This is slightly higher than in previous years except for 1981 when 3.0 million acres were available. However, the May through August production amounted to only 25.7 million pounds, compared to 28.5 million pounds in 1984 which was not a good producing year. The major exception that occurred during 1985 was that more brown shrimp were caught in offshore waters in May than in inshore waters. Further, the shrimp were extremely small along coastal Louisiana with an average size of 120 count in May 1985 as compared to 102 count in May 1984. The exodus of small shrimp into offshore waters led the offshore fishery to harvest 6.9 million pounds of extremely small shrimp during the month of May. June was a normal month in that approximately the same size shrimp

were harvested in 1984 and 1985. Louisiana's inshore fishery declined to 8.9 million pounds during the May-August period as compared to 14.9 million pounds in 1984. Since 1981, the inshore fisheries have been producing around 15 million pounds and the decline to 8.9 million pounds is significant. However, this production was probably offset by the large catch in the offshore waters in May. The total landings of 25.7 million pounds is not considered to be overly productive because the average May-August production for Louisiana since 1981 has been over 28 million pounds.

Texas

Recruitment in Texas appeared to be relatively good from the inshore indices of bait shrimp and samples from the Galveston marshes; however, the overall production from May through August amounted to only 20 million pounds in 1985. Although we predicted (in June 1985) an estimated annual production of 29 million pounds for 1985, we now recognize that this is probably an overestimate. The confounding factor was most likely the extremely small size of shrimp. Samples from the bait shrimp fishery in Galveston Bay averaged 194-count per pound in June compared to counts of around 150 per pound in previous closure years. The bay shrimp fishery curtailed fishing in some Texas bays because of the overall small size shrimp (129 per pound) and low price. Coupled with these facts, the Texas season opened on July 8 and an appreciable amount of discarding was noted in offshore waters, primarily due to the small size of shrimp. We estimate at this time approximately 1.1 million pounds of shrimp were discarded during the first six weeks of the season. Discarding quickly dissipated after the fishermen realized they were not going to make bonanza catches and it was worthwhile to save whatever was onboard. The early opening of the season coupled with small size of shrimp and lower prices could cause economic problems for shrimp fishermen. The discarding

figure of 1.1 million pounds and the small size did not benefit the fishery. Since there is no legal reason for discarding under the present FMP, the fishery would have earned an estimated \$1.6 million⁷ by landing those discards. Although catch rates were approximately half the 1981 level and certainly in the same range as the 1982 and 1983 CPUE levels, they did not necessarily produce adequate income because of the smaller size shrimp produced offshore. Average size during July was approximately 46 count per pound as compared to 40-43 per pound during other closure years. The inshore fishery this year decreased to approximately 5.4 million pounds compared to 7.1 in 1984. Again, part of the reason for this decrease is due to the small size and the curtailment of many fishermen from attempting to fish for small shrimp. In fact, Galveston Bay produced only 265 thousand pounds of 130-count shrimp in June 1985 as compared to over 900,000 pounds of 109-count shrimp in June of 1984. A substantial reduction in the poundage was also noted in Matagorda Bay as compared to 1984.

Overall, the 1985 season can be linked to small size of shrimp prevalent throughout the Texas Bay systems and small size shrimp available to the offshore commercial fishery. Resultant reduced income was due to the size-price structure and to discarding.

⁷John Poffenberger, personal communication, Dept. of Commerce, NOAA, NMFS, SEFC, 75 Virginia Beach Drive, Miami, Florida 33149.

SUMMARY

Brown shrimp production in statistical subareas 18-21 from May 1984 to April 1985 amounted to 24.3 million pounds. Over 15.3 million pounds were produced in July and August 1984 compared with 25.0 and 13.1 million pounds produced in July and August of 1981 and 1983, respectively. Peak production occurred from July to September and accounted for 72% (17.5 million pounds) of the total annual landings. Fair catches and fair levels of relative abundance occurred off the Texas coast in July and August. A peak in CPUE of almost 1,074 pounds/day occurred in July but dropped to 723 pounds/day in August. Production of brown shrimp from September to December 1984 amounted to 5.2 million pounds with an average CPUE of around 366 pounds/day. In the January-April 1985 period, production amounted to only 1.4 million pounds with the CPUE falling to an average of approximately 353 pounds/day.

The offshore brown shrimp production in statistical subareas 13-17 from May 1984 to April 1985 amounted to 18.3 million pounds. The 6.6 million pound brown shrimp catch in Louisiana offshore waters during the July-August 1984 period was much lower than the 15.3 million lbs produced in Texas waters. The CPUE averaged 587 pounds/day. The September-December Louisiana offshore catch amounted to 2.7 million pounds, down from 4.3 million lbs in 1981 and about the same as the 2.5 million lbs in 1983. This time period's overall CPUE of 575 pounds/day was about 36% higher than in Texas offshore waters. The catch in January-April amounted to only 2.0 million pounds with an average CPUE of 459 pounds/day, or about 22% higher than in Texas.

In comparing the catch, fishing effort and CPUE for offshore waters between Texas and Louisiana from September 1984 to April 1985, we found no significant differences in catch. Fishing effort was significantly greater and CPUE was significantly lower off Texas than Louisiana. The major differences, however, that

were observed were the higher catches and CPUEs that occurred off Texas in July and August.

Recruitment to the Texas brown shrimp fishery in 1984 was below average. Our predicted annual production of 22.9 million pounds from July 1984-June 1985 was very close to the actual catch of 24.1 million pounds and was below the average 26.9 million pounds for offshore production covering the past 24 years.

Recruitment in 1985 appeared to be much greater than in 1982, 1983, and 1984 but less than 1981. We estimated an annual yield of 29.0 million pounds with a range from 19 to 39.0 million pounds for Texas offshore waters. The offshore catch in July-August 1985 from subareas 18-21 amounted to 14.0 million pounds or an estimated annual yield of 29.8 or 23.3 million pounds depending on the percent caught during July-August. Louisiana Department of Wildlife and Fisheries also indicated that brown shrimp recruitment to Louisiana fisheries would be higher in 1985 than in 1982, 1983 and 1984.

Factors affecting 1985 shrimp production were the extremely small size of shrimp in the estuaries from the Mississippi River to the Mexican border which resulted in the small size shrimp caught offshore. Because of the small size shrimp and possible early opening of the Texas closure season, 1.1 million pounds of shrimp (worth an estimated \$1.6 million) were discarded during the first six weeks in the Texas Closure. This resulted in overall lower production than anticipated.

Home port information indicated that during the June 1 through August 31 period Louisiana vessels predominantly landed in Louisiana and very few Texas vessels landed in Louisiana. Likewise, Texas vessels predominantly caught the majority of shrimp landed in Texas. Louisiana vessels rarely landed in Texas. Over 90% of the landings in Louisiana were caught by Louisiana vessels and over 75% of the Texas landings were caught by Texas vessels or boats.

Summary of % of state landings by vessels and boats from
Louisiana and Texas from June 1-August 30, 1985

Time	State	
	Louisiana	Texas
June 1-30	93	92
July 1-15	89	74
July 16-30	75	78
August 1-30	87	84

The catch off Texas in July-August 1985 amounted to 14.0 million pounds compared to 15.3, 9.9, 13.1 and 25.0 million pounds in 1984, 1983, 1982 and 1981, respectively. The average CPUE for this period was 918 pounds/day compared to 819 pounds/day in 1984, 962 pounds/day in 1983, 922 pounds/day in 1982 and 1,895 pounds/day in 1981.

The July-August 1985 catch off Louisiana amounted to 6.1 million pounds with an average CPUE of 625 pounds/day, whereas the July-August 1984 catch was 6.6 million pounds with an average CPUE of only 587 pounds/day. The July-August 1985 Texas offshore brown shrimp catch and CPUE were 2.3 and 1.5 times greater than the respective catch and CPUE off Louisiana. The difference in the offshore catches is attributed to larger shrimp being present which we believe is due to the Texas closure management measure. The average size of shrimp in July and August off Louisiana was 58.2 and 44.2 per pound whereas off Texas the average count was 46.0 in July and 39.1 in August 1985. The lower catch and CPUE off Louisiana may be due to the extensive Louisiana inshore and offshore fisheries which harvest predominantly large amounts of small shrimp in May and June.

In 1985 the total Louisiana May-August catch was 10% lower than in 1984 and in Texas the total catch was 15% lower than in 1984. Both states recorded lower landings in 1985 than 1984 for

this time period. The inshore fisheries shares of the total landings decreased to 34% from 52% in Louisiana and to 27% from 30% in Texas. The decreases in the inshore landings are due to an exodus of small shrimp to the offshore water in May in Louisiana and to small shrimp and poor prices in Texas.

The Louisiana inshore brown shrimp fishery produced approximately 14.9 million pounds in 1984 compared with 12.1 million pounds in 1983, but only 8.9 million pounds in 1985. The inshore catch was predominated by shrimp in the 116-count or larger size categories with an average size of 132- and 120-count per pound in May and June, respectively. Texas inshore fisheries accounted for approximately 7.1 million pounds of brown shrimp in 1984, 5.9 million pounds in 1983, but only 5.4 million pounds in 1985. The inshore catch in 1985 was dominated by shrimp of 116-count or larger size groups, with the average size count of 123 and 120 in May and June, respectively. The inshore Texas catch may seriously impact the Texas offshore shrimp fishery if not limited (Nichols 1984).

The size composition of the 1985 offshore brown shrimp catch in Texas waters was different than other closure years with the average size of about 46 count compared to 40-43 count since 1981.

Several problems were identified by fishermen throughout the Gulf. They are:

1. Too many out-of-state vessels fishing off Texas at the opening of the season, leaving few shrimp during the remainder of the year.
2. Loss of migrating shrimp to Mexico during the closure period.
3. Lack of a closure throughout the entire northern Gulf.

4. Complaints of short notice for the 1984 season's opening (few, if any, complaints were noted in 1985).

The goals of the Fishery Management Plan were partially achieved in 1985. Small emigrating brown shrimp were protected and allowed to grow to an average size of 46-count but discarding was a problem. Without a prohibition on trawling during the period of brown shrimp emigration, it is anticipated that larger quantities of small shrimp would have been caught resulting in wastage and an even lower yield to the fishery.

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Table 1. Monthly summary of total offshore brown shrimp catch in millions of pounds, total fishing effort in 1000's of days and CPUE for Louisiana statistical subareas 13-17, and Texas statistical subareas 18-21 for 1973-1985 (1980 not included).

Area	Jan.		Feb.		Mar.		Apr.	
	13-17	18-21	13-17	18-21	13-17	18-21	13-17	18-21
1973								
Catch	1.1	0.4	0.8	0.3	0.8	0.4	0.5	0.4
Effort	1.6	1.4	2.0	0.7	2.0	1.0	1.2	1.7
CPUE	695	272	414	439	400	350	411	222
1974								
Catch	0.5	1.1	0.4	0.6	0.3	0.5	0.2	0.4
Effort	1.1	1.7	1.0	1.5	0.8	1.5	0.6	1.9
CPUE	448	653	408	427	385	301	308	202
1975								
Catch	0.4	0.7	0.4	0.6	0.4	0.3	0.2	0.2
Effort	0.5	1.8	1.1	1.7	1.0	1.0	0.6	0.0
CPUE	754	407	376	327	388	293	324	0.0
1976								
Catch	0.8	0.5	0.6	0.6	0.4	0.4	0.5	0.5
Effort	1.4	1.3	1.3	2.0	1.0	1.7	1.2	2.1
CPUE	534	384	501	289	401	245	370	227
1977								
Catch	0.5	0.2	0.4	0.2	0.5	0.1	0.4	0.3
Effort	1.8	1.0	1.6	0.9	1.8	0.7	1.8	1.5
CPUE	296	193	249	163	274	149	232	201
1978								
Catch	0.9	0.7	1.1	0.5	1.4	1.2	0.5	0.4
Effort	1.1	2.0	2.1	1.3	3.4	0.9	1.2	1.6
CPUE	836	353	531	371	413	174	438	247
1979								
Catch	0.7	0.7	1.0	0.6	0.8	0.5	0.6	0.4
Effort	1.9	2.3	2.0	2.4	2.3	2.1	2.0	1.5
CPUE	374	312	524	266	361	235	312	293
1981								
Catch	0.2	0.3	0.1	0.1	0.2	0.06	0.08	0.06
Effort	0.6	1.0	0.4	0.4	0.4	0.3	0.04	0.2
CPUE	319	253	329	296	387	228	195	301
1982								
Catch	0.5	0.6	0.6	0.6	0.4	0.2	0.2	0.2
Effort	0.9	1.4	1.2	1.9	1.1	0.6	0.7	0.8
CPUE	549	454	446	317	370	276	281	271
1983								
Catch	0.4	0.3	0.3	0.2	0.4	0.1	0.3	0.2
Effort	1.2	1.0	1.2	1.0	1.1	0.5	0.8	0.8
CPUE	373	261	281	206	331	255	346	215
1984								
Catch	0.4	0.2	0.4	0.2	0.3	0.1	0.3	0.3
Effort	0.8	1.2	0.9	0.9	0.8	0.6	0.8	1.2
CPUE	502	196	382	236	326	227	366	74
1985								
Catch	0.6	0.4	0.5	0.3	0.4	0.2	0.4	0.4
Effort	0.8	1.1	1.3	0.9	1.4	0.9	0.9	0.9
CPUE	734	357	405	326	298	267	519	464

Table 1. cont. Monthly summary of total offshore brown shrimp catch in millions of pounds, total fishing effort in 1000's of days and average CPUE for Louisiana statistical subareas 13-17, and Texas statistical subareas 18-21 for 1973-1985 (1980 not included).

Area	May		June		July		Aug.	
	13-17	18-21	13-17	18-21	13-17	18-21	13-17	18-21
1973								
Catch	0.8	0.7	2.5	2.8	1.1	7.2	1.3	4.0
Effort	1.9	2.9	3.7	3.0	2.8	7.3	3.2	10.2
CPUE	423	261	673	925	402	989	406	392
1974								
Catch	0.8	0.6	1.1	1.8	2.1	5.9	1.9	7.1
Effort	2.2	2.9	2.3	3.9	3.3	7.3	3.0	10.8
CPUE	374	219	480	455	628	806	637	657
1975								
Catch	1.0	0.5	0.7	2.7	1.5	6.1	1.4	5.4
Effort	1.4	2.2	1.4	3.4	2.0	6.8	2.3	8.2
CPUE	724	208	529	797	723	891	620	651
1976								
Catch	1.4	0.8	3.8	1.2	4.8	6.2	3.1	5.3
Effort	3.2	3.1	5.0	2.5	5.4	7.4	3.6	8.8
CPUE	456	246	770	497	880	839	866	607
1977								
Catch	3.6	0.5	6.4	2.1	5.9	8.6	5.9	8.1
Effort	4.3	3.6	7.7	2.8	6.3	7.5	6.3	9.0
CPUE	839	150	835	771	935	1147	943	891
1978								
Catch	5.3	0.8	5.6	2.6	8.5	5.4	5.1	6.3
Effort	7.7	3.8	8.0	3.8	9.0	5.5	7.2	8.4
CPUE	685	217	708	677	941	982	713	746
1979								
Catch	4.1	0.9	5.7	1.9	4.2	3.9	5.3	3.5
Effort	7.6	3.2	10.4	3.3	14.7	5.6	9.6	6.3
CPUE	536	271	554	582	285	685	555	548
1981								
Catch	5.0	0.4	7.6	-	7.5	10.4	3.0	14.6
Effort	5.8	1.1	9.0	-	8.1	4.4	3.8	10.4
CPUE	861	308	842	-	927	2382	799	1408
1982								
Catch	3.3	0.8	5.3	-*	3.3	6.6	1.8	6.4
Effort	5.4	2.6	8.8	-	6.4	5.2	3.4	10.2
CPUE	609	295	604	-	525	1279	522	629
1983								
Catch	1.0	0.5	2.9	0.2	2.6	5.2	2.3	4.8
Effort	2.5	1.8	6.6	0.5	4.2	3.7	4.9	6.7
CPUE	417	294	441	163	415	1414	470	714
1984								
Catch	2.6	0.6	4.5	0.2	3.8	8.8	2.7	6.5
Effort	3.3	2.1	6.5	0.3	6.4	8.2	4.7	9.0
CPUE	769	275	691	748	598	1074	573	723
1985								
Catch	6.9	0.6	4.0	0.0	3.6	8.2	2.5	5.6
Effort	5.7	1.5	5.4	0.0	6.0	6.8	3.7	8.4
CPUE	1221	391	732	2942	591	1223	682	672

Table 1. cont. Monthly summary of total offshore brown shrimp catch in millions of pounds, total fishing effort in 1000's of days and CPUE for Louisiana statistical subareas 13-17, and Texas statistical subareas 18-21 for 1973-1985 (1980 not included).

Area	Totals and Averages for Jan-Apr.		Totals and Averages for May-June		Totals and Averages for July-Aug.		Totals and Averages for Sept.-Dec.	
	13-17	18-21	13-17	18-21	13-17	18-21	13-17	18-21
1973								
Catch	3.2	1.5	3.3	3.5	2.4	11.2	1.8	7.1
Effort	6.8	4.8	5.6	5.9	6.0	17.5	3.5	15.1
CPUE	480	321	548	593	404	691	590	506
1974								
Catch	1.4	2.6	1.9	2.4	4.0	13.0	3.5	8.4
Effort	3.5	6.6	4.5	6.8	6.3	18.1	4.8	13.5
CPUE	387	396	427	337	633	732	807	575
1975								
Catch	1.4	1.8	1.7	3.2	2.9	11.5	3.1	8.3
Effort	3.2	4.5	2.8	5.6	4.3	15.0	4.1	16.5
CPUE	461	257	627	503	671	771	940	497
1976								
Catch	2.3	2.0	5.2	2.0	7.9	11.5	5.7	10.7
Effort	4.9	7.1	8.2	5.6	9.0	16.5	9.6	19.1
CPUE	452	286	613	372	873	723	590	504
1977								
Catch	1.8	0.8	10.0	2.6	11.8	16.7	5.8	12.6
Effort	7.0	4.1	12.0	6.5	12.6	16.5	8.1	20.7
CPUE	263	177	837	461	939	1019	765	586
1978								
Catch	3.9	1.8	10.9	3.4	13.6	11.7	4.1	10.9
Effort	7.8	5.8	15.7	7.6	16.2	13.9	8.9	24.4
CPUE	555	286	697	447	827	864	451	436
1979								
Catch	3.1	2.2	9.8	2.8	9.5	7.4	4.1	6.4
Effort	8.2	8.3	18.0	6.5	24.3	11.9	11.2	15.0
CPUE	393	277	545	427	420	617	387	420
1981								
Catch	0.6	0.5	12.6	0.4	10.5	25.0	4.3	14.1
Effort	1.8	1.9	14.8	1.1	11.9	14.8	6.6	21.1
CPUE	308	269	852	308	863	1895	654	648
1982								
Catch	1.7	1.6	8.6	0.8	5.1	13.1	2.8	7.3
Effort	3.9	4.7	14.2	2.6	9.8	15.7	6.2	18.0
CPUE	412	330	607	295	524	922	447	403
1983								
Catch	1.4	0.8	3.9	0.7	4.9	9.9	2.5	6.6
Effort	4.3	3.3	9.1	2.3	11.2	10.3	4.7	14.6
CPUE	326	242	43	310	439	962	526	452
1984								
Catch	1.3	0.9	7.1	0.8	6.6	15.3	2.7	5.2
Effort	3.4	3.9	9.8	2.4	11.2	18.6	4.7	14.2
CPUE	395	224	718	295	587	819	575	366
1985								
Catch	2.0	1.4	10.9	0.6	6.1	14.0	-	-
Effort	4.4	3.8	11.1	1.5	9.7	15.2	-	-
CPUE	459	353	982	389	625	918	-	-

Table 2. Results of paired comparisons test of monthly brown shrimp a) catch, b) effort and c) CPUE data, September 1984-April 1985, from Louisiana (statistical subareas 13-17 combined) and Texas (statistical subareas 18-21 combined).

A. Catch.

<u>Source of Variation</u>	<u>Degrees of Freedom</u>	<u>Sum of Squares</u>	<u>F</u>	<u>P</u>
Areas	1	732,308.	3.488	n.s.*
Months	7	3,075,708.	2.093	n.s.
<u>Error</u>	<u>7</u>	<u>1,469,632.</u>		
<u>Total</u>	<u>15</u>	<u>5,469,632</u>		

B. Effort.

Areas	1	4,090,548.	4.381	n.s.
Months	7	9,468,346.	1.207	n.s.
<u>Error</u>	<u>7</u>	<u>7,844,258.</u>		
<u>Total</u>	<u>15</u>	<u>22,222,152</u>		

C. Catch per unit effort (CPUE).

Areas	1	74,666.	5.852	<0.05
Months	7	162,386.	1.818	n.s.
<u>Error</u>	<u>7</u>	<u>89.309.</u>		
<u>Total</u>	<u>15</u>	<u>326,361</u>		

*n.s. not significant

Table 3. Results of t-tests comparing recent (July 1984–April 1985) monthly catch, efforts and CPUE's with their respective historical (1960–1979) monthly means for the brown shrimp fishery off Texas (statistical subareas 18–21 combined).

A negative sign for a t-test indicates the historical mean was larger than the recent month's value.

A. Catch (lbs x 1000)

<u>Month</u>	<u>Recent</u>	<u>1960–1979</u>		<u>df</u>	<u>t-value</u>	<u>Probability</u>
		<u>Mean</u>	<u>Std. Dev.</u>			
Jul	8780	6220	2094	19	1.193	n.s.
Aug	6490	6320	1918	19	0.086	n.s.
Sep	2239	4555	1623	19	-1.392	n.s.
Oct	1687	2894	1085	19	-1.085	n.s.
Nov	1306	1798	729	19	-0.659	n.s.
Dec	1592	1237	542	19	0.640	n.s.
Jan	408	508	263	19	-0.371	n.s.
Feb	305	370	194	19	-0.326	n.s.
Mar	238	296	144	19	-0.393	n.s.
Apr	409	345	122	19	0.510	n.s.

B. Effort (days)

Jul	8175	6954	1315	19	0.906	n.s.
Aug	8978	8475	1177	19	0.417	n.s.
Sep	3962	6455	1635	19	-1.488	n.s.
Oct	3198	4818	1397	19	-1.132	n.s.
Nov	2798	3224	1366	19	-0.304	n.s.
Dec	4338	2452	1021	19	1.803	n.s.
Jan	1141	1350	640	19	-0.319	n.s.
Feb	938	1201	705	19	-0.364	n.s.
Mar	890	1061	558	19	-0.299	n.s.
Apr	878	1459*	677	18	-0.836	n.s.

C. CPUE (lbs/day)

Jul	1074	907	275	19	0.593	n.s.
Aug	723	747	204	19	-0.115	n.s.
Sep	565	700	160	19	-0.822	n.s.
Oct	527	610	151	19	-0.536	n.s.
Nov	467	584	150	19	-0.759	n.s.
Dec	367	520	134	19	-1.114	n.s.
Jan	358	393	119	19	-0.287	n.s.
Feb	326	361	185	19	-0.185	n.s.
Mar	267	289	83	19	-0.257	n.s.
Apr	465	259*	65	18	3.105	<0.01

2-tailed. $t_{0.05}(18) = 2.101$ $t_{0.01}(18) = 2.878$

2-tailed. $t_{0.05}(19) = 2.093$ $t_{0.01}(19) = 2.861$

*No data for 1975.

Table 4. Results of t-tests comparing recent (July 1984-April 1985) monthly catch, efforts and CPUE's for the brown shrimp fishery off Texas (statistical subareas 18-21 combined) with their respective monthly means from the five years (1975-1979) just prior to the implementation of the Texas Closure of the Fishery Conservation Zone.

A. Catch (lbs x 1000).

<u>Month</u>	<u>Recent</u>	<u>1975-1979</u>		<u>df</u>	<u>t-value</u>	<u>Probability</u>
		<u>Mean</u>	<u>Std. Dev.</u>			
Jul	8780	6022	1704	4	1.478	n.s.
Aug	6490	5694	1669	4	0.435	n.s.
Sep	2239	3923	1508	4	-1.019	n.s.
Oct	1687	2746	677	4	-1.428	n.s.
Nov	1306	1989	430	4	-1.450	n.s.
Dec	1592	1121	387	4	1.111	n.s.
Jan	408	570	237	4	-0.624	n.s.
Feb	305	485	195	4	-0.843	n.s.
Mar	238	290	170	4	-0.279	n.s.
Apr	409	377	99	4	0.295	n.s.

B. Effort (days)

Jul	8175	6566	949	4	1.548	n.s.
Aug	8978	8153	1067	4	0.706	n.s.
Sep	3962	6043	1741	4	-1.091	n.s.
Oct	3198	5769	1016	4	-2.310	n.s.
Nov	2798	4309	1440	4	-0.958	n.s.
Dec	4338	3041	765	4	1.548	n.s.
Jan	1141	1684	552	4	-0.898	n.s.
Feb	938	1679	580	4	-1.166	n.s.
Mar	890	1268	620	4	-0.557	n.s.
Apr	879	1739*	253	4	-3.103	<0.05

C. CPUE (lbs/day)

Jul	1074	909	171	4	0.881	n.s.
Aug	723	689	134	4	0.232	n.s.
Sep	565	634	123	4	-0.512	n.s.
Oct	527	479	80	4	0.548	n.s.
Nov	467	476	77	4	-0.107	n.s.
Dec	367	365	91	4	0.020	n.s.
Jan	358	330	84	4	0.304	n.s.
Feb	326	283	78	4	0.503	n.s.
Mar	267	219	58	4	0.755	n.s.
Apr	465	234*	38	4	5.549	<0.01

2-tailed. $t_{0.05(4)} = 2.776$ $t_{0.01(4)} = 4.604$

*No data for 1975, used, 1974 data.

Table 5a. Percent of (inshore and offshore) Texas, Louisiana, Mississippi, Alabama and Florida landings caught off each state in 1985.

Percent of Texas landings caught off each state				
State	Time Periods			
Caught	June 1-30	July 1-15	July 16-31	August 1-31
TX	60.5	74.5	96.3	86.8
LA	39.5	25.5	3.7	13.2
MS	0.0	0.0	0.0	0.0
AL	0.0	0.0	0.0	0.0
FL	0.0	0.0	0.0	0.0
Million Pounds	3.4	2.6	7.4	8.5

Percent of Louisiana landings caught off each state				
State	Time Periods			
Caught	June 1-30	July 1-15	July 16-31	August 1-31
TX	0.0	1.5	21.0	6.1
LA	98.5	98.1	77.9	93.6
MS	1.5	0.4	1.1	0.3
AL	0.0	0.0	0.0	0.0
FL	0.0	0.0	0.0	0.0
Million Pounds	13.2	2.7	3.3	5.0

Table 5a. continued

Percent of Mississippi landings caught off each state				
State	Time Periods			
Caught	June 1-30	July 1-15	July 16-31	August 1-31
TX	0.2	0.0	0.0	1.1
LA	73.4	69.4	66.3	60.2
MS	26.2	30.6	33.7	38.7
AL	0.0	0.0	0.0	0.0
FL	0.2	0.0	0.0	0.0
Million Pounds	3.1	0.3	1.1	0.9

Percent of Alabama landings caught off each state				
State	Time Periods			
Caught	June 1-30	July 1-15	July 16-31	August 1-31
TX	0.0	0.0	23.7	16.5
LA	9.6	12.5	16.9	12.1
MS	66.4	51.0	33.2	61.3
AL	23.7	36.5	26.2	10.0
FL	0.3	0.0	0.0	0.0
Million Pounds	2.6	0.6	0.8	1.2

Percent of Florida landings caught off each state				
State	Time Periods			
Caught	June 1-30	July 1-15	July 16-31	August 1-31
TX	0.0	1.4	7.6	7.5
LA	1.3	0.0	0.0	0.5
MS	5.7	0.9	0.2	7.5
AL	16.5	6.2	13.7	5.7
FL	76.4	91.5	78.5	78.8
Million Pounds	1.4	0.2	0.5	0.7

Table 5b. Percent of offshore Texas, Louisiana, Mississippi, Alabama and Florida landings caught off each state in 1985.

Percent of Texas landings caught off each state offshore				
State	Time Periods			
Caught	June 1-30	July 1-15	July 16-31	August 1-31
TX	10.7	73.3	95.5	83.4
LA	89.3	26.7	4.5	16.5
MS	0.0	0.0	0.0	0.0
AL	0.0	0.0	0.0	0.0
FL	0.0	0.0	0.0	0.0
Thousand Pounds	1,484.4	2,521.7	6,250.0	6,816.2

Percent of Louisiana landings caught off each state offshore				
State	Time Periods			
Caught	June 1-30	July 1-15	July 16-31	August 1-31
TX	0.0	2.8	25.5	8.4
LA	95.7	96.4	73.0	91.1
MS	4.3	0.8	1.5	0.4
AL	0.0	0.0	0.0	0.0
FL	0.0	0.0	0.0	0.0
Thousand Pounds	4,578.1	1,441.5	2,563.8	3,586.4

Table 5b. continued

Percent of Mississippi landings caught off each state offshore				
State	Time Periods			
Caught	June 1-30	July 1-15	July 16-31	August 1-31
TX	0.0	0.0	0.0	4.0
LA	10.5	11.5	15.9	8.1
MS	86.8	88.5	84.1	87.9
AL	0.2	0.0	0.0	0.0
FL	2.5	0.0	0.0	0.0
Thousand Pounds	241.7	74.6	62.5	244.4

Percent of Alabama landings caught off each state offshore				
State	Time Periods			
Caught	June 1-30	July 1-15	July 16-31	August 1-31
TX	0.0	0.0	43.6	21.1
LA	2.2	0.0	14.8	8.8
MS	97.2	100.0	41.6	69.7
AL	0.0	0.0	0.0	0.4
FL	0.6	0.0	0.0	0.0
Thousand Pounds	1,062.7	186.9	446.4	955.6

Percent of Florida landings caught off each state offshore				
State	Time Periods			
Caught	June 1-30	July 1-15	July 16-31	August 1-31
TX	0.0	1.8	11.1	10.0
LA	0.4	0.0	0.0	0.7
MS	7.4	1.2	0.3	0.7
AL	5.8	0.0	0.0	0.0
FL	86.5	97.0	88.6	88.7
Thousand Pounds	1,075.8	198.6	342.7	525.7

Table 6a. Percent and total pounds landed in millions of pounds (inshore and offshore) by vessels and boats from Louisiana and Texas from June through August 1985.

Home Port	Area Landed	Area Fished	Pounds Landed	Landing in State	% Total Pounds
June 1-30, 1985					
LA	LA	LA	10.25	13.19	78
TX	LA	LA	.30	13.19	2
Other*	LA	LA	.35	13.19	3
Unknown**	LA	LA	2.10	13.19	15
LA	TX	LA	.06	3.41	2
TX	TX	LA	1.03	3.41	30
Other	TX	LA	.06	3.41	2
Unknown	TX	LA	.17	3.41	5
LA	TX	TX	-	3.41	-
TX	TX	TX	1.09	3.41	32
Other	TX	TX	-	3.41	-
Unknown	TX	TX	.93	3.41	27
Unknown	TX	Unknown	.05	3.41	2
July 1-15, 1985					
LA	LA	LA	1.84	2.69	68
TX	LA	LA	.08	2.69	3
Other	LA	LA	.14	2.69	5
Unknown	LA	LA	.57	2.69	21
LA	TX	LA	0.04	2.68	2
TX	TX	LA	.44	2.68	16
Other	TX	LA	.10	2.68	4
Unknown	TX	LA	.09	2.68	4
LA	TX	TX	.09	2.68	3
TX	TX	TX	1.169	2.68	43
Other	TX	TX	.40	2.68	15
Unknown	TX	TX	.29	2.68	11

Table 6a. continued.

Home Port	Area Landed	Area Fished	Pounds Landed	Landing in State	% Total Pounds
July 16-31, 1985					
LA	LA	LA	1.51	3.30	46
TX	LA	LA	.08	3.30	2
Other	LA	LA	.16	3.30	5
Unknown	LA	LA	.82	3.30	24
LA	LA	TX	.36	3.30	11
TX	LA	TX	.04	3.30	1
Other	LA	TX	.12	3.30	4
Unknown	LA	TX	.17	3.30	5
LA	TX	LA	.04	7.56	1
TX	TX	LA	.14	7.56	2
Other	TX	LA	.04	7.56	1
Unknown	TX	LA	.06	7.56	1
LA	TX	TX	.33	7.56	4
TX	TX	TX	4.36	7.56	57
Other	TX	TX	1.09	7.56	15
Unknown	TX	TX	1.39	7.56	18
August 1-31, 1985					
LA	LA	LA	3.01	4.97	61
TX	LA	LA	.12	4.97	2
Other	LA	LA	.33	4.97	7
Unknown	LA	LA	1.19	4.97	24
LA	LA	TX	.21	4.97	4
Unknown	LA	TX	.07	4.97	2
LA	TX	LA	.08	8.65	1
TX	TX	LA	.65	8.65	8
Other	TX	LA	.16	8.65	2
Unknown	TX	LA	.23	8.65	3
LA	TX	TX	.23	8.65	3
TX	TX	TX	4.60	8.65	53
Other	TX	TX	.88	8.65	10
Unknown	TX	TX	1.70	8.65	20

*Other home port vessels from other states Florida, Mississippi and Alabama.

**Unknown consolidated vessels and boats, mostly inshore boats.

Table 6b. Percent and total pounds landed in millions of pounds (offshore only) by vessels and boats from Louisiana and Texas from June through August 1985.

Home Port	Area Landed	Area Fished	Pounds Landed	Landing in State	% Total Pounds
June 1-30, 1985					
LA	LA	LA	3.4	4.6	73
TX	LA	LA	.3	4.6	6
Other*	LA	LA	.3	4.6	7
Unknown**	LA	LA	.4	4.6	9
LA	TX	LA	.06	1.5	4
TX	TX	LA	1.1	1.5	72
Other	TX	LA	.06	1.5	4
Unknown	TX	LA	.09	1.5	6
LA	TX	TX	-	1.5	-
TX	TX	TX	.1	1.5	6
Other	TX	TX	-	1.5	-
Unknown	TX	TX	.05	1.5	3
July 1-15, 1985					
LA	LA	LA	1.1	1.4	73
TX	LA	LA	.07	1.4	5
Other	LA	LA	.1	1.4	9
Unknown	LA	LA	.1	1.4	8
LA	TX	LA	.04	2.5	2
TX	TX	LA	.5	2.5	19
Other	TX	LA	.1	2.5	4
Unknown	TX	LA	.05	2.5	2
LA	TX	TX	.09	2.5	3
TX	TX	TX	1.2	2.5	47
Other	TX	TX	.4	2.5	16
Unknown	TX	TX	.1	2.5	5

Table 6b. continued.

Home Port	Area Landed	Area Fished	Pounds Landed	Landing in State	% Total Pounds
July 16-31, 1985					
LA	LA	LA	1.5	2.6	57
TX	LA	LA	.07	2.6	3
Other	LA	LA	.2	2.6	6
Unknown	LA	LA	.2	2.6	7
LA	LA	TX	.4	2.6	17
TX	LA	TX	.04	2.6	2
Other	LA	TX	.1	2.6	5
Unknown	LA	TX	.07	2.6	3
LA	TX	LA	.04	6.3	1
TX	TX	LA	.1	6.3	2
Other	TX	LA	.04	6.3	1
Unknown	TX	LA	.06	6.3	1
LA	TX	TX	.3	6.3	5
TX	TX	TX	4.1	6.3	64
Other	TX	TX	1.1	6.3	17
Unknown	TX	TX	.5	6.3	7
August 1-31, 1985					
LA	LA	LA	2.6	3.6	73
TX	LA	LA	.1	3.6	3
Other	LA	LA	.3	3.6	9
Unknown	LA	LA	.2	3.6	6
LA	LA	TX	.3	3.6	7
TX	LA	TX	.0	3.6	0
Other	LA	TX	.01	3.6	1
Unknown	LA	TX	.0	3.6	0
LA	TX	LA	.08	6.8	1
TX	TX	LA	.8	6.8	12
Other	TX	LA	.2	6.8	2
Unknown	TX	LA	.08	6.8	2
LA	TX	TX	.2	6.8	3
TX	TX	TX	4.1	6.8	60
Other	TX	TX	.8	6.8	13
Unknown	TX	TX	.4	6.8	6

*Other home port vessels from other states Florida, Mississippi and Alabama.

**Unknown vessels and boats.

Table 7. Galveston Bay bait shrimp index from 1960 through 1985.

Year	Bait Index	Predicted catch	Actual Texas Offshore catch July-June in millions of lbs	Difference in million of lbs
1960	53.6	29.1	34.5	+ 5.4
1961	20.8	20.0	13.2	- 6.8
1962	26.1	21.5	17.3	- 4.2
1963	53.0	29.0	24.6	- 4.4
1964	30.2	22.6	18.6	- 3.9
1965	41.0	25.6	26.5	+ 0.9
1967	89.4	39.0	42.7	+ 3.7
1968	28.0	22.0	27.9	+ 5.9
1969	43.5	26.3	24.7	- 1.6
1970	70.0	33.7	30.7	- 3.0
1971	82.3	37.1	34.5	- 2.6
1972	85.6	38.0	35.5	- 2.5
1973	18.7	19.4	23.3	+ 3.9
1974	34.3	23.8	26.4	+ 2.6
1976	34.1	23.6	25.7	+ 2.1
1977	58.1	30.3	34.4	+ 4.0
1978	40.5	25.5	27.7	+ 2.2
1980	45.0	26.7	25.7	- 1.0
1981	54.3	29.3	40.0	+10.7
1982	26.3	21.5	21.8	+ 0.3
1983	12.7	17.8	18.1	+ 0.3
1984	31.2	22.9	24.1	+ 1.2
1985	44.9*	29.0		

*Modified index.

Table 8. Weekly brown shrimp catch (C), discard (D), and percent discarded (%D) in 1985 by Texas statistical subarea (SS), unloading dates, and depth zones (in 5-fm increments, where zone 1 = 1-5 fm). Catch and discard for the 575 trips interviewed are given in pounds, heads off.

SS	Unloading Dates	Data	Depth Zones							
			1 & 2	3	4	5	6	7	8	9 & 10
18	7/8-14	C	0	0	0	351	0	0	0	0
		D	0	0	0	0	0	0	0	0
		%D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	7/15-21	C	0	0	7,335	0	585	0	0	0
		D	0	0	2,162	0	306	0	0	0
		%D	0.0	0.0	22.8	0.0	34.3	0.0	0.0	0.0
	7/22-28	C	0	0	6,200	0	2,439	0	0	2,163
		D	0	0	0	0	16	0	0	26
		%D	0.0	0.0	0.0	0.0	0.7	0.0	0.0	1.0
	7/29-8/4	C	0	0	4,120	1,821	908	5,440	223	0
		D	0	0	23	180	0	0	87	0
		%D	0.0	0.0	0.6	9.0	0.0	0.0	28.1	0.0
	8/5-11	C	0	0	1,878	0	6,446	6,296	2,288	1,282
		D	0	0	0	0	0	0	0	0
		%D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	8/12-18	C	1,320	0	8,591	2,678	1,819	953	3,945	3,399
		D	0	0	0	0	0	0	0	0
		%D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	<u>Total</u>	C	1,320	0	28,124	4,850	12,197	12,689	6,456	7,294
		D	0	0	2,185	180	322	0	87	26
		%D	0.0	0.0	7.2	3.6	2.6	0.0	1.3	0.4
19	7/8-14	C	0	0	7,072	0	4,547	0	0	0
		D	16	0	2,477	0	0	0	0	0
		%D	100.0	0.0	25.9	0.0	0.0	0.0	0.0	0.0
	7/15-21	C	20,255	0	35,924	10,250	9,106	5,136	0	9,369
		D	855	0	4,655	1,095	3,472	134	0	5,525
		%D	4.1	0.0	11.5	9.7	27.6	2.5	0.0	37.1
	7/22-28	C	5,927	0	10,939	6,782	15,331	530	2,476	3,284
		D	13	0	4,192	1,702	371	43	444	0
		%D	0.2	0.0	0.4	27.7	20.1	7.5	15.2	0.0

Table 8. continued.

SS	Unloading Dates	Data	Depth Zones								
			1 & 2	3	4	5	6	7	8	9 & 10	
19	7/29-8/4	C	0	0	22,527	5,559	10,985	6,321	10,118	8,667	
		D	0	0	69	180	57	19	87	0	
		%D	0.0	0.0	0.3	3.1	0.5	0.3	0.9	0.0	
	8/5-11	C	2,176	0	5,080	1,850	3,656	6,055	4,364	4,579	
		D	0	0	893	0	0	35	0	0	
		%D	0.0	0.0	15.0	0.0	0.0	0.6	0.0	0.0	
	8/12-18	C	0	0	13,859	9,148	5,652	7,894	12,358	5,948	
		D	0	0	0	0	0	0	0	35	
		%D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	
	<u>Total</u>	C	28,358	0	95,401	33,589	49,277	25,936	29,316	31,847	
		D	884	0	12,286	2,977	3,900	531	531	5,560	
		%D	3.02	0.0	11.4	8.1	7.3	0.9	1.8	14.9	
	20	7/8-14	C	3,691	0	11,435	9,291	2,110	473	0	0
			D	2,087	0	2,314	928	0	15	15	0
			%D	36.1	0.0	16.8	9.1	0.0	3.1	100.0	0.0
		7/15-21	C	9,907	0	79,378	47,624	16,646	4,740	3,919	0
			D	4,000	0	3,749	13,136	696	134	0	0
			%D	28.8	0.0	4.5	21.6	4.1	2.8	0.0	0.0
7/22-28		C	500	0	33,601	32,162	5,688	17,094	2,881	10,635	
		D	0	0	1,795	8,269	46	536	0	2,547	
		%D	0.0	0.0	5.1	20.5	0.8	3.0	0.0	19.3	
7/29-8/4		C	1,055	0	2,795	5,301	100	3,113	15,508	8,893	
		D	641	0	1,328	54	0	19	24	45	
		%D	37.8	0.0	32.2	1.0	0.0	0.6	0.2	0.5	
8/5-11		C	2,314	0	12,075	7,518	14,403	0	1,000	6,960	
		D	0	0	0	30	457	0	0	0	
		%D	0.0	0.0	0.0	0.4	3.1	0.0	0.0	0.0	
8/12-18		C	0	0	3,002	5,811	450	4,043	2,302	1,037	
		D	0	0	38	0	31	0	0	0	
		%D	0.0	0.0	0.3	0.0	6.4	0.0	0.0	0.0	
<u>Total</u>	C	17,467	0	142,286	107,707	39,397	29,463	25,610	27,525		
	D	6,728	0	9,224	22,417	1,230	704	39	2,592		
	%D	27.8	0.0	6.1	17.2	3.0	2.3	0.2	8.6		

Table 8. continued.

SS	Unloading Dates	Data	Depth Zones							
			1 & 2	3	4	5	6	7	8	9 & 10
21	7/8-14	C	0	0	6,818	9,242	4,612	0	0	552
		D	0	0	0	4,313	2,773	0	0	0
		%D	0.0	0.0	0.0	31.8	37.6	0.0	0.0	0.0
	7/15-21	C	6,015	0	33,941	4,759	300	0	7,336	1,185
		D	2,170	0	7,353	1,897	1,427	0	25	1,155
		%D	26.5	0.0	17.8	28.5	82.6	0.0	0.3	49.4
	7/22-28	C	0	0	11,900	23,235	0	3,875	7,214	12,850
		D	0	0	327	697	27	0	802	2,472
		%D	0.0	0.0	2.7	2.9	100.0	0.0	10.0	16.1
	7/29-8/4	C	0	0	0	0	0	0	0	1,200
		D	0	0	350	0	0	0	0	0
		%D	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
	8/5-11	C	0	0	0	0	0	0	0	0
		D	0	0	0	30	0	0	0	0
		%D	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
	8/12-18	C	0	0	0	0	0	0	0	0
		D	0	0	0	0	0	0	0	0
		%D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	<u>Total</u>	C	6,015	0	52,659	37,236	4,912	3,875	14,550	15,787
		D	2,170	0	8,030	6,937	4,227	0	827	3,627
		%D	26.5	0.0	13.2	15.7	46.3	0.0	5.4	18.7
18-21	7/8-14	C	3,691	0	25,325	18,884	11,269	473	0	552
		D	2,103	0	4,791	5,241	2,773	15	15	0
		%D	36.3	0.0	15.9	21.7	19.8	3.1	100.0	0.0
	7/15-21	C	36,177	0	156,578	62,633	26,637	9,876	11,255	10,554
		D	7,025	0	17,919	16,128	5,901	268	25	6,680
		%D	16.3	0.0	10.3	20.5	18.1	2.6	0.2	38.8
	7/22-28	C	6,427	0	62,640	62,179	23,458	21,499	12,571	29,382
		D	13	0	6,314	10,668	460	579	1,246	5,045
		%D	0.2	0.0	9.2	14.6	1.9	2.6	9.2	14.7
	7/29-8/4	C	1,055	0	29,442	12,681	11,993	14,874	25,849	18,760
		D	641	0	1,770	414	57	38	198	45
		%D	37.8	0.0	5.7	3.2	0.5	0.3	0.8	0.2

Table 8. continued.

SS	Unloading		Depth Zones							
	Dates	Data	1 & 2	3	4	5	6	7	8	9 & 10
18-21	8/5-11	C	4,490	0	19,033	9,368	24,505	12,351	7,652	12,821
		D	0	0	893	60	457	35	0	0
		%D	0.0	0.0	4.5	0.6	1.8	0.3	0.0	0.0
	8/12-18	C	1,320	0	25,452	17,637	7,921	12,890	18,605	10,384
		D	0	0	38	0	31	0	0	35
		%D	0.0	0.0	0.2	0.0	0.4	0.0	0.0	0.3
<u>Grand Total</u>	C	53,160	0	318,470	183,382	105,783	71,963	75,932	82,453	
	D	9,782	0	31,725	32,511	9,679	935	1,484	11,805	
	%D	15.5	0.0	9.1	15.1	8.4	1.3	1.9	12.5	

Table 9. Summary of Texas brown shrimp catch and discard (lbs, heads off) by unloading date and statistical subarea of fishing activity as determined by trips interviewed between July 8-August 18, 1985. These 575 trip interviews consist solely of replies stating whether or not shrimp were discarded and, if so, how much. N = number of trips interviewed, %D = % discard.

Unloading Dates	Fishing Area	Weekly				Cumulative			
		N	Catch	Discard	%D	N	Catch	Discard	%D
7/8-14	18	3	351	0	0.0	-	-	-	-
	19	9	11,619	2,493	17.7	-	-	-	-
	20	19	27,000	5,359	16.6	-	-	-	-
	21	12	21,224	7,086	25.0	-	-	-	-
	18-21	43	60,194	14,938	19.9	-	-	-	-
7/15-21	18	6	7,920	2,468	23.8	9	8,271	2,468	23.0
	19	44	90,040	15,736	14.9	53	101,659	18,229	15.2
	20	75	162,214	21,715	11.8	94	189,214	27,074	12.5
	21	29	53,536	14,027	20.8	41	74,760	21,113	22.0
	18-21	154	313,710	53,946	14.7	197	373,904	68,884	15.6
7/22-28	18	5	11,252	42	0.4	14	19,523	2,510	11.4
	19	37	45,269	6,765	13.0	90	146,928	24,994	14.5
	20	46	102,561	13,193	11.4	140	291,775	40,267	12.1
	21	23	59,074	4,325	6.8	64	133,834	25,438	16.0
	18-21	111	218,156	24,325	10.0	308	592,060	93,209	13.6
7/29-8/4	18	10	12,512	290	2.3	24	32,035	2,800	8.0
	19	42	64,177	412	0.6	132	211,105	25,406	10.7
	20	40	36,765	2,111	5.4	180	328,540	42,378	11.4
	21	7	1,200	350	22.6	71	135,034	25,788	16.0
	18-21	99	114,654	3,163	2.7	407	706,714	96,372	12.0
8/5-11	18	11	18,190	0	0.0	35	50,225	2,800	5.3
	19	26	27,760	928	3.2	158	238,865	26,334	9.9
	20	33	44,270	487	1.1	213	372,810	42,865	10.3
	21	4	0	30	100.0	75	135,034	25,818	16.1
	18-21	74	90,220	1,445	1.6	418	796,934	97,817	10.9
8/12-18	18	16	22,705	0	0.0	51	72,930	2,800	3.7
	19	45	54,859	35	0.1	203	293,724	26,369	8.2
	20	33	16,645	69	0.4	246	389,455	42,934	9.9
	21	0	0	0	0.0	75	135,034	25,818	16.1
	18-21	94	94,209	104	0.1	575	891,143	97,921	9.9

Table 10. Summary of Texas brown shrimp catch (lbs, heads off) by trips interviewed with no information on discarding and by trips recorded by dealers which were not interviewed at all during the period July 8-August 18, 1985. Fishing area = statistical subarea, N = number of trips.

Unloading Dates	Fishing Area	Interviews - No Discard Data				Dealer Records - No Interview			
		Weekly		Cumulative		Weekly		Cumulative	
		N	Catch	N	Catch	N	Catch	N	Catch
7/8-14	18	12	34,332	-	-	157	174,219	-	-
	19	28	54,950	-	-	77	127,118	-	-
	20	17	43,298	-	-	15	45,194	-	-
	21	78	260,862	-	-	22	81,415	-	-
	18-21	135	393,442	-	-	271	427,946	-	-
7/15-21	18	28	95,369	40	129,701	172	450,992	329	625,211
	19	58	215,212	86	270,162	143	595,277	220	722,395
	20	28	172,811	45	216,109	40	197,281	55	242,475
	21	124	643,509	202	904,371	33	166,765	55	248,180
	18-21	238	1,126,901	373	1,520,343	388	1,410,315	659	1,838,261
7/22-28	18	25	109,870	65	239,571	170	403,874	499	1,029,085
	19	45	183,044	131	453,206	101	430,586	321	1,152,981
	20	49	282,349	94	498,458	31	213,011	86	455,486
	21	80	534,033	282	1,438,404	31	77,860	86	326,040
	18-21	199	1,109,296	572	2,629,639	333	1,125,331	992	2,963,592
7/29-8/4	18	20	61,908	85	301,479	132	308,250	631	1,337,335
	19	46	201,230	177	654,436	466	546,213	787	1,699,194
	20	44	284,774	138	783,232	349	351,231	435	806,717
	21	62	330,153	344	1,768,557	24	47,300	110	373,340
	18-21	172	878,065	744	3,507,704	971	1,252,994	1,963	4,216,586
8/5-11	18	28	83,945	113	385,424	81	147,163	712	1,484,498
	19	55	191,027	232	845,463	92	277,392	879	1,976,586
	20	38	225,067	176	1,008,299	17	125,945	452	932,662
	21	55	285,328	399	2,053,885	14	17,925	124	391,265
	18-21	176	785,367	920	4,293,071	204	568,425	2,167	4,785,011
8/12-18	18	22	104,371	135	489,795	87	125,520	793	1,610,018
	19	83	286,391	315	1,131,854	136	276,054	1,015	2,252,640
	20	57	252,797	233	1,261,096	32	101,383	484	1,034,045
	21	80	338,019	479	2,391,904	21	31,390	145	422,655
	18-21	242	981,578	1,162	5,274,649	276	534,347	2,443	5,319,358

Table 11. Louisiana inshore brown shrimp catch 1985, in 1,000 pounds -
Mississippi River to Texas. Does not include pieces.

Size Count	May	June	July	August	Total
15			.9		.9
16-20					
21-25					
26-30		.2	.3		.5
31-40	.2	3.9	2.3		6.5
41-50	2.7	3.4	26.6	*	32.8
51-67	8.5	66.8	136.4		211.7
68-80	14.2	321.3	276.4		611.9
81-100	86.9	598.6	298.5		984.1
101-115	439.9	900.7	188.7		1,529.4
>116	2,418.6	2,843.3	164.9		5,431.8
Total	2,970.9	4,743.6	1,095.1	95.4	8,905.1

*No size class data available.

Table 12. Texas inshore brown shrimp catch 1985, in 1,000 pounds.

Size Count	May	June	July	Aug.	Total
15			.6		
16-20		.3	3.6		4.0
21-25			4.5		4.7
26-30	.6	.5	7.3	.5	8.9
31-40	8.3	3.1	46.7	58.8	117.0
41-50	8.7	11.5	87.6	141.8	249.6
51-67	29.9	109.7	183.4	79.8	402.8
68-80	22.1	51.2	294.9	34.6	402.9
81-100	124.5	94.9	321.0	18.4	558.9
101-115	611.9	421.4	199.4	9.5	1,242.2
116- >	1,102.0	1,167.1	102.1	11.5	2,382.8
Total	1,908.3	1,859.9	1,251.5	354.9	5,374.6

Table 13. May-August catch of brown shrimp in millions of pounds from inshore and offshore Louisiana waters in statistical subareas 13-17 and in Texas waters in statistical subareas 18-21.

Area	Years							
	1985	1984	1983	1982	1981	1980	1979	1978
Louisiana:								
Inshore	8.9	14.9	12.1	15.1	15.2	7.3	10.6	14.1
Offshore	16.9	13.6	8.8	13.7	23.1	11.7	19.3	24.5
Total	25.7	28.5	20.9	28.8	38.3	19.0	29.9	38.6
Texas:								
Inshore	5.4	7.1	5.9	4.1	4.2	4.5	2.0	2.0
Offshore	14.5	16.1	10.5	13.9	25.3	12.6	10.1	15.1
Total	19.9	23.5	16.4	18.0	29.5	17.1	14.2	17.1

Table 14. Percent by size class of brown shrimp caught in statistical subareas 18-21 in July from 1981-1985, and G-test comparisons.

Size class	YEAR				
	1981	1982	1983	1984	1985
	% By Size Class in July				
<15	-	0.4	0.9	-	0.8
16-20	0.6	1.5	0.6	0.6	1.2
21-25	3.4	4.6	1.6	3.3	2.6
26-30	9.3	10.0	3.5	11.4	6.1
31-40	46.2	45.9	43.5	55.1	33.4
41-50	21.4	18.3	30.0	16.7	27.3
51-67	14.3	13.0	14.5	10.2	21.6
>68	4.8	6.5	6.2	2.6	6.8
Average July size per pound	41.2	40.8	43.2	40.0	46.0
Average August size per pound	37.8	35.9	38.3	31.8	39.1
G-test comparison with 1985					
July	7.0	7.7	4.9	17.7*	
August	11.1	3.1	3.6	25.5**	

* $\chi^2_{.05(7)}=14.1$

** $\chi^2_{.01(7)}=18.5$

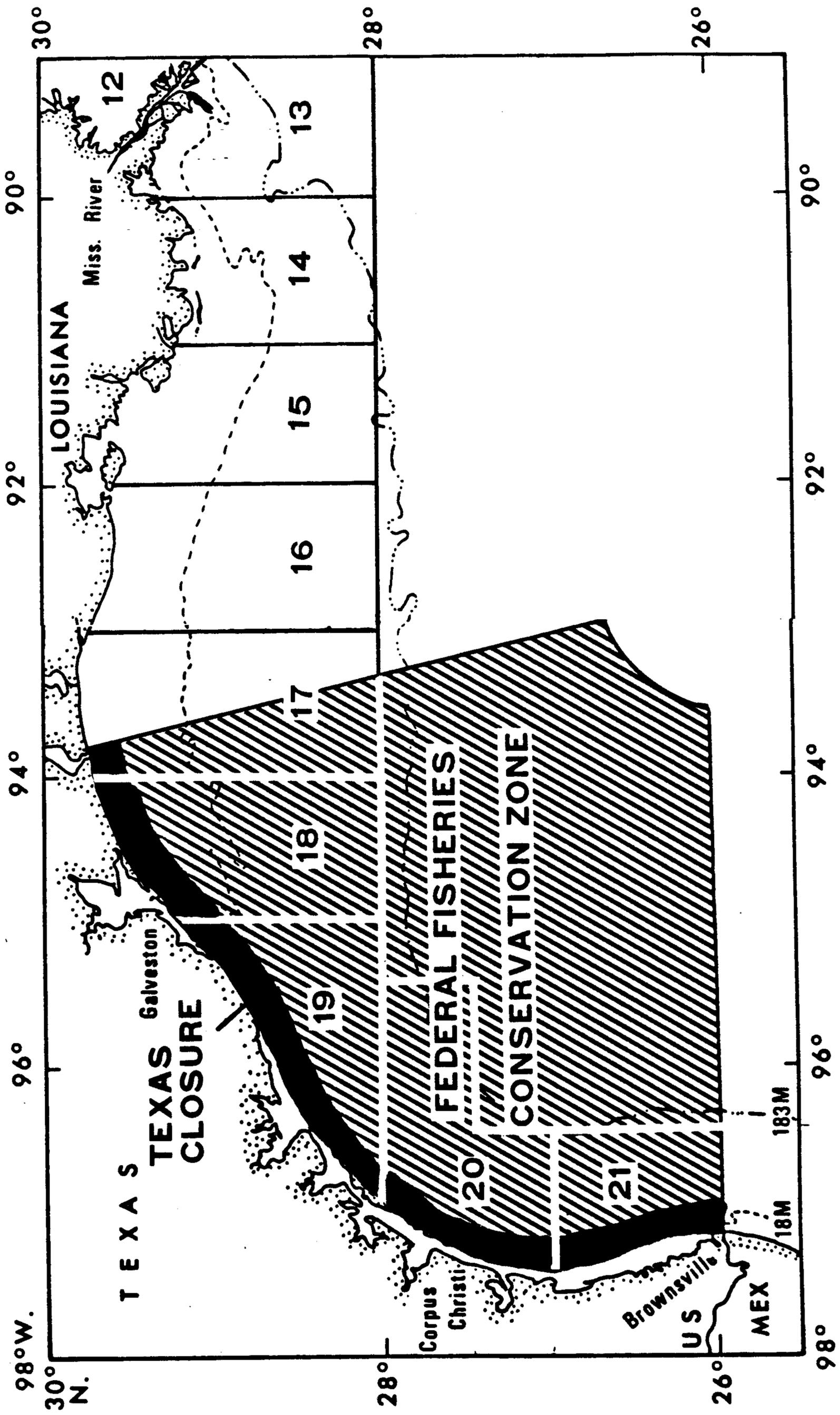


Figure 1. Location of statistical subareas and the Texas closure area.

**SUBAREAS 18-21
BIOLOGICAL YEAR 1984**

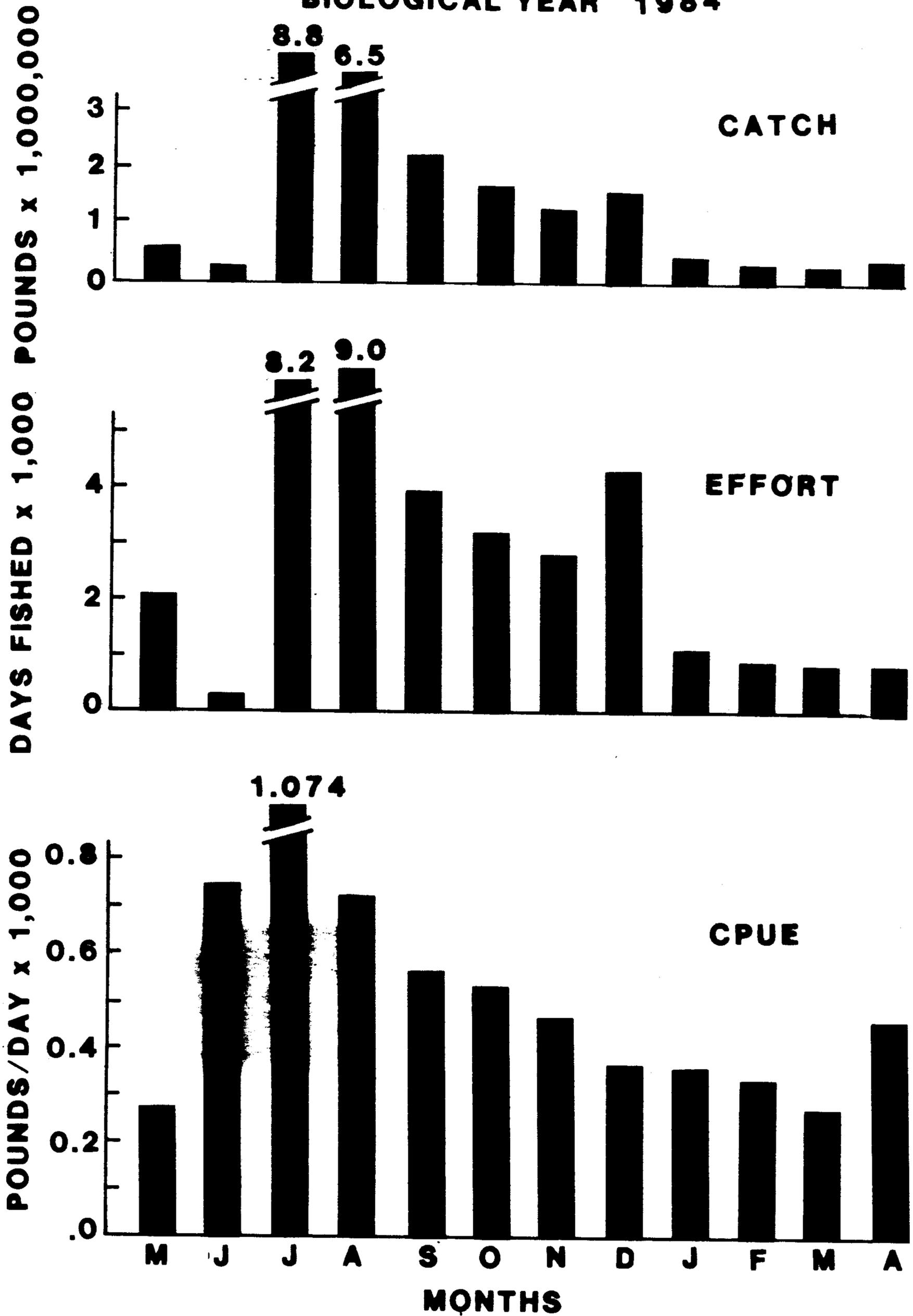


Figure 2. Commercial catch statistics from May 1984-April 1985 for statistical subareas 18-21 a) catch in millions of pounds, b) fishing effort in thousands of days fished and c) CPUE.

**SUBAREAS 13-17
BIOLOGICAL YEAR 1984**

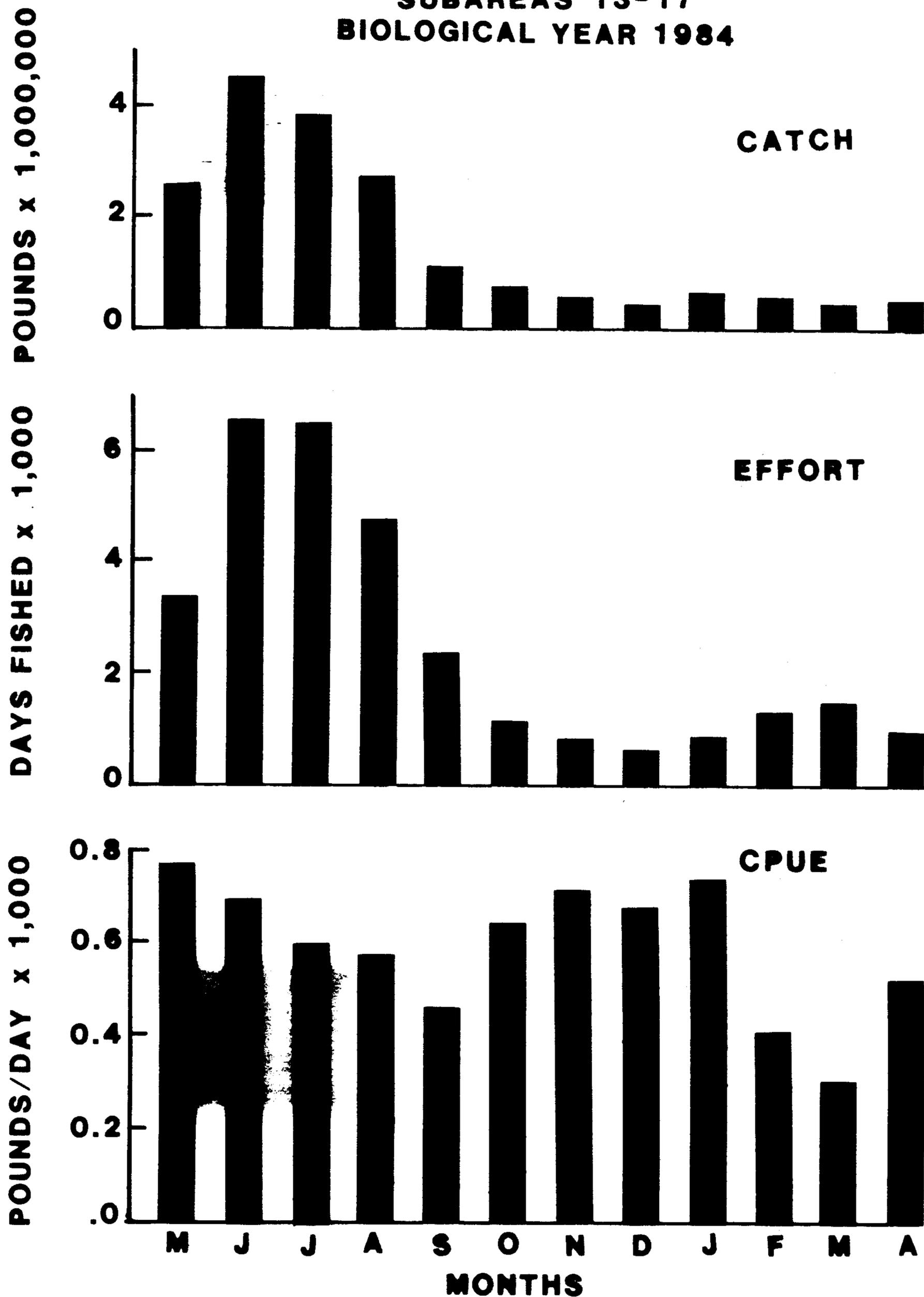


Figure 3. Commercial catch statistics from May 1984-April 1985 for statistical subareas 13-17 a) catch in millions of pounds b) fishing efforts in thousands of days and c) CPUE.

BROWN SHRIMP STATISTICAL SUBAREAS 18-21 OFFSHORE

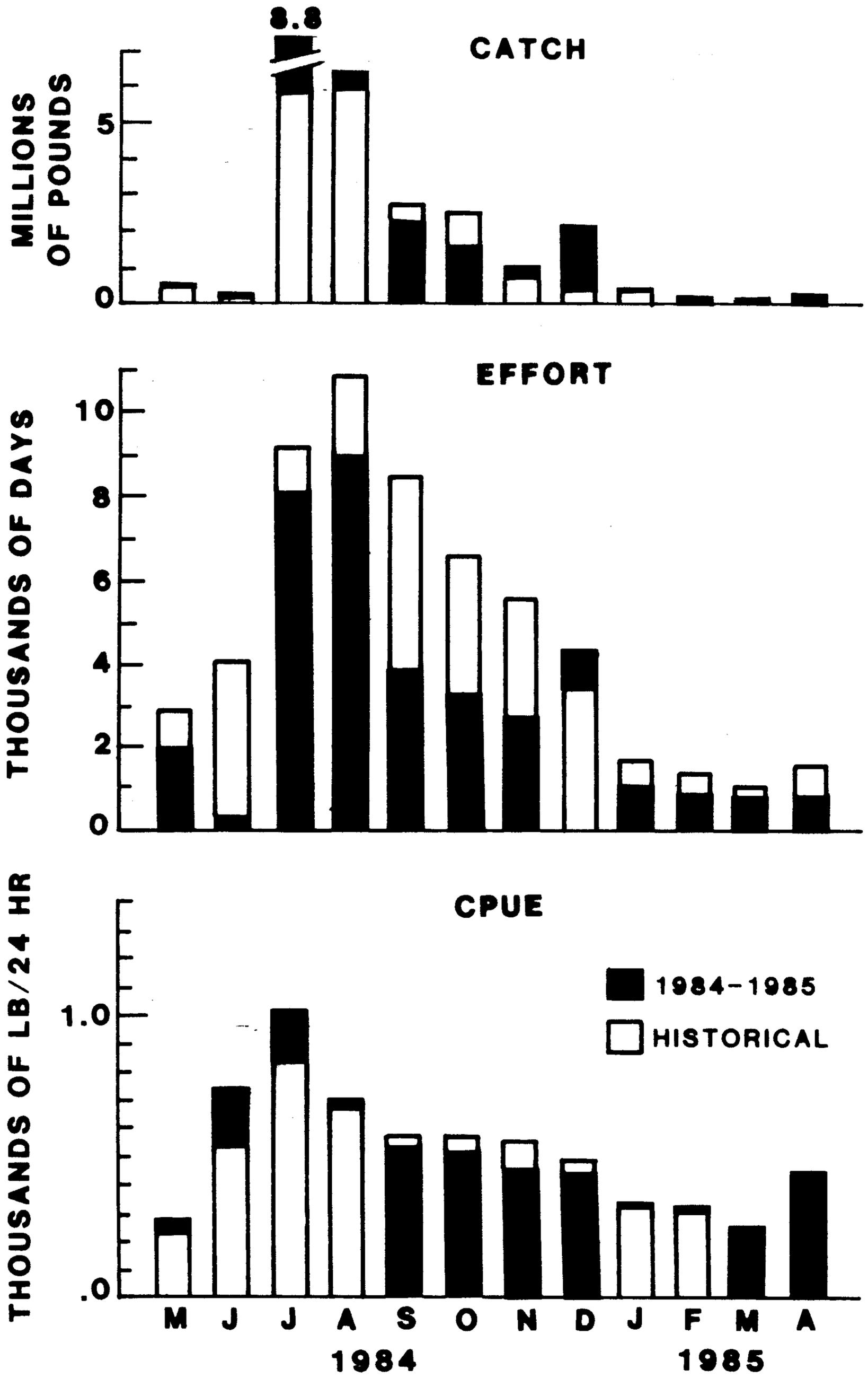


Figure 4. Average monthly historical commercial catch statistics with standard deviation (+) 1960-1981 and catch statistics from May 1984-April 1985 for Statistical subareas 10-21 a) catch in millions of pound, b) fishing effort in 1000s of days fished and c) CPUE.

SUBAREAS 18-21 INSHORE BROWN SHRIMP LANDINGS MAY-APRIL

12

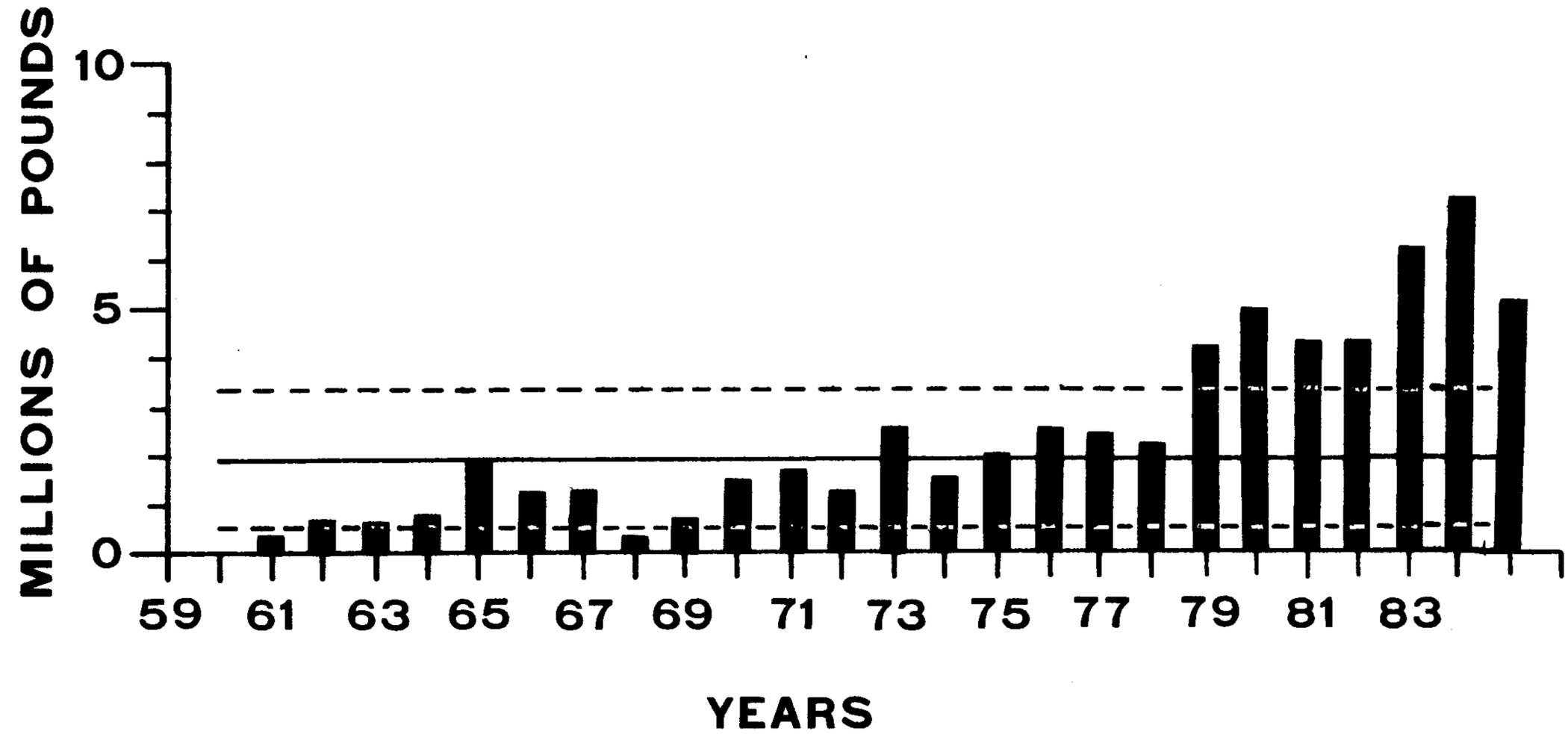


Figure 6. Annual inshore brown shrimp landings in Texas (solid line is average 1960-1983 and broken line is one standard deviation).

SUBAREAS 13-17 INSHORE BROWN SHRIMP LANDINGS MAY-APRIL

70

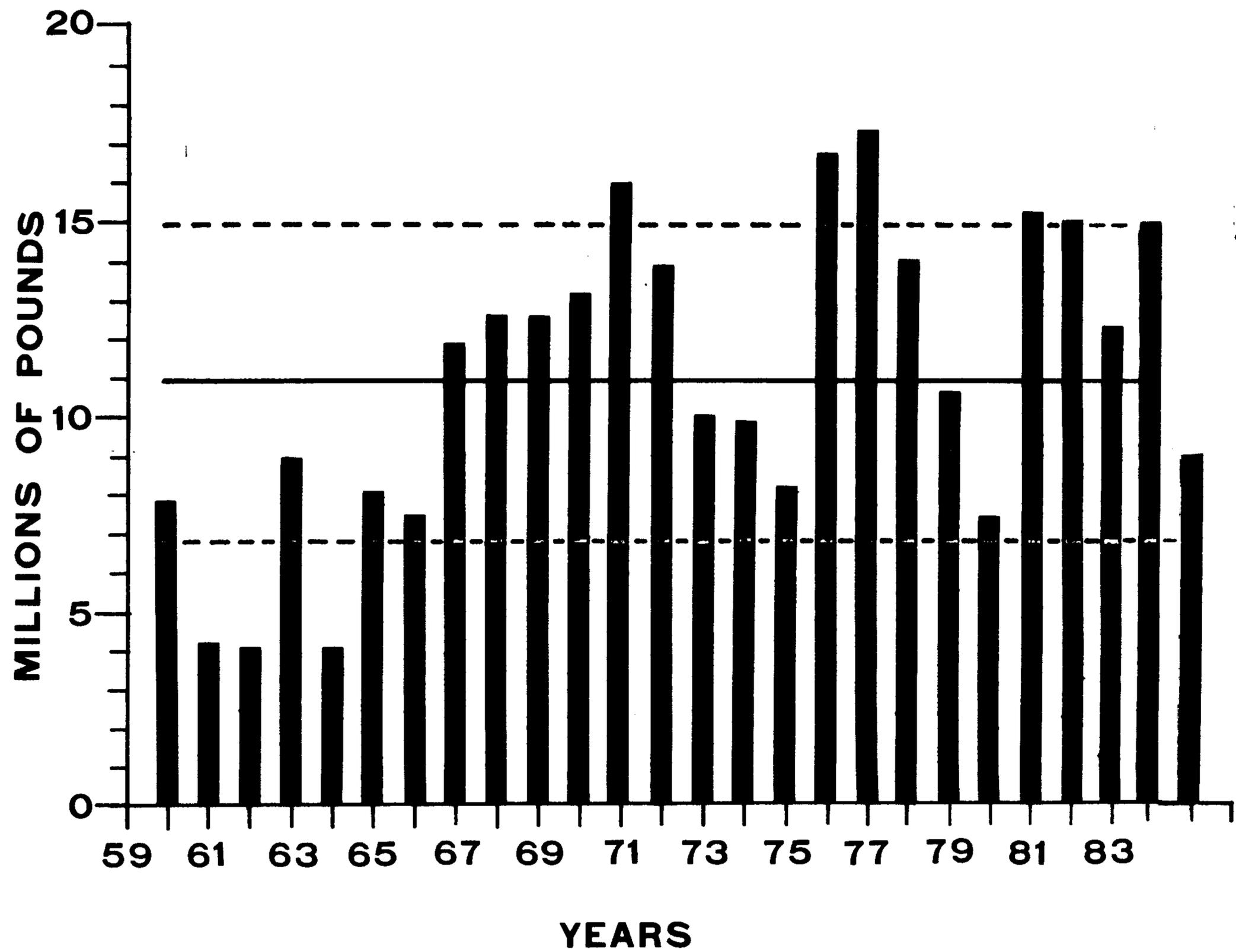


Figure 5. Annual inshore brown shrimp landings in Louisiana west of the Mississippi river (solid line is average 1960-1983 and broken line is standard deviation).

INSHORE BROWN SHRIMP 1985

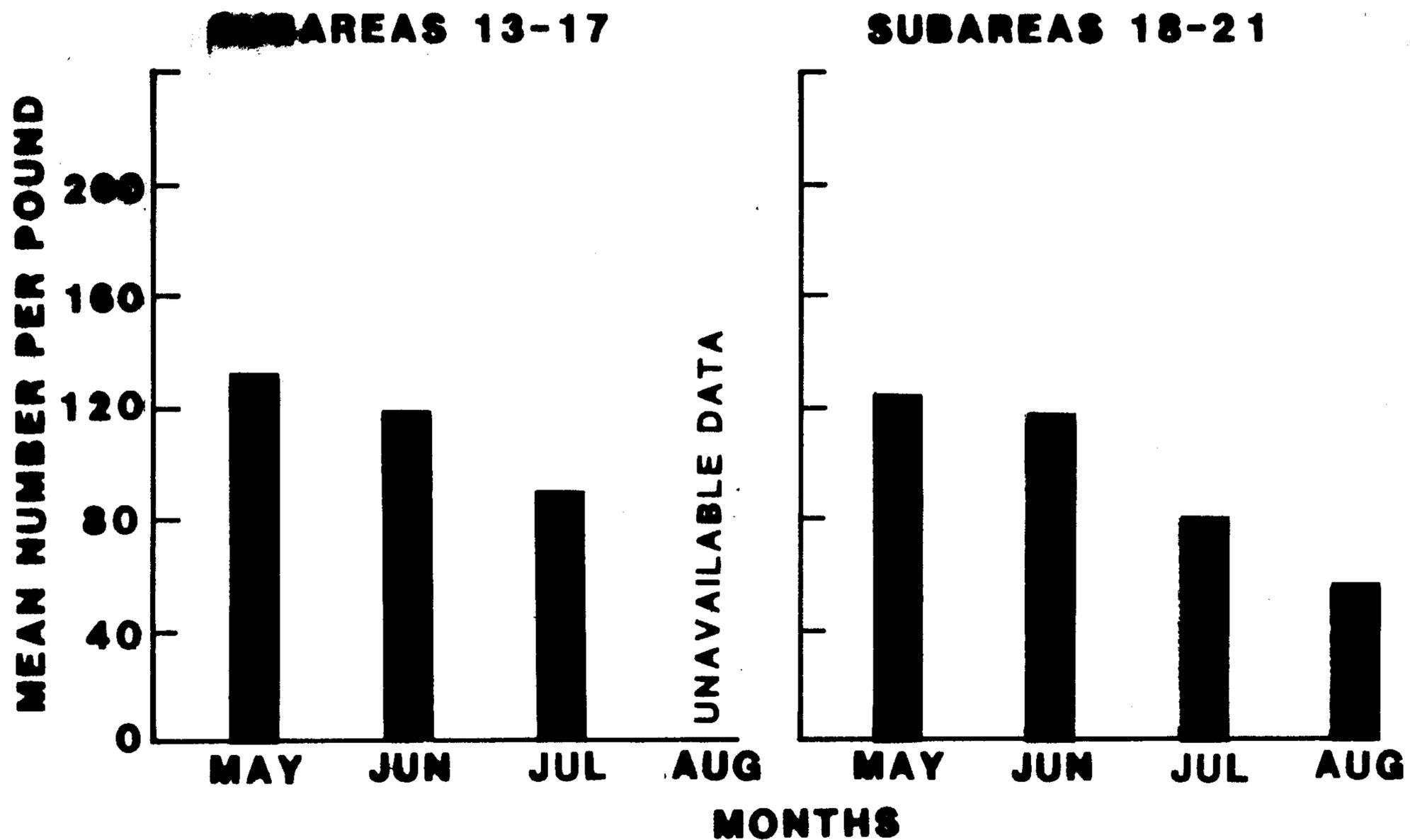


Figure 7. Average number of shrimp per pound caught in the inshore waters of a) Louisiana and b) Texas using size categories 15/116.

SUBAREAS 13-17 OFFSHORE BROWN SHRIMP LANDINGS MAY-APRIL

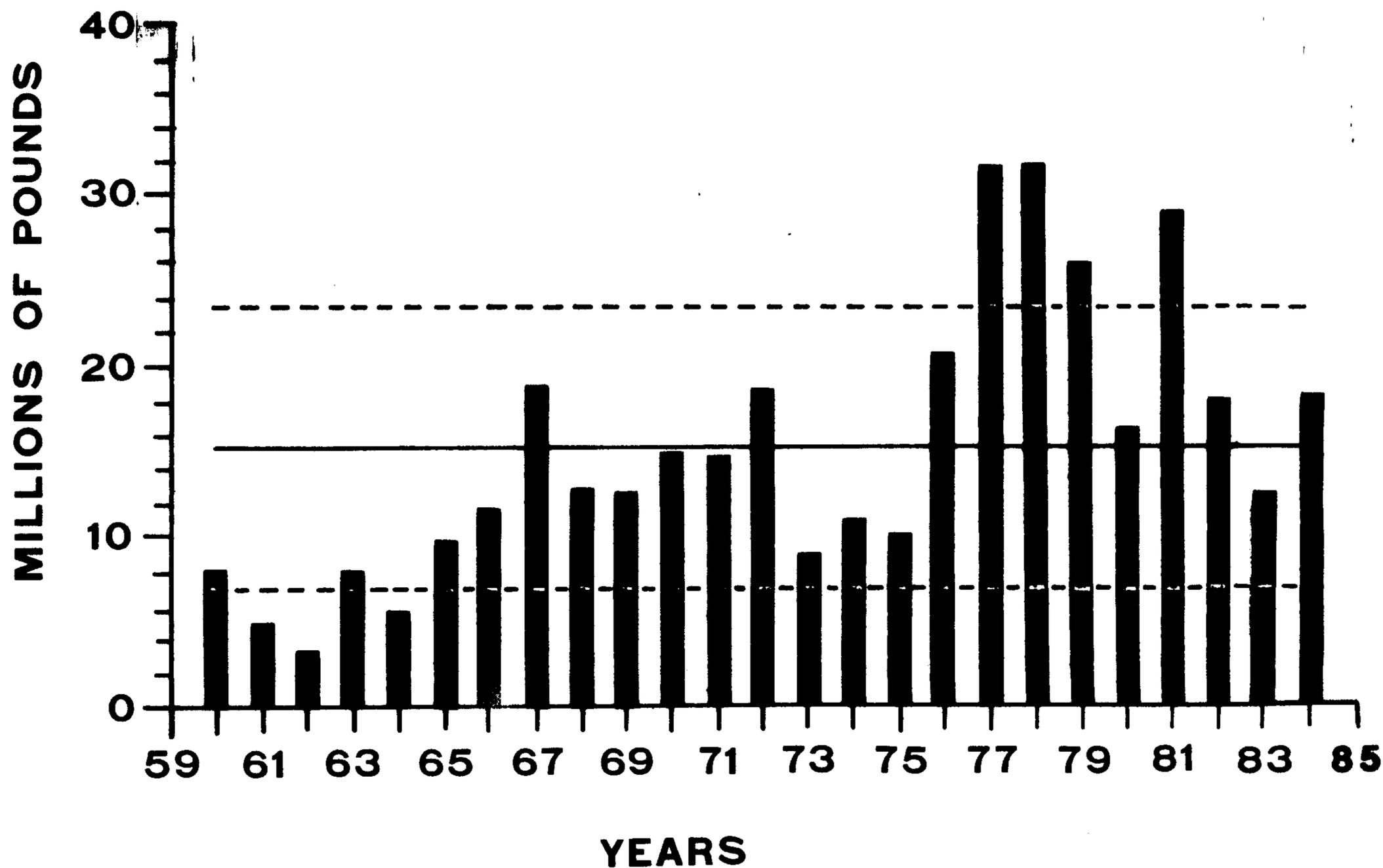


Figure 8. Annual offshore brown shrimp landings from statistical subareas 13-17 (solid line is average 1960-1983 and broken line is on standard deviation).

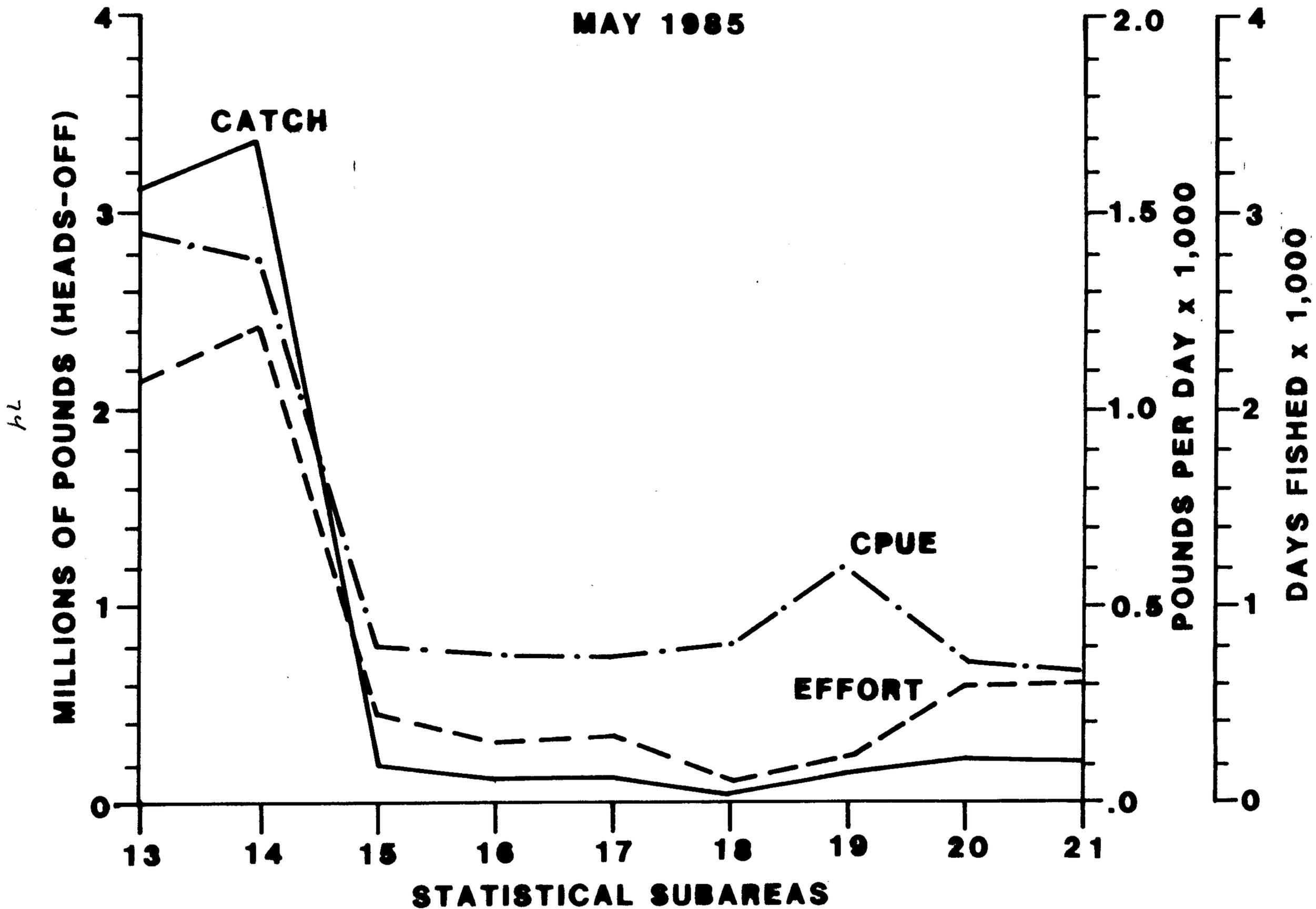


Figure 9. Offshore brown shrimp catch fishing effort in days fished and CPUE in statistical subareas 13-21 in May 1985.

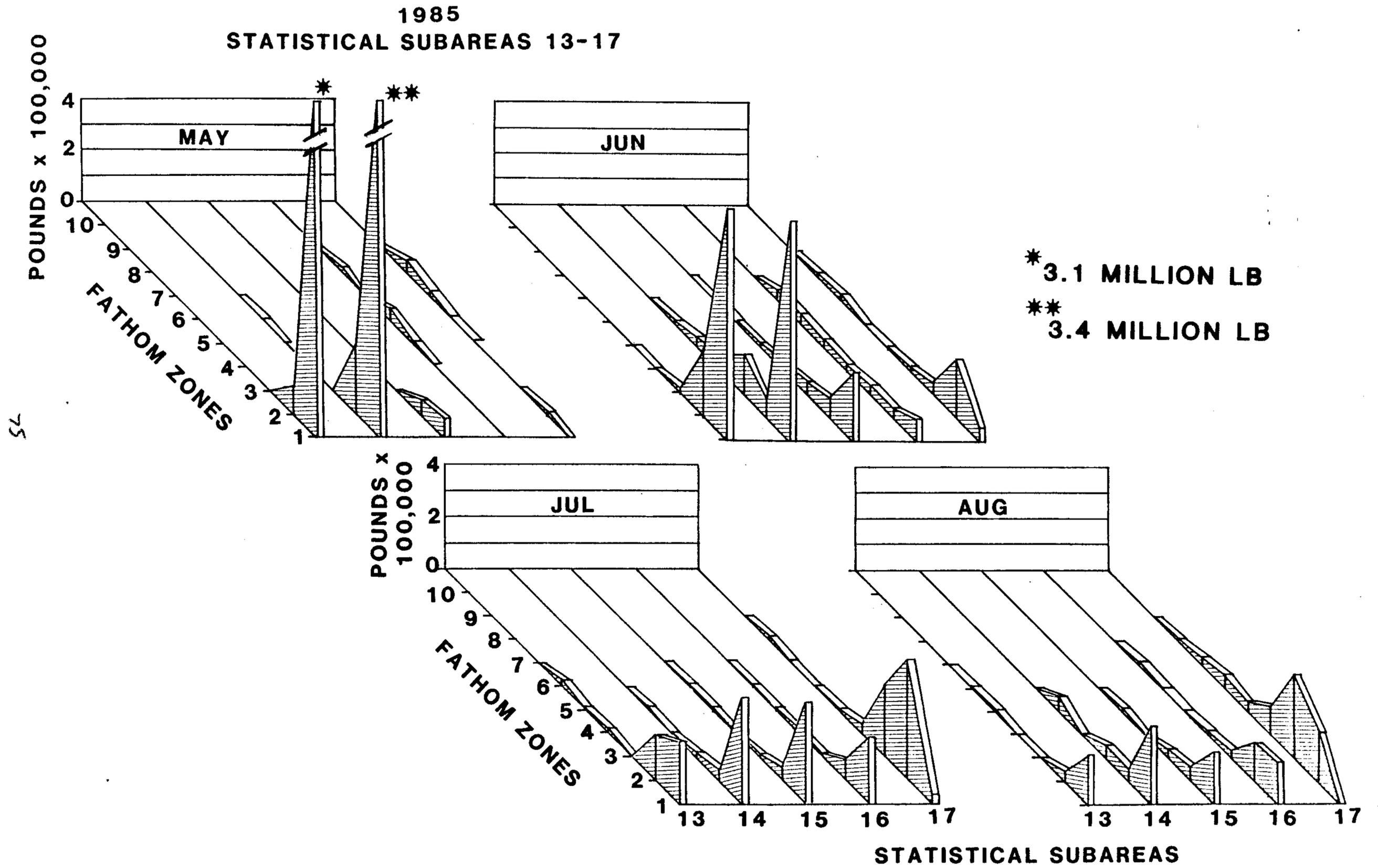


Figure 10. Offshore brown shrimp catch in statistical subareas 13-17 in May, June, July and August 1985.

JUNE 1985

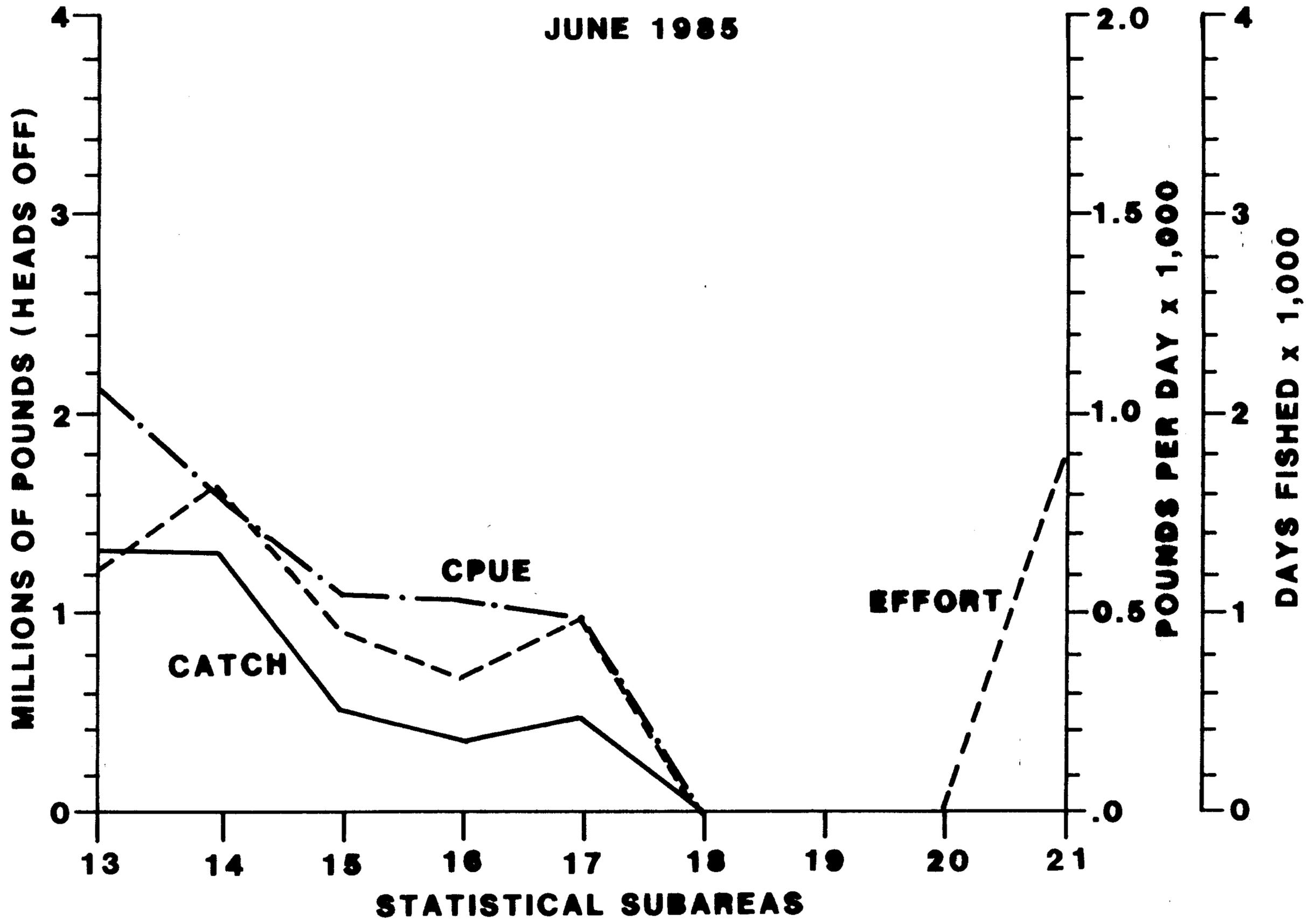


Figure 11. Offshore brown shrimp catch fishing effort in days fished and CPUE in statistical subareas 13-21 in June 1985.

JULY 1985

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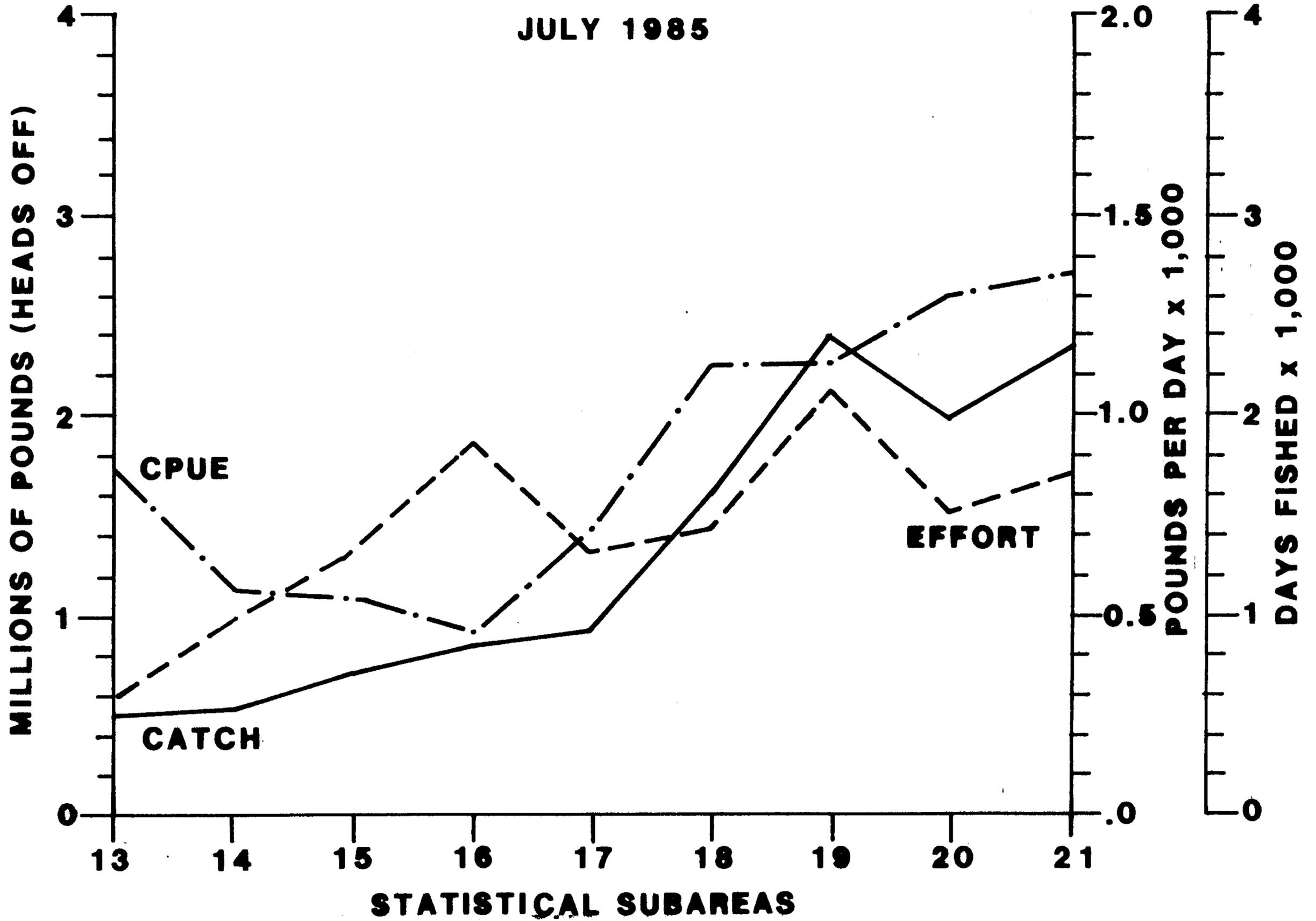


Figure 12. Offshore brown shrimp catch, fishing effort in days fished and CPUE in statistical subareas 13-21 in July 1985.

SUBAREAS 13-17 INSHORE BROWN SHRIMP LANDINGS MAY-APRIL

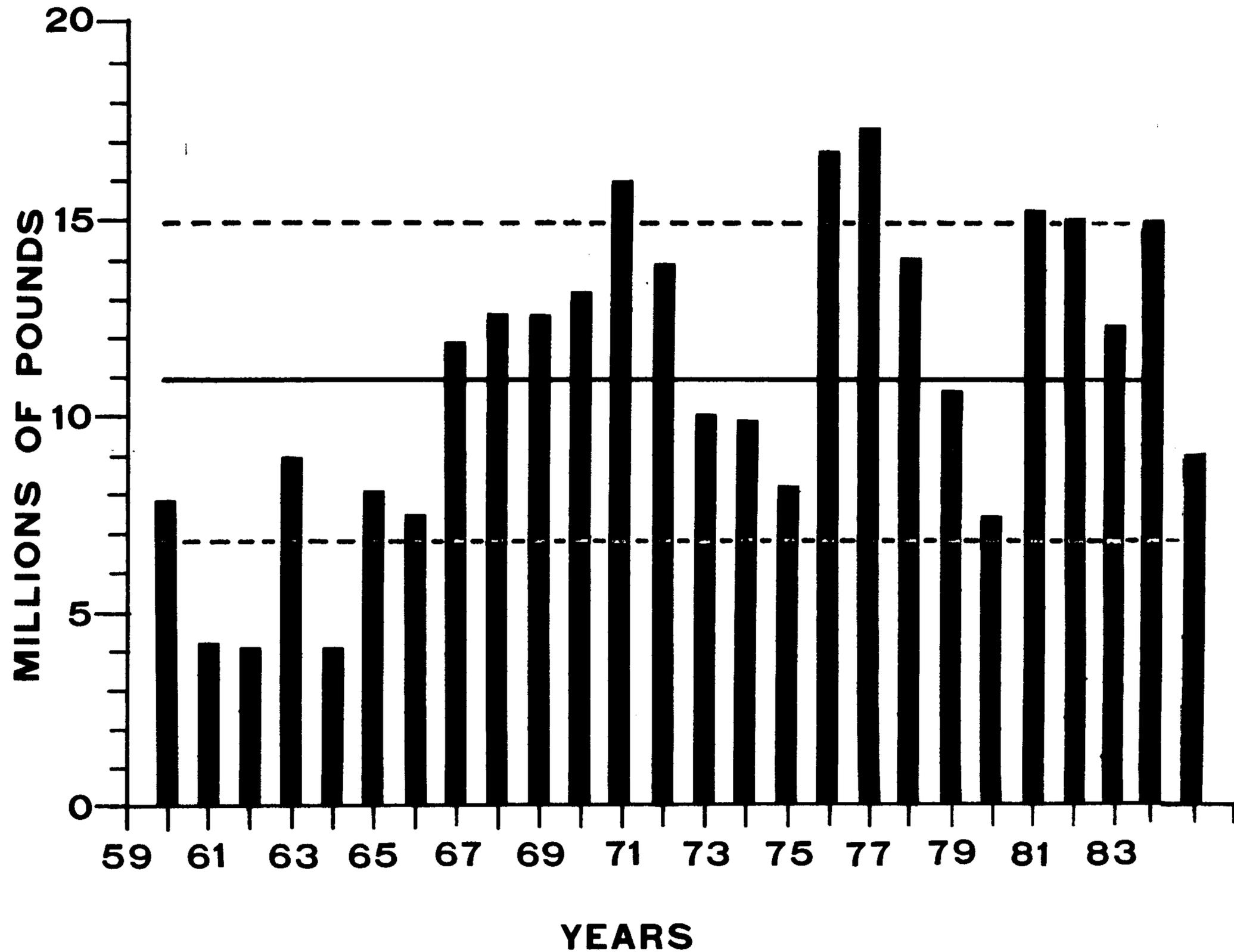


Figure 5. Annual inshore brown shrimp landings in Louisiana west of the Mississippi river (solid line is average 1960-1983 and broken line is standard deviation).

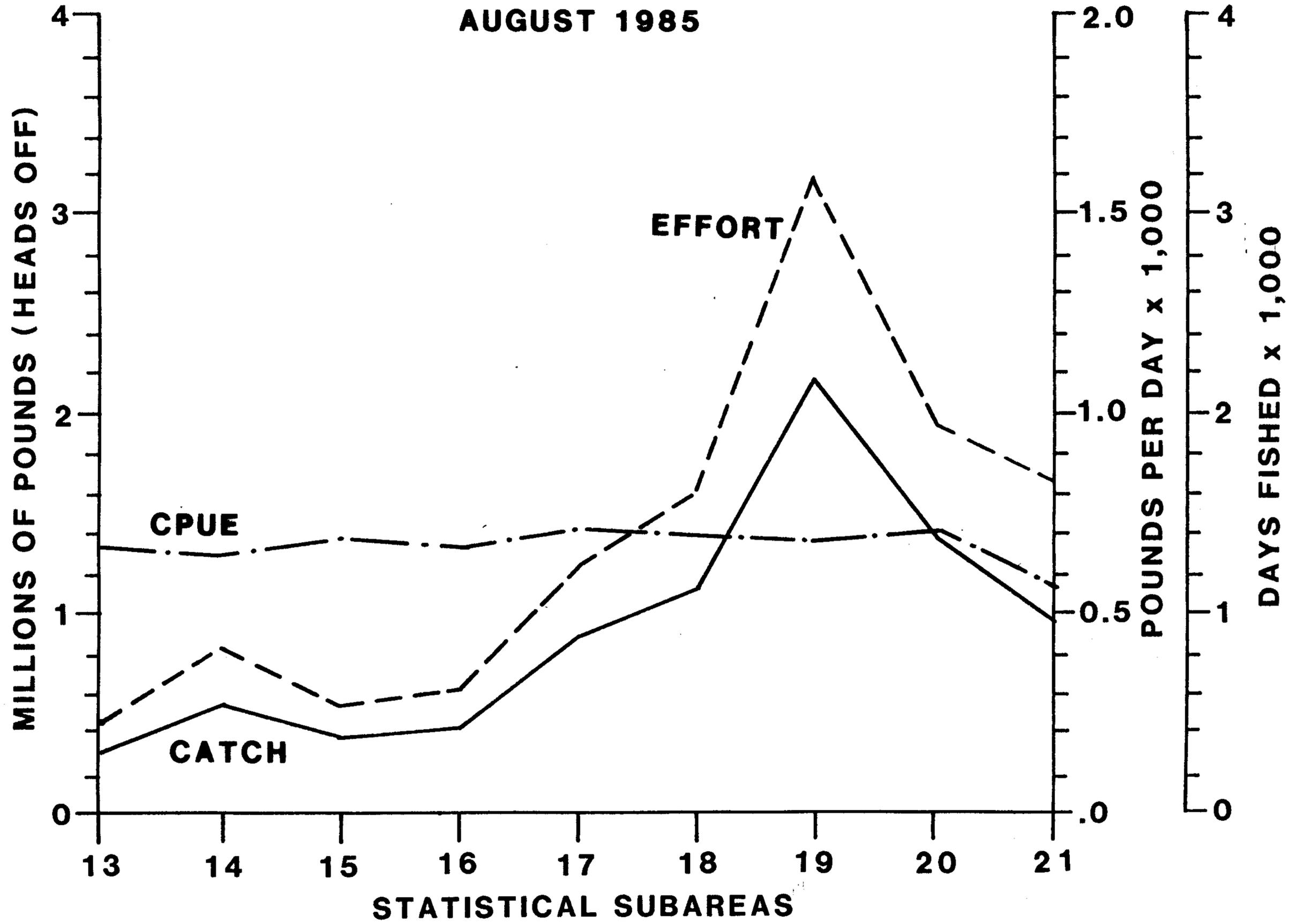


Figure 13. Offshore brown shrimp catch, fishing effort in days fished and CPUE in statistical subarea 13-21 in August 1984.

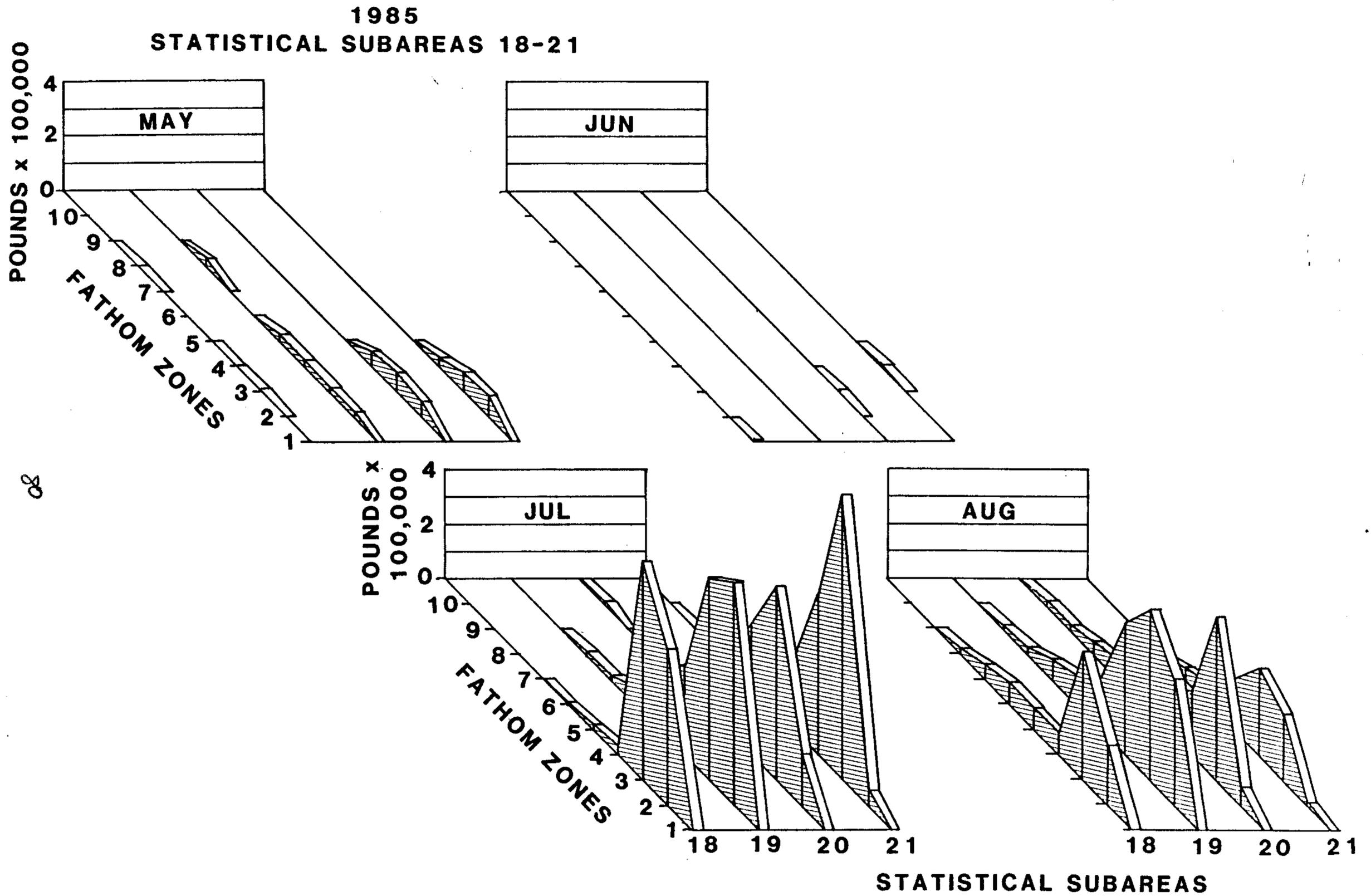


Figure 15. Offshore brown shrimp catch from statistical subareas 18-21 in May, July and August 1985.

OFFSHORE BROWN SHRIMP 1985

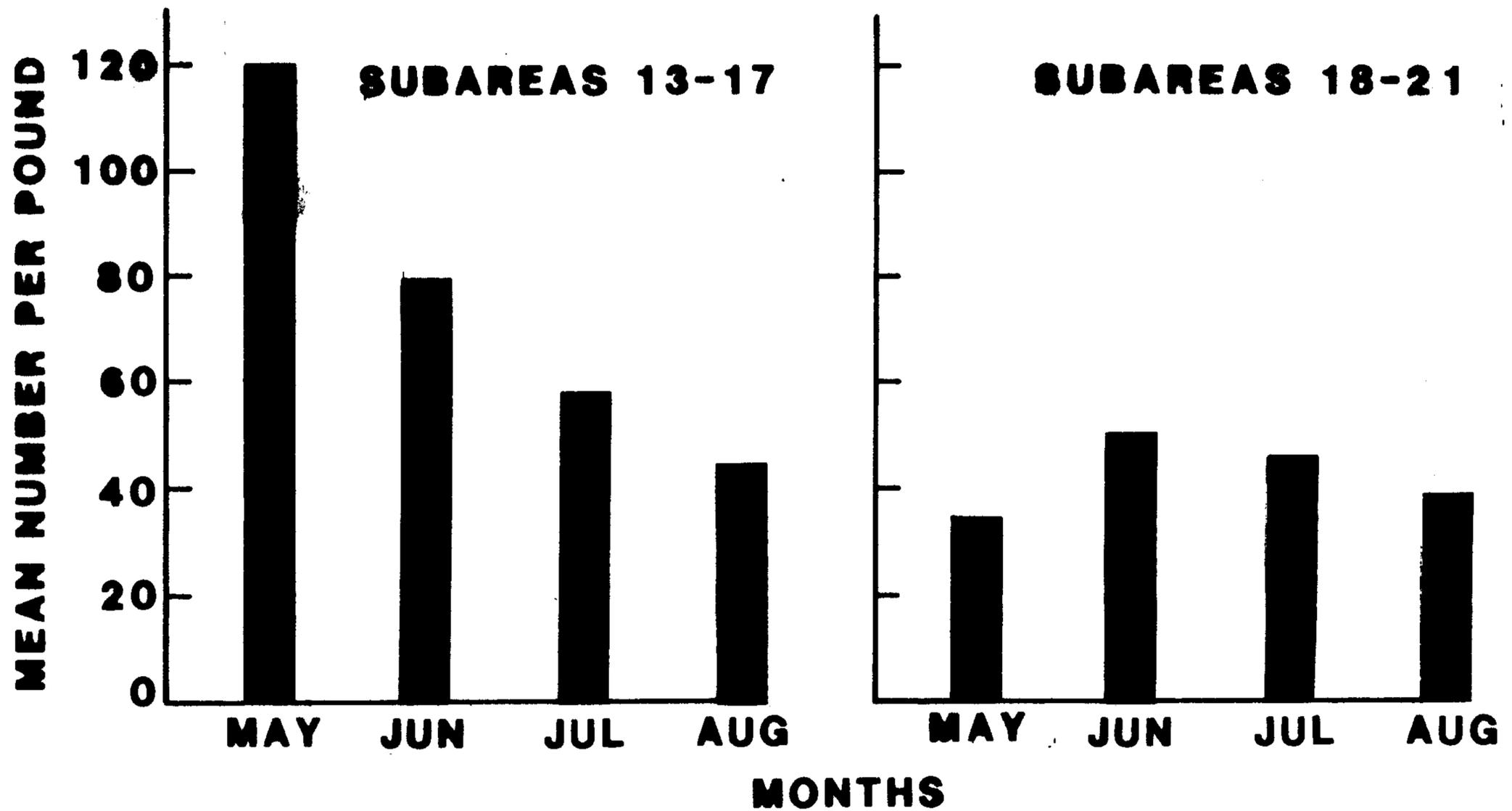


Figure 16. Mean number per pound of brown shrimp caught in statistical subareas a) 13-17 May-August 1985 and b) 18-21 May-August 1985.

BROWN SHRIMP PERCENT BY WEIGHT 1985

SUBAREAS 13-17

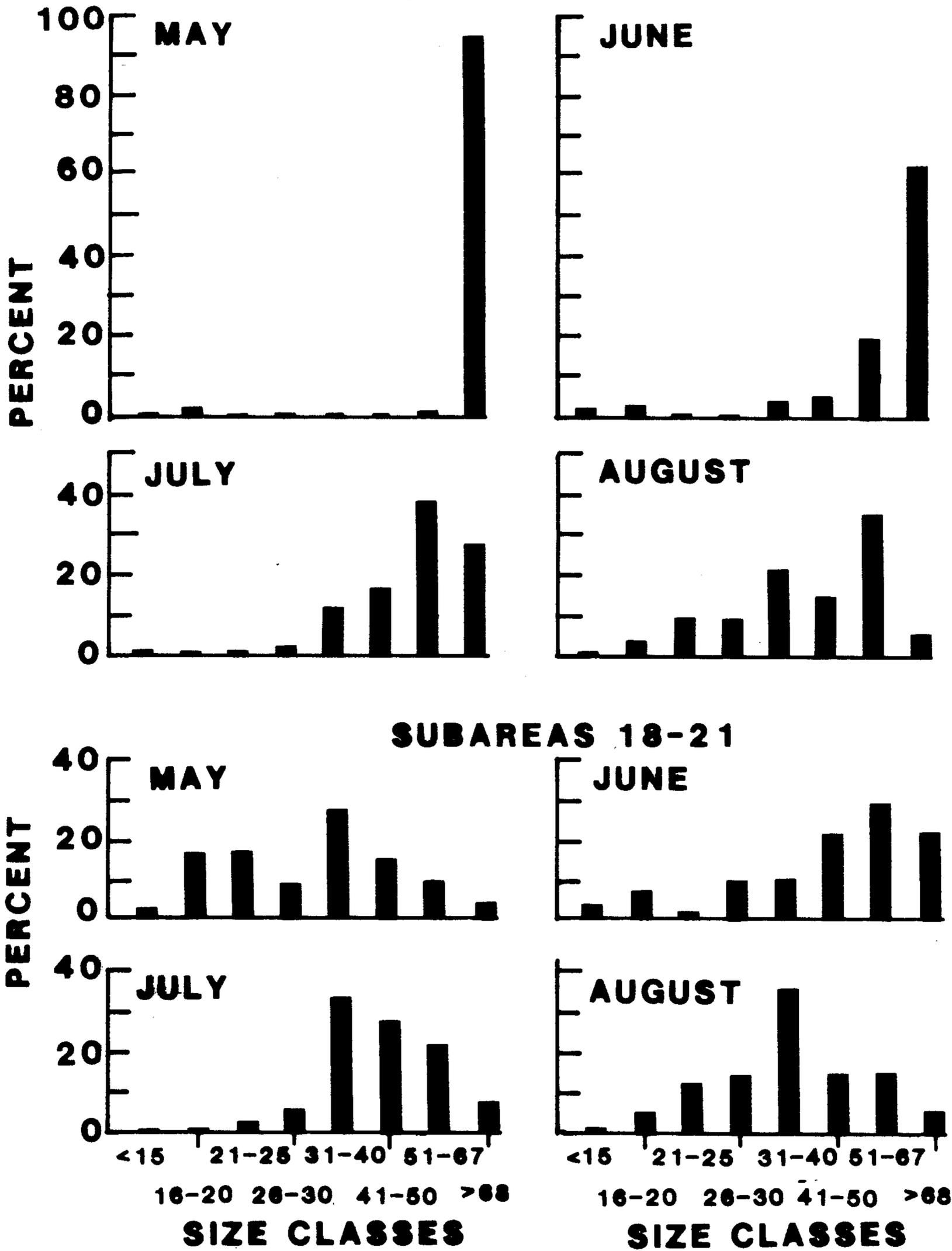


Figure 17. Percent size distribution of brown shrimp caught in a) statistical subareas 13-17 and b) statistical subareas 18-21 using size categories 15/116 count.

NUMBER OF BROWN SHRIMP 1985

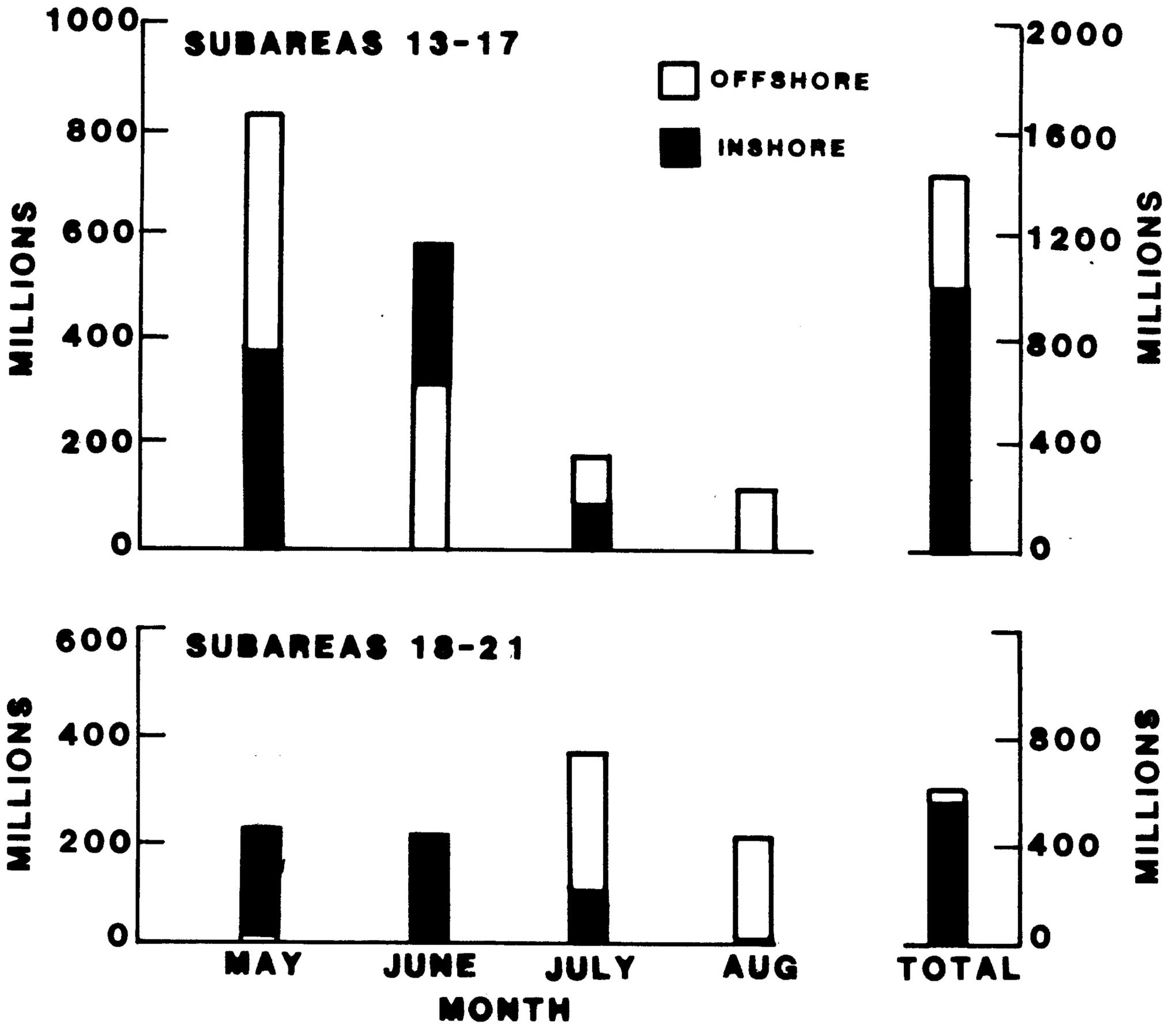


Figure 18. Number of brown shrimp caught in a) Louisiana inshore and offshore waters west of the Mississippi River and b) Texas inshore and offshore waters. 83