

Biological Review of the 2009 Texas Closure

Report to the Gulf of Mexico
Fishery Management Council

by

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Introduction

In 1981, the Gulf of Mexico Shrimp Fishery Management Plan (FMP) was implemented with a primary objective to increase the yield of brown shrimp harvested from Texas offshore waters. Since then, various aspects of the Texas closure management measure have been analyzed and reported on by scientists at the Southeast Fisheries Science Center (SEFSC). This report contains an overview of selected effects of the 2009 Texas closure and will be presented by the SEFSC to the Gulf of Mexico Fishery Management Council (GMFMC) at the January 2010 meetings.

It must be noted that the 2005 reported shrimp landings for August and even July may be below their actual value since many dealer records were either lost or destroyed due to the destructive hurricanes that summer along the northern coastal areas of the Gulf of Mexico. Hurricane Katrina came ashore near the Louisiana – Mississippi boarder on August 29, 2005, and impacted an area from New Orleans, Louisiana, to around Orange Beach, Alabama. This was followed by Hurricane Rita, which came ashore along the upper Texas coast on September 23, 2005. This storm impacted an area from Galveston, Texas, to Marsh Island, Louisiana.

It must be further noted that the 2008 reported shrimp landings for August and even July may be below their actual value since many dealer records could have been either lost or destroyed due to the destructive hurricanes this summer along the southern and northern coastal areas of the Gulf of Mexico. Hurricane Dolly came ashore near the Texas - Mexico boarder on July 23, 2008, and impacted an area from Brownsville to Corpus Christi, Texas. This was followed by Hurricane Gustav, which came ashore near the mid coastal areas of Louisiana on August 31, 2008, and impacted an area from New Orleans, Louisiana, to around Port Arthur, Texas. This was followed by Hurricane Ike, which came ashore on Galveston Island, Texas, on September 13, 2008. This storm impacted most of the northern Gulf States on its track through the Gulf of Mexico.

Background

The Shrimp FMP regulates fishing for brown shrimp in the Exclusive Economic Zone (EEZ) off the coast of Texas. Provisions in the Shrimp FMP prohibited brown shrimp fishing from the coast line to 200-miles off

Texas during the periods: May 22-July 15, 1981; May 26-July 14, 1982; May 27-July 15, 1983; May 16-July 6, 1984; and May 20-July 8, 1985. In 1986, 1987, and 1988 only the portion of the EEZ from 9 to 15-miles was closed to fishing. In 1986, the area was closed May 10-July 2, while in both 1987 and 1988, Texas offshore waters were closed from June 1-July 15. In 1989, the 200-mile closure again went into effect and has remained in effect every year since that time. Closure periods were: June 1-July 15, 1989; May 15-July 8; 1990; May 17-July 6, 1991; May 15-July 6, 1992; May 15-July 6, 1993; May 13-July 7; 1994; May 15-July 15; 1995; June 1-July 15; 1996; May 15-July 15, 1997; May 15-July 8, 1998; May 15-July 15, 1999; May 11-July 5, 2000; May 15-July 8, 2001; May 15-July 15, 2002, May 15-July 15, 2003, May 15-July 15, 2004, May 15-July 15, 2005, May 15-July 10, 2006, May 15-July 15, 2007, May 15-July 15, 2008, and May 15-July 15, 2009. State of Texas regulations, implemented in 1960, prohibited shrimp fishing in the territorial sea off Texas during these same periods, except for the white shrimp fishery from the beach out to 4 fathoms. In 1990, however, state law prohibited all shrimping activities including the 4 fathom daytime fishery. This closure has been in effect during each of the subsequent closures (1991 through 2009).

The management objectives of the Texas closure regulation (as specified in the Shrimp FMP) are to increase the yield of brown shrimp and eliminate the waste of the resource caused by discarding undersized shrimp caught during a period in their life cycle when they are growing rapidly. The objective of the 1960 through 1980 Texas territorial sea closures was to ensure that a substantial portion ($\geq 50\%$) of the shrimp in Gulf waters had reached 65 tails/pound or 112 mm in length by the season's opening. Thus, this temporary closure of the offshore fishery from mid-May to mid-July each year results in larger shrimp to the fishery and subsequently a higher market value.

Methods

National Marine Fisheries Service (NMFS) port agents and state trip ticket systems in Louisiana and Alabama collect shrimp statistics on the catch, effort, and fishing location of shrimp vessels operating in the Gulf of Mexico. These data provided information on the species, size and location of capture, as well as information on the catch rates and fishing efforts of the vessels in the fleet. An electronic logbook program, started in quantity in 2005, is also being used to collect detailed data on fishing location and effort for the offshore fishing fleet (Gallaway, et al., 2003).

Conclusions

1. Recruitment

Postlarval brown shrimp begin entering estuaries in Texas and western Louisiana in mid-February and continue through July, depending on environmental conditions. Several waves of postlarvae may enter; however, peak recruitment usually occurs from February through early April. A wide array of environmental and biological factors affects the fate of these young shrimp. Salinity, temperature, and water height have all been identified as important primary environmental factors affecting the survival, growth and abundance levels of subsequent offshore shrimp populations. The amount of usable nursery area for juvenile and subadult brown shrimp appears to be related to the distribution of favorable salinities (≥ 10 ppt) as well as to the tidal water height in interior marshes. Bay water temperatures exceeding 60° F in April and May are also favorable for above average shrimp production, with optimal growth occurring after 68° F.

Rainfall this year was below normal for Texas and western Louisiana and resulted in higher salinities. Above average tidal water heights were also observed this past year. This combination of higher salinities and higher tidal heights resulted in juvenile shrimp being able to use large areas of the bay system during most of the period. This expanded nursery habitat decreased food competition and resulted in near-optimal growth during this critical time period. Monthly average air temperatures were warmer than historical levels, during most of the period.

Based on the Galveston Bay, Texas, postlarval and juvenile brown shrimp 2008 indices of abundance, the bait index-model (Berry and Baxter, 1969) predicted that the brown shrimp season, from July 2009 through June 2010, would yield approximately 24.7 million pounds off the Texas coast. This value is 1.3 million pounds below the long-term (1960 – 2007) average catch of 26.0 million pounds. Our environmental model did not support this below average yield prediction. The model uses Galveston air temperature during mid-April (the key component), rainfall during early March, and bay water height during late April and early May. These components are additive in the model, thus higher values indicate higher catch. The largest contributing factor, temperature during mid-April, was near average this year (69.9°F; Table 3). Rainfall during early March was low (Trace = 0.005"). These were offset by relatively high tides during late April and

early May (~5.61'). Collectively, the factors suggest above average production of brown shrimp from Texas as related to environmental conditions conducive for optimal shrimp growth and survival. (Matthews, personal communication, NMFS Galveston Laboratory).

The 2009 Louisiana indices point to a slightly below average yield of brown shrimp this season from west of the Mississippi River to the Texas-Louisiana border. Catch information from Louisiana inshore and offshore fisheries in May is used to estimate total production for the biological year from May through April. With high fuel costs and low shrimp prices fewer vessels were active this year; however, catch rates (catch-per-unit-effort) were high. Using 2009 May estimated catch data (7.4 million pounds) in our Louisiana model, we predict a harvest of 29.2 million pounds for Louisiana west of the Mississippi River for the 2009-2010 season. This is below the historical average of 30.9 million pounds. Freshwater discharge data from the Mississippi River were obtained from the Louisiana Department of Wildlife and Fisheries. Mississippi River discharge was 767 thousand cubic feet per second in April, lower than recorded in 2008, and similar to that of years with above average production.

The 2009 abundance indices are varied relative to offshore brown shrimp production estimates. The Galveston Bay bait index forecasts a below average year at 24.7 million pounds from offshore Texas waters from July 2009 through June 2010. The 2009 Louisiana indices point to a below average yield of approximately 29.2 million pounds of brown shrimp this season from west of the Mississippi River to the Texas-Louisiana border. Overall, the western Gulf of Mexico could expect an annual brown shrimp production of approximately 53.9 million pounds during the 2009-2010 season. This is below the 1960-2007 historical average of 56.9 million pounds for the two-state area. However, increasing brown shrimp recruitment in Texas at the end of our monitoring surveys, combined with favorable environmental conditions suggests that brown shrimp yields have the potential to be above our model's predicted values.

2. Fishing Trends

Louisiana

The May through August 2009 catch in Louisiana for inshore waters was 8.8 million pounds, with about 98.8% of the total catch taken during May and June (Table 1). This percentage is typical of the catch taken during the May

through June period. Inshore production was below the 1981-2008 historical average for the May through August period (13.8 million pounds). This 2009 catch represents one of the lowest levels when compared to the other catch levels since the closure off Texas was established in 1981. May inshore production was 4.5 million pounds, with June production at 4.2 million pounds. Production declined considerably after June, with a catch of 0.1 million pounds in July, and only 0.0 million pounds in August.

The Louisiana offshore fishery produced 1.6 million pounds of brown shrimp in May 2009, with a fishing effort of about 1,990 days. The majority of the catch occurred from depths of less than 10 fathoms in statistical subareas 13 through 16 (Figure 1a). Average CPUE value was 811 pounds per day. Catch per unit effort (CPUE) values were moderate (500-1,000 pounds per day) in four of the Louisiana subareas, with subarea 17 having high (>1,000 pounds per day) catch rates (Figure 1b).

In June, the fishery off Louisiana produced 3.9 million pounds of brown shrimp with a fishing effort of around 4,070 days. Average CPUE value was 954 pounds per day. CPUE values were moderate (500 to 1,000 pounds per day) in four of the Louisiana offshore water subareas (subareas 13, and 15-17) with subarea 14 having high (>1,000 pounds per day) catch rates (Figure 2b). Compared to May, shrimp were caught further offshore in each of the five Louisiana statistical subareas (subareas 13 through 17) (Figure 2a).

In July, the Louisiana offshore fishery produced 2.2 million pounds of brown shrimp with an effort of about 1,925 days of fishing (Table 2). Average CPUE was 1,131 pounds per day. This CPUE value was above average when compared to the other July CPUE values experienced off the coast of Louisiana since 1981 (Table 2). CPUE values were high (>1,000 pounds per day) in all five statistical subareas (Figure 3b). Most of the shrimp were taken from water depths less than 25 fathoms in all the Louisiana subareas (subareas 13 through 17) (Figure 3a).

In August, the Louisiana offshore fishery produced approximately 2.8 million pounds of brown shrimp with an effort level of about 1,507 days. Average CPUE was 1,880 pounds per day. CPUE values were high (>1,000 pounds per day) in all of the Louisiana offshore waters (subareas 13 through 17) (Figure 4b).

Overall, during the May through August 2009 period, 10.5 million pounds of brown shrimp were landed from the offshore Louisiana fishery (Table 1).

This catch level is below average when compared to the May through August period from 1981-2008 (16.2 million pounds). The catch resulted from a very low expenditure of effort; a total of nearly 9,495 days of fishing occurred during this four-month period off Louisiana. Average CPUE was 1,107 pounds per day. During May and June, sizes of landed shrimp were predominantly in the >67 count size class (Figure 5). However, as catch declined during July and August, the >67 count size class component accounted for a smaller percentage of the overall catch. This trend was similar to those observed in previous years.

Texas

In Texas bays, from May through August 2009, only 0.5 million pounds of brown shrimp were landed (Table 1). This represents a below average value when compared to the other inshore catches for this period since the closure began in 1981 (1981-2008 average was 4.6 millions pounds). Monthly catches in 2009 were quit equally distributed. May and June each having around 0.2 million pounds, and July and August each with about 0.1 million pounds. Thus, the first two months accounted for about 80% of the Texas inshore catch during the four-month period. This percentage of the total is about average of the values found during most years.

Offshore production during May through August 2008 was 13.9 million pounds, with 13.4 million pounds (96%) of the catch produced in the July through August period (Table 1). The total catch for this period represents a near average level when compared to catch values since EEZ closures were initiated in 1981 (1981-2008 average was 14.0 millions pounds). During the July through August 2009 period, the size composition of landed shrimp was around 1.1% in the >67 count size category (Figure 6).

In May 2009, about 0.5 million pounds of brown shrimp were landed from the offshore waters with a fishing effort of around 623 days fished. Average CPUE was only 758 pounds per day. CPUE values off the Texas coast were moderate (500 to 1,000 pounds per day) in all Texas coastal subareas (Figures 1a and 1b).

With both state territorial and EEZ waters being closed to shrimp trawling, the June catch was, as expected, low (12,700 pounds). This catch level is about average when compared to values from most other June periods during 200-mile closure years. Effort could not be calculated for the area and

average CPUE was not estimated. Catch was extremely low in all statistical subareas off Texas (18-21) (Figures 2a and 2b).

After the reopening of waters to fishing in July, 3.5 million pounds of shrimp were caught with a little over 1,470 days fished. This represents both a below average catch and a below average effort for the month of July (Tables 1 and 2). With these below average levels of catch and effort, average CPUE was high at 2,247 pounds per day fished (Table 2). CPUE was high (>1,000 pounds per day) in all subareas off Texas (subareas 18 through 21) (Figure 3b). The greatest catches occurred in a broad area of moderate to good catches from 11-30 fathoms off statistical subareas 19, 20 and 21 (Figure 3a).

In August, the offshore Texas catch was above average at 9.9 million pounds of brown shrimp when compared to the August periods from 1981-2008 (average of 7.2 million pounds) (Table 1). During August a below average amount fishing effort was expended (4,480 days) (Table 2). Average CPUE was around 2,258 pounds per day. CPUE was very good in comparison with most other August values (Table 2). Similar to previous years, the majority of the catch was concentrated from 11-35 fathoms near subarea 19 (Figure 4a). However, moderate to good catches also occurred in the offshore areas (11-35 fathom area) in subareas 20 and 21. CPUE was high (>1,000 pounds per day) in all subareas off Texas (Figure 4b).

3. Distribution of Catch from Texas Waters

Some concern has been expressed regarding the distribution of shrimp landings following the Texas closure. To evaluate this concern, the Texas offshore catch and the Louisiana offshore catch (all shrimp species) during the May through August period was partitioned by port of landing. Landing locations were summarized into five general groups. These groups included lower Texas ports (Port Mansfield, Aransas County, Riviera, Nueces County, Port Isabel and Brownsville), middle Texas ports (Brazoria County, Matagorda County, Calhoun County, Refugio County, Port Lavaca, Matagorda, Palacios, Port O'Connor and Seadrift), upper Texas ports (Jefferson County, Chambers County, Galveston Island, Harris County and Kemah), Louisiana ports (all Louisiana ports), and other ports (ports from Mississippi, Alabama, Florida and the U.S. east coast).

As discussed in the 1993 Texas closure report to the GMFMC (Nance, 1994), the distribution of shrimp catch from Texas offshore waters to

various ports throughout the Gulf of Mexico had not significantly changed since 1977, although annual fluctuations are evident in the data. Distribution of catch this year was not notably different than observed in past years, although there was an increase in catch landed at the upper Texas ports, with a decrease in landing along the lower Texas coast ports (Figure 7). Ports on the lower Texas coast still have the greatest percentage of the 2009 landings at around 43%. This was followed by the middle Texas ports (34%), and finally the upper Texas ports (12%). This overall general relationship seems to have held true during both 15-mile (1986-1988) and 200-mile closure years (1981-1985, 1989-2009). During 2009, about 90% of the shrimp taken from Texas waters were landed in Texas ports. This is near the 1981-2008 historical average of 91%. Note that the increase in landings to upper Texas ports and the decrease in landings to lower Texas ports this past year is starting to put their percentage values nearer to their long-term averages.

The distribution of shrimp catch from Louisiana offshore waters to various ports throughout the Gulf of Mexico is shown in Figure 8. Ports on the middle and lower Texas coast appear to have the lowest percentage of the 2009 landings at around 8% and 5%, respectively. This is followed by the upper Texas ports (40%). This relationship seems to hold true during both 15-mile (1986-1988) and 200-mile closure years (1981-1985, 1989-2009). During 2009, about 35% of the shrimp taken from Louisiana waters were landed in Louisiana ports. The average over all the closure years (1981-2008) is around 72%.

4. Shrimp Landings by Port

The distribution of shrimp landings in Texas and Louisiana ports was examined to determine if changes in shrimp landings at the various ports had occurred since the initial closure in 1981. May through August Gulf-wide shrimp catch was summarized by port of landing. During the May through August period from 1981 through 2008, an average of about 33% of the shrimp caught in the U.S. Gulf of Mexico are landed in Texas ports, with 48% landed in Louisiana ports. This distribution has not changed significantly during the 29 years of closures (Figure 9). However, during the six year period from 1994 through 1999 there appeared to be a general increase in landings to Louisiana ports accompanied by a slight decrease in landings to Texas ports. This trend did not continue in either 2000 or 2001, with landing values in both 2000 and 2001 similar to those experienced in 1998. In 2002, the trend reversed itself with an increase shown for Texas ports and a decrease for Louisiana ports. In 2003 a decrease in landings to

ports in both Louisiana and Texas was noted from the analysis of the data. In 2004 the decrease in landings to ports in Texas continued, but a significant increase was noted to the ports in Louisiana. In 2005 an increase was observed in both port groups. In 2006 a slight increase in landings was seen in Texas ports, with a decrease in Louisiana ports. In 2007 there was a slight decrease in landings noted in Texas ports, with no notable change to landings at Louisiana ports. In 2008 there was again a slight increase in landings in Texas ports, with a decrease in landings in Louisiana ports. In 2009 this trend continued with an increase in landings in Texas ports and a decrease in landings in Louisiana ports.

The distribution of Texas landings by individual ports was also examined. Figure 10 shows landings of the five upper Texas coast ports, Figure 11 shows the landings of the five middle Texas coast ports, and Figure 12 shows the landings of the four lower Texas coast ports. The five upper Texas coast ports (with long term mean landing percentage) include Jefferson (14.42%), Chambers (0.50%), Galveston (4.29%), Harris (2.41%), and Kemah (10.03%). The five middle Texas coast ports (with overall mean landing percentage) include Port Lavaca (3.19%), Brazoria (7.88%), Matagorda (0.67%), Palacios (13.22%), and Seadrift (2.12%). The four lower Texas coast ports (with overall mean landing percentage) include Aransas (11.97%), Nueces (2.71%), Port Isabel (11.73%), and Brownsville (14.36%).

Two of the upper Texas coast ports (Harris and Jefferson) experienced slight to moderate decreases in landings during 2009. Two upper Texas coast port (Galveston and Kemah) experienced a moderate increase in landings, while the other port (Chambers) experienced no notable change in landings. Jefferson County, which had the highest percentage of landings for all ports in Texas for many years, was lower than both Kemah and Palacios this year. For the middle Texas coast ports, landings at Matagorda, Seadrift, and Port Lavaca remained low during 2009. Palacios experienced a very slight decrease in landings in 2009, while Brazoria saw increases from the landings experienced in 2009. Three of the four Lower Texas coast ports (Port Isabel, Brownsville and Aransas) experienced slight to moderate decreases in landings compared to the previous year. No notable change in landings was experienced in 2009 for Nueces County.

5. White Shrimp Catch off Texas

For the nineteenth consecutive year, the 0-4 fathom white shrimp fishery off Texas has been closed in conjunction with the Texas closure. During July 1990, following the first 0-4 fathom closure, the majority of the white shrimp caught were in the <15 count range (Figure 13). This trend towards larger shrimp carried into August 1990, with the majority of the shrimp in the <30 count group (Figure 14). Following the 1991 closure, the majority of the shrimp in July were in the <20 count range, with a peak in production that had not been observed in any other year since 1960. One million pounds of white shrimp taken in July 1991 off the coast of Texas were about 2 times greater than in any previous recorded catch. Production of shrimp in August 1991 was still good, but landings during 1984, 1986 and 1990 were higher (Figure 14). White shrimp in August 1991 were still quite large, with the majority <25 count. Following the 1992 closure, most white shrimp in July were again in the <20 count range, with a peak in landings second only to the level experienced in 1991. Abundance in August 1992 was quite high, but unlike the previous two years, most of the catch was composed of small sized shrimp (>41 count). Following the 1993 closure, the majority of white shrimp in July were again in the <20 count range, but peak production was lower than observed during either 1991 or 1992. Production in August 1993 was extremely low in comparison with all other years since 1980 (Figure 14).

After the 1994 closure, most of the white shrimp landed in July were in the <20 count range, with a peak in production equal to that experienced in 1992 (Figure 13). Production in August 1994 was above average when compared to all other years since 1980 (Figure 14). After the 1995 closure, most of the white shrimp landed in July were in the <20 count range, but with a lower production level than experienced in previous years (Figure 13). Production in August 1995 was near average when compared to all other years since 1980 (Figure 14). Following the 1996 closure, most of the white shrimp landed in July were in the <20 count range, but with an extremely low production level (Figure 13). Production in August 1996 was also low when compared to all other years since 1980 (Figure 14). Following the 1997 closure, most of the white shrimp landed in July were in the <20 count range, but with an extremely low production level that was similar to last year's level (Figure 13). Production in August 1997 was higher than experienced in 1996, but moderate when compared to all other years since 1980. Following the 1998 closure, most of the white shrimp landed in July were in the <20 count range, with an average production level that was above last year's level, but below other catch levels in the 1990's (Figure 13). Production in August 1998 was higher than experienced in 1996, but

low to moderate when compared to all other years since 1980 (Figure 14). After the 1999 closure, most of the white shrimp landed in July were in the <20 count range, with an average production level that was above last year's level, and above other catch levels experienced in most of the 1990's (Figure 13). Production in August 1999 was excellent. It is the highest experienced since about 1980, with the exception of this year (Figure 14). Following the 2000 closure, most of the white shrimp landed in July were in the <20 count range, with an average production level that was similar last year's level, and above other catch levels experienced in most of the 1990's (Figure 13). Production in August 2000 was excellent. It is, to this point, the highest level experienced since about 1980 (Figure 14).

Following the 2001 closure, most of the white shrimp landed in July were in the <20 count range, with a production level that was much lower than last year's level, and below the level experienced in most of the 1990's (Figure 13). Production in August 2001 was average (Figure 14). After the 2002 closure, as usual, most of the white shrimp landed in July were in the <20 count range, with a production level that was average (Figure 13). Production in August 2002 was excellent. In fact, it was the highest level experienced since about 1980 (Figure 14). In 2003 the July white shrimp catch was low (similar to values in 2001), with most of the shrimp in the <20 count range. August 2003 catch was again at record levels, which were even better than the catch experienced last year. After the 2004 closure, most of the white shrimp landed in July were in the <20 count range, with an average production level that was above last year's level, and above other catch levels experienced in most of the previous years (Figure 13). Production in August 2004 was excellent. It is the highest catch experienced since about 1980 (Figure 14). During 2005, the bulk of the shrimp landed in July were again in the <20 count range. However, the July production was below the historical average. Although, production in August 2005 was below the record levels experienced last year, they were still above the historical average, with >50% in the <20 count range. Following the 2006 closure, most of the white shrimp landed in July were in the <20 count range with an above average level of production (Figure 13). Production in August 2006 also above the historical average, but below the production levels observed over the past four years (Figure 14).

Following the 2007 closure, most of the white shrimp landed in July were in the <20 count range with an above average level of production (Figure 13). Production in August 2007 was above the historical average. Following the 2008 closure, most of the white shrimp landed in July were in the <20 count

size range with an above average level of production (Figure 13). Production in August 2008 was below the historical average with most of the shrimp landed still in the <20 count size range (Figure 14). Following the 2009 closure, most of the white shrimp landed in July were in the <20 count size range with a below average level of production (Figure 13). Production in August 2008 was also below the historical average with about half of the shrimp landed still in the <20 count size range (Figure 14).

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Table 1. May - August catch of brown shrimp in millions of pounds from Louisiana (13-17) and Texas (18-21)

	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996
Area														
Louisiana														
Inshore	8.8	10.9	18.2	17.9	14.1	16.2	17.6	14.4	22.9	21.2	16.3	13.6	11.0	12.5
Offshore	10.5	6.3	13.8	15.3	11.7	17.3	21.9	15.3	14.7	16.5	20.0	15.8	12.4	18.7
Total	19.4	17.2	32.0	33.2	25.8	33.4	39.5	29.7	37.6	37.7	36.3	29.4	23.4	31.2
ANNUAL	*	21.0	36.5	40.9	30.1	37.6	44.8	36.3	42.5	45.1	42.5	32.5	29.8	34.8
Texas														
Inshore	0.5	0.3	0.7	0.8	1.4	1.3	2.8	3.2	5.2	3.7	2.7	5.3	6.1	4.8
Offshore	13.9	8.4	8.6	14.9	7.6	11.0	13.3	14.2	16.0	18.4	11.8	13.8	8.2	11.5
Total	14.4	8.8	9.3	15.6	9.0	12.4	16.1	17.4	21.2	22.1	14.5	19.1	14.3	16.3
ANNUAL	*	19.0	20.4	34.5	20.2	21.2	26.5	25.4	30.6	36.5	25.4	32.8	24.2	27.9
Offshore Only														
Louisiana														
May-June	5.5	3.2	5.8	6.4	5.2	10.6	14.0	10.8	9.1	10.2	12.1	9.3	5.5	11.1
July	2.2	1.8	4.9	5.7	4.6	5.1	4.7	3.6	3.6	3.2	5.9	4.0	3.8	4.6
August	2.8	1.3	3.1	3.2	1.9	1.6	3.2	0.9	2.0	3.1	2.0	2.5	3.1	3.0
ANNUAL	*	9.7	17.7	21.2	15.9	20.0	24.9	19.3	19.5	23.8	26.1	18.9	18.1	21.9
Texas														
May-June	0.5	0.1	0.3	0.4	0.4	0.5	0.2	0.3	0.4	0.6	0.5	0.3	0.3	0.6
July	3.5	2.0	1.8	4.4	1.3	2.1	3.8	3.8	7.2	8.3	3.0	5.3	3.2	4.0
August	9.9	6.3	6.5	10.1	5.9	8.4	9.3	10.1	8.4	9.5	8.3	8.2	4.7	6.9
ANNUAL	*	18.7	19.7	33.6	18.7	19.6	23.2	21.7	25.0	31.6	22.0	26.4	17.0	22.7
* calendar year data not complete.														

Table 2. Summary of Offshore Fishing Effort and CPUE for Louisiana (13-17) and Texas (18-21)

	Fishing Effort (1000 Days)						
	Area 13 - 17			Area 18 - 21			
	May - June	July	August	May - June	July	August	
1995	20.8	7.9	2.7	2.6	5.4	8.4	
1996	18.8	9.4	5.6	3.0	3.8	10.0	
1997	20.9	13.2	8.4	1.4	4.2	9.7	
1998	13.6	3.7	3.2	1.0	3.9	8.5	
1999	15.0	7.6	2.3	1.2	2.2	7.9	
2000	19.2	4.6	4.3	1.9	6.3	9.8	
2001	22.7	6.7	3.8	1.4	6.0	10.4	
2002	24.2	8.3	1.8	1.5	3.0	8.8	
2003	21.2	8.2	3.2	1.0	2.8	9.5	
2004	13.3	6.8	1.4	1.2	1.7	9.1	
2005	8.1	7.1	0.8	0.6	1.2	5.8	
2006	8.1	4.5	0.6	0.6	2.2	5.5	
2007	9.1	5.0	2.4	0.7	1.4	4.1	
2008	3.6	1.6	0.5	0.1	0.7	3.2	
2009	6.1	1.9	1.5	0.6	1.5	4.5	
	CPUE (Pounds per Fishing Day)						
	Area 13 - 17			Area 18 - 21			
	May - June	July	August	May - June	July	August	
1995	452	516	642	222	987	829	
1996	591	484	527	201	1,047	687	
1997	264	286	364	230	750	485	
1998	681	1,104	782	292	1,355	960	
1999	804	779	867	383	1,353	1,051	
2000	534	683	715	327	1,317	972	
2001	403	536	519	279	1,213	809	
2002	448	428	470	217	1,233	1,142	
2003	659	568	1,003	250	1,327	975	
2004	797	744	1,129	425	1,215	926	
2005	635	654	2,322	535	1,127	1,018	
2006	791	1,283	5,134	606	1,982	1,830	
2007	633	989	1,270	401	1,286	1,593	
2008	892	1,144	2,615	1,022	2,872	1,954	
2009	907	1,131	1,880	758	2,247	2,258	

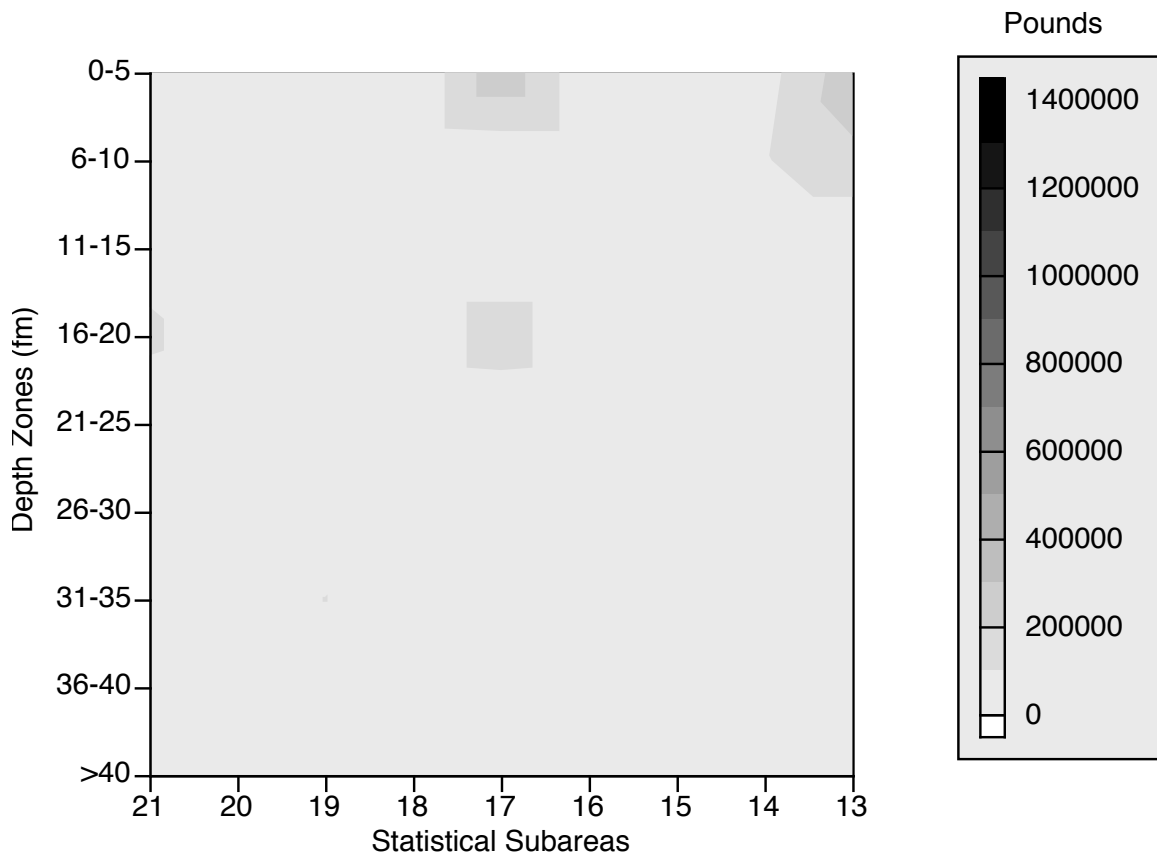
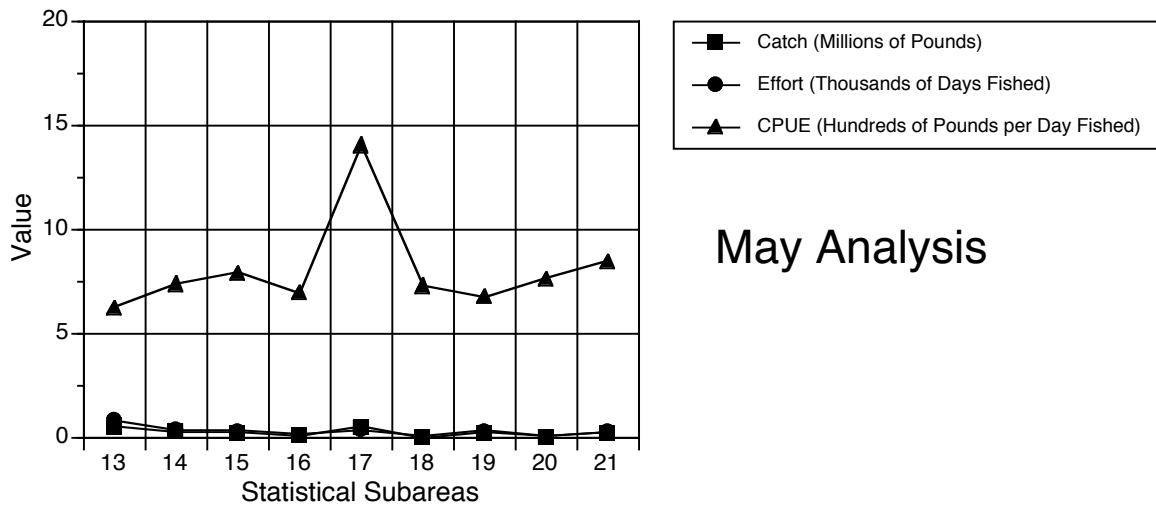


Figure 1a. Offshore brown shrimp catch by area and depth during May 2009.



May Analysis

Figure 1b. Offshore brown shrimp catch, effort and CPUE during May 2009.

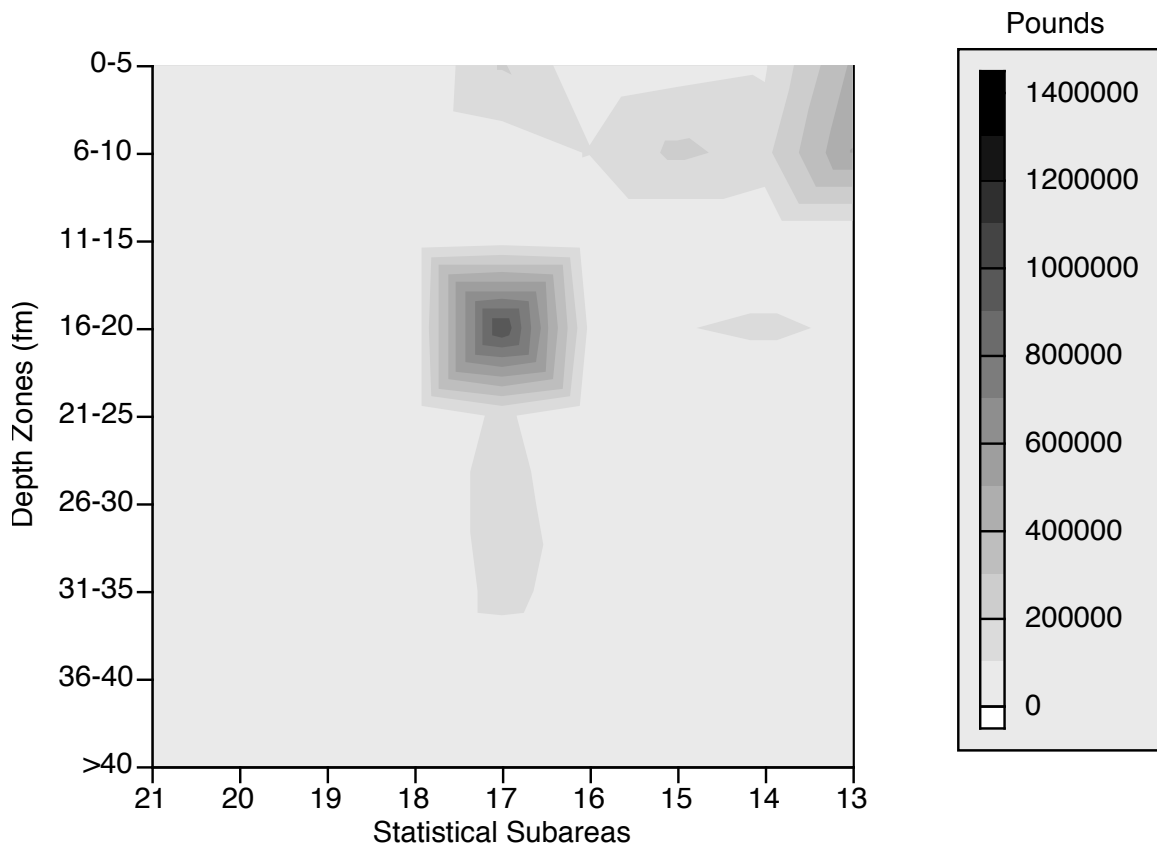
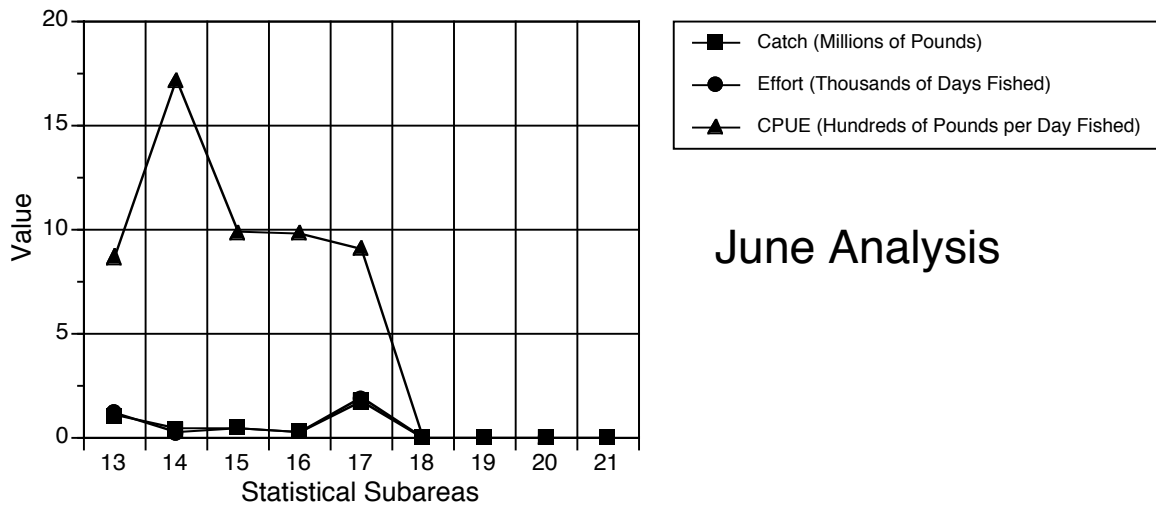


Figure 2a. Offshore brown shrimp catch by area and depth during June 2009.



June Analysis

Figure 2b. Offshore brown shrimp catch, effort and CPUE during June 2009.

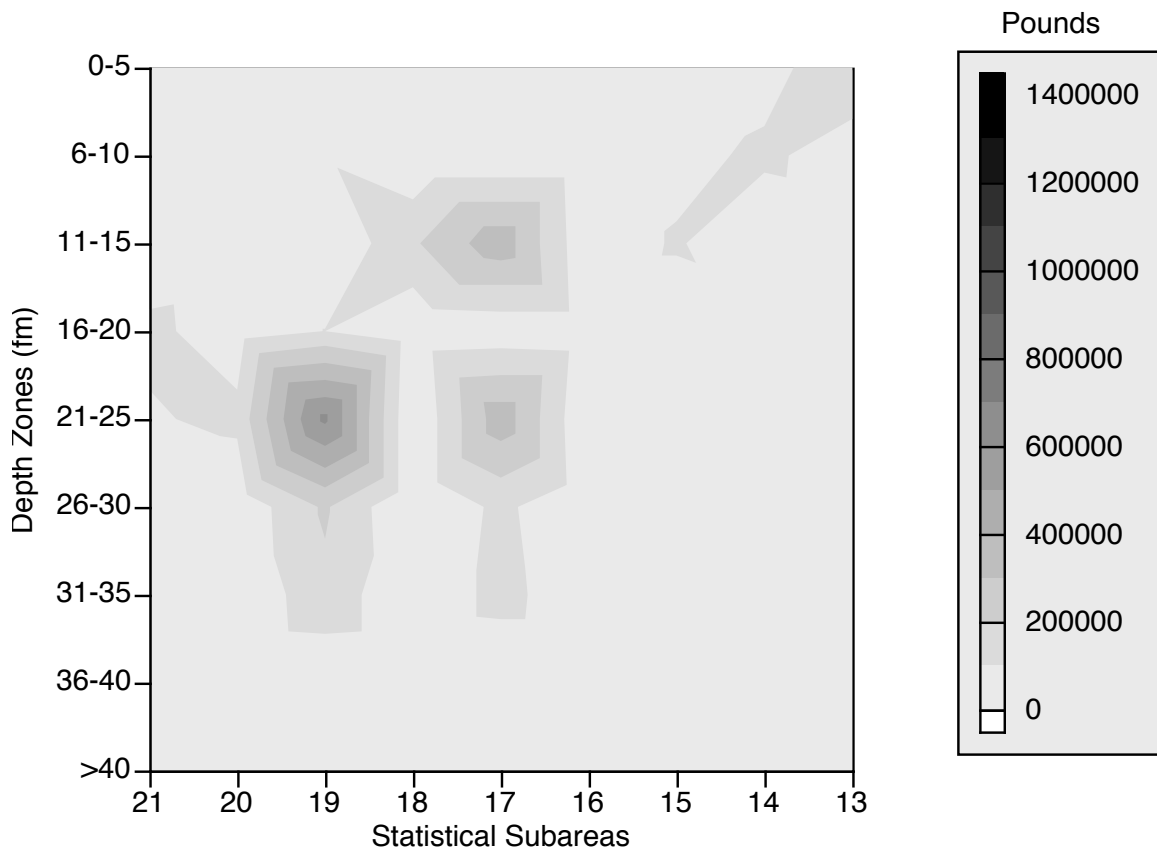
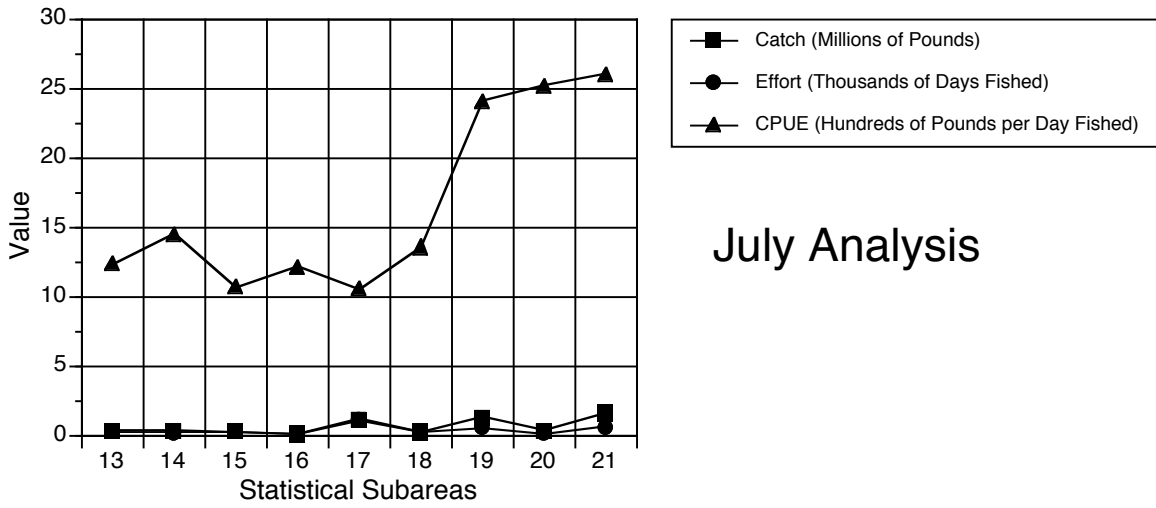


Figure 3a. Offshore brown shrimp catch by area and depth during July 2009.



July Analysis

Figure 3b. Offshore brown shrimp catch, effort and CPUE during July 2009.

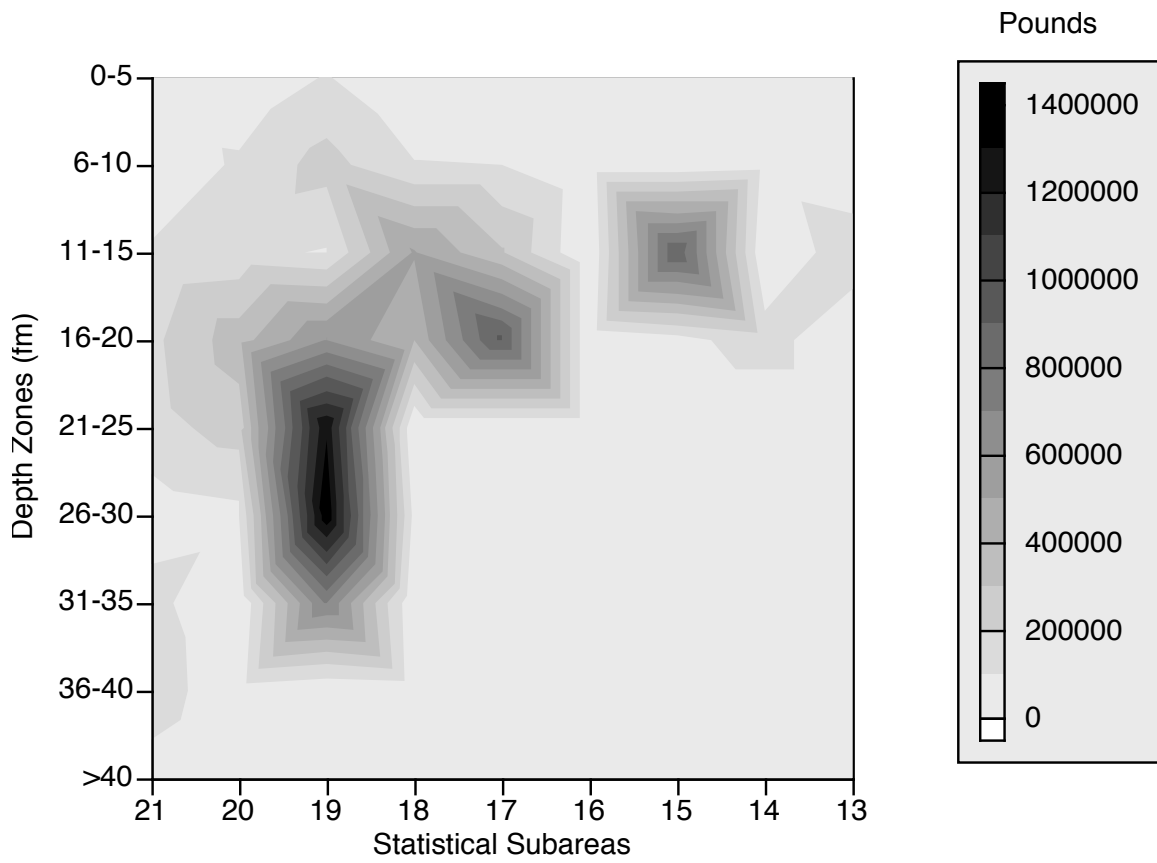
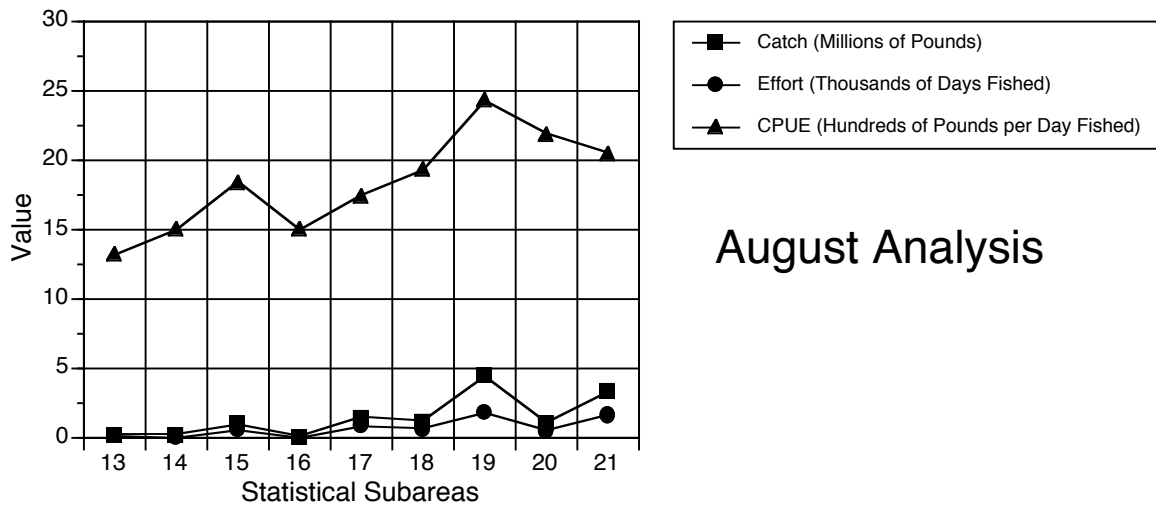


Figure 4a. Offshore brown shrimp catch by area and depth during August 2009.



August Analysis

Figure 4b. Offshore brown shrimp catch, effort and CPUE during August 2009.

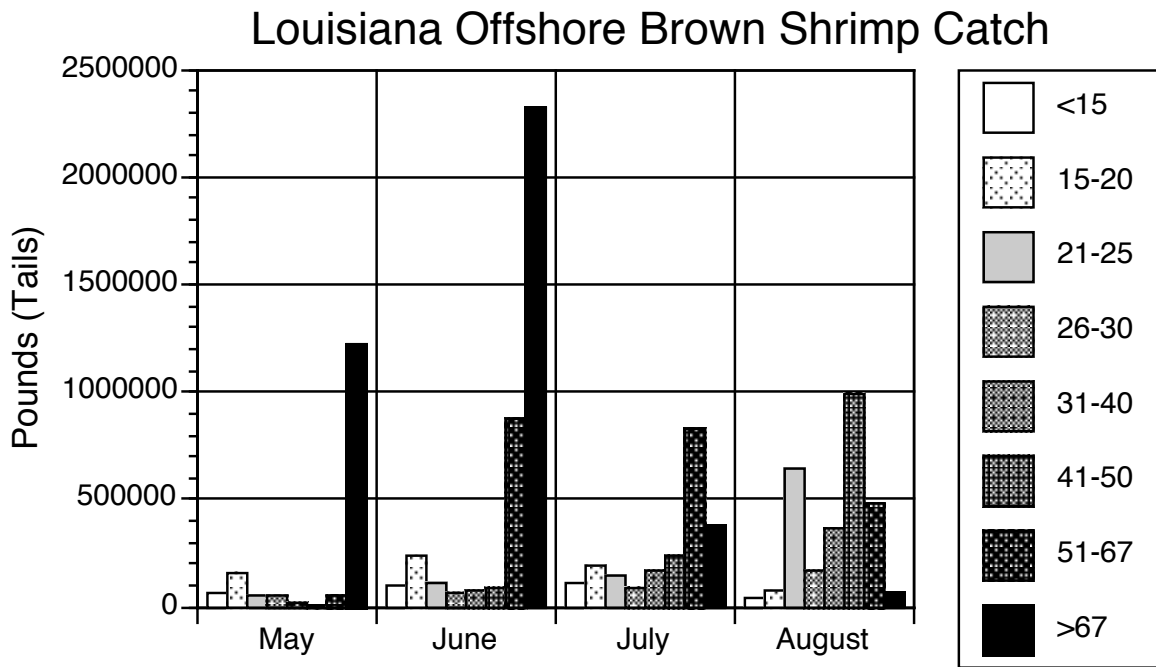


Figure 5. Size composition of brown shrimp taken from offshore Louisiana.

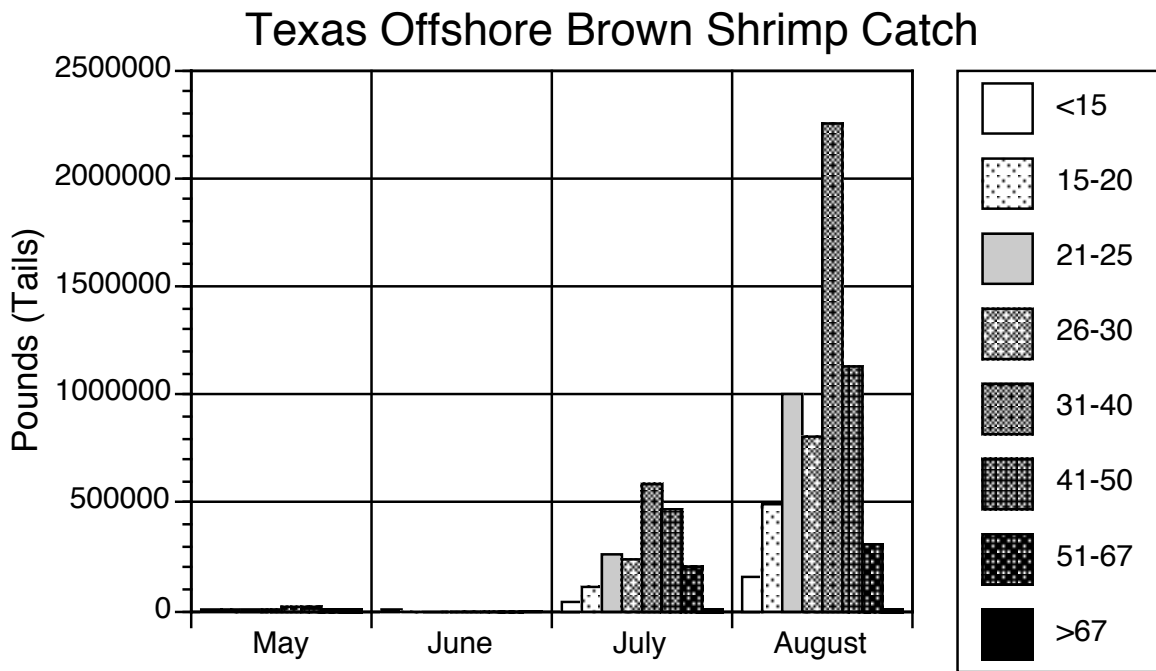


Figure 6. Size composition of brown shrimp taken from offshore Texas.

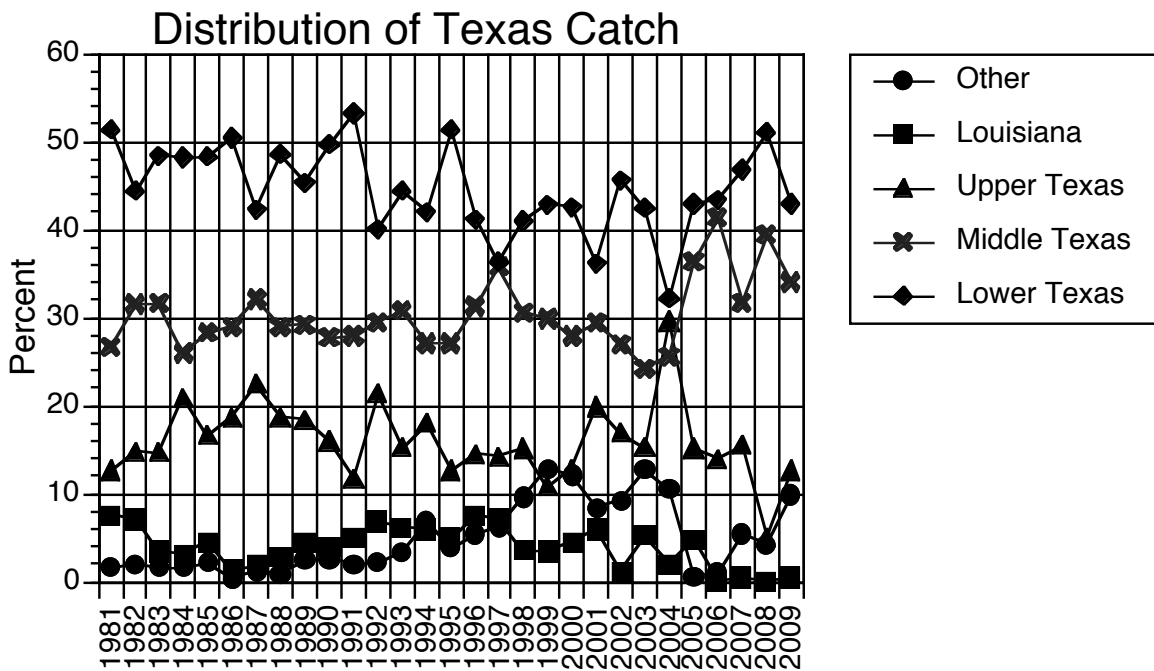


Figure 7. Distribution of May through August total shrimp catch from Texas offshore waters, 1981 - 2009.

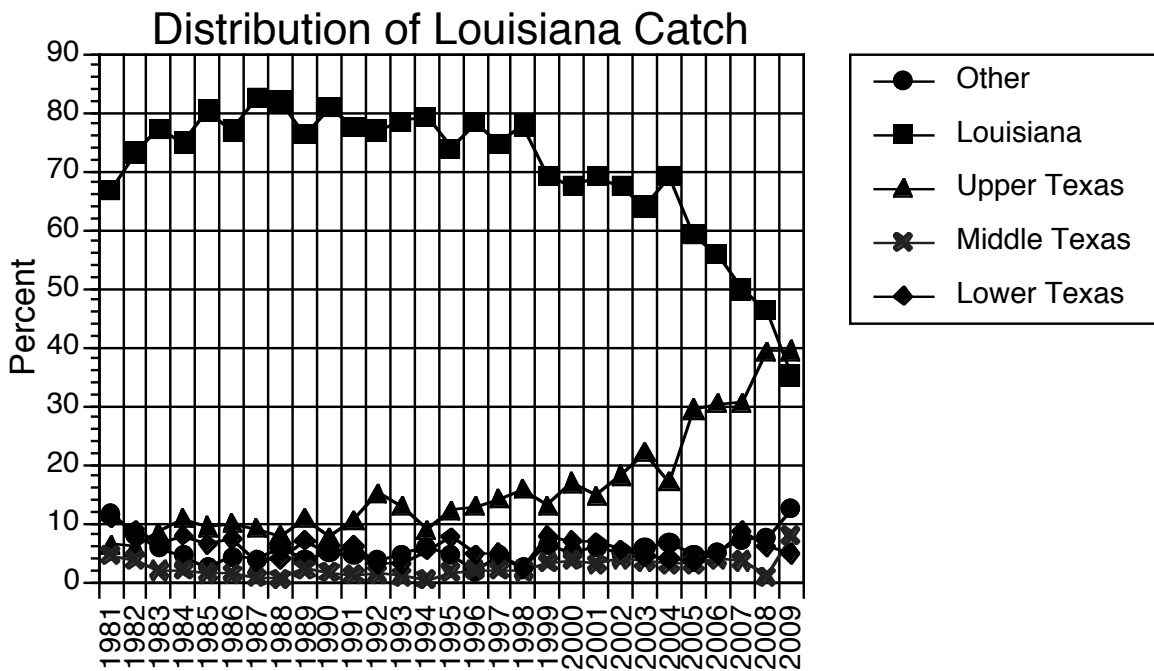


Figure 8. Distribution of May through August total shrimp catch from Louisiana offshore waters, 1981 - 2009.

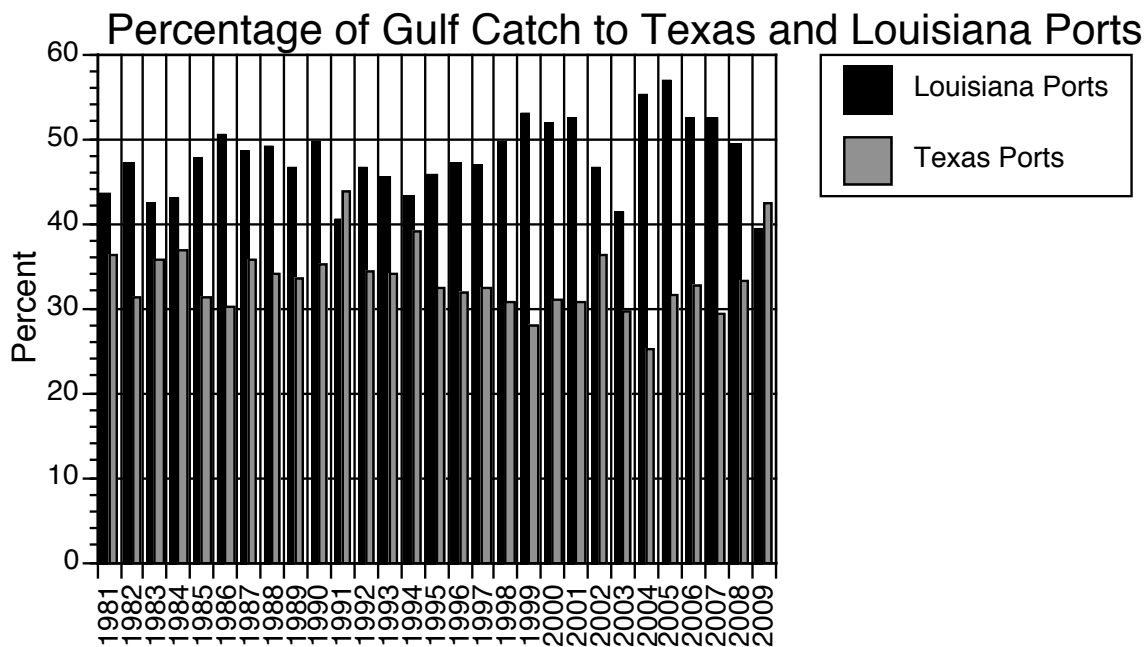


Figure 9. Distribution of May through August Gulf of Mexico shrimp production to all Texas and Louisiana ports, 1981 - 2009.

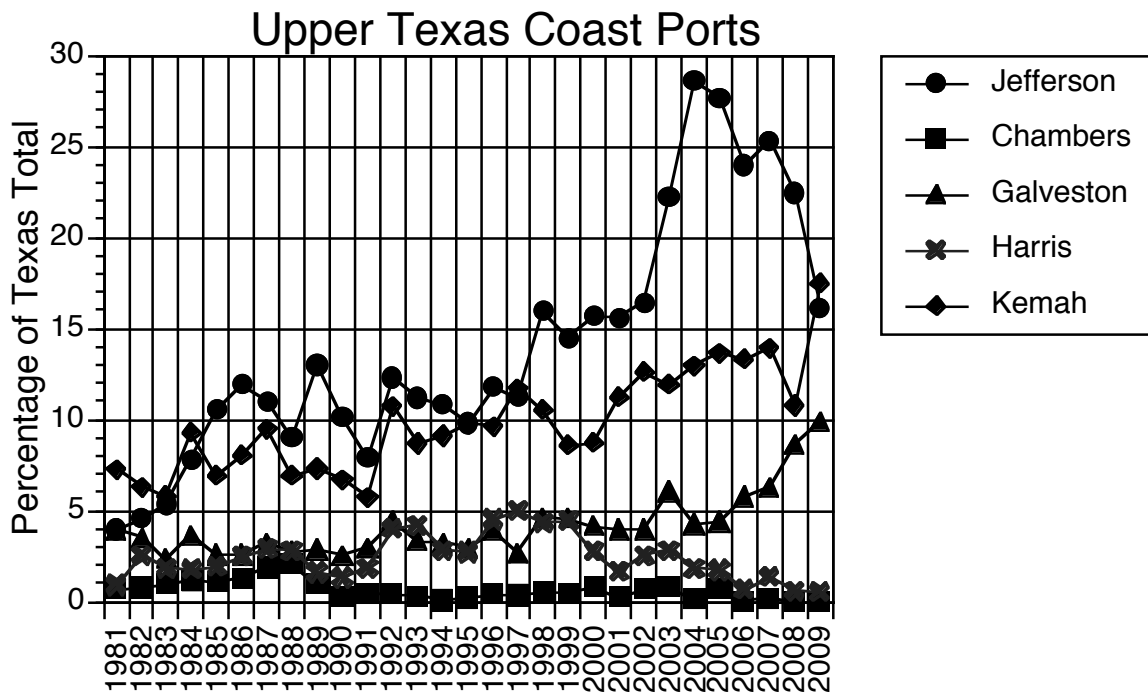


Figure 10. Distribution of May through August Texas landings by upper coast ports, 1981 - 2009.

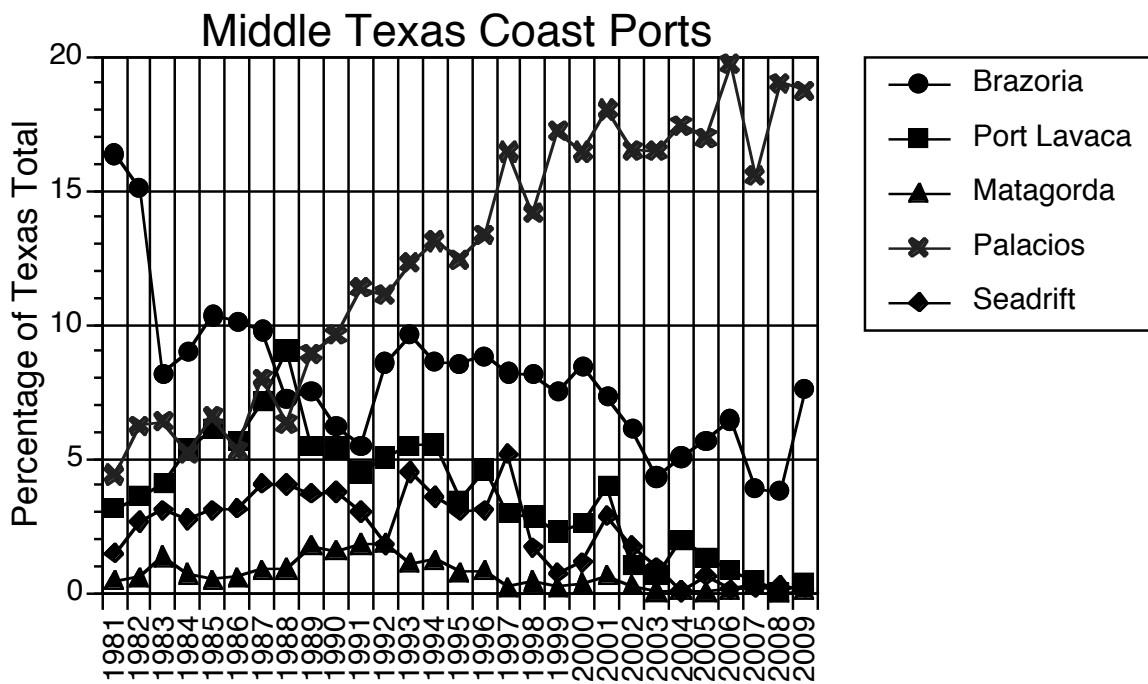


Figure 11. Distribution of May through August Texas landings by middle coast ports, 1981 - 2009.

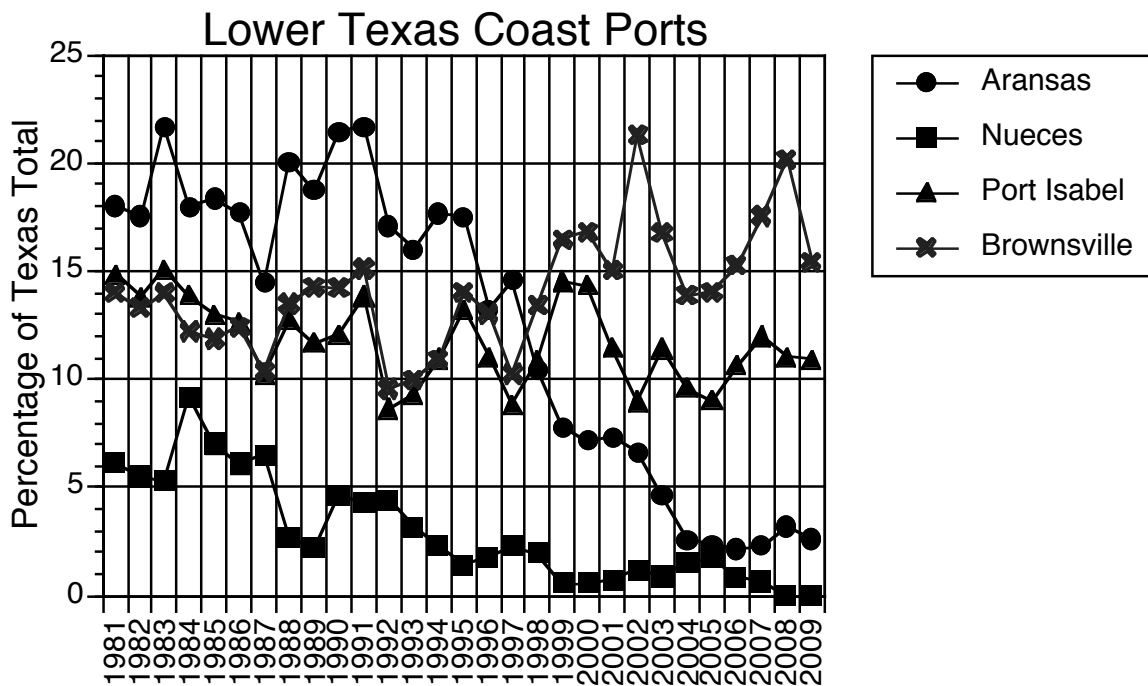


Figure 12. Distribution of May through August Texas landings by lower coast ports, 1981 - 2009.

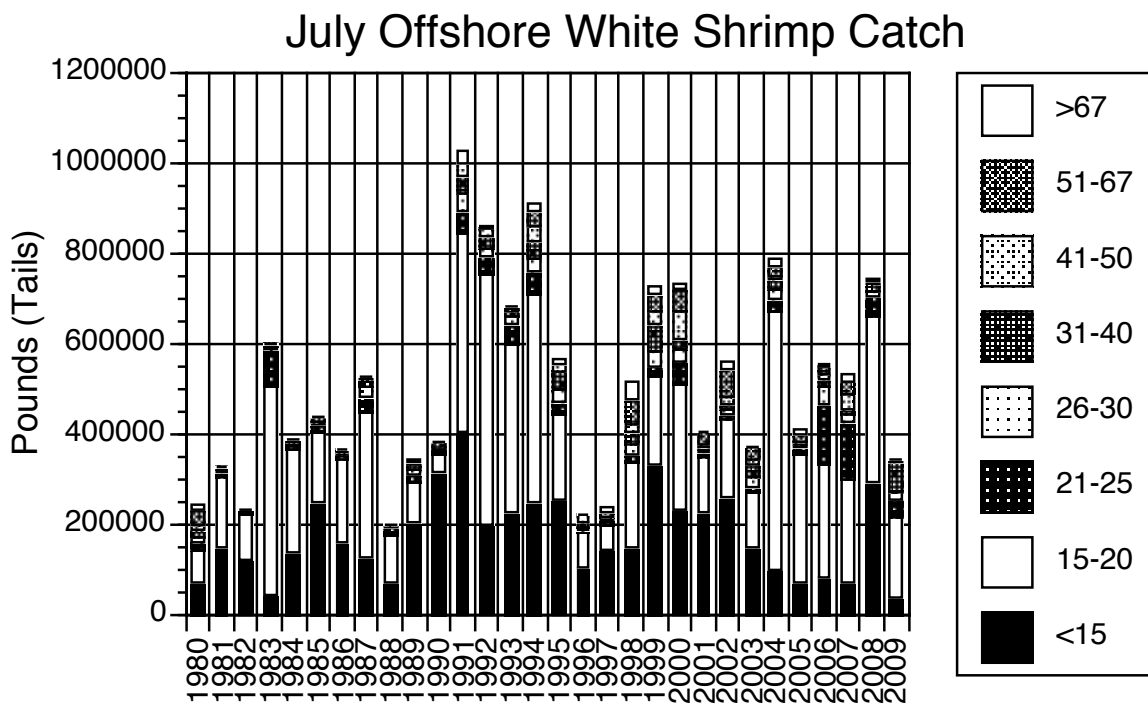


Figure 13. White shrimp size distribution off the Texas coast from 1980 - 2009 during July.

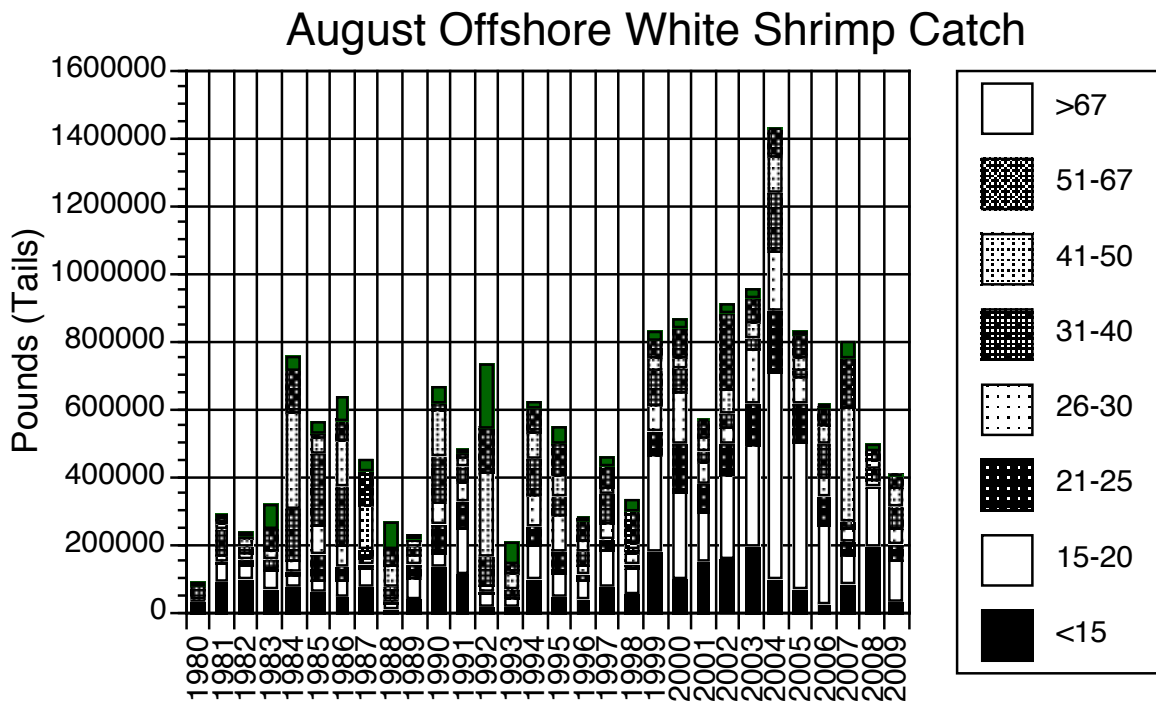


Figure 14. White shrimp size distribution off the Texas coast from 1980 – 2009 during August.