Biological Review of the 2017 Texas Closure

Report to the Gulf of Mexico Fisheries Management Council

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Introduction

In 1981, the Gulf of Mexico Shrimp Fishery Management Plan (FMP) was implemented with the 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 2017 Texas closure and will be presented by the SEFSC to the Gulf of Mexico Fishery Management Council (GMFMC) at the April 2018 meetings.

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 each 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, May 15-July 15, 2009, May 15-July 15, 2010, May 15-July 15, 2011, May 15-July 15, 2012, May 23-July 15, 2013, May 15-July 15, 2014, May 15-July 15, 2015, and May 15-July 15, 2016, May 15-July 15, 2017. State of Texas regulations, implemented in 1960, prohibited shrimp fishing in the territorial sea off Texas during these same periods, with the exception of allowing white shrimp fishing 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 2017).

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 (>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.

National Marine Fisheries Service (NMFS) port agents, as well as state trip ticket systems in Louisiana, Mississippi, Alabama, and Florida, collect shrimp statistics on the catch, effort, and fishing location of shrimp vessels operating in the Gulf of Mexico. These data provide information on the species, size and location of capture, as well as information on

the catch rates and fishing effort of the vessels in the fleet. In addition, the electronic logbook program collects detailed data on fishing location and effort for the offshore fishing fleet (Gallaway, et al., 2003).

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 postlarve may enter the estuaries throughout the spring 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. Research has identified salinity, temperature, and water height 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. However, unlike last year, Texas and Louisiana did not experience record high rainfall in the spring.

In 2016 high rainfall amounts subsequently led to large freshwater discharges into the estuaries. This unprecedented flooding in Texas, and to a lesser degree in Louisiana, most likely concentrated young shrimp at the mouth of bays and out of the nursery habitats required for optimal growth and survival. These high levels of precipitation did not occur in 2017. Therefore, the young shrimp were provided with an opportunity for optimal growth in 2017 compared to last year.

This is reflected in the 2017 Galveston Bay, Texas, postlarval and juvenile brown shrimp indices of abundance, the bait index-model (Berry and Baxter, 1969). This model predicted that the brown shrimp season, from July 2017 through June 2018, would yield approximately 22.5 million pounds off the Texas coast. This value is below the historical average of 25.8 million pounds for 1960-2012. Our environmental model did not support this below average yield prediction, predicting an above average production for Texas offshore waters. 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 greatest contributing factor and key component, temperature during mid-April, was above average this year (76.7º F). Rainfall recorded during early March equaled 0.32 inches and was much less than the historical average of 0.6 inches. Relatively high tidal heights during late April and early May were recorded at approximately 6 feet. Using these environmental parameters, our model suggests an above average production of brown shrimp from Texas waters as related to environmental conditions conducive for optimal shrimp growth and survival.

Catch information from Louisiana inshore and offshore fisheries in May is used to estimate total production for the biological year from May through April. Using 2017 May catch data in our Louisiana Model, we predict a harvest of 21.7 million pounds for

Louisiana west of the Mississippi River for the 2017-2018 season. This is below the historical average of 30.7 million pounds.

In summary, the 2017 abundance indices point to a below year of brown shrimp production in offshore waters of the western Gulf of Mexico. The Galveston Bay bait index forecasts a slightly below average year at 22.5 million pounds from offshore Texas waters. However, the 2017 Environmental Model predicts above average production for Texas offshore waters. Louisiana indices also indicate a below average brown shrimp yield of 21.7 million pounds this season from west of the Mississippi River to the Texas-Louisiana border. Overall, the western Gulf of Mexico should expect an annual brown shrimp production of approximately 44.2 million pounds during the 2017-2018 season. This is below the 1960-2012 long-term historical average of 56.5 million pounds for the two-state area.

Texas Fishing Trends

In Texas bays, from May through August 2017, 0.21 million pounds of brown shrimp were landed. This represents a below average value relative to the historical inshore catches for this period since the closure began in 1981 (1981-2011 average was 4.2 millions pounds). Monthly catches in 2017 were not equally distributed across each of the four months. The first two months accounted for most of the Texas inshore catch during the four-month period.

Offshore production during May through August 2017 was 10.8 million pounds, with 10.2 million pounds (>95%) of the catch produced in the July through August period. The total catch for this period represents a below average level when compared to catch values since EEZ closures were initiated in 1981 (1981-2011 average was 13.6 millions pounds). During the July through August 2017 period only about 1.4% of the landed shrimp were in the >67 count size category (Figure 1).

Texas Ports Shrimp Landings

The distribution of shrimp landings in Texas 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. Figure 2 shows landings of the five upper Texas coast ports, figure 3 shows the landings of the five middle Texas coast ports, and figure 4 shows the landings of the four lower Texas coast ports. The five upper Texas coast ports (with long term mean landing percentage) include Jefferson (17.1%), Chambers (0.38%), Galveston (4.7%), Harris (1.84%), and Kemah (11.18%). The five middle Texas coast ports (with overall mean landing percentage) include Port Lavaca (2.56%), Brazoria (6.59%), Matagorda (0.54%), Palacios (14.29%), and Seadrift (1.78%). The four lower Texas coast ports (with overall mean landing percentage) include Aransas (9.95%), Nueces (2.07%), Port Isabel (10.71%), and Brownsville (15.92%).

Only one of the upper Texas coast ports, Jefferson, experienced a slight increase in landings relative to the other ports during 2017. Jefferson County also had the highest

percentage of landings for all ports in Texas again this year. The other upper ports; Chambers, Galveston, Harris, and Kemah experienced decreased landings relative to the other ports. For the middle Texas coast ports, landings at Brazoria, Matagorda, Seadrift, Palacios, and Port Lavaca were all lower this year compared to 2016. In addition, three of the Lower Texas coast ports of Brownsville, Port Isabel, Aransas, and Nueces landings showed no dramatic shift compared to the previous year.

White Shrimp Catch off Texas

For the twenty-eighth consecutive year, the 0-4 fathom white shrimp fishery off Texas has been closed in conjunction with the Texas closure. Following the 2017 closure, most of the white shrimp landed in July were in the 15-20 and smaller count size range with a below average level of production (Figure 5). Production in July and August 2017 was slightly greater than July and August 2016. Most of the shrimp landed in both months were large and in the 15-20 count size range (Figure 6).

References

Berry, R. and K. Baxter. 1969. Predicting brown shrimp abundance in the northwestern Gulf of Mexico. FAO Fish. Rep. 57(3): 775-798.

Gallaway, B. J., J. G. Cole, L. R. Martin, J. M. Nance, and M. Longnecker. 2003. Description of a simple electronic logbook designed to measure effort in the Gulf of Mexico shrimp fishery. North American Journal of Fishery Management: 23: 581-589.

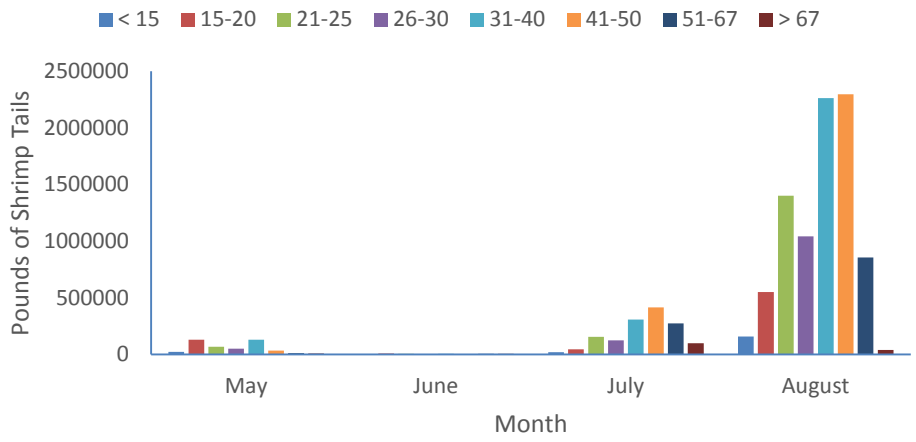

Figure 1. Size composition of brown shrimp catch from offshore Texas, May through August, 2017.

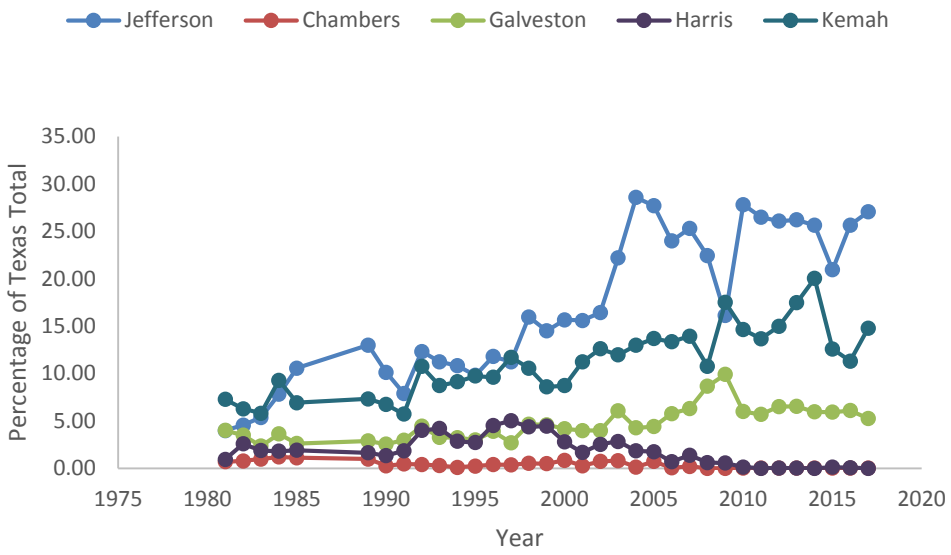

Figure 2. Distribution of landings by Upper Texas coast ports, May through August 1981-2017.

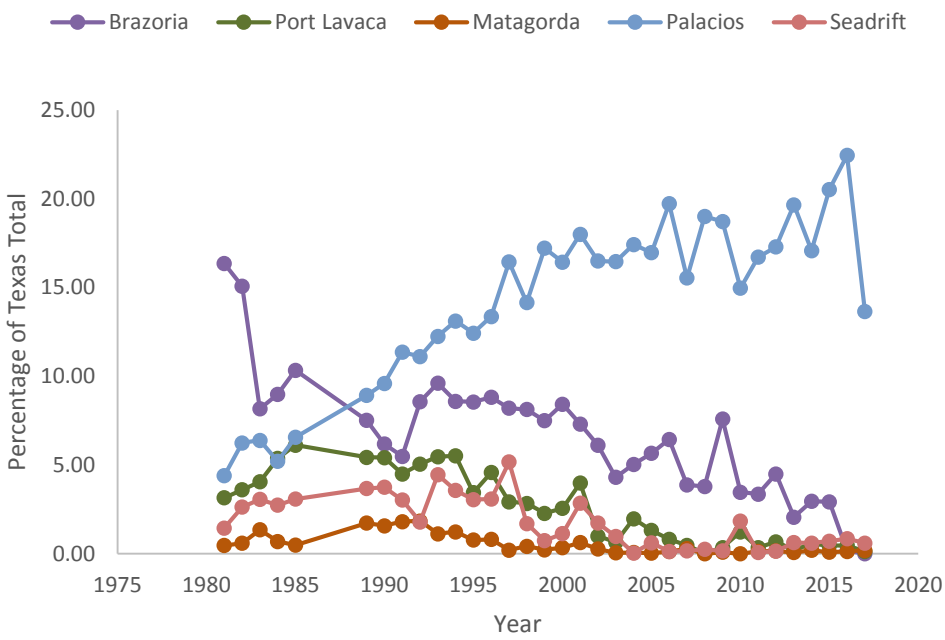

Figure 3. Distribution of landings by Middle Texas coast ports, May through August 1981-2017.

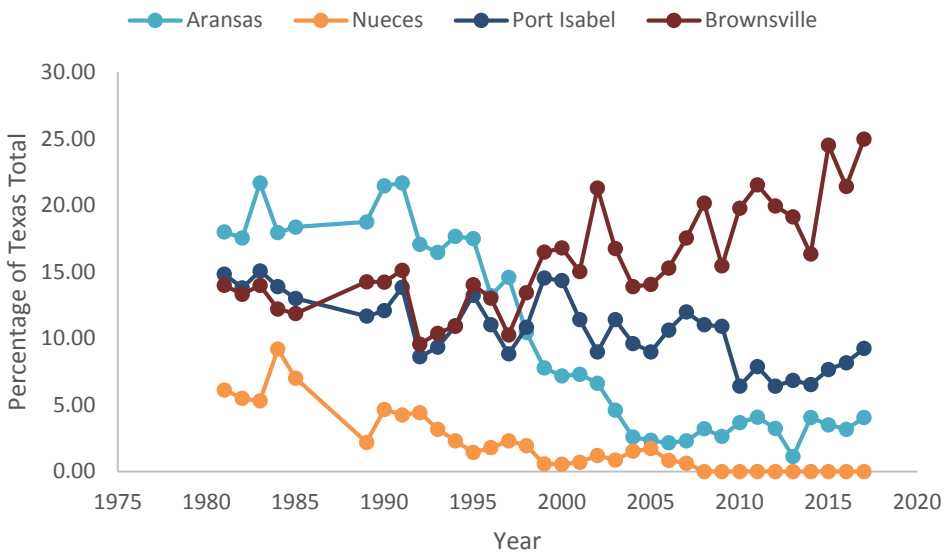

Figure 4. Distribution of landings by Lower Texas coast ports, May through August 1981-2017.

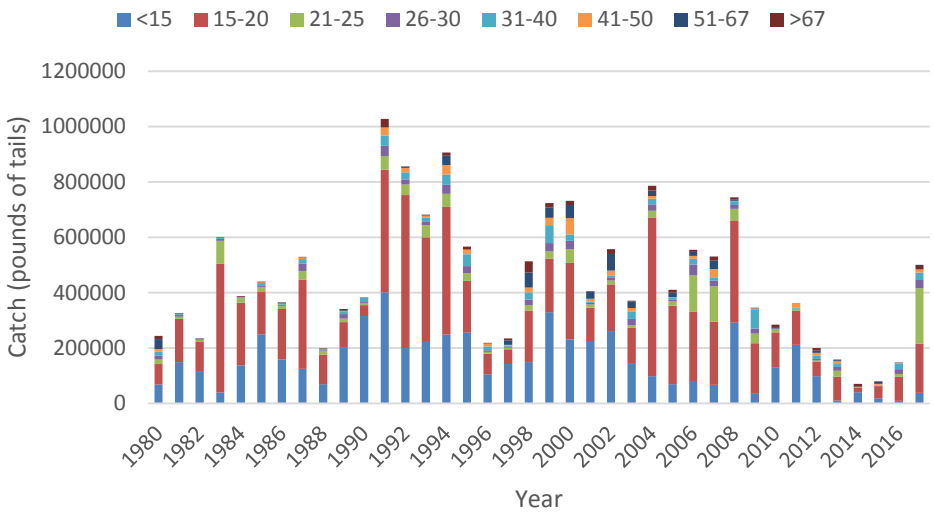

Figure 5. Size composition of Texas July offshore white shrimp catch, 1981-2017.

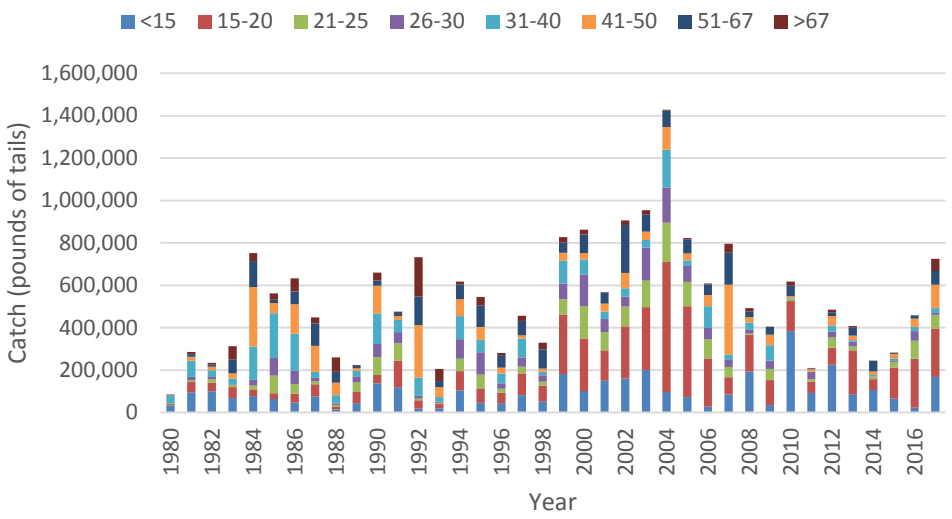

Figure 6. Size composition of Texas August offshore white shrimp catch, 1981-2017.

The 2017 Texas Closure – Results of SEAMAP Sampling

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Potential gain from the 2017 Texas Closure was again calculated based on the brown shrimp size composition observed in the June/July SEAMAP trawling survey. The same methods used in last year's report were repeated. NMFS continues to monitor the Texas Closure to alert the Council to any changes in the system that might warrant reopening discussion of the management measure. The SEAMAP sampling will show quickly if any substantial changes in biological potential from the Texas Closure occur over the years.

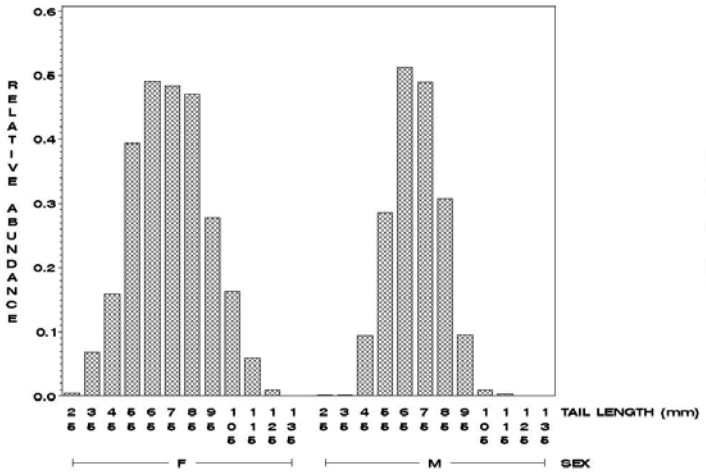

Figure 1. Size and sex composition of brown shrimp in the Texas EEZ, as determined by SEAMAP sampling. (Projected to July 1, 2017)

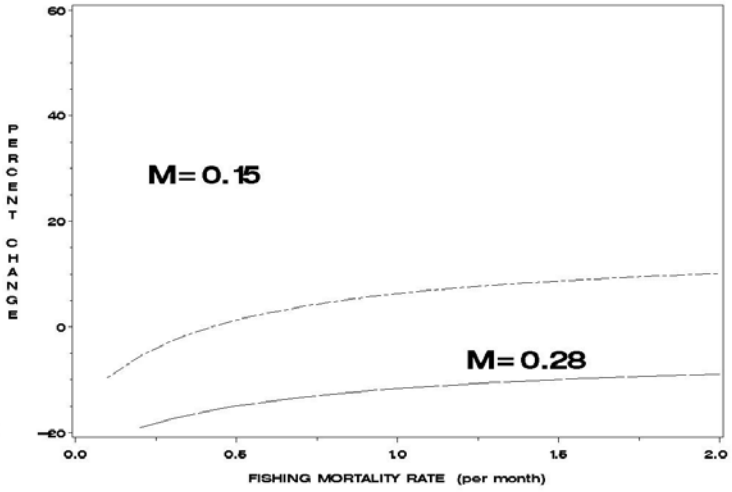

Figure 2. Estimated percent change in yield in the EEZ closure area at 2 values of natural mortality rate.

The 2017 size composition of brown shrimp in the EEZ off Texas was estimated from data collected aboard NOAA Ship *Oregon II*, as part of the standard summer SEAMAP survey (Figure 1). Yield per recruit calculations evaluate the trade-off between growth of individual shrimp and losses due to natural mortality in the closed area, producing estimates of change in yield, due to closure. Changes in yield are calculated for an extended range of fishing mortality rates (F's), for two values of natural mortality rate (M=0.15 and 0.28 per month). As in previous analyses, the two M values were chosen to bracket the range of values expected in the closed area. To compare the biological potential in 2017 with other years, calculations were based on a hypothetical 200 mile, 45 day (June 1 to July 15) closure for all years since 1981. The estimates of percent change due to closure versus F are shown in Figure 2. The percent change in yield values at F=1 and M=0.15 and 0.28 are 6.29% and -11.67%, respectively. F=1.0, which has approximated the F off Texas upon opening in past years, is taken as the point of comparison among years (Figure 3).

The performance indicated for the 2017 Closure as a percentage change was below average and decreased from that of 2016. The modal sizes for both sexes appear similar to those of 2017. The catch per effort in the 2017 SEAMAP survey off Texas (4.4 shrimp per minute) was lower than 2016 (7.1 shrimp per minute) and lower than the average of the time series (11.5 shrimp per minute) and much lower than in 2006 (30.7 shrimp per minute), which was the highest of the time series (Figure 4).

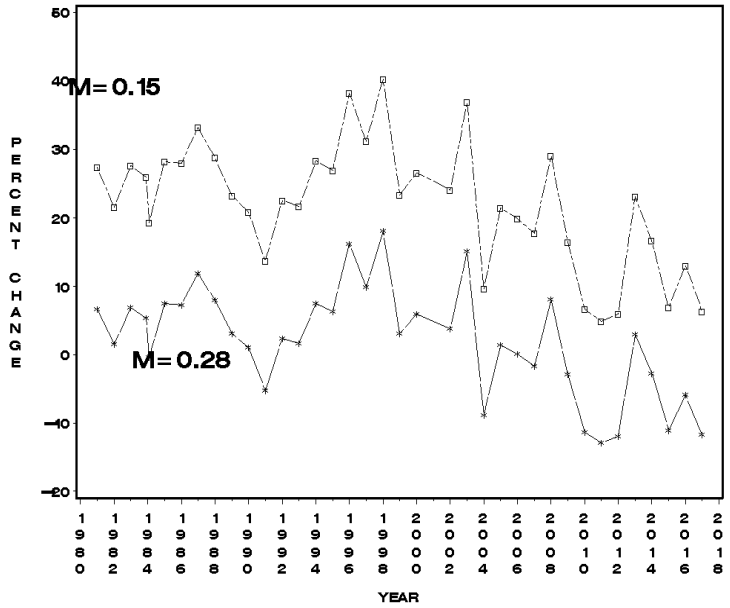

Figure 3. Yearly estimates of change in yield at F=1.

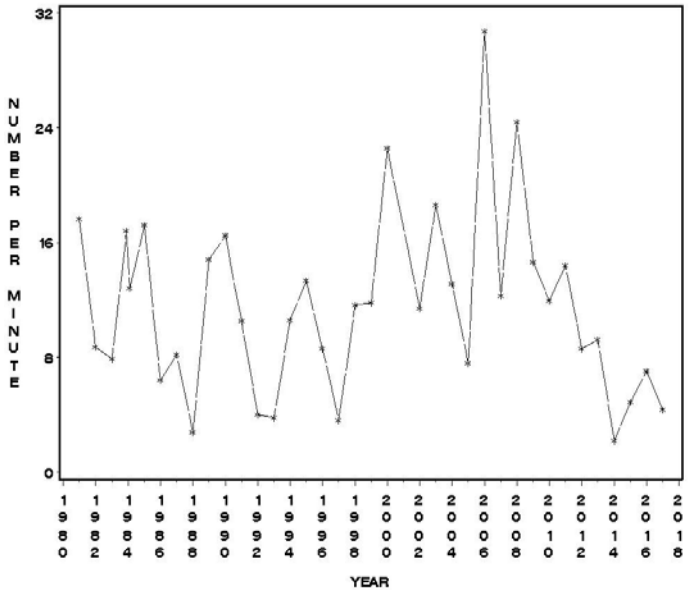

Figure 4. Brown shrimp mean catch per effort.