

## Discussion of Days Fished Expansion in the Gulf of Mexico Shrimp Fishery

**Wade Griffin**  
**Texas A&M University**

Each year the total days fished in the Gulf of Mexico shrimp fishery is estimated from the interviewed trips. The latest stock assessment by the NMFS has increased in the last 2 to 3 years depending on the species. Correct estimation is very important because of bycatch issues and shrimp options papers for amendments 13 and 14. Correct estimates are critical for options paper for amendment 14 since it will be dealing with further reducing bycatch in the Gulf of Mexico shrimp fishery by reducing effort. In addition, other species, which are being managed by the Gulf Council, such as royal red shrimp, have little information about effort except for number of trips.

There are 3 concerns with the current expansion of effort in the shrimp fishery. They are:

1. Increasingly the interviewed trips and landings are non-representative of the total trips and landings.
2. Skimmers have become an important gear in shrimp harvesting.
3. There is no total effort data for species other than brown, pink and white shrimp.

### Interviewed Days Fished

Figure 1 illustrates that in terms of landing and value, interviewed data (Gulf wide) is at least 10% of total landings for the period 1965-2001. However the percent of interviewed trips began a serious decline in 1985. Only about 3% of the total trips are being interviewed since 1990. This implies the vessels being interviewed since 1985 are vessels that have greater landings per trip.

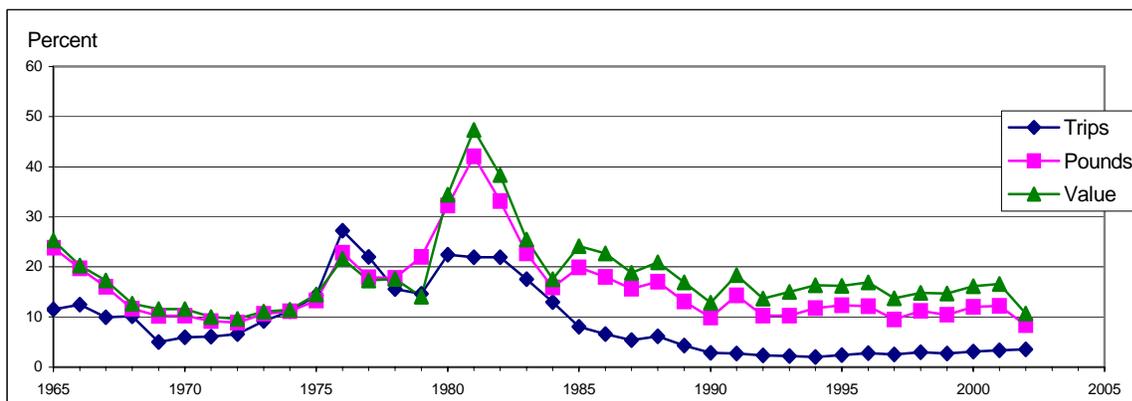


Figure 1. Interviewed trips, pounds and value as a percent of total trips, pounds and value, respectively, for shrimp landings in the Gulf of Mexico for the period 1965-2001.

Figure 2 shows that the percent of interviews by large ( $\geq 60$  ft) and small ( $< 60$  ft) vessels for trips and pounds. Prior to 1985 the number of interviewed small and large vessels was representative of their total trip and landings. Beginning in 1985 however, a disproportionate number of large vessels began to be interviewed relative to the small vessels. By 1993 very few small vessels are being interviewed. Thus, the interviewed data has become very non-representative with respect to vessels size.

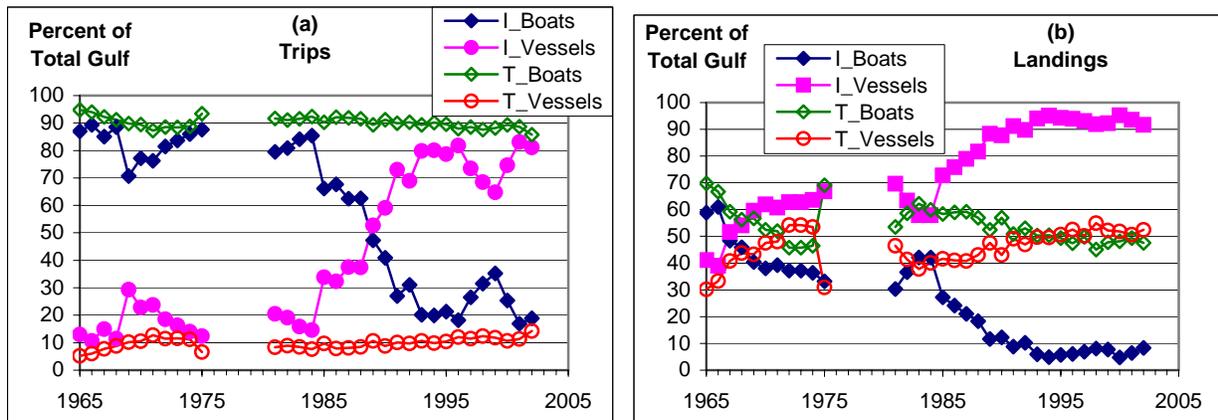


Figure 2. Percent interview (I) and total (T) trips and landings by length of vessel for shrimp landings in the Gulf of Mexico for the period 1965-2002 (data for 1967-1980 is unavailable).

Figure 3 shows that the percent of interviews by states for trips and landings. Figure 3a shows in about 1985 there was a move from interviewing vessels in Louisiana to interviewing vessels in Texas. Louisiana has the largest percent of total trips taken the Gulf of Mexico; Texas had an equivalent number of total trips from 1991 to 1998. While Louisiana has at least maintained 40% of the total trips in the Gulf of Mexico its number of interviewed trips has ranged from 10% to 20% since 1987. Texas, which has around 40% of the trips in the Gulf of Mexico, has since 1987 50% to 70% of the interviewed trips in the Gulf of Mexico. Alabama, which has 2% to 3% of the vessels trips in the Gulf of Mexico, has since 1985 around 10% of the interviewed trips; except in 2000-2001 when the interviewed trips jumped to 20-30% and fell to zero in 2002. Landings show that interviewed landings were proportional total landings until the early 1980s when Texas began to dominate the interviewed landings and Louisiana interviewed dropped to less than 10%. Thus, the interviewed data has become very non-representative with respect to state landings.

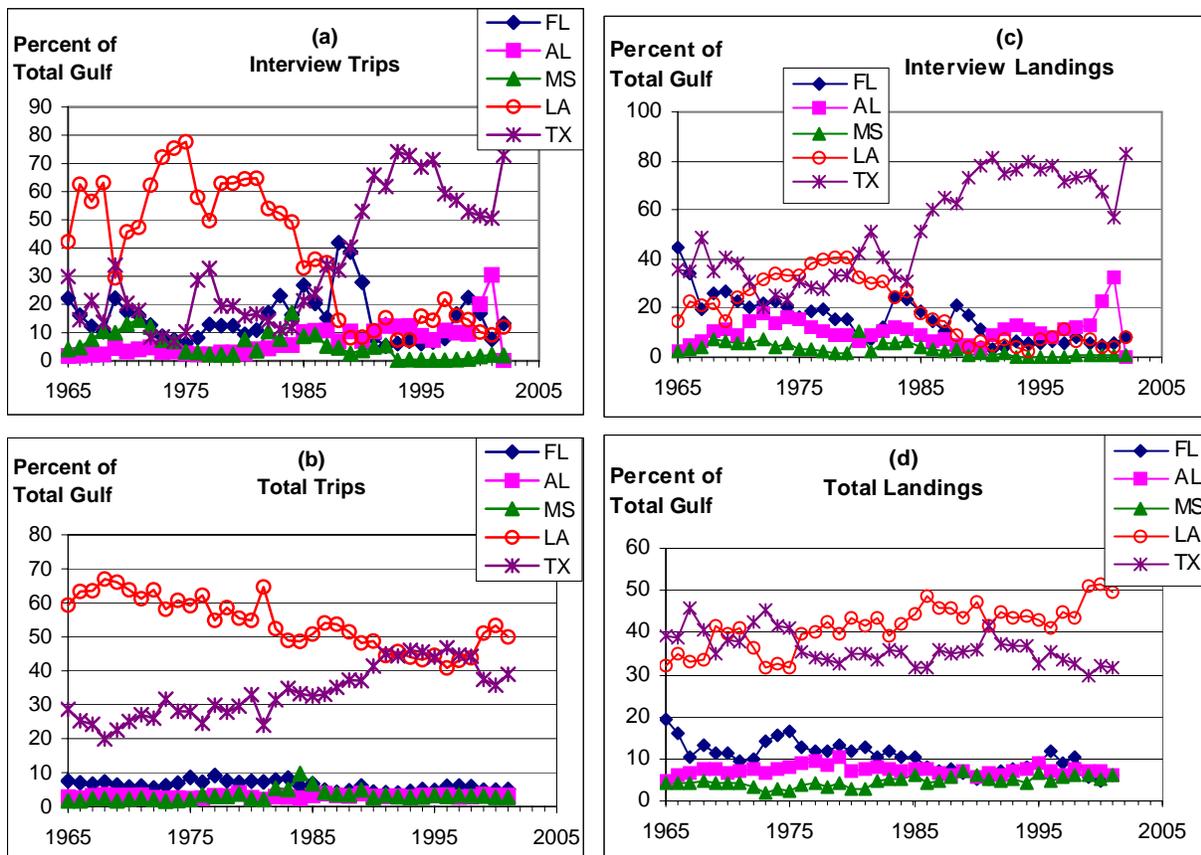


Figure 3. Percent interviewed and total trips and landings by state in the Gulf of Mexico for the period 1965-2002.

Figure 4 shows that interviewed trips and landings in the inshore and offshore were fairly representative up until the early 1980s. However, since 1990 the interview trip and landings inshore is basically non-existent since 1990. This helps explain why there is little interview data for small vessels since small vessels fish. It appears that either the schedulers are targeting only large vessels or small vessel operators have become non-cooperative. Therefore, with respect to inshore-offshore the interviewed data has become non representative.

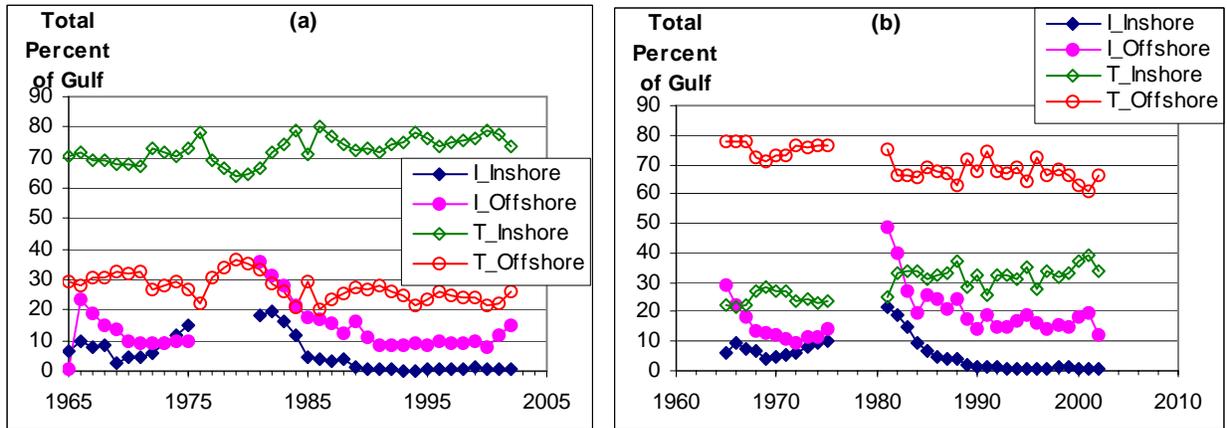


Figure 4. Interviewed trips as a percent of total trips by inshore-offshore for shrimp landings in the Gulf of Mexico for the period 1965-2002.

In 1985 the NMFS began to record the type of gear used by the vessel in the landings file. Figure 5 shows that in 1985 through 1987 the percent of interviews of skimmers were represented. Other gear was represented from 1985 through 1990 although these landings are less than 1% of the total landings. By 1988 few skimmers were interviewed, however, skimmers are becoming more important with time such that they are almost 40% of the trips and 20% of the landings.

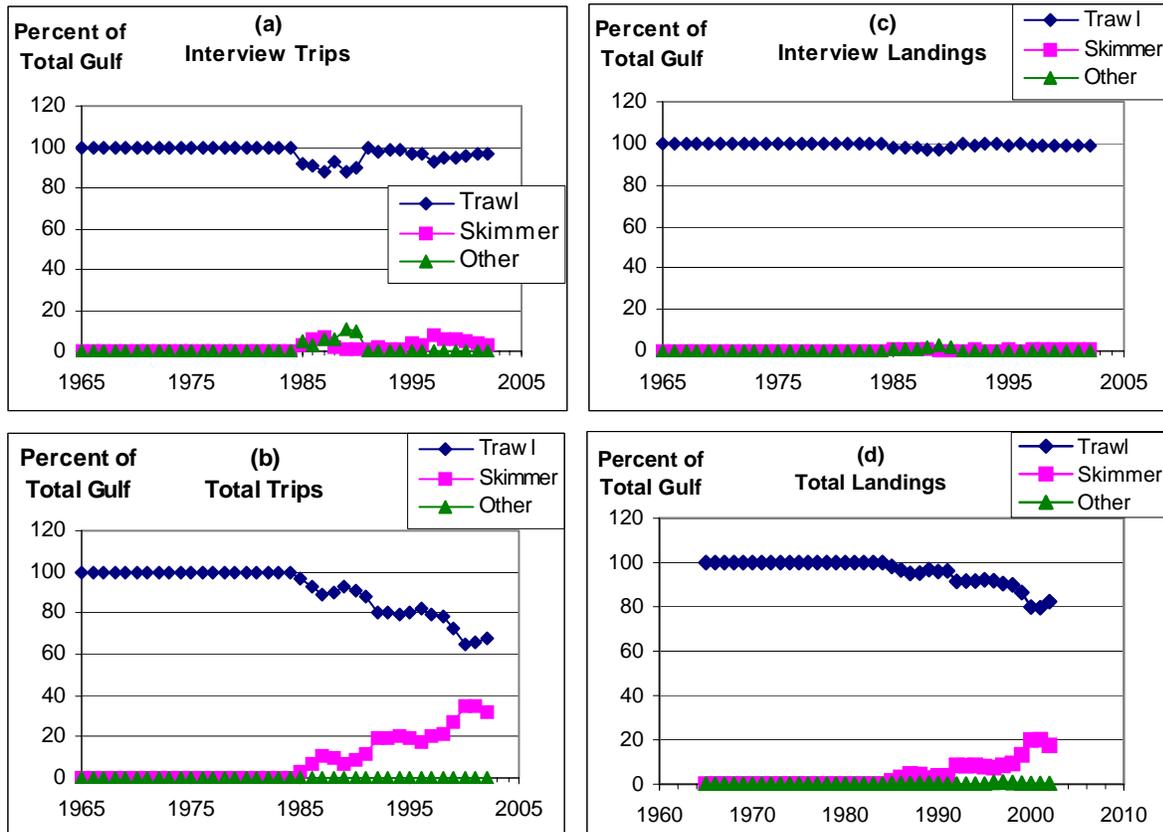


Figure 5. Percent interviewed and total trips and landings by gear type for shrimp in the Gulf of Mexico for the period 1965-2002.

### Summary

In the early 1980s, for whatever reason, the NMFS are collecting interview data for basically large vessel that fish offshore of which a disproportional share are from Texas.. This has caused the interview data to become very non-representative with respect to size of vessel, the five states, and inshore/offshore. Because the interview data has become so non-representative, the simple average method user by NMFS and the regression method used by Griffin, Shah, and Nance may be inadequate.

## Expansion Models

The regression models considered for estimating days fished for the non-interviewed vessels are

Model 1:  $\ln(dfpt)=f[\ln(cpt), \ln(price), \ln(price)^2, vessel, area, depth, month]$

Model 2:  $\ln(dfpt)=f[\ln(cpt), \ln(price), \ln(price)^2, vessel, area, depth, month, gear]$

Model 3:  $\ln(dfpt)=f[\ln(cpt), \ln(price), \ln(price)^2, vessel, area, depth, month, gear, year]$

Model 4:  $\ln(dfpt)=f[\ln(cpt), \ln(price), \ln(price)^2, vessel, area, depth, month, gear, year, species]$

where *dfpt* is the days fished per trip, *vessel* (< 60 ft and  $\geq$  60 ft in length)<sup>1</sup>, *area* (8 area groups: 1-3, 4-6, 7-9, 10-12, 13-15, 16-17, 18-9, 20-21, and  $\geq$  22)<sup>2</sup>, *depth* (6 depth groups: inshore, 1-5 fm, 6-10 fm, 11-15 fm, 16-25 fm and  $\geq$  26 fm), *month* (12 months), *gear* (2 gear groups: trawls and skimmers and butterfly nets), *species* ( 7 shrimp species: brown, pink, white, seabobs, royal red, rock and trachypenaus) and *year* (1965-2002).

A separate regression was estimated each year for Models 1 and 2. Models 3 and 4 were a single equation where *year* is included as dummy variables to account for the abundance effect and price change. In Models 1-3 all shrimp are included as a single species and in Model 4 *species* is included as a dummy variable to account for the difference in catchability of each species. for a given interviewed trip, if a given species were greater than 50% of the landings then that trip was assigned to that species with respect to the dummy variable.

## Expansion Model Validation

Figure 6 shows the estimated total days fished for the four models for shrimp in the Gulf of Mexico for the period 1965-2002. This is compared to the NMFS days fished which includes only data for brown, pink and white shrimp whereas models 1-4 include all species of shrimp. Models 1-4 also most identical results in all but a few years. From 1987 the downtrend in estimated days fished is more smooth then the NMFS estimated. In 2002, the estimated days fished for model 3 and 4 is below that of models 1 and 2 and all are below the estimate by the NMFS. Models 3 and 4 show a decline in days fished from 2001 to 2002 whereas the NMFS show and increase in days fished. There is 70,000 days fished difference between the NMFS estimate and models 3 and 4 estimates. Models 1 and 2 estimated lies between the NMFS estimate and Models 3 and 4 estimates.

Figure 7 compares Model 4 and NMFS estimates of days fished with and trips. The number of trips in 1996 is lower then the number of trips in 1965. Figure 8 shows that the days fished per trip have been increasing over the 1956-2002 period. So, even though there are fewer trips per

<sup>1</sup> Documented vessels were assigned a length from the vessel operating units file. Records with a 9999985- 9999989 were assumed to be  $\geq$  60 ft in length and vessels with a 9999995- 9999999 were assumed to be (< 60 ft in length.

<sup>2</sup> Mexican waters were the 8<sup>th</sup> area. Griffin, Shah, and Nance used 9 areas where the 8 and 9 were Mexican waters.

year in the 1996-2002 period then in 1965 there are more total days fished per year in this latter period per year than in 1965. The days fished per trip for the NMFS shows a much sharper increase in the days fished per trip than model 4. Is this difference due to more marginal vessels leaving the fishery due to the economic hard times such that the vessels in the fishery make more days fished per trip or is it the lack of non-representative data combined with the simple averaging method used by the NMFS giving a significant bias in estimating days fished for non-interviewed vessels. The only way to really know is to get more representative interviewed data.

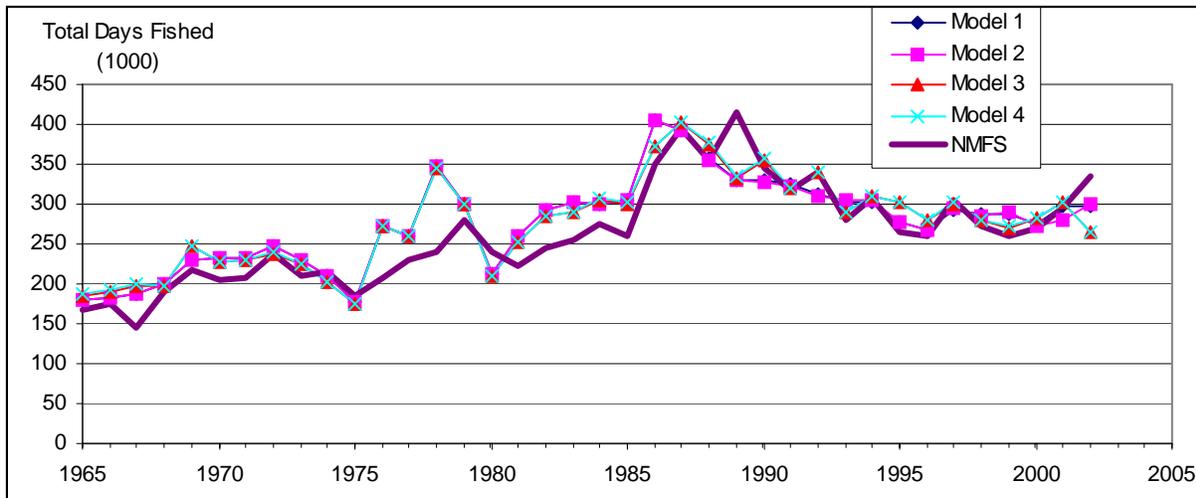


Figure 6. Estimated total days fished by model type and the NMFS for shrimp in the Gulf of Mexico for the period 1965-2002. (Note: models 1-4 include all species whereas NMFS includes only brown, pink and white shrimp.)

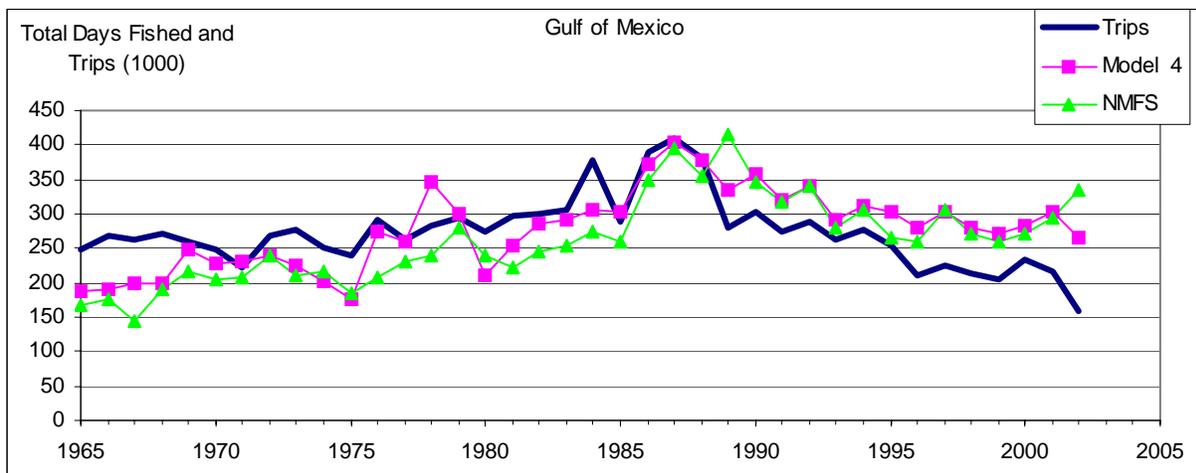


Figure 7. Estimated total days fished by model 4 and the NMFS compared to total trips for shrimp in the Gulf of Mexico for the period 1965-2002. (Note: model 4 includes all species whereas NMFS includes only brown, pink and white shrimp.)

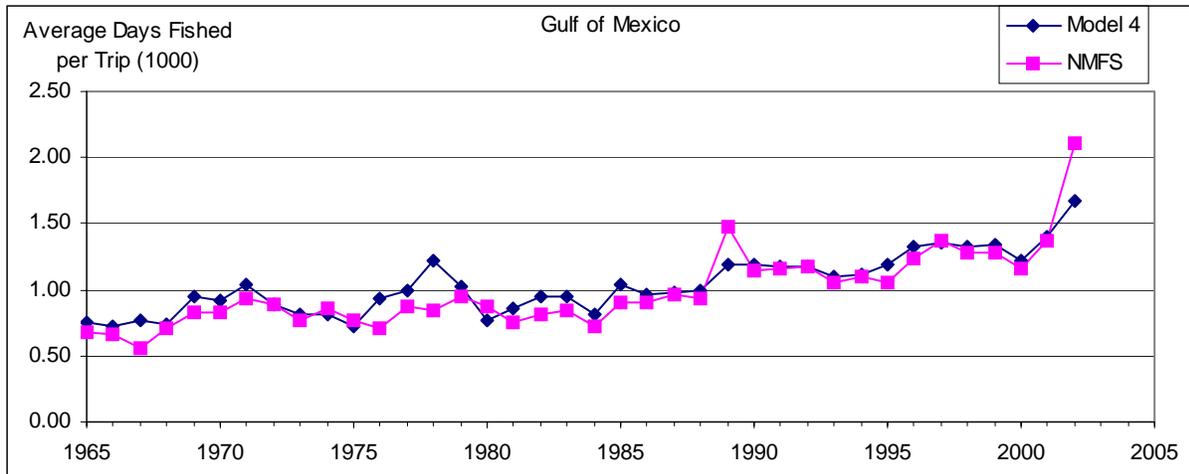


Figure 8. Average day fished per trip for model 4 and the NMFS for shrimp in the Gulf of Mexico for the period 1965-2002. (Note: model 4 includes all species whereas NMFS includes only brown, pink and white shrimp.)

We will proceed with the use of model 4 since it gets around the three problems mentioned at the beginning of this paper. Also by including all years in a single regression it includes the representative data from 1965-1985 in estimating days fished in the years when the data is non-representative.

### Results of Model 4

Total days fished using trawls, skimmers<sup>3</sup>, and other gear in the Gulf of Mexico is shown in Figure 9. This results shows that days fished by trawls has been on a downward trend since 1987. Days fished by trawls are 25,000 units less than it was in 1981 and over 150,000 days fished less than in 1987. For 2002 the trawl estimated from model 4 are over 100,000 units less than the estimates by the NMFS. Half of the difference between the NMFS and model 4 estimates is due to skimmers. Day fished with skimmers has increased to 50,000 units by year 2000. Fishing by other gear is relatively unimportant. Most of the skimmer days fished is in the inshore area (Figure 10) and in the state of Louisiana (Figure 11).

<sup>3</sup> Skimmers include butterfly nets.

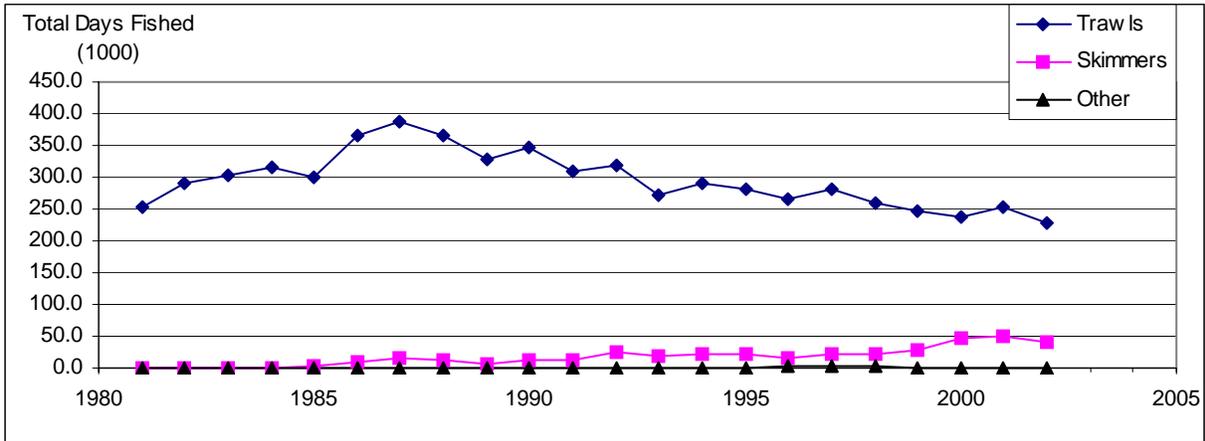


Figure 9. Day fished using trawls, skimmers and other gear with model 4 for shrimp in the Gulf of Mexico for the period 1981-2002.

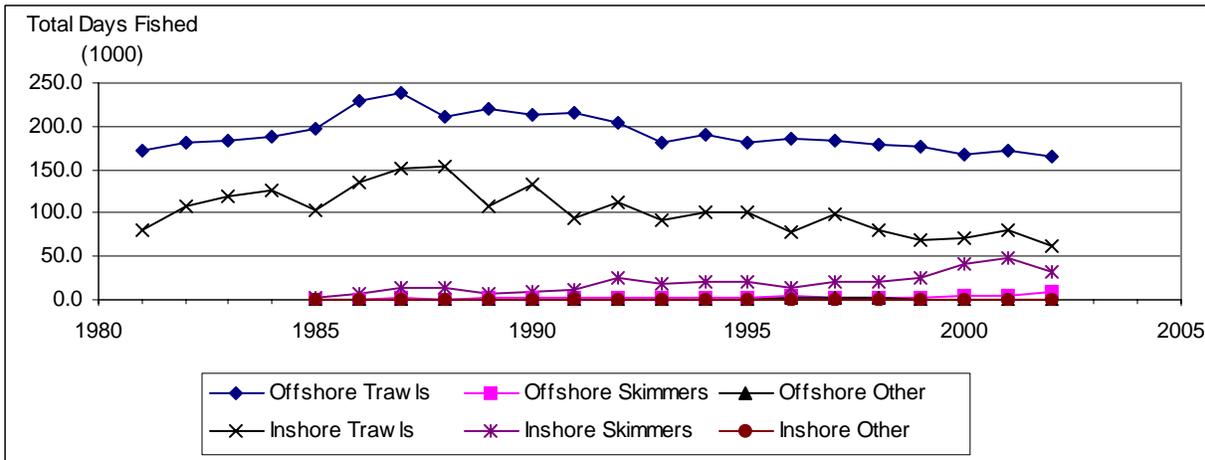


Figure 10. Day fished using trawls, skimmers and other gear with model 4 for shrimp by inshore/offshore in the Gulf of Mexico for the period 1981-2002.

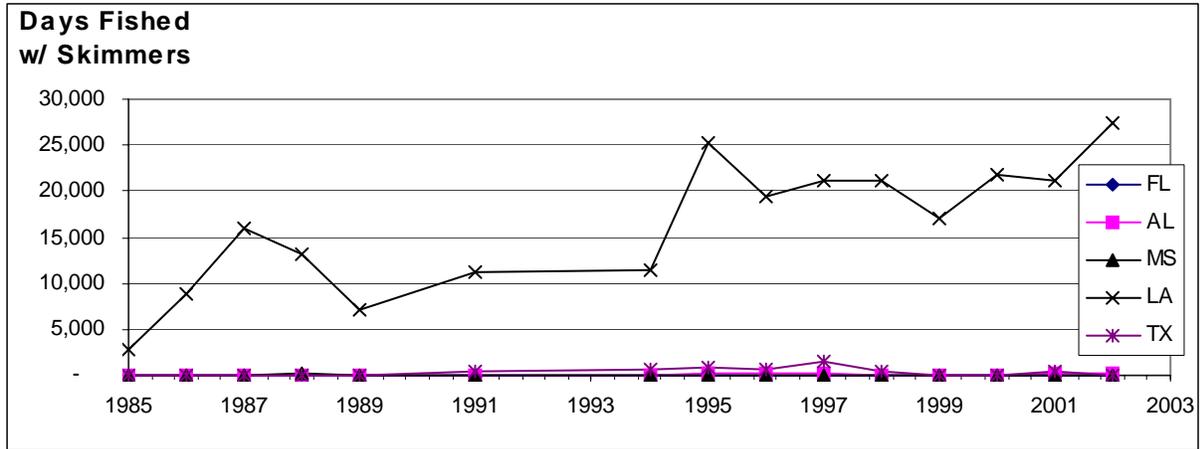


Figure 11. Day fished using skimmers gear with model 4 for shrimp by state in the Gulf of Mexico for the period 1981-2002.