

REVIEW OF THE CATCH SIZING AND AGING OF KING (*Scomberomorus cavalla*) FROM U.S. GULF OF MEXICO AND SOUTH ATLANTIC FISHERIES

Mauricio Ortiz, Patricia L Phares and Nancie J. Cummings

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service, Southeast Fisheries Center
75 Virginia Beach Drive, Miami, Florida USA

December 2003

Sustainable Fisheries Division Contribution SFD-2003-####

SUMMARY

Catch data from commercial and recreational fisheries for king mackerel are sized by sex to generate catch-at-size (CAS) tables. Then the CAS data are converted into catch-at-age (CAA) tables also by sex and combined sexes; these constitute the main input for stock assessment protocols. Aging of the CAS are done by using age-length-keys (ALK) when available, or by a stochastic-aging method using current age-size relationships by sex. A review of the size-samples, aged-fish samples for ALK, sex-ratios, and the protocols applied is presented.

Introduction

King mackerel commercial and recreational fisheries in the US extend from the Northeast states of New York and Virginia to Texas. Presently, this fishery is managed under the Coastal Migratory Pelagic Resources Fishery Management Plan implemented in February 1983. The FMP recognized two different stocks for the purpose of fishery management: the Atlantic migratory stock extending from New England to the South Florida east coast, and the Gulf of Mexico migratory stock extending from the Florida West coast to the Texas border with Mexico. The FMP also recognized the seasonal mix of these stocks on the East coast of Florida. At present, for management and assessment purposes, there is a mobile boundary between Atlantic and Gulf stocks; in the winter (November 1st to March 31st), the boundary is defined as a line due east from the Volusia/Flagler County coastal border. While in the summer (April 1st to October 31st), the boundary is defined as a line due west from the Monroe/Collier County coastal border (Fig 1).

Commercial and Recreational Landings Data

Catch data from commercial fisheries have been collected by NMFS and individual state programs and were extracted from the SEFSC Accumulated Landings System (ALS) and General Canvass files or provided by the NMFS Northeast Regional Office. Recreational catch was estimated by the Marine Recreational Fishery Statistics Survey (MRFSS), NMFS Headboat Survey, and the Texas Parks and Wildlife Coastal Creel Survey. Table 1 and Figure 2 show the catch for king mackerel Atlantic and Gulf stocks (data for 2001-02 are partial; "year" is the calendar year).

Commercial catch inputs are in weight units (lbs), by month, state, county (FL only) and gear. Tables 2-3 and Figure 3 show the distribution of catch by gear for the commercial sector. Gear was not available from the ALS for Florida monthly landings before 1997. For 1984-96, gear for Florida landings

was estimated for the mackerel assessments by the SEFSC Statistics Division using information from Fishery Reporting Specialists about individual landings, knowledge of general trends in gear use and regulations concerning gears in certain areas, and amount of catch. Generally, the only gears assigned were hook and line or gillnet (with all types of gillnets and other net gears assigned to gillnet), but the Data Review Panel in 1989 felt that it was important to distinguish between drift gillnets and non-drift gillnets in East Florida during the summer months in 1985-89, when they most likely were operating simultaneously. For 1981-83, gears were assigned using Florida General Canvas gear information (annual data) and the general rule that Martin, St. Lucie and Monroe Counties had gillnet catches during January-March. It was assumed that with the start of the Florida Trip Ticket system in 1986; all landings were recorded in the data files as whole weight. For 1985 and earlier, it was assumed that weights for Florida landings were "as-landed" in the data files. The Statistics Division estimated that 100% of the net catches and 90% of the hook and line catches were landed gutted (some charterboat catch was sold as whole). Gutted weight for those years was converted to whole weight using a factor of 1.04.

Recreational catch inputs were the numbers of fish by state (ie. Florida East and West as separate states), mode (ie. private, shore, charterboat, headboat, or charterboat and headboat combined), month or groups of months. The MRFSS estimates of catch released alive were not used. Tables 4-5 and Figure 4 show the distribution of recreational catch by mode. The MRFSS estimate for Florida East (FL-East) included Nassau through Dade Counties, and Florida West (FL-West) included Monroe through Escambia Counties. In January-March and November-December, when the Volusia-Dade counties were part of the Gulf migratory group, the entire MRFSS estimate for FL-East was assigned to the Gulf group. Thus, Nassau-Flagler counties from the Atlantic group were included in the Gulf group. In April-October, Monroe county was part of the Atlantic group, but was included (with the FL-West MRFSS estimate) in the Gulf group. The estimates of catch from MRFSS were for bimonthly periods, but March-April was subdivided equally for the FL-East estimate when this area shifted from the Atlantic to the Gulf stock. These assignments most likely did not have much impact on the assessments, since little recreational catch was taken in those areas and months which were mis-assigned.

The distribution of commercial catch by region is presented in Tables 6-7 and Figure 5. The recreational catch by region in Tables 8-9 and Figure 6 shows similar distributions. For the recreational sector, the values presented were the estimated catch in weight, after sizing the catch in numbers. Since the implementation of the FMP, allowable king mackerel catch was partitioned among sectors and regions based on historic unregulated catches, thus the distributions by regions presented in Figures 5 and 6 may reflect these restrictions. At present, for the Gulf migratory group, the total allowable catch (TAC) is allocated with 68% for the recreational fishermen and 32% for commercial sector. The commercial sector was further subdivided as 69% for the eastern zone (Florida west and east coast) and 31% for the western zone (Alabama, Mississippi, Louisiana and Texas). For the TAC of the king Atlantic migratory group, 62.9% was allocated to the recreational fisherman and 37.1% to the commercial sector (GMFMC and SAFMC 1998). To further review the distribution of catch by gear and smaller areas, Table 10 presents the percent distribution of commercial catch by gear and sub-areas for the last 8 years of king mackerel, and Table 11 presents the percent distribution of the recreational catch.

King mackerel is considered a migratory coastal species, with preference for waters with temperatures above 20° C. In the Gulf of Mexico, kings are more abundant in the northeastern Gulf from the Panhandle area to Alabama and Mississippi during the summer months. In the western Gulf, off Texas, they are available in spring and summer months. In the winter months, they tend to concentrate in the Florida Keys and in the south western Gulf region (Trent et al. 1983). For the Atlantic kings, during the summer months, they tend to move northwards following the 20° C isocline, which may bring them off the New England coast in certain years; however they are commonly present off New Jersey and south. During the winter months, the Atlantic stock also congregates in the south, off the Florida east coast primarily. Commercial and recreational fisheries follow the migratory movements of the stocks.

The catch distribution for the commercial sector of the king Gulf stock by month and subarea is shown in Table 12. This table shows the percentage catch by month for each subarea, the total catch in weight (lbs) for each subarea and their respective percentage of the total commercial catch by year. The

major subareas are the FL-Keys Monroe county (31.5%), the Florida South East (FL-SE) Volusia-Dade (27.4%), and Louisiana (23.9%), respectively for the period 1995-2002. Figure 7 shows the percent distributions by month. For the commercial sector the main peaks were in the winter (December-March) corresponding to the South Florida catches and in the summer (July-August) off Louisiana. Table 13 shows the catch distribution by month and subarea for the commercial king Atlantic stock. The main subareas were the North Carolina (46.1%) and the FL-SE Volusia-Dade (45.4%) for the 1995-2002 period. Figure 8 shows the monthly percent distributions with peaks in April-May mostly from the Florida catch, and October-December from the North Carolina commercial catch.

The percent catch distribution of king mackerel for the recreational sector for 1995-2002 by month group and subarea is shown in Tables 14 and 15. The estimates of catch from MRFSS and TPWD are for bimonthly periods (except March-April for the FL-East estimate which has been split into months), and Headboat Survey estimates are generally by month. In the tables, Headboat catches have been summed into the same bimonthly periods to match the MRFSS and TPWD estimates. For the Gulf stock, Table 14 shows the Florida west coast Monroe-Escambia as the main component (62%), followed by the Florida east Nassau-Dade (16%) and the Alabama-Mississippi (11.2%). Figure 7 (right panel) shows the average distribution bimonthly with an average trend plotted. The South Florida catches were mainly in the winter months (November-March), while in the North Gulf recreational catches were mainly in May-September. For the Atlantic stock, Table 15 shows Florida east Nassau-Dade (46.8%), North Carolina (33.1%) and South Carolina-Georgia (15.1%) as main components. Figure 8 (right panel) shows bimonthly percent distribution, with main peaks in May-October.

Once commercial catch (in weight) and recreational catch (in numbers of fish) were compiled, they were summed over some strata. For the commercial sector, Florida catches were summed within month, county group, and gear group, while non-Florida catches were summed within month, state and gear group. For the recreational sector, modes were grouped into non-headboat modes combined or headboat. MRFSS and Texas PWD estimates were summed within wave (bimonthly period) and state (with FL-east and FL-west separated). Headboat Survey estimates were summed within month and county group for Florida and within month and state for other states. The county groups used in Florida for both commercial and recreational catches were defined to maintain the separation of the two stocks and the mixing zone, and to allow for possible differences in factors pertinent to the assessment along the long coastlines of Florida (e.g. catch levels). Catches were combined over states within regions of low catch: AL-MS, SC- GA, and states north of NC. The MRFSS estimate from the FL east coast for wave 2 (Mar-Apr) was evenly split into single months.

Catch was then sized using size frequencies samples for each year, stock, sector, area and month where available. But before discussing the actual process itself, first the size-frequency samples collected for king mackerel since 1981 are reviewed below.

In additional notes related to catch and landing estimates for mackerels, recreational catch estimates included tournament fishing, but tournament and non-tournament fishing could not be separated. The MRFSS and Texas PWD surveys did not visit tournament sites, but they did not exclude tournament fishers encountered in any part of the survey. Thus, tournament fishing was generally included in the MRFSS or TPWD private boat mode, but almost no samples of fish were taken. Texas PWD and MRFSS both surveyed Texas in 1981-1985, but neither covered all modes. The estimates used in the assessment were a combination of the two surveys and substitutes generated for missing estimates. Since 1986, Texas PWD surveyed Texas while MRFSS covered all other states. Beginning in 1986, the Headboat Survey began to provide the estimates for southeast headboats (TX-NC); the MRFSS eliminated coverage of headboats in the southeast, only including charterboats in the for-hire mode.

Beginning in 2000, the MRFSS began using a new method to estimate charterboat estimates in the Gulf of Mexico. However, because these estimates were not comparable with those from the method used previously, the "old method" has still been used in the assessments (until enough years are available to adjust the earlier years to be compatible with the "new method").

Size Frequency Sample Data

Size frequency sample data for commercial fisheries in the southeast states have been provided since 1983 by the SEFSC Trip Interview Program (TIP). This cooperative program receives data from state sampling programs as well as NMFS samplers in some states. Before 1991, some samples of commercial landings collected under the direction of the NMFS Panama City Laboratory which were not submitted to TIP were also available. (The Panama City Lab samples also included some from recreational catch and from research fishing trips which were similar to commercial or recreational fishing.) There were also small numbers of king mackerel samples from the State of North Carolina not provided through TIP because they appeared in the non-reef fish fishery sector, the only samples from NC submitted to TIP. Samples of commercial landings for states north of NC have not been available.

Size frequency sample data for recreational fisheries were collected by the MRFSS (southeast and northeast states), NMFS Headboat Survey (southeast states) and Texas Parks and Wildlife coastal creel survey, which also provided the recreational catch estimates. As noted earlier, these surveys did not sample at tournament sites, but some tournament sampling was provided by TIP and NC. Occasional samples in TIP were from other recreational catch, or from charterboats which were selling some catch. Some recreational samples through 1990 were from the Panama City Lab's program (see above). The Alabama Charterboat Survey collected samples during 1991-1995. Although some gears other than hook and line were used in recreational fishing and were coded in the MRFSS samples, these were infrequent and the information was not useful because the recreational estimates were for gears combined.

Tournament samples from TIP or NC size-frequency data files were included in the assessment files, but generally were not used in the sizing of the catches. The size-samples from North Carolina tournaments coded as "sector=47" represented measures taken by tournament fisherman who were given measuring boards and were instructed to measure all the fish caught. These can potentially be used in sizing general recreational landings, and were referred to as "unbiased" tournament samples. Size samples from tournaments in other states (as well those from North Carolina coded as sector=81) were considered "biased" in relation to the general recreational catch, as they were sampling fish that entered in the tournament, usually only the larger individuals. Otherwise, tournament samples from all states (except the NC board samples) were considered biased in relation to the general recreational catch even if they were submitted as unbiased samples. Very occasionally, these non-board tournament samples have been used for sizing catches, only if there were very few non-tournament samples and if they appeared similar in mean size and range to those non-tournament samples that were available.

Table 16 and Figure 9 show the total number of king mackerel size sampled by migratory group and sector from 1981 to 2002 (2002 is incomplete). Commercial size samples were predominant in a ratio 3 to 1 compared to recreational size samples. Table 17 shows the distribution of annual samples (number of fish size-sampled) from recreational fisheries for both the Atlantic and the Gulf migratory groups. On average, for the last 10 years 1,800 and 3,500 fish were measured annually from recreational fisheries for the Atlantic and the Gulf stocks, respectively. Figure 10 shows this distribution by mode (Headboat or other modes combined). Table 18 presents the number of fish samples by year and gear from the Atlantic stock commercial fisheries. The total numbers were roughly twice the recreational samples, with an annual average of 5,500 samples in the last 10 years. The largest percent of size samples came from hook and line gear commercial fisheries (Fig 11 left panel). Table 19 presents the size sample distribution of commercial fisheries from the Gulf stock. The average was approximately 5,500 samples per year in the last 10 years (Fig 11 right panel).

Tables 20 and 21 show the percent distribution of size samples by year, month and mode (headboat and other modes combined) from recreational fisheries for the Atlantic and Gulf stocks, respectively. Figures 12 and 13 present the monthly average (as a percent of the annual sample \pm one

standard deviation) trends over the 1981-2002 period, for the Atlantic and Gulf stocks, respectively. For Atlantic king, most recreational size samples were collected from April through October, with no major differences between headboat or other recreational modes. For Gulf king, headboat samples were mainly collected in the summer (Jul-Aug) and winter (Nov-Dec), non-headboat samples were also primarily collected in the summer (Jul-Aug) months. Tables 22 and 23 present the percent distribution of size samples by month from the commercial fisheries for the Atlantic and Gulf stocks, respectively. In the case of commercial fisheries, only the hook & line gear was reviewed, as it accounted for 93% in the Atlantic, and 80% in the Gulf of the commercial size samples. For the Atlantic stock, most commercial samples were collected from April through August, while for the Gulf stock most samples were from December through March (Fig 14).

Looking in the distribution of size samples in the most recent years, Table 24 and Figures 15 and 16 present the number of king mackerel size sample from 1994 through 2002 by stock, sector and subareas. For Atlantic king commercial sector most size samples came from Florida east Nassau-Dade area, while recreational samples came from North Carolina and Florida east Nassau-Dade areas. For Gulf king commercial sector most size samples came also from Florida east Nassau-Dade and Florida Keys Monroe subareas. Instead Gulf recreational size samples were more evenly distributed between Texas, Florida west Citrus-Escambia, and Florida Key Monroe subareas. Table 25 presents the percent size sample distributions by sector, gear and subarea.

Figures 17 through 20 present density size-frequency sample distributions for each migratory group, subdivided by sector and major gear (commercial) or mode (recreational). The data on these plots were restricted to size samples that have more than 100 fish samples, and have corresponding direct match with catch records. Each line in these graphs represents an annual density size distribution. King sample sizes were grouped in 10 cm intervals starting from 20 to 30 up to 140+ cm. Also in these graphs, the left panels are the density size distribution [y-axis 0 to 1], while the right panel shows the deviation for each year distribution to the overall average [e.g. in the graph average of all years is represented by the horizontal zero line]. The deviation plots might help to identify particular years where size density diverge significantly from prior or overall average, as in the case for example of strong cohort passing through the fishery. Positive deviations would indicate a larger than normal frequency of particular size class, correspondingly negative deviations would indicate a lower than normal frequency of particular size class.

Figure 17 shows the density size distributions of Atlantic king for commercial (hook & line gear) sector. The commercial size frequency was rather constant for 1981-2002, the most common size(s) of king was 70-80 cm and 80-90 cm. The deviation plot indicates that for 2002, 1983 and 1995, the commercial fishery caught larger size fish. For the recreational sector, size distributions were broader and variable by year, with main size varying from 50-60 in 1985, 60-70 in 1991, to 90-100 cm in 1982 (Fig 18). In recent years, main size recreational catch has been about 70-80 cm, for Atlantic king. Headboat recreational fisheries started size sampling in 1986 for Atlantic king, from 1986-89 the mean size catch was above average, 1990 to 1994 the mean size catch was below average, and in the latest years, the mean size of catch appeared to increase again (Fig 18).

For the Gulf king size frequency density, the commercial samples were divided for hook & line and gillnet gears, although there were only size-samples from 1981 to 1990 for gillnets (Fig 19). As with the commercial fishery of the Atlantic, the commercial hook & line Gulf catch was mainly composed of fish between 70-90 cm. However, larger size fish (80-100 cm) were predominant in early years 1983/84/87, while in 1996/97/99 and 2000 smaller size fish (60-70 cm) were more common. For the gillnet size frequency, most common size varied from 60 to 90 cm. Figure 20 shows the density size frequency distributions for the recreational Gulf king fishery, all sectors (top) and headboat (bottom). The headboat fishery caught smaller size kings (50-70 cm) in 1997 and 1998.

Catch sizing

Catch records were matched to size frequency samples by:

1. Year: 1981 to 2002
2. Migratory group: Atlantic, Gulf
3. Sector: commercial, recreational
4. Mode: (only recreational) Headboat, non-headboat
5. Subarea: For commercial and recreational headboat -North of NC, North Carolina, South Carolina-Georgia combined, FL NE (Nassau-Flagler), FL SE (Volusia-Dade), Florida Keys (Monroe), FL SW (Collier-Hernando), FL NW (Citrus-Escambia), Alabama-Mississippi combined, Louisiana, Texas. For non-headboat recreational, Florida catches were FL east (Nassau-Dade) and FL west (Monroe-Escambia).
6. Gear: hook & line, gillnet(s), trawl, haul seine, purse seine, drift gillnet, trammel net, beach seine, traps & other.
7. Month: individual months for commercial and recreational headboat, bimonthly periods for non-headboat recreational.

A minimum of 100 fish per catch was required to “size” a catch, except if the catch was very small (e.g. most headboat or trawl catches), or if not enough samples were available to meet this restriction. For 1981-1983 commercial catches of Atlantic king, the minimum sample size was reduced to 50 fish per catch due to low numbers.

In 1989 the Mackerel Stock Assessment Panel (MSAP) established the following general rules for matching size samples to catch:

- Commercial samples from north-east Florida should not be used as substitutes for sizing SC-GA recreational catches;
- Catches should be sized with samples from the same migratory group only;
- Florida commercial samples should not be used as substitutes for sizing Florida recreational catches;
- And, recreational headboat should be separated from private and charter in the catches and matching of catch and size samples.

If there was not a direct match size sample for a given catch record, an algorithm designated ‘alternative’ size samples according to the following criteria under the restrictions established by the 1989 MSAP:

- Size samples for the same year, migratory group, sector, mode, subarea, and gear but for months next or prior to the month of the catch record (as long as the month did not violate the definition of migratory stock, within samples from the mixing area);
- Size samples for the same year, migratory group, sector, mode, and gear but for adjacent subareas to the area of the catch record;
- Size samples for other gears/modes/sector with similar size distributions;
- The search for alternative size samples also took into account the minimum size sample of 100 fish, and if necessary, it added one or more size samples until this requirement was completed;
- If the algorithms did not provide alternative size samples, the user assigned manually a size sample for the sizing procedure.

In the following analyses, the designation of a “direct match” for a size sample with reference to a given catch corresponded to size samples that have the same migratory group, year, sector, mode (only apply to recreational; headboat and non-headboat), area, gear and bymonth. Also, the match of size samples to a catch ignored whether the size samples came from a single sampling occurrence (e.g. only one boat sampled) for from more than one sampling case. Thus, samples may be highly clustered. There were many other issues in the commercial samples (from the TIP) that are being studied presently by a separate

group (The TIP Working Group). Therefore, the fact that a given catch had a direct match size samples did not necessarily imply a complete random size sample, particularly if there was only one sample per catch.

Tables 26 and 27 show the percent of the total catch by sector (commercial, recreational) that have direct match size-samples and catch without direct match size samples, for the Atlantic and Gulf migratory groups respectively. Further, the catch with direct match was split between size samples with 100 or more fish and samples with less than 100 fish measured. The same information is presented in Figures 21 and 22. In the case of Atlantic king, for the commercial sector on average 90% of the catch had direct match size samples in the last 11 years (1991-2001), a higher percentage compared to early years when about 70% of the catch had direct match size samples (1981-2000). However, about only 63% of the commercial catch had direct match samples with 100 or more fish per sample. In the case of recreational fisheries, about 98% of the catch has size samples, albeit about 38% had size samples with 100 or more fish, in the 1991-2000 period.

For the Gulf king, the commercial fisheries had on average 80% direct match size samples from 1992 to 2002. This percentage was lower compared with early years (87%, 1981-1991). Also, for the most recent period, the size samples with less than 100 fish increased up to 45% (1995-2002). For the recreational Gulf king fisheries, the size samples covered about 98% of the catch by direct matching since 1991. However, about 40% of the catch had size samples with 100 or less fish per sample, in the same years. Again these catch percentages reflect direct size sample matching, only, overall most of the sizing of the catch for both migratory groups was done with direct size frequency samples for each fishery, gear, area and by month.

Another important component of the sizing of the catch procedure was the classification of catch by sex. King mackerel shows dimorphic growth patterns, with females attaining larger size compared to same age males, for both the Atlantic and Gulf migratory groups (Manooch et al. 1987). The proportion of males at size in the catches of king mackerel showed a decreasing trend with size, most likely due to the sexually-dimorphic growth, catch sizing and catch aging procedures (having taken into account sex ratios to avoid biases in age-structure models). However, as sex identification was not available in all size samples, in 1996 the MSAP adopted a method to estimate sex-ratio-at-length for king and Spanish mackerels (Restrepo 1996). The sex-ratios were estimated using fishery independent sex at length data from commercial and recreational catches from different areas and seasons. The sex ratios were estimated using Generalized Additive models (GAMs) where the proportion of males was modeled as a logit function of the factors year, season, migratory group and a four-degree polynomial of the size (Restrepo 1996). Estimates of sex-ratio [proportion of males] in 1 cm intervals were then provided for the years 1984 through 1994, and for the seasons: summer [April – October] and winter [November – March] for each stock.

In the case of king mackerel, both Atlantic and Gulf stocks, the estimated sex ratios were applied for fish within the size of 50 and 130 cm. For fish less than 50 cm, it was assumed a 50% sex ratio (MSAP 1996).

For years prior to 1984, the MSAP decided to use the 1984 sex-ratio values, and for years 1995+ on, the sizing protocols used the 1994 sex-ratios-at-length. Figure 23 and 24 show the estimates of sex-ratio-at-size by season for Atlantic and king mackerel, respectively. Particularly for Gulf king, the sex-ratios-at-length varied among years, for smaller size fish (50-80 cm). Figure 25 presents the average of all years (1984-1996) for each stock, with Atlantic king having higher proportions of males for the small size classes (50-90 cm) compared to Gulf kings.

In the sizing protocol, if the size-samples had sex information that information was retained and the sex-ratio-at-length was only applied for non-sexed fish. Thus, once the catch and size frequency samples were matched, the output of the sizing protocol provided Catch-at-Size (CAS) by sex for king mackerel.

Catch Aging

Aging protocols for king mackerel have been previously described by Cummings and Turner (2003, Ref), and Cummings (1989). In addition, reports regarding the aging methods, number and source of otolith samples, etc. have been provided in prior assessments to the MSAP (Cummings and DeVries 2003).

Briefly, king mackerel otoliths were collected from commercial, recreational fisheries and research projects. Otolith treatment and reading followed standardized methods and they were all read at the NMFS SEFSC Panama city Laboratory. Age-length keys (ALK) were then generated for each year, quarter and migratory group. The aging of CAS by sex was then performed using preferentially ALKs, whenever possible, and then by a stochastic method, using sex-specific growth functions (Cummings and Turner 2003). The current protocols for estimating age composition of king mackerel were adopted by the MASP in 1989.

Review of the available fish-aged samples, from king mackerel otoliths is summarized in Table 28. Over 31,000 otoliths have been aged from 1986 to 2002*. Table 29 shows the breakdown of otolith samples by sex and migratory group, the Gulf king is further split into the eastern and western regions, in the ALK no samples from Mexico were included. For the Western Gulf (Louisiana - Texas) aging samples were only available until 1994 (Fig 26). For both Atlantic and Gulf stocks, there was a higher proportion of female-aged fish. Fewer fish were not sexed; those samples were also excluded from the ALK (Figs 26 and 27). Figure 20 and Table 30 present the number of otolith samples for Atlantic king (sexed fish) by month and year. Most of the samples were collected between May and October. Instead, for Gulf king most otolith samples were collected in the month of July from 1987 to 1995. Thereafter, most of the samples were collected in the winter months, January and February. The distribution of otolith samples by main areas is shown in Table 32 and 33 for Gulf and Atlantic king, respectively (Fig 31). In general, most samples come from the Florida coast; samples from Louisiana, Texas and Alabama stopped in 1994/95. For Atlantic king, North Carolina provided most of the otolith samples, followed by Florida, and in smaller proportions, South Carolina and Georgia.

Descriptions and evaluation of the aging process, otolith preparation, reading, and validation were provided by DeVries et al (1988). Input files for the ALK consisted of single fish records with size, sex, date, geographic area, and source. The age length keys were then constructed by grouping aged fish into 5 cm. intervals, starting in 30 to 200 cm for king mackerel. The rule guide was to have at least 10 fish or more per size interval. However, due to the low number of samples within bin sizes, normally the bins of the smallest and largest size fish were merged. For example, Table 34 shows the number of aged-fish per 5 cm size interval by age and year, for the eastern Gulf mackerel female group. For this group 10,535 fish were aged, grouping into 5 cm intervals by age and year, generated 1,518 cells, of which only 296 (19%, darker shade in table) have 10 or more fish per cell and 531 (35%, lighter shade in table) have 5 or more fish per cell. Thus, several of the bins were merged into larger size bins. The Table 34 also shows that most of the ALK fish are from ages 1 to 6, although the oldest fish recorded was age 26.

ALK were created for each migratory group Atlantic or Gulf, year, and sex. For the Gulf king ALK were further disaggregated for Eastern Gulf (Florida to Alabama) and western Gulf (Texas to Louisiana), for those years when samples were available from the western region. There were however ALK for the whole Gulf region (coded GOM in tables and figures); of course, if there were only samples from the eastern Gulf, the ALKs for GOM and EGM were the same. Figure 32 presents box plot distribution of the size (fork length cm) of aged fish for the ALK, for males and females of each migratory group by year. Overall, females have larger sizes, for each group, and also show a greater range of sizes. Figure 33 presents the age-length relationship from the ALK as box plots for each age, migratory group and sex. The box width was proportional to the number of aged-fish. The largest size for females was about 130-140 cm fork length for both the Gulf and Atlantic stocks, for males the largest average size was about 110 cm.

Tables 35 through 42 present (albeit in small print) the current ALKs for king mackerel, each ALK table is order by age class [0 to 19] then by year [1986-2002] in the row direction, while the columns are the size bin (upper boundary in cm of fork length). Size bins are not the same size. The values in the table are the probability of fish [$p_i(\text{Age}_j)$] for each size i in that particular age class j for each year.

Thus, if for example the 65 cm size bin was selected, the sum of probabilities for all ages (0 to 19) for each year was one.

$$\text{For 1995, } \sum_{j=\text{Age } 0}^{\text{Age } 19} p_i(\text{Age}_j) = 1.00 \quad \text{for } i \text{ Min size bin to max size bin.}$$

For the size bin boundaries (e.g. 35 or 200 cm) a value of $p_i(\text{Age}_j) = 1.0$ was added for the Ages 0 ($i=35$ cm), and for Age 19 ($i=200$ cm), in particular for those years where no samples were available to the bin size limits. Tables 34 and 35 show the ALK for Gulf king females and males, respectively. Tables 36 and 37 show the ALK for Atlantic king also by sex, and Tables 38-42 show the ALKs for Gulf king split by region, e.g. eastern Gulf and western Gulf by sex.

As mentioned above, the preferential method for aging the CAS by sex data is to use ALK; the alternative method is the stochastic length deconvolution method of Shepherd (1985). For king mackerel, the CAS by sex data were converted to Catch at age for each year, migratory group and quarter. For the Gulf stock, the CAS was also considered by region: eastern Gulf and western Gulf. Decision rule(s) on what method to use depended on whether ALKs were available for each migratory group (or region) in a given year, and if for each quarter of the year, the ALK was appropriate or not. The algorithms read a user defined instruction file that command the program at to which method to apply. The latest version of the instruction file for king mackerel is shown in Table 43, which was applied for the 2002 assessment of Gulf king and the 2003 assessment of Atlantic king. The aging protocols were applied for CAS by sex data from 1985-2001, for Gulf and Atlantic king mackerel. The age-structured VPA for both migratory groups started in 1981, thus CAA for 1981-1984 was in the prior(s) stock assessments, and not recalculated. In table 43 the KEY code refers to the use of ALK; the SAR code refers to the stochastic length deconvolution methods. In the Atlantic king, ALK were available from 1986 through 2001 for Quarters 2, 3 and 4 (April-December); stochastic method was primarily used for the catch in Quarter 1 (January-March). For the Gulf king, the VPA assessment was conducted for the whole Gulf; however, the CAA was generated for the Eastern and Western regions (only for 1986-1992), and then added together. The Eastern Gulf was aged primarily by ALK, with few exceptions in primarily Quarters 1 and 4. The Western Gulf was aged primarily by the stochastic method since 1994.

Figure 34 presents a summary of the proportions by age of the total catch from 1981 to the latest calendar year for the Gulf and Atlantic migratory groups. For both groups, the main bulk of the catch was from ages 1, 2, 3, 4 and 5. Also, the age distribution of the catch was somewhat different for the earlier years (ie. 1981-84 Atlantic king and 1981-85 for Gulf king), coincidentally the years prior to the aged samples or available ALK. For Gulf king also in 1998, there was a change in the age composition compared to prior or posterior years, with a significant reduction for ages 1 and 2, and an increased proportion for ages 3, 4 and 5.

Figure 35 shows the age distribution of catch by sector, commercial and recreational for Gulf king as available for the last stock assessment (2002). The recreational sector shows that main ages of catch were 2, 3, 4 and 5, at least from 1985 to 1999 (excluding 1998). While, for the commercial sector, the main catches were from ages 1, 2, 3, and 4.

Literature Cited

- Cummings N J and Turner S C. 2003. Further notes on the otolith samples available for ageing Gulf king mackerel in the 2000 and 2002 stock assessments. NOAA/NMFS SEFSC SFD 2003-009.
- Cummings N. 1989. Determining Age frequency from length frequency. NOAA/NMFS SEFSC Coastal Resources Division MASP/89/2.
- Cummings N J and D. A. Devries. 2003. Updated information on the otolith ageing data used in the 2003 King and Spanish mackerel stock assessment analyses. NOAA/NMFS SEFSC SFD 2003-11.
- Restrepo V R. 1996. Smoothing sex-ratio-at-length data for king and Spanish mackerels in the southeast U.S. Report U. of Miami RSMAS/CUFER
- NOAA (National Oceanographic and Atmospheric Administration)
- GMFMC (Gulf of Mexico Fishery Management Council) and SAFMC (South Atlantic Fisheries Management Council). 1998. Amendment 9 to the Fishery Management Plan for coastal migratory pelagic resources (mackerels) in the Gulf of Mexico and South Atlantic. Gulf of Mexico Fisheries Management Council.
- MSAP (Mackerel Stock Assessment Panel) 1996. 1996 Report of the Mackerel Stock Assessment Panel. Gulf of Mexico Fishery Management Council & South Atlantic Fishery Management Council.
- Manooch C S, S P Naughton, C B Grimes and L Trent. 1987. Age and growth of king mackerel, *Scomberomorus cavalla*, from the U.S. Gulf of Mexico. Marine Fisheries Review 49(2) 1:102-108.
- Finucane J H, L A Collins, H A Brusher and C H Saloman. 1986. Reproductive biology of king mackerel, *Scomberomorus cavalla*, from the southeastern United States. Fishery Bulletin 84(4):841-850.

Table 1. King mackerel landings (pounds) by migratory group and sector from 1981 to 2002. (2002 data is provisional, and 2001-02 recreational landings were provided in numbers of fish, but not converted to weight units.)

Sum of LB	STOCK		Atlantic Total	Sector		Gulf Total
	Sector			Gulf		
	Commercial	Recreational		Commercial	Recreational	
YR	Commercial	Recreational		Commercial	Recreational	
1981	2,399,459	3,813,916	6,213,375	6,714,600	5,581,753	12,296,353
1982	3,938,370	5,853,949	9,792,319	4,566,449	8,403,500	12,969,949
1983	2,386,021	6,231,916	8,617,937	4,751,722	2,440,391	7,192,113
1984	1,968,572	6,152,396	8,120,968	3,383,376	3,028,207	6,411,583
1985	2,456,228	7,034,836	9,491,064	3,072,275	1,910,715	4,982,990
1986	2,801,995	5,895,233	8,697,228	2,969,771	1,707,993	4,677,764
1987	3,392,485	4,036,602	7,429,087	1,822,192	3,951,485	5,773,677
1988	3,166,062	4,786,299	7,952,361	1,390,413	4,685,704	6,076,117
1989	2,480,843	3,336,627	5,817,470	1,190,061	2,677,376	3,867,437
1990	2,537,741	3,905,392	6,443,133	2,320,777	3,994,043	6,314,820
1991	2,567,902	5,338,859	7,906,761	1,654,709	4,773,681	6,428,390
1992	2,244,302	6,670,337	8,914,639	2,754,142	3,965,159	6,719,301
1993	2,141,263	4,284,508	6,425,771	3,606,441	7,045,373	10,651,814
1994	2,069,574	3,882,720	5,952,294	2,149,527	5,536,448	7,685,975
1995	2,011,811	4,142,416	6,154,227	2,616,933	7,424,592	10,041,525
1996	2,228,032	3,740,689	5,968,721	2,887,972	6,689,630	9,577,602
1997	3,045,909	5,281,571	8,327,480	3,212,639	7,798,919	11,011,558
1998	2,470,723	4,473,059	6,943,782	3,346,639	5,959,000	9,305,639
1999	2,345,625	3,413,082	5,758,707	3,724,817	4,654,630	8,379,447
2000	2,220,774	5,297,380	7,518,154	2,923,983	4,509,300	7,433,283
2001	1,934,857	4,095,440	6,030,297	2,991,040		2,991,040
2002	246,620	31,132	277,752	1,962,793		1,962,793

Table 2. King Atlantic commercial catch in weight units (pounds) by gear.

Year	Hook & Line	Gillnet	Trawl	Unknown	Haul seine	Purse seine	Drift gillnet
1981	2022794	328227	46446	1992			
1982	2991221	920379	14460	12310			
1983	2060285	305117	9564	11055			
1984	1899448	58923	7533	2668			
1985	2333475	26326	10239	599			85589
1986	2496660	19145	4469	3532			278189
1987	2610318	39295	15081	4354	250		723187
1988	1951661	300561	1816	15938		117577	778509
1989	1759303	13008	5772	1216		7569	693975
1990	2474517	52623	6987	3614			
1991	2536791	25178	812	4393	728		
1992	2205065	33094	1384	4759			
1993	2104924	25797	10118	355	69		
1994	2001024	62315	3489	2273	473		
1995	1942059	62957	144	6651			
1996	2168792	55928	1311	1889	112		
1997	2638529	402616	1542	1960	237	1025	
1998	2374174	89644	1453	5452			
1999	2273268	68143	224	3905	85		
2000	2081850	132957	826	5061	80		
2001	1850966	73326	521	10044			
2002	245527	592		501			

Table 3. King Gulf commercial catch in weight units (pounds) by gear.

Year	Hook & Lin Gillnet	Purse seine	Trawl	Unknown	Haul seine	Traps & po	Other	Beach sein
1981	3440404	3274196						
1982	2325897	2240552						
1983	2821326	1928100		2296				
1984	2131263	1251630	200	283				
1985	2013731	1058544						
1986	1425903	1511421	32397	50				
1987	1453271	367877	899	145				
1988	934648	455259	375	131				
1989	1189159		902					
1990	1854028	465647	1102					
1991	1426095	228614						
1992	2754142							
1993	2097317	1417378		91746				
1994	2020016	2599		126912				
1995	2243400	373533						
1996	2395831	492141						
1997	2720502	491836		301				
1998	2683589	654720		6807	1523			
1999	2711403	1009135	166	108	3936	69		
2000	2448619	410097		1026	64158	83		
2001	2466484	455726	22	11	68684		77	21
2002	1448876	330849		53462	71430		58016	160

Table 4. King Atlantic recreational catch in numbers of fish by mode.

Year	Shore	Private	Charter	Headboat	Prv-Chr	Total
1981	-	153,400	-	-	263,048	416,448
1982	-	401,126	-	-	208,608	609,734
1983	-	442,928	-	-	226,581	669,509
1984	2,814	403,206	-	-	208,092	614,112
1985	-	269,152	-	-	536,948	806,100
1986	23,232	441,559	189,615	28,183	1,484	684,073
1987	1,570	336,796	199,571	29,424	-	567,361
1988	8,470	307,732	207,668	22,066	304	546,240
1989	5,194	180,949	156,086	24,017	2,492	368,738
1990	17,350	266,131	152,732	27,861	220	464,294
1991	12,600	340,933	195,073	41,292	500	590,398
1992	1,620	400,023	289,246	23,172	1,752	715,813
1993	3,048	194,201	139,130	21,641	-	358,020
1994	10,418	183,700	177,766	25,079	838	397,801
1995	3,426	196,292	245,015	18,703	892	464,328
1996	1,714	166,814	162,999	31,573	1,824	364,924
1997	9,836	230,961	268,948	18,658	1,000	529,403
1998	74,056	187,731	169,136	16,260	1,964	449,147
1999	2,890	216,972	119,432	19,961	370	359,625
2000	2,408	395,354	132,313	19,988	-	550,063
2001	4,866	236,648	85,911	12,485	-	339,910
2002	-	801	1,144	71	-	2,016

Table 5. King Gulf recreational catch in numbers of fish by mode.

Year	Shore	Private	Charter	Headboat	Prv-Chr	Total
1981	81,084	368,506	-	-	218,060	667,650
1982	23,100	680,164	21,476	3,218	183,768	911,726
1983	32,058	217,848	21,476	3,218	49,675	324,275
1984	828	340,458	3,862	7,558	48,006	400,712
1985	-	116,328	4,074	7,000	68,946	196,348
1986	5,862	155,077	43,365	17,228	-	221,532
1987	42,824	315,498	144,449	44,192	-	546,963
1988	23,838	268,402	171,220	11,642	-	475,102
1989	9,818	240,543	93,620	20,469	-	364,450
1990	124,216	264,791	141,068	32,870	-	562,945
1991	125,524	396,237	175,455	30,571	-	727,787
1992	54,086	244,205	163,978	30,079	-	492,348
1993	63,930	250,735	346,102	34,082	-	694,849
1994	67,512	193,908	356,936	35,836	-	654,192
1995	16,626	225,044	378,229	35,026	-	654,925
1996	7,704	177,114	508,931	39,338	-	733,087
1997	14,222	291,291	393,640	41,796	-	740,949
1998	6,504	197,695	387,682	31,126	-	623,007
1999	25,218	185,970	293,910	28,503	-	533,601
2000	31,034	230,857	240,278	28,503	-	530,672
2001	51,842	184,500	282,005	26,441	-	544,788
2002	33,578	103,737	142,419	10,161	-	289,895

Table 6. Distribution by region of commercial Atlantic king catch (pounds).

Year	FL E	NC	SC & GA	North NC	Total
1981	1,515,153	736,073	145,499	2,734	2,399,459
1982	2,526,641	1,207,108	190,493	14,128	3,938,370
1983	1,355,805	843,311	180,209	6,696	2,386,021
1984	1,032,149	757,573	175,482	3,368	1,968,572
1985	1,434,721	833,321	178,295	9,891	2,456,228
1986	1,495,226	1,006,057	297,003	3,709	2,801,995
1987	1,827,807	1,348,443	200,016	16,219	3,392,485
1988	2,110,287	886,302	154,338	15,135	3,166,062
1989	1,569,368	720,237	182,907	8,331	2,480,843
1990	1,210,584	1,130,699	180,073	16,385	2,537,741
1991	1,152,885	1,102,794	290,206	22,017	2,567,902
1992	909,926	1,034,583	268,638	31,155	2,244,302
1993	1,061,221	887,664	171,890	20,488	2,141,263
1994	1,119,450	849,666	99,207	1,251	2,069,574
1995	894,369	1,013,188	93,845	10,409	2,011,811
1996	1,330,934	793,593	98,981	4,524	2,228,032
1997	1,403,125	1,558,380	68,870	15,534	3,045,909
1998	1,244,396	1,143,223	78,357	4,747	2,470,723
1999	1,182,547	1,082,667	75,233	5,178	2,345,625
2000	1,082,518	1,046,612	82,748	8,896	2,220,774
2001	1,045,798	832,065	56,093	901	1,934,857
2002	2,195	243,049	1,376	-	246,620

Table 7. Distribution by region of commercial Gulf king catch (pounds).

Year	AL MS	FL E	FL W	LA	TX	Total
1981		3,535,038	3,179,562			6,714,600
1982		2,302,529	2,034,734	229,186		4,566,449
1983	2,373	1,876,262	1,383,548	1,489,539		4,751,722
1984	3,589	1,499,869	1,131,214	747,538	1,166	3,383,376
1985	3,029	1,304,657	791,265	969,665	3,659	3,072,275
1986	1,419	933,173	1,699,174	334,344	1,661	2,969,771
1987	4,099	796,705	490,264	527,960	3,164	1,822,192
1988	9,221	418,652	509,187	446,962	6,391	1,390,413
1989	4,384	313,336	219,001	651,883	1,457	1,190,061
1990	1,852	751,219	930,575	635,809	1,322	2,320,777
1991	977	523,382	547,745	582,189	416	1,654,709
1992	10,862	573,464	1,037,599	1,090,795	41,422	2,754,142
1993	2,158	588,632	2,115,598	808,307	91,746	3,606,441
1994	5,450	588,177	682,814	746,174	126,912	2,149,527
1995	3,218	766,170	1,092,206	583,953	171,386	2,616,933
1996	4,001	679,189	1,471,792	583,392	149,598	2,887,972
1997	4,608	1,168,404	1,251,009	521,758	266,860	3,212,639
1998	3,672	929,426	1,244,438	842,778	326,325	3,346,639
1999	3,189	873,816	1,759,702	837,679	250,431	3,724,817
2000	3,716	779,279	1,109,415	948,710	82,863	2,923,983
2001	19,362	798,899	1,335,334	794,528	42,917	2,991,040
2002	3,866	493,225	961,955	503,747		1,962,793

Table 8. Distribution by region of recreational Atlantic king catch (pounds).

Year	FL E	NC	SC & GA	North NC	Total
1981	1,054,154	2,558,088	173,546	28,128	3,813,916
1982	3,326,305	1,977,652	549,992	-	5,853,949
1983	3,022,886	1,812,326	1,396,704	-	6,231,916
1984	2,476,134	2,938,510	737,752	-	6,152,396
1985	1,917,242	3,565,922	1,549,858	1,814	7,034,836
1986	1,552,996	1,789,870	2,474,815	77,552	5,895,233
1987	1,201,183	1,974,777	812,036	48,606	4,036,602
1988	1,409,445	1,797,339	1,457,949	121,566	4,786,299
1989	1,375,269	1,040,154	849,406	71,798	3,336,627
1990	1,880,458	1,297,652	713,630	13,652	3,905,392
1991	2,051,522	1,701,256	1,493,395	92,686	5,338,859
1992	2,661,442	1,393,668	2,514,905	100,322	6,670,337
1993	2,068,895	1,274,232	721,967	219,414	4,284,508
1994	1,762,212	1,199,672	896,878	23,958	3,882,720
1995	2,264,811	1,121,625	748,146	7,834	4,142,416
1996	2,323,465	763,138	632,360	21,726	3,740,689
1997	2,518,737	1,906,491	728,199	128,144	5,281,571
1998	2,142,606	1,112,873	1,154,064	63,516	4,473,059
1999	2,345,593	742,951	298,744	25,794	3,413,082
2000	2,806,632	1,691,607	625,861	173,280	5,297,380
2001	1,970,689	1,686,302	391,783	46,666	4,095,440
2002	-	25,153	5,979	-	31,132

Table 9. Distribution by region of recreational Gulf king catch (pounds).

Year	AL MS	FL E	FL W	LA	TX	Total
1981	373,948	469,051	2,204,592	354,386	2,179,776	5,581,753
1982	5,887,398	782,348	603,106	580,536	550,112	8,403,500
1983	133,010	83,093	1,123,512	478,234	622,542	2,440,391
1984	543,394	479,057	1,537,594	167,192	300,970	3,028,207
1985	731,028	161,733	498,212	99,078	420,664	1,910,715
1986	255,272	234,701	810,442	94,003	313,575	1,707,993
1987	419,188	524,676	2,439,067	110,411	458,143	3,951,485
1988	713,932	1,004,822	2,481,446	152,317	333,187	4,685,704
1989	188,576	443,254	1,638,971	50,485	356,090	2,677,376
1990	570,874	937,167	2,043,914	3,234	438,854	3,994,043
1991	347,132	606,636	3,431,151	30,058	358,704	4,773,681
1992	370,648	760,276	1,979,071	149,276	705,888	3,965,159
1993	505,880	1,934,471	3,596,292	58,745	949,985	7,045,373
1994	439,152	760,253	3,893,682	120,372	322,989	5,536,448
1995	602,966	1,454,867	4,942,081	97,152	327,526	7,424,592
1996	316,364	994,753	4,969,385	60,333	348,795	6,689,630
1997	801,494	1,774,227	4,436,678	183,722	602,798	7,798,919
1998	363,026	1,216,771	3,507,817	62,423	808,963	5,959,000
1999	415,048	1,093,376	2,544,454	51,708	550,044	4,654,630
2000	862,748	737,445	2,294,235	87,480	527,392	4,509,300
2001						-
2002						-

Table 10. Percent distribution of commercial catch for king mackerel by gear and subareas for 1995 to 2002*.

Sector		King Mackerel 95-02 Catch % (of year total wgt) by Gear and Area for the Atlantic & Gulf Stocks																	
Commercl																			
Sum of WgtCat		Stock year																	
		Atlantic								Gulf									
Gear	NewAr	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002		
BCHSEI	FL-Keys, Monroe FL-NE, Nassau-Flagler FL-NW, Citrus-Escambia FL-SE, Volusia-Dade FL-SW, Collier-Hernando North Carolina																		
GILLNT	Alabama and Mississippi FL-Keys, Monroe FL-NE, Nassau-Flagler FL-NW, Citrus-Escambia FL-SE, Volusia-Dade FL-SW, Collier-Hernando North Carolina North of NC			7.28%				1.27%		14.27%	13.38%	13.43%	18.75%	23.26%	11.50%	13.43%	16.26%		
		2.89%	2.39%	5.52%	2.65%	1.71%	4.75%	2.45%	5.87%		3.66%	1.74%		4.03%	1.93%	1.68%			
H&L	Alabama and Mississippi FL-E, Nassau-Dade (MRFSS) FL-Keys, Monroe FL-NE, Nassau-Flagler FL-NW, Citrus-Escambia FL-SE, Volusia-Dade FL-SW, Collier-Hernando Louisiana North Carolina North of NC South Carolina and Georgia Texas	2.12%	8.65%	1.16%	6.00%		1.09%	2.82%	2.20%	20.93%	23.95%	8.73%	8.99%	9.07%	11.99%	15.63%	23.07%		
		1.99%	2.50%	1.60%	2.56%		1.52%	1.60%		3.38%	7.81%	13.54%	6.55%	6.90%	7.10%	7.45%	1.78%		
		40.14%	48.58%	35.99%	40.73%	47.39%	45.03%	47.80%	44.88%	29.28%	23.52%	36.23%	27.99%	23.43%	26.57%	26.43%	24.96%		
										3.14%	2.16%	1.50%	1.98%	3.78%	4.88%	4.32%	3.83%		
		47.40%	33.14%	45.59%	43.56%	44.44%	42.34%	40.52%	42.77%	22.31%	20.20%	16.24%	25.45%	22.51%	32.53%	26.56%	19.99%		
		4.66%	4.44%	2.26%	3.17%	3.21%	3.72%	2.90%	2.84%	6.55%	5.18%	8.31%	9.85%	6.73%	2.84%	1.43%			
PURSEI	FL-Keys, Monroe FL-SE, Volusia-Dade FL-SW, Collier-Hernando																		
TRAWL	Alabama and Mississippi FL-Keys, Monroe FL-NE, Nassau-Flagler FL-NW, Citrus-Escambia FL-SE, Volusia-Dade FL-SW, Collier-Hernando Louisiana North Carolina North of NC South Carolina and Georgia																2.72%		
UNK	Alabama and Mississippi FL-Keys, Monroe FL-NE, Nassau-Flagler FL-NW, Citrus-Escambia FL-SE, Volusia-Dade FL-SW, Collier-Hernando Louisiana North Carolina North of NC															1.62%	3.35%		
																	2.96%		
Grand Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%		

Total Catch (wgt) for Comm
Item shows only catch > 1%

2012224	2228298	3046378	2471125	2345978	2221501	1935392	1394150	2617043	2888039	3212846	3311804	3721700	2916290	2991040	1962793
---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------	---------

Table 11. Percent distribution of recreational catch for king mackerel by subareas for 1996 to 2002*.

Sector		King Mackerel 95-02 Catch % (of year total Numb) by Gear and Area for the Atlantic & Gulf Stocks																
Recreatn																		
Sum of NumCat		Stock year								Gulf								
Gear		Atlantic								Gulf								
NewAr		1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002	
RECH&L	Alabama and Mississippi									11.05%	5.73%	13.23%	6.83%	9.19%	20.31%	14.77%	8.30%	
	FL-E, Nassau-Dade (MRFSS)	57.05%	52.98%	40.74%	46.97%	65.03%	57.42%	54.41%		17.14%	12.92%	18.89%	18.36%	25.43%	13.06%	13.05%	12.20%	
	FL-Keys, Monroe																	
	FL-NE, Nassau-Flagler																	
	FL-NW, Citrus-Escambia																	
	FL-SE, Volusia-Dade	3.26%	7.87%	2.51%	2.55%	4.72%	2.57%	2.47%		1.59%	2.12%	2.19%	2.02%	1.50%	1.93%	1.25%		
	FL-SW, Collier-Hernando																	
	FL-W, Collier-Escambia																	
	FL-W, Monroe-Escambia (MRF)									63.13%	72.67%	55.67%	59.60%	53.42%	55.03%	62.09%	74.28%	
	Louisiana									1.34%		2.18%			1.45%			
	North Carolina	24.79%	20.90%	37.66%	22.55%	21.37%	25.12%	33.59%	78.86%									
	North of NC			3.05%	1.42%		3.59%	1.31%										
	South Carolina and Georgia	14.42%	17.37%	15.78%	26.31%	7.80%	11.12%	7.77%	20.30%									
	Texas									5.06%	4.93%	7.01%	11.65%	9.27%	7.83%	8.25%	2.56%	
Grand Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	
Total Catch (fish) for Recreational		464347	364967	529465	449264	359696	550105	339989	2044	654994	733161	741014	623136	533734	536054	544763	289885	
<i>Item shows only catch > 1%</i>																		

Table 12. Percent catch distribution by subarea and month* for Gulf king mackerel of the Commercial sector.

Gulf Stock Commercial Sector		Gulf King Mackerel % catch* by month for each area of the commercial fishery								
King Mackerel		Year								
Area	Month	1995	1996	1997	1998	1999	2000	2001	2002	
Alabama and Mississippi	Apr									
	Jun									
	Jul	58.5%	73.4%	98.0%	81.0%	73.5%	36.5%	16.5%	70.9%	
	Aug	32.0%	18.8%		18.8%	26.5%	11.1%	46.2%	27.2%	
	Sep	7.9%	7.8%					34.6%		
	Oct						52.1%			
Alabama and Mississippi Sum	Total lbs	3218	4001	4621	3716	3189	3734	19362	3866	
	% of Total	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.6%	0.2%	
FL-NW, Citrus-Escambia	Jan									
	Feb									
	Mar									
	Apr									
	May									
	Jun								5.2%	
	Jul	19.2%	5.3%	6.0%		10.4%	17.9%	10.2%	73.7%	
	Aug	9.3%	5.4%		6.8%	6.4%	8.4%	8.1%	10.3%	
	Sep	15.2%	18.0%	8.0%	6.0%	7.2%	8.1%	9.4%	8.3%	
	Oct	9.0%	40.4%	56.8%	22.2%	32.3%	39.7%	44.7%		
	Nov	11.7%	16.9%	23.6%	45.7%	39.8%	25.2%	26.8%		
	Dec	34.5%	12.5%		14.8%					
FL-NW, Citrus-Escambia Sum	Total lbs	88541	225688	434994	216799	260749	208784	234037	37451	
	% of Total	3.4%	7.8%	13.5%	6.5%	7.0%	7.2%	7.8%	1.9%	
FL-SE, Volusia-Dade	Jan	21.5%	21.0%	21.3%	19.5%	21.2%	17.1%	24.7%	58.4%	
	Feb	15.5%	29.2%	14.3%	15.6%	37.6%	18.4%	25.0%	15.5%	
	Mar	19.8%	6.5%	17.1%	10.2%	20.2%	33.8%	17.2%	26.1%	
	Nov	15.6%	7.2%	19.4%	30.0%		18.4%	5.9%		
	Dec	27.6%	36.1%	27.9%	24.7%	17.8%	12.3%	27.2%		
FL-SE, Volusia-Dade Sum	Total lbs	766170	679189	1168437	929789	874145	778592	798899	493225	
	% of Total	29.3%	23.5%	36.4%	28.1%	23.5%	26.7%	26.7%	25.1%	
FL-Keys, Monroe	Jan	32.4%	15.9%	77.1%	40.6%	86.5%	44.1%	67.4%	57.0%	
	Feb	54.6%	55.0%	12.2%	43.5%	7.3%	34.2%	24.0%	23.2%	
	Mar	7.0%	6.9%		9.4%		12.8%		19.8%	
	Nov									
	Dec		21.4%	7.6%			6.8%	6.1%		
FL-Keys, Monroe Sum	Total lbs	921407	1078244	712138	924969	1204614	694986	917563	837810	
	% of Total	35.2%	37.3%	22.2%	27.9%	32.4%	23.8%	30.7%	42.7%	
FL-SW, Collier-Hernando	Jan			54.8%		63.5%	64.5%	17.4%	21.7%	
	Feb	10.3%	62.9%			9.7%	20.2%	42.4%	56.7%	
	Mar					8.0%			11.6%	
	Apr	13.0%	12.2%		16.4%				6.0%	
	May									
	Jun									
	Jul									
	Aug									
	Sep									
	Oct				8.8%					
	Nov	24.9%		12.1%	19.4%			13.3%		
	Dec	45.8%	19.1%	24.4%	49.8%	9.3%	7.0%	17.0%		
FL-SW, Collier-Hernando Sum	Total lbs	82290	167923	104010	67398	290813	198612	183734	86694	
	% of Total	3.1%	5.8%	3.2%	2.0%	7.8%	6.8%	6.1%	4.4%	
Louisiana	Feb				7.3%					
	Mar				12.9%					
	Apr									
	May									
	Jun									
	Jul	60.1%	58.9%	88.5%	52.7%	58.1%	60.7%	31.6%	58.2%	
	Aug	29.2%	37.6%	11.4%	27.0%	41.4%	39.2%	25.6%	41.8%	
	Sep	10.2%						14.7%		
	Oct							10.5%		
	Nov							17.6%		
	Dec									
	Louisiana Sum	Total lbs	583960	583392	521758	842778	837759	948719	794528	503747
	% of Total	22.3%	20.2%	16.2%	25.4%	22.5%	32.5%	26.6%	25.7%	
Texas	Jan									
	Feb									
	Mar				17.8%					
	May									
	Jun									
	Jul	76.6%	61.4%	95.2%	45.5%	65.5%	74.0%	67.3%		
	Aug	19.5%	38.4%		33.6%	34.4%	25.0%	19.9%		
	Sep							12.8%		
	Oct									
	Nov									
	Dec									
	Texas Sum	Total lbs	171457	149602	266888	326355	250431	82863	42917	0
	% of Total	6.6%	5.2%	8.3%	9.9%	6.7%	2.8%	1.4%	0.0%	
Grand Total		2617043	2888039	3212846	3311804	3721700	2916290	2991040	1962793	

* Items show only those of 5% or more

Table 13. Percent catch distribution by subarea and month for Atlantic king mackerel commercial sector

Atlantic Stock Commercial sector		Atlantic King Mackerel % catch* by month for each area of the commercial fishery								
King Mackerel	Year									
Area	Month	1995	1996	1997	1998	1999	2000	2001	2002	
North of NC	Jan									
	Feb									
	Mar					14.1%				
	Apr		18.5%						7.2%	
	May									
	Jun	75.2%	46.9%		6.8%	6.2%	21.9%	41.4%	25.5%	
	Jul	7.9%		74.6%	42.2%	17.9%	24.6%	14.2%	8.2%	
	Aug			8.1%	8.4%	8.3%	20.6%	6.8%		
	Sep		12.7%	5.6%	26.4%	12.2%	24.0%	25.8%	40.9%	
	Oct	9.3%	16.2%	5.0%	11.5%	39.1%			14.3%	
	Nov							5.6%		
	Dec									
North of NC Sum	Total lbs	10527	4641	15555	4908	5319	9080	1076	886	
	% of Total	0.5%	0.2%	0.5%	0.2%	0.2%	0.4%	0.1%	0.1%	
North Carolina	Jan	12.2%	10.5%		8.3%	21.7%	10.7%		7.8%	
	Feb			10.9%		5.4%	5.5%	8.6%	9.0%	
	Mar	17.2%	6.6%	29.6%	11.5%	7.2%	8.4%	5.3%	18.9%	
	Apr	6.4%	14.4%	8.4%	8.1%		6.8%	14.2%	5.4%	
	May									
	Jun									
	Jul									
	Aug									
	Sep									
	Oct	18.0%	23.7%	14.7%	14.4%	9.2%	21.7%	16.5%	20.8%	
	Nov	20.8%	27.8%	21.5%	41.6%	22.9%	30.9%	19.9%	30.8%	
	Dec	13.4%	5.6%	5.6%	5.9%	23.5%		20.8%		
North Carolina Sum	Total lbs	1013413	793708	1558530	1143345	1082694	1046808	832286	679978	
	% of Total	50.4%	35.6%	51.2%	46.3%	46.2%	47.1%	43.0%	48.8%	
South Carolina and Georgia	Jan				9.8%	9.5%	6.9%			
	Feb			6.3%						
	Mar			7.3%						
	Apr	5.5%	9.6%	5.0%	5.7%			9.6%	10.1%	
	May	5.1%	6.5%	5.7%	16.8%	7.7%	6.5%	6.4%		
	Jun	12.4%	5.4%	8.1%	12.7%	9.7%	11.3%	10.4%	7.9%	
	Jul	18.3%		13.8%		12.8%	13.0%	14.7%	28.3%	
	Aug	5.8%	15.7%	7.8%	6.9%	14.2%	18.5%	24.6%	30.8%	
	Sep	6.3%		6.1%	5.3%		8.9%	7.9%		
	Oct	10.0%	13.2%	17.6%	11.9%	6.7%	7.1%	6.3%	9.7%	
	Nov	13.9%	20.9%	14.9%	17.0%	17.5%	13.4%	8.6%		
	Dec	16.9%	16.7%	5.3%	5.9%	9.2%	6.7%	6.9%		
South Carolina and Georgia Sum	Total lbs	93915	99015	68902	78368	75256	82797	56156	39757	
	% of Total	4.7%	4.4%	2.3%	3.2%	3.2%	3.7%	2.9%	2.9%	
FL-E, Nassau-Dade (MRFSS)	Jun					84.1%				
	Jul					15.9%				
FL-E, Nassau-Dade (MRFSS)	Total lbs					3835				
	% of Total					0.2%				
FL-NE, Nassau-Flagler	Jan		8.9%	10.4%	17.2%	12.1%	11.5%	22.4%	13.2%	
	Feb		26.0%	19.6%	17.2%		7.4%	5.9%	8.1%	
	Mar	12.6%		8.7%	25.9%	7.9%	12.4%	7.0%	9.1%	
	Apr	6.6%							27.5%	
	May	5.0%				6.7%	5.7%	6.2%		
	Jun	8.3%		8.7%	6.8%	14.2%	6.2%	9.7%	25.1%	
	Jul	9.7%	9.0%	12.3%	6.3%	10.7%	8.5%	17.6%	5.6%	
	Aug			10.3%		8.5%	8.0%	7.7%	5.5%	
	Sep							10.2%		
	Oct									
	Nov	9.9%		6.0%	12.2%		14.3%	8.2%		
	Dec	39.4%	36.4%	15.4%	6.5%	29.5%	21.2%			
FL-NE, Nassau-Flagler Sum	Total lbs	40113	55717	48981	63303	23112	36740	31880	7237	
	% of Total	2.0%	2.5%	1.6%	2.6%	1.0%	1.7%	1.6%	0.5%	
FL-SE, Volusia-Dade	Apr	21.1%	11.2%	21.0%	18.0%	27.6%	24.4%	18.3%	35.2%	
	May	41.3%	36.0%	37.3%	25.4%	36.3%	27.6%	27.6%	35.3%	
	Jun	15.4%	17.6%	10.1%	13.2%	11.1%	12.7%	14.7%	14.5%	
	Jul	7.4%	8.4%	9.5%	13.1%	7.1%	11.0%	15.8%	10.0%	
	Aug	8.5%	16.1%	13.6%	12.1%	11.2%	13.9%	15.2%		
	Sep		5.9%			7.7%	5.4%	6.2%	5.7%	
	Oct				10.5%					
FL-SE, Volusia-Dade Sum	Total lbs	807793	1082408	1319117	1030022	1138635	1021567	957655	635245	
	% of Total	40.1%	48.6%	43.3%	41.7%	48.5%	46.0%	49.5%	45.6%	
FL-Keys, Monroe	Apr	51.1%	89.7%	39.8%	84.1%	32.5%	41.7%	73.8%	82.6%	
	May	20.4%		14.9%		24.0%	15.4%		6.4%	
	Jun	5.8%		6.3%		8.7%	8.8%		5.7%	
	Jul			5.5%		7.1%	5.6%			
	Aug			11.6%		5.9%	7.5%			
	Sep	6.2%		8.2%		10.0%	6.5%			
	Oct	7.7%		13.6%		11.8%	14.4%	7.8%		
FL-Keys, Monroe Sum	Total lbs	42628	192809	35293	151179	20962	24509	56339	31047	
	% of Total	2.1%	8.7%	1.2%	6.1%	0.9%	1.1%	2.9%	2.2%	
Grand Total	Total lbs	2012224	2228298	3046378	2471125	2345978	2221501	1935392	1394150	

* Items show only those of 5% or more

Table 14. Percent catch distribution by subarea and month* for Gulf king mackerel recreational sector.

Catch Numbers	Year	Year								
		Area	Bymonth	1995	1996	1997	1998	1999	2000	2001
FL-E, Nassau-Dade (MRFSS)	Jan-Feb		30%	23%	36%	33%	33%	41%	43%	49%
	March		15%	25%	16%	23%	23%	32%	32%	51%
	Nov-Dec		55%	52%	48%	43%	44%	27%	25%	
FL-E, Nassau-Dade (MRFSS) Sum			112279	94714	139943	114416	135733	69982	71068	35374
	% of G Total		17.14%	12.92%	18.89%	18.36%	25.43%	13.06%	13.05%	12.20%
FL-SE, Volusia-Dade	Jan-Feb		39%	20%	30%	31%	23%	42%	52%	76%
	March		29%	8%	18%	27%	10%	21%	17%	24%
	Nov-Dec		32%	72%	52%	42%	67%	37%	32%	
FL-SE, Volusia-Dade Sum			10442	15523	16240	12602	7984	10350	5294	3621
	% of G Total									
FL-Keys, Monroe	Jan-Feb		66%	44%	72%	77%	65%	64%	40%	50%
	March		22%	30%	11%	11%		7%	40%	50%
	Nov-Dec		12%	26%	17%	12%	30%	29%	20%	
FL-Keys, Monroe Sum			2911	4033	4135	3953	1206	796	1733	1389
	% of G Total									
FL-SW, Collier-Hernando	Jan-Feb				6%					7%
	March		10%		38%		11%	11%	11%	17%
	April		20%		22%	18%	29%	29%	29%	44%
	May-Jun			5%	22%	10%	21%	21%	21%	32%
	Jul-Aug		8%			10%	15%	15%	15%	
	Sep-Oct		50%		6%	19%	8%	8%	8%	
	Nov-Dec		6%	81%	7%	41%	11%	11%	11%	
FL-SW, Collier-Hernando Sum			124	788	72	141	62	62	62	41
	% of G Total									
FL-NW, Citrus-Escambia	March									
	April		14%	7%			6%	6%	6%	19%
	May-Jun		30%	28%	25%	22%	24%	24%	24%	80%
	Jul-Aug		35%	31%	28%	45%	43%	43%	43%	
	Sep-Oct		21%	33%	44%	27%	23%	23%	23%	
	Nov-Dec									
FL-NW, Citrus-Escambia Sum			1447	1265	1932	1194	1218	1218	1218	367
	% of G Total									
FL-W, Collier-Escambia	Jan-Feb					18%	8%	8%	8%	25%
	March						6%	6%	6%	19%
	April					9%				13%
	May-Jun					18%	14%	14%	14%	44%
	Jul-Aug					18%	36%	36%	36%	
	Sep-Oct					18%				
	Nov-Dec				98%	18%	32%	32%	32%	
FL-W, Collier-Escambia Sum					42	11	50	50	50	16
	% of G Total									
FL-W, Monroe-Escambia (MRF	Jan-Feb		33%	21%	32%	29%	16%	8%	17%	31%
	March		41%	27%	14%	21%	21%	11%	17%	25%
	May-Jun		8%	17%	8%	8%	15%	18%	15%	45%
	Jul-Aug			14%	9%	16%	18%	34%	27%	
	Sep-Oct			13%	21%	12%	15%	17%	13%	
	Nov-Dec		10%	8%	16%	14%	14%	13%	9%	
FL-W, Monroe-Escambia (MRF Sum			413496	532760	412522	371380	285136	294979	338220	215315
	% of G Total		63.13%	72.67%	55.67%	59.60%	53.42%	55.03%	62.09%	74.28%
Alabama and Mississippi	March		5%						5%	16%
	May-Jun		42%	25%	25%	27%	51%	20%	7%	84%
	Jul-Aug		24%	43%	35%	47%	18%	40%	32%	
	Sep-Oct		28%	31%	36%	20%	21%	11%	31%	
	Nov-Dec						9%	27%	24%	
	Alabama and Mississippi Sum			72394	42025	98016	42583	49040	108850	80476
	% of G Total		11.05%	5.73%	13.23%	6.83%	9.19%	20.31%	14.77%	8.30%
Louisiana	Jan-Feb			6%		18%			34%	16%
	March							8%		32%
	April			6%						
	May-Jun		38%		30%	20%	14%	7%	32%	51%
	Jul-Aug		55%	8%	51%	19%	63%	46%	37%	
	Sep-Oct			54%	12%	12%	18%		18%	
	Nov-Dec			24%	7%	30%				
Louisiana Sum			8782	5910	16190	4289	3845	7784	1719	2289
	% of G Total									
Texas	Jan-Feb									
	March									
	April		6%	5%						
	May-Jun		13%	25%	19%	27%	12%	13%	15%	89%
	Jul-Aug		64%	49%	66%	64%	81%	76%	70%	
	Sep-Oct		17%	22%	9%	6%		8%	13%	
Nov-Dec										
Texas Sum			33119	36143	51922	72567	49460	41983	44923	7427
	% of G Total		5.06%		7.01%	11.65%	9.27%	7.83%	8.25%	
Grand Total			654994	733161	741014	623136	533734	536054	544763	289885

* Month may represent one or a bymonth (MRFSS) estimation.

Table 15. Percent catch distribution by subarea and month* for Atlantic king mackerel recreational sector

Catch Numbers		Year							
Area	By month	1995	1996	1997	1998	1999	2000	2001	2002
FL-E, Nassau-Dade (MRFSS)	April	6%	12%	10%	13%	13%	7%	12%	
	May-Jun	35%	36%	39%	47%	41%	25%	44%	
	Jul-Aug	26%	41%	37%	27%	32%	51%	33%	
	Sep-Oct	33%	11%	13%	14%	13%	16%	11%	
FL-E, Nassau-Dade (MRFSS) Sum		264917	193355	215727	211015	233917	315868	184984	
% of G Total		57%	53%	41%	47%	65%	57%	54%	
FL-SE, Volusia-Dade	April	20%	9%	35%	17%	8%	16%	16%	
	May-Jun	28%	23%	27%	24%	14%	23%	22%	
	Jul-Aug	13%	19%	16%	16%	6%	17%	24%	
	Sep-Oct	39%	50%	23%	43%	72%	44%	38%	
FL-SE, Volusia-Dade Sum		15126	28728	13309	11456	16979	14119	8397	
% of G Total			8%						
FL-Keys, Monroe	April	14%		8%	9%	8%	7%	11%	
	May-Jun	38%	37%	21%	33%	32%	14%	24%	
	Jul-Aug	14%	34%	31%	35%	18%	10%	29%	
	Sep-Oct	34%	28%	39%	24%	43%	69%	36%	
FL-Keys, Monroe Sum		1131	1303	1316	822	364	520	1390	
% of G Total									
FL-NE, Nassau-Flagler	Jan-Feb								35%
	March							8%	65%
	April	31%	55%			6%		10%	
	May-Jun	21%	6%	23%	24%	52%	36%	27%	
	Jul-Aug	14%	36%	67%	9%	32%	32%	49%	
	Sep-Oct	33%		10%	26%	6%	12%		
	Nov-Dec				39%		10%		
FL-NE, Nassau-Flagler Sum		215	67	30	96	195	470	142	17
% of G Total									
North Carolina	Jan-Feb								98%
	March	8%	12%	22%	15%	5%			
	April				15%	5%			
	May-Jun	11%	25%	15%	22%	20%	26%	31%	
	Jul-Aug	30%	16%	13%	9%	30%	16%	18%	
	Sep-Oct	36%	37%	42%	22%	22%	36%	36%	
	Nov-Dec	15%	9%	7%	17%	17%	16%	6%	
North Carolina Sum		115125	76279	199402	101288	76878	138205	114211	1612
% of G Total		25%	21%	38%	23%	21%	25%	34%	79%
North of NC	March		44%						
	May-Jun		56%		14%				
	Jul-Aug	100%		17%	31%	100%	92%	100%	
	Sep-Oct			83%	55%				
North of NC Sum		893	1825	16131	6379	3290	19743	4437	
% of G Total									
South Carolina and Georgia	Jan-Feb								100%
	March	6%							
	April								
	May-Jun	10%	32%	19%	71%	18%	33%	33%	
	Jul-Aug	27%	12%	36%	7%	20%	36%	30%	
	Sep-Oct	18%	33%	36%	16%	13%	21%	11%	
	Nov-Dec	38%	20%	6%	5%	44%	9%	22%	
South Carolina and Georgia Sum		66940	63410	83550	118208	28073	61180	26428	415
% of G Total		14%	17%	16%	26%	8%	11%	8%	20%
Grand Total		464347	364967	529465	449264	359696	550105	339989	2044

Table 16. Number of fish size sample for king mackerel by sector.

NumFish Year	Atlantic		Atlantic Tota Gulf		Gulf Total	
	Commercl	Recreatn		Commercl	Recreatn	
1981	980.00	2,141.00	3,121.00	15,563.00	916.00	16,479.00
1982		578.00	578.00	7,994.00	947.00	8,941.00
1983	858.00	902.00	1,760.00	15,160.00	1,355.00	16,515.00
1984	4,447.00	1,372.00	5,819.00	31,871.00	2,320.00	34,191.00
1985	5,059.00	2,918.00	7,977.00	17,691.00	3,845.00	21,536.00
1986	4,548.00	3,663.00	8,211.00	6,536.00	3,644.00	10,180.00
1987	6,785.00	6,168.00	12,953.00	4,210.00	5,601.00	9,811.00
1988	6,434.00	2,500.00	8,934.00	1,577.00	3,035.00	4,612.00
1989	5,917.00	2,131.00	8,048.00	3,069.00	2,944.00	6,013.00
1990	6,378.00	2,055.00	8,433.00	2,951.00	2,445.00	5,396.00
1991	8,334.00	1,959.00	10,293.00	4,807.00	4,331.00	9,138.00
1992	6,755.00	2,631.00	9,386.00	8,873.00	4,181.00	13,054.00
1993	4,401.00	1,511.00	5,912.00	7,520.00	2,574.00	10,094.00
1994	6,632.00	1,415.00	8,047.00	3,455.00	2,989.00	6,444.00
1995	2,405.00	1,583.00	3,988.00	4,623.00	2,432.00	7,055.00
1996	4,374.00	954.00	5,328.00	7,355.00	2,726.00	10,081.00
1997	1,746.00	2,662.00	4,408.00	4,636.00	3,863.00	8,499.00
1998	5,182.00	1,930.00	7,112.00	4,570.00	3,846.00	8,416.00
1999	6,891.00	1,463.00	8,354.00	7,310.00	3,842.00	11,152.00
2000	7,800.00	2,136.00	9,936.00	6,491.00	4,028.00	10,519.00
2001	6,313.00	1,776.00	8,089.00	4,321.00	3,329.00	7,650.00
2002	3,180.00	853.00	4,033.00	4,243.00	1,446.00	5,689.00
Grand Total	105,419.00	45,301.00	150,720.00	174,826.00	66,639.00	241,465.00

Table 17. Number of fish size sample for king mackerel recreational fisheries by mode.

Stock	Year	Other Rec	Headboat	Total	Stock	Year	Other Rec	Headboat	Total
Atlantic	1981	2,141		2,141	Gulf	1981	916		916
	1982	578		578		1982	947		947
	1983	902		902		1983	1,355		1,355
	1984	276	1,096	1,372		1984	1,856	464	2,320
	1985	1,382	1,536	2,918		1985	3,451	394	3,845
	1986	1,893	1,770	3,663		1986	2,964	680	3,644
	1987	5,179	989	6,168		1987	3,951	1,650	5,601
	1988	1,929	571	2,500		1988	2,488	547	3,035
	1989	1,606	525	2,131		1989	1,623	1,321	2,944
	1990	1,761	294	2,055		1990	1,714	731	2,445
	1991	1,575	384	1,959		1991	3,518	813	4,331
	1992	2,246	385	2,631		1992	3,213	968	4,181
	1993	1,119	392	1,511		1993	1,793	781	2,574
	1994	1,053	362	1,415		1994	2,060	929	2,989
1995	1,249	334	1,583	1995	1,475	957	2,432		
1996	882	72	954	1996	1,966	760	2,726		
1997	2,164	498	2,662	1997	2,647	1,216	3,863		
1998	1,418	512	1,930	1998	3,052	794	3,846		
1999	1,155	308	1,463	1999	3,297	545	3,842		
2000	1,739	397	2,136	2000	3,642	386	4,028		
2001	1,482	294	1,776	2001	2,975	354	3,329		
2002	853		853	2002	1,446		1,446		
Atlantic Total		34,582	10,719	45,301	Gulf Total		52,349	14,290	66,639

Table 18. Number of fish size sample for Atlantic king mackerel commercial fisheries by gear.

Year	Atlantic								Atlantic Total	
	Drift GN	GILLNT	H&L	PURSE	TRAMML	TRAWL	Unclass	UNK		
1981		69	911						980	
1982										
1983			858						858	
1984		114	4,333						4,447	
1985	1	32	5,007				2	17	5,059	
1986		209	4,243				96		4,548	
1987		3,597	3,154				34		6,785	
1988	263	1,643	4,524				4		6,434	
1989	2,047	87	3,499	253			30	1	5,917	
1990			6,368				8	1	6,378	
1991	16	6	8,311					1	8,334	
1992	5		6,750						6,755	
1993		81	4,235			4	5	4	72	4,401
1994	39	63	6,476				54		6,632	
1995	26		2,378					1	2,405	
1996	85	184	4,102					3	4,374	
1997		3	1,743						1,746	
1998		7	5,175						5,182	
1999	2	11	6,878						6,891	
2000			7,800						7,800	
2001			6,313						6,313	
2002			3,180						3,180	
Grand Total	2,484	6,106	96,238	253	4	233	28	73	105,419	

Table 19. Number of fish size sample for Gulf king mackerel commercial fisheries by gear

Year	Gulf							Gulf Total	
	DRFGNT	GILLNT	H&L	PURSEI	TRAWL	Unclass	UNK		
1981	116	4,609	10,838					15,563	
1982		4,396	3,598					7,994	
1983		2,979	11,171	1,010				15,160	
1984		3,527	23,793	4,535			16	31,871	
1985		2,091	14,247	1,275	31		9	38	17,691
1986		3,219	3,043	271			1	2	6,536
1987		625	3,585						4,210
1988		564	990				23		1,577
1989			3,013				56		3,069
1990		401	2,547				3		2,951
1991	124		4,683						4,807
1992	237		8,585	3			48		8,873
1993	1,374	1	6,144				1		7,520
1994	29	1	3,385				40		3,455
1995	983		3,635				5		4,623
1996	1,606	2	5,697					50	7,355
1997	537	6	4,086				7		4,636
1998	1,457		3,107				6		4,570
1999	1,528	1	5,756				25		7,310
2000	1,257		5,202				32		6,491
2001	432		3,887				2		4,321
2002	572		3,642				29		4,243
Grand Total	10,252	22,422	134,634	7,094	31	303	90		174,826

Table 20. Fish size samples distribution by month and year for recreational fisheries of Atlantic king.

Num Fish	Non-Headboat recreational												
	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981					5.7%	3.1%	19.4%	41.5%	10.9%	11.8%	7.0%		
1982					23.7%	26.5%	6.6%	9.7%	14.0%	10.7%	8.0%		
1983					1.9%	24.7%	12.5%	6.9%	22.2%	15.7%	15.7%		
1984					4.0%	18.1%	18.8%	5.4%	16.3%	2.9%	34.4%		
1985						26.6%	6.8%	14.5%	21.3%	12.8%	15.5%	1.7%	
1986						10.8%	17.9%	8.9%	17.2%	9.9%	14.8%	11.0%	9.0%
1987						4.8%	13.6%	12.7%	10.8%	8.5%	18.7%	17.5%	13.3%
1988						8.4%	28.8%	7.3%	13.8%	12.0%	18.0%	11.5%	
1989						10.3%	19.9%	17.1%	12.6%	5.9%	5.0%	20.7%	8.6%
1990				1.5%	5.2%	3.8%	5.7%	16.0%	18.9%	21.6%	15.8%	11.5%	
1991					1.1%	10.0%	11.6%	11.9%	15.4%	12.4%	28.3%	8.5%	
1992			1.2%	2.6%	3.6%	7.4%	10.8%	26.1%	10.3%	4.3%	24.8%	7.4%	
1993					3.1%	8.8%	12.2%	11.9%	5.6%	5.4%	26.1%	26.5%	
1994					8.1%	4.3%	11.4%	15.0%	4.0%	7.5%	36.0%	13.7%	
1995					3.0%	7.0%	7.2%	14.7%	3.1%	4.8%	26.6%	32.8%	
1996				3.9%	7.3%	10.8%	7.8%	5.9%	5.6%	16.3%	28.3%	13.5%	
1997			12.4%	23.5%	3.5%	8.5%	4.8%	6.2%	6.7%	9.6%	20.5%	4.1%	
1998				12.1%	21.8%	13.3%	4.2%	7.5%	6.2%	5.4%	14.0%	14.0%	
1999				5.3%	20.7%	17.2%	7.2%	9.5%	11.9%	4.8%	11.3%	9.7%	2.4%
2000					11.8%	10.3%	9.7%	11.6%	10.9%	8.8%	24.1%	12.0%	
2001				5.2%	6.1%	17.3%	12.3%	11.7%	15.5%	8.6%	15.9%	6.6%	
2002					24.0%	13.4%	26.6%	19.9%	13.1%		1.2%		
Avg		0.1%	0.7%	2.6%	8.6%	14.1%	11.0%	13.7%	11.3%	10.0%	18.8%	8.8%	0.3%
Stdev		0.003	0.026	0.055	0.074	0.077	0.055	0.079	0.054	0.057	0.090	0.085	0.006
Headboat													
1984					6.7%	18.5%	12.4%	15.3%	26.7%	7.4%	12.7%		
1985					4.2%	16.6%	9.2%	17.5%	21.7%	9.4%	21.0%		
1986					13.8%	30.6%	4.8%	12.1%	17.0%	9.3%	11.5%		
1987		1.4%			25.4%	18.7%	6.1%	9.5%	9.8%	8.7%	20.1%		
1988					5.1%	20.5%	7.0%	9.1%	35.4%	9.1%	13.8%		
1989					5.5%	10.1%	7.6%	8.2%	18.7%	21.0%	29.0%		
1990					18.0%	10.5%	6.8%	16.7%	37.8%	6.8%	2.7%		
1991					5.5%	6.0%	6.0%	9.4%	11.5%	26.3%	34.6%		
1992				1.0%	15.8%	8.6%	12.5%	10.4%	10.9%	11.9%	23.1%	5.7%	
1993					5.9%	13.3%	8.9%	7.7%	15.6%	8.4%	34.9%	5.1%	
1994					13.0%	19.6%	5.5%	7.7%	10.8%	8.8%	33.1%	1.4%	
1995					18.0%	11.7%	10.2%	12.3%	6.6%	12.3%	27.2%	1.8%	
1996				15.3%	8.3%	15.3%	4.2%	9.7%		8.3%	26.4%	6.9%	5.6%
1997			2.4%	1.8%	1.4%	1.8%	1.8%	4.8%	6.0%	17.7%	59.4%	2.8%	
1998		1.6%			14.5%	15.4%	7.4%	11.3%	18.9%	12.3%	17.6%		
1999					21.8%	26.0%	19.2%	11.0%	7.5%	10.4%	3.6%		
2000				1.3%	8.1%	15.1%	12.6%	14.1%	10.8%	15.1%	21.2%	1.0%	
2001					16.7%	12.6%	8.2%	19.0%	16.0%	17.3%	9.5%		
Avg		0.2%	0.2%	1.1%	11.5%	15.0%	8.3%	11.4%	15.6%	12.3%	22.3%	1.6%	0.4%
Stdev		0.005	0.006	0.036	0.068	0.069	0.040	0.038	0.099	0.053	0.135	0.021	0.013

Table 21. Fish size samples distribution by month and year for recreational fisheries of Gulf king.

Sum of sNumFish	Year	Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981		9.7%	9.9%	6.6%		53.8%	4.9%	2.7%	1.9%			1.9%	8.0%
1982		5.6%	6.2%	13.7%		48.6%	3.5%	2.4%				15.1%	4.0%
1983		4.7%	4.1%	2.4%			5.7%	15.5%	14.0%	5.4%	8.6%	15.1%	23.8%
1984			4.7%		1.5%		6.6%	23.4%	21.7%	21.9%	17.0%	1.5%	
1985						3.2%	9.8%	45.0%	35.9%	1.5%	1.2%	1.3%	1.2%
1986		1.9%	1.4%			1.3%	23.0%	42.9%	19.0%	4.0%	3.9%	1.4%	
1987		2.0%	3.3%	4.9%		8.5%	19.3%	16.4%	27.9%	12.6%	1.8%		1.8%
1988						6.1%	12.5%	45.5%	22.5%	3.2%	6.9%	1.4%	1.8%
1989		5.1%	8.0%	4.1%		2.2%	4.8%	15.4%	28.8%	18.1%	5.7%	5.3%	2.5%
1990		2.3%	3.9%	4.8%	2.9%	2.7%	12.4%	14.3%	33.0%	10.0%	8.2%	1.9%	3.6%
1991		1.4%				2.9%	8.2%	30.5%	30.6%	14.6%	9.2%		
1992		1.4%	2.2%			3.1%	22.5%	28.0%	24.7%	8.7%	4.3%	2.2%	
1993		4.9%	3.2%	4.2%		3.8%	15.2%	18.1%	15.7%	18.2%	6.1%	4.0%	6.1%
1994		5.9%	2.5%	2.2%	5.0%	7.7%	12.3%	15.8%	24.1%	8.9%	6.6%	5.4%	3.5%
1995		8.3%	8.6%	9.8%		3.6%	8.4%	35.4%	8.1%	10.6%		1.4%	4.1%
1996		9.6%	6.3%	8.2%	1.4%	7.4%	22.5%	20.5%	11.2%	6.4%	1.8%	1.9%	2.9%
1997		3.3%	1.6%	4.0%		3.7%	12.4%	16.6%	23.8%	11.0%	6.5%	7.1%	9.5%
1998		14.6%	7.2%	12.5%		3.9%	2.2%	17.9%	17.1%	3.9%	5.0%	8.9%	6.2%
1999		5.9%	10.4%	6.5%	5.4%	3.1%	8.0%	15.6%	20.2%	7.1%	8.0%	4.5%	5.3%
2000		2.5%	3.2%	3.2%	2.1%	7.0%	15.6%	24.2%	14.8%	6.1%	13.2%	6.1%	2.0%
2001		3.5%	8.4%	6.5%		7.0%	12.1%	25.7%	13.3%	8.4%	4.0%	4.4%	6.0%
2002		12.9%	9.1%	12.7%	8.8%	6.6%	14.6%	16.4%	15.0%			2.4%	1.6%
Avg		4.8%	4.8%	4.9%	1.6%	8.5%	11.6%	22.2%	19.2%	8.2%	5.4%	4.3%	4.4%
Stdev		0.040	0.033	0.043	0.022	0.140	0.062	0.118	0.093	0.061	0.043	0.042	0.050
Headboat													
1984		25.4%	21.1%	12.7%		2.4%	1.5%	8.0%	3.9%			13.6%	11.2%
1985		14.2%	8.9%	7.6%								46.7%	22.6%
1986		8.8%	5.0%	2.2%	2.6%	2.5%	14.1%	11.2%	29.4%	1.5%		17.1%	5.1%
1987		10.7%	6.4%	23.3%		1.6%	8.1%	13.9%	16.0%	1.8%	2.4%	6.1%	9.8%
1988						8.8%	9.3%	49.5%	19.7%	1.5%	1.5%	3.7%	6.0%
1989		2.7%	2.3%	2.2%		3.9%	10.6%	22.0%	20.7%	21.7%	3.0%	4.2%	6.4%
1990		6.8%	8.8%	15.2%	2.5%	4.4%	11.1%	2.5%	9.8%	12.4%	2.1%	10.7%	13.8%
1991				4.1%			4.1%	15.1%	41.1%	12.5%	6.2%	10.3%	6.2%
1992		2.7%	1.8%	3.1%		6.5%	24.6%	32.2%	9.7%	8.3%	2.8%	3.5%	3.9%
1993		4.9%	6.4%	1.8%		5.8%	16.1%	20.6%	15.4%	10.4%	3.3%	7.9%	7.4%
1994		2.3%	2.8%	5.8%	1.2%	15.7%	6.9%	22.6%	16.6%	18.7%	3.0%	2.5%	1.9%
1995		1.8%	6.1%	11.1%		2.1%	18.6%	11.9%	30.3%	7.8%	2.0%	4.2%	3.2%
1996		2.9%	7.9%	1.2%		4.5%	13.7%	27.0%	12.4%	18.4%	7.6%	1.7%	1.8%
1997		3.2%				1.4%	5.6%	3.9%	1.2%	3.8%	2.9%	29.7%	46.2%
1998		24.9%	7.8%	14.9%		4.3%	11.0%	8.7%	5.2%	2.5%	1.6%	13.0%	5.9%
1999		10.6%	2.0%	5.0%	2.8%	6.2%	9.2%	18.7%	18.9%	6.8%	4.0%	9.9%	5.9%
2000		1.8%	2.3%	10.9%	1.3%	5.4%	17.6%	16.3%	13.5%	5.2%	7.0%	7.8%	10.9%
2001		10.5%	19.2%	13.6%	1.1%	4.8%	9.0%	4.8%	4.0%	3.7%	8.8%	9.6%	11.0%
Avg		7.5%	6.1%	7.5%	0.9%	4.5%	10.6%	16.1%	14.9%	7.6%	3.3%	11.2%	10.0%
Stdev		0.077	0.059	0.065	0.009	0.036	0.062	0.121	0.109	0.068	0.026	0.111	0.103

Table 22. Fish size samples distribution by month and year for commercial fisheries (hook & line gear only) of Atlantic king.

Num Fish												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981				71.4%	19.5%	3.6%	5.5%					
1983					61.3%					29.4%	7.8%	1.5%
1984	1.1%			8.0%	27.9%	4.3%	3.2%	31.3%	9.6%	7.6%	4.0%	2.4%
1985	1.3%		1.2%	7.8%	16.8%	6.5%	15.8%	26.0%	1.1%	8.8%	12.7%	1.5%
1986	6.2%	1.7%		9.5%	13.1%	1.3%	4.7%	23.5%	15.8%	15.9%	7.2%	
1987	1.9%		9.7%	26.3%	8.4%	4.7%	2.8%	3.4%	12.0%	14.6%	9.7%	6.4%
1988	1.4%		2.2%	8.0%	22.4%	9.4%	7.0%	8.9%	13.8%	9.6%	14.3%	3.1%
1989	2.3%	1.7%		18.6%	32.7%	2.5%	2.2%	1.8%	14.0%	11.4%	12.5%	
1990			3.8%	13.6%	16.5%	7.5%	5.0%	20.6%	5.3%	15.6%	10.4%	
1991	1.7%		3.4%	5.6%	13.5%	5.4%	6.0%	20.6%	6.8%	8.7%	4.5%	23.1%
1992			4.0%	11.1%	13.2%	8.9%	9.8%	26.1%	12.0%	9.7%	3.8%	1.0%
1993	1.6%	5.5%	1.4%	14.0%	16.8%	8.2%	9.7%	20.8%	9.9%	6.4%	2.3%	3.4%
1994				6.1%	41.6%	18.7%	6.4%	13.8%	7.6%	3.5%		
1995	1.4%	1.1%		1.7%	43.2%	11.1%	9.7%	15.3%	1.8%	3.0%	2.5%	9.0%
1996			4.3%	9.9%	20.0%	26.9%	2.2%	16.0%	10.1%	1.7%	3.0%	5.1%
1997			11.6%	5.6%	4.1%	23.4%	22.4%	7.7%	4.5%	7.9%	5.0%	6.7%
1998	7.0%	5.1%	6.4%	18.2%	14.5%	4.4%	2.3%	4.2%	14.0%	18.4%	4.9%	
1999	5.5%	1.4%		26.2%	14.7%	11.3%	9.9%	15.9%	6.5%		3.8%	3.9%
2000	6.4%	1.7%	4.6%	14.8%	23.4%	12.2%	7.2%	13.3%	7.5%	3.0%	4.2%	1.7%
2001	6.2%	4.2%		21.0%	19.3%	7.3%	10.9%	21.4%	5.1%	1.3%	2.6%	
2002				18.6%	23.6%	15.1%	13.2%	10.0%	8.6%	5.7%		3.7%
Avg	2.2%	1.3%	2.6%	15.0%	22.2%	9.2%	7.4%	14.3%	7.9%	8.7%	5.5%	3.6%
Stdev	0.024	0.017	0.033	0.148	0.132	0.070	0.053	0.092	0.048	0.071	0.042	0.051

Table 23. Fish size samples distribution by month and year for commercial fisheries (hook & line gear only) of Gulf king.

Num Fish												
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981	24.6%	24.8%	19.8%	3.9%								26.5%
1982	27.2%	25.6%	8.7%	3.3%								35.2%
1983	22.6%	4.0%	13.9%	3.1%				4.7%	14.2%	17.7%	1.5%	18.3%
1984	5.6%	23.3%	13.7%	3.3%		3.4%	7.1%	1.4%	1.5%	3.3%	8.1%	29.0%
1985	6.5%	9.8%	5.0%		4.8%	7.1%	15.3%	8.4%		4.7%	10.0%	27.8%
1986	36.4%	37.1%	3.6%				2.2%	7.3%	4.7%	1.2%		7.3%
1987	36.3%	10.6%					3.7%	31.6%	13.8%	3.3%		
1988	1.8%					35.3%	13.0%	5.6%	3.0%	3.7%	21.5%	15.8%
1989	19.5%	14.2%	7.0%				3.8%	8.5%	15.5%	15.6%	6.3%	9.1%
1990	34.0%										3.0%	62.8%
1991	4.1%						11.4%	9.8%	17.2%	1.3%	6.0%	50.2%
1992	33.2%						8.7%	4.2%	10.1%	15.6%	1.9%	25.6%
1993	20.4%	7.8%	17.1%				6.7%	3.6%	3.9%	1.9%	9.8%	28.6%
1994	17.1%	4.5%	5.1%				17.0%	8.7%	9.0%	3.3%	19.7%	15.4%
1995	14.9%	14.9%	2.8%				11.9%	9.2%	2.4%		18.7%	24.9%
1996	13.7%	22.2%	5.5%				2.7%	3.2%	3.2%	6.4%	3.4%	38.6%
1997	15.9%	13.4%	17.4%				8.5%	2.0%		20.6%	8.1%	13.7%
1998	9.8%	14.0%	12.7%					2.2%	4.0%	4.7%	30.4%	22.0%
1999	21.7%	27.1%	20.1%					3.9%		4.6%	4.5%	16.5%
2000	12.3%	29.9%	33.8%				4.5%	2.9%		4.7%	9.5%	1.6%
2001	24.2%	24.4%	9.7%				1.1%	4.2%	2.6%	8.3%	5.0%	20.5%
2002	28.6%	25.2%	19.1%	0.0%	0.0%	0.0%	1.3%	0.1%	0.0%	3.0%	5.5%	17.2%
Avg	0.196	0.152	0.098	0.007	0.003	0.021	0.055	0.055	0.049	0.056	0.079	0.230
Stdev	0.105	0.111	0.088	0.013	0.010	0.076	0.054	0.066	0.057	0.061	0.080	0.147

Table 24. Fish size sample distribution of king mackerel by migratory group, sector and subarea from 1994 to 2002. (2002 year is incomplete)

Size sample fish			year									
Stock	Sector	Area	1994	1995	1996	1997	1998	1999	2000	2001	2002	
Atlantic	Commercl	NC	330	227	346	141	239	714	1170	740		
		GA	32	63	14	15	14	23	18	20		
		SC	169	385	469	552	437	635	862	633	192	
		FL Nassau-Flager		3	222	117	1019	146	93	91	184	
		FL Volusia-Dade	6006	1701	3139	753	2960	5231	5587	4579	2662	
		FL Broward-Dade				32	167	137	65	154	140	
		FL Monroe	95	26	184	136	346	5	5	96	2	
	Recreatn	NY-MD			1	2		1			1	
		VI		6		3	3	6	1	3	5	
		NC	848	983	709	1869	1077	482	894	819	181	
		GA	10	14	6	3	7	7	31	9	4	
		SC	83	84	83	212	152	81	227	57	18	
		FL Nassau-Flager	15	12	4	5	19	14	41	42	58	
		FL Volusia-Dade	397	398	87	441	533	577	630	754	519	
	FL Broward-Dade	37	70	25	27	81	222	213	30	44		
	FL Monroe	19	21	37	100	55	78	97	60	28		
	Unclass	NC		416	11		175				1	
		FL Nassau-Flager				136			21			
		FL Volusia-Dade		1		8						
	Gulf	Commercl	FL Volusia-Dade	1132	1753	3212	2237	1361	4035	3384	2554	2531
			FL Broward-Dade				86	82	127	76	76	49
FL Citrus-Escambia			816	558	860	1188	651	577	422	403	94	
FL Collier-Escambia			36	146	108	93	108	334	376	231	276	
FL Sarasota-Escambia			32	3	1	36	31	246	299	181	120	
FL Monroe			272	1543	2844	626	2300	1990	1877	870	1105	
MS								1				
AL											1	
LA			1167	620	330	370	37		57	6	67	
Recreatn			FL Volusia-Dade	103	164	79	923	532	283	153	385	212
		FL Broward-Dade	29	31	34	29	66	160	59	77	11	
		FL Citrus-Escambia	477	149	361	599	610	929	2075	1243	557	
		FL Collier-Escambia	12		2	7	5	52	4	9	1	
		FL Sarasota-Escambia	86	68	36	154	218	240	160	196	166	
		FL Monroe	277	374	533	541	1154	576	266	371	287	
		MS	11	12	3	26	22	78	65	30	67	
		AL	475	125	37	74	62	186	407	195	135	
		LA	60	114	61	163	179	192	93	50	10	
		TX	1459	1395	1580	1347	998	1146	746	773		
Unclass		FL Citrus-Escambia	37	87	215	223						
		FL Collier-Escambia	172	132								
	FL Sarasota-Escambia	563	290	1	53							
	FL Monroe				197	118	109	7		20		
	LA	148										
TX	66		94	43								

Table 25. Percent distribution of size samples of king mackerel by sector, gear and subarea from 1994 to 2002. (2002 year is incomplete)

Sector		King Mackerel % Size-Samples 94-02 (of year total, numb) by Gear and Area for the Atlantic & Gulf stocks																			
Commercl																					
Num Fish Sz		Stock year																			
		Atlantic										Gulf									
Gear	Area	1994	1995	1996	1997	1998	1999	2000	2001	2002	1994	1995	1996	1997	1998	1999	2000	2001	2002		
DRFGNT	FL Volusia-Dade	0.59%																			
	FL Monroe		1.08%	1.94%							0.81%	21.22%	21.13%	11.58%	31.88%	19.52%	19.37%	8.35%	10.65%		
	FL Collier-Escambia												0.71%			1.38%		1.64%	2.80%		
	AL																				
	LA																				
GILLNT	FL Volusia-Dade	0.95%		4.21%																	
	FL Monroe																				
	FL Citrus-Escambia																				
H&L	NC	4.16%	9.44%	7.91%	8.08%	4.61%	10.36%	15.00%	11.72%												
	SC	2.55%	15.97%	10.72%	31.62%	8.43%	9.21%	11.05%	10.03%	6.04%											
	GA		2.62%		0.86%																
	FL Nassau-Flager		5.08%	6.70%	19.66%	2.12%	1.19%	1.44%	5.79%												
	FL Volusia-Dade	89.02%	70.73%	67.49%	42.96%	56.99%	75.72%	71.63%	72.53%	83.71%	32.76%	37.88%	43.66%	48.12%	29.78%	55.18%	51.98%	59.11%	59.65%		
	FL Broward-Dade				1.83%	3.22%	1.99%	0.83%	2.44%	4.40%				1.86%	1.79%	1.74%	1.17%	1.76%	1.15%		
	FL Monroe	1.43%		2.26%	7.79%	6.68%			1.52%		7.06%	12.16%	17.53%	1.92%	18.45%	7.70%	9.55%	11.78%	15.39%		
	FL Collier-Escambia										1.04%	3.14%	0.76%	2.01%	2.36%	3.17%	5.79%	3.70%	3.70%		
	FL Citrus-Escambia										23.59%	12.07%	11.69%	25.60%	14.14%	7.89%	6.49%	9.33%	2.22%		
	FL Sarasota-Escambia													0.65%	0.66%	3.04%	4.28%	4.14%	2.14%		
MS																					
LA										33.02%	13.35%	3.81%	7.98%	0.81%		0.88%			1.58%		
TRAWL	NC	0.81%																			
Unclass	SC																				
	FL Volusia-Dade																				
	FL Collier-Escambia																				
	FL Citrus-Escambia																				
	FL Sarasota-Escambia																			0.68%	
LA										0.72%											
UNK	LA																				
Grand Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%		
Total numb size-sample fish		6632	2405	4374	1746	5182	6891	7800	6313	3180	3455	4623	7355	4636	4570	7310	6491	4321	4243		
<i>items show are >0.5% of year-total</i>																					

Sector		King Mackerel % Size-Samples 94-02 (of year total, numb) by Gear and Area for the Atlantic & Gulf stocks																			
Recreatn																					
Sum of sNumFish		Stock year																			
		Atlantic										Gulf									
Gear	Area	1994	1995	1996	1997	1998	1999	2000	2001	2002	1994	1995	1996	1997	1998	1999	2000	2001	2002		
RECH&L	NY-MD																				
	VI																				
	NC	59.93%	62.10%	74.32%	70.21%	55.80%	32.95%	41.85%	46.11%	21.22%											
	SC	5.87%	5.31%	8.70%	7.96%	7.88%	5.54%	10.63%	3.21%	2.11%											
	GA	0.71%	0.88%	0.63%				1.45%	0.51%												
	FL Nassau-Flager	1.06%	0.76%			0.98%	0.96%	1.92%	2.36%	6.80%											
	FL Volusia-Dade	28.06%	25.14%	9.12%	16.57%	27.62%	39.44%	29.49%	42.45%	60.84%	3.45%	6.74%	2.90%	23.89%	13.83%	7.37%	3.80%	11.57%	14.66%		
	FL Broward-Dade	2.61%	4.42%	2.62%	1.01%	4.20%	15.17%	9.97%	1.69%	5.16%	0.97%	1.27%	1.25%	0.75%	1.72%	4.16%	1.46%	2.31%	0.76%		
	FL Monroe	1.34%	1.33%	3.88%	3.76%	2.85%	5.33%	4.54%	3.38%	3.28%	9.27%	15.38%	19.55%	14.00%	30.01%	14.99%	6.60%	11.14%	19.85%		
	FL Collier-Escambia																				
	FL Citrus-Escambia																				
	FL Sarasota-Escambia																				
	MS														1.35%						
	AL														15.96%	6.13%	13.24%	15.51%	15.86%	24.18%	
	LA														2.88%	2.80%	1.32%	3.99%	5.67%	6.25%	
TX																	0.67%	0.57%	2.03%		
Grand Total		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%		
Total numb size-sample fish		1415	1583	954	2662	1930	1463	2136	1776	853	2989	2432	2726	3863	3846	3842	4028	3329	1446		

Table 26. Percent of the catch for Atlantic king with direct size-frequency samples match by sector and year. 100 samples refer to a minimum number of fish measured.

Atlantic YEAR	Commercial			Total Commercial	Recreational			Total Recreational
	Catch + Sample-size		Catch w/o Size		Catch + Sample-size		Catch w/o Size	
	> 100 samples	< 100 samples			> 100 samples	< 100 samples		
1981	24.2%	24.30%	51.51%	2,399,459	30.8%	68.45%	0.74%	3,813,916
1982	0.0%	0.00%	100.00%	3,938,370	49.7%	50.29%	0.00%	5,853,949
1983	33.3%	12.30%	54.45%	2,386,021	48.4%	51.64%	0.00%	6,231,916
1984	69.3%	17.76%	12.96%	1,968,572	0.0%	99.90%	0.10%	6,152,396
1985	87.1%	7.54%	5.39%	2,456,228	49.9%	50.09%	0.00%	7,034,836
1986	76.3%	12.22%	11.43%	2,801,995	74.0%	25.78%	0.20%	5,895,233
1987	57.0%	17.20%	25.83%	3,392,485	75.6%	24.37%	0.00%	4,036,602
1988	64.4%	4.75%	30.88%	3,166,062	68.7%	31.22%	0.05%	4,786,299
1989	74.8%	19.97%	5.23%	2,480,843	46.9%	52.80%	0.26%	3,336,627
1990	88.1%	6.20%	5.66%	2,537,741	27.9%	71.66%	0.43%	3,905,392
1991	83.9%	14.99%	1.09%	2,567,902	46.2%	53.60%	0.22%	5,338,859
1992	71.5%	26.26%	2.27%	2,244,302	52.4%	47.41%	0.17%	6,670,337
1993	67.3%	29.76%	2.95%	2,141,263	22.1%	77.80%	0.07%	4,284,508
1994	45.9%	49.23%	4.89%	2,069,574	21.8%	78.22%	0.00%	3,882,720
1995	31.3%	62.07%	6.66%	2,011,811	22.8%	77.16%	0.09%	4,142,416
1996	54.8%	33.80%	11.41%	2,228,032	8.5%	85.48%	6.06%	3,740,689
1997	44.9%	36.70%	18.37%	3,045,909	33.9%	63.86%	2.28%	5,281,571
1998	70.4%	14.20%	15.41%	2,470,723	24.1%	75.45%	0.41%	4,473,059
1999	82.4%	9.23%	8.35%	2,345,625	70.4%	29.09%	0.48%	3,413,082
2000	77.7%	15.39%	6.86%	2,220,774	73.8%	25.75%	0.44%	5,297,380
2001	55.0%	38.67%	6.28%	1,934,857				
2002	0.1%	0.36%	99.58%	246,620				

Table 27. Percent of the catch for Gulf king with direct size-frequency samples match by sector and year.

Gulf Year	Commercial			Total Commercial	Recreational			Total Recreational
	Catch + Sample-size		Catch w/o Size		Catch + Sample-size		Catch w/o Size	
	> 100 samples	< 100 samples			> 100 samples	< 100 samples		
1981	92.4%	0.30%	7.31%	6,714,600	25.0%	72.22%	2.79%	5,581,753
1982	90.4%	0.00%	9.57%	4,566,449	7.2%	18.37%	74.45%	8,403,500
1983	87.3%	0.34%	12.31%	4,751,722	25.2%	73.23%	1.56%	2,440,391
1984	93.3%	1.02%	5.70%	3,383,376	46.9%	52.44%	0.65%	3,028,207
1985	97.1%	2.44%	0.43%	3,072,275	16.9%	78.19%	4.87%	1,910,715
1986	80.8%	7.81%	11.39%	2,969,771	53.4%	43.11%	3.54%	1,707,993
1987	56.2%	4.37%	39.41%	1,822,192	84.3%	15.73%	0.01%	3,951,485
1988	90.2%	5.78%	4.04%	1,390,413	54.4%	43.95%	1.61%	4,685,704
1989	83.4%	0.48%	16.12%	1,190,061	58.8%	41.10%	0.15%	2,677,376
1990	63.9%	7.31%	28.83%	2,320,777	49.0%	50.94%	0.06%	3,994,043
1991	69.6%	15.90%	14.51%	1,654,709	67.2%	30.23%	2.54%	4,773,681
1992	96.0%	1.84%	2.11%	2,754,142	60.0%	40.01%	0.00%	3,965,159
1993	57.0%	0.67%	42.37%	3,606,441	54.5%	45.35%	0.12%	7,045,373
1994	89.7%	4.17%	6.18%	2,149,527	61.2%	38.77%	0.00%	5,536,448
1995	67.0%	11.91%	21.04%	2,616,933	55.6%	44.38%	0.00%	7,424,592
1996	72.7%	21.30%	6.03%	2,887,972	55.2%	44.60%	0.20%	6,689,630
1997	68.1%	8.20%	23.73%	3,212,639	61.6%	37.93%	0.43%	7,798,919
1998	41.6%	26.96%	31.46%	3,346,639	66.9%	32.84%	0.30%	5,959,000
1999	43.4%	0.06%	56.49%	3,724,817	79.6%	19.52%	0.86%	4,654,630
2000	48.4%	32.70%	18.93%	2,923,983	69.4%	29.39%	1.18%	4,509,300
2001	47.1%	52.92%	0.00%	2,991,040				
2002	51.7%	48.28%	0.00%	1,962,793				

Table 28. Number of king mackerel otoliths aged by migratory group and year.

Year	ATL	GOM	MEX	Total
1986	531	350		881
1987	500	934		1434
1988	453	693	103	1249
1989	836	877	174	1887
1990	967	697	244	1908
1991	810	1609	166	2585
1992	1282	1421	114	2817
1993	905	1302	99	2306
1994	895	1006	100	2001
1995	658	1026		1684
1996	969	1759		2728
1997	531	1210		1741
1998	821	646		1467
1999	889	588		1477
2000	713	892		1605
2001	823	1714		2537
2002	31	1111		1142
rand Total	12,614	17,835	1,000	31,449

Table 29. Sex distribution of king otolith samples for ALK input

Year	ATL			Eastern Gulf			Western Gulf			Grand Tot:
	Fem	Male	Unk	Fem	Male	Unk	Fem	Male	Unk	
1986	203	182	146	155	53	26	50	49	17	881
1987	293	205	2	427	164	7	203	131	2	1434
1988	250	196	7	268	97	2	220	99	7	1146
1989	497	339		319	171	31	245	110	1	1713
1990	576	350	41	298	158	5	148	88		1664
1991	527	279	4	849	374	8	252	125		2418
1992	799	478	5	733	319	6	221	140	2	2703
1993	551	353	1	774	379	9	72	68		2207
1994	483	408	4	657	263	6	49	31		1901
1995	353	295	10	728	298					1684
1996	701	267	1	1371	380	8				2728
1997	283	225	23	856	354					1741
1998	545	270	5	422	221	1				1464
1999	503	372	14	391	196					1476
2000	476	234	3	719	172				1	1605
2001	550	271	2	941	772					2536
2002	15	12	4	627	484					1142
rand Total	7605	4736	272	10535	4855	109	1460	841	30	30443

Table 30. Monthly distribution of otolith samples king mackerel sexed fish Atlantic group.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986				20	27	85	126	97	20	10		
1987				31	63	119	90	46	18	21	110	
1988				37	145	118	63	33	44	6		
1989					64	84	164	97	218	196	13	
1990	1		18	12	74	135	140	208	179	115	38	6
1991	41	10	9	24	40	55	158	145	142	131	34	17
1992	17	13	1	23	65	173	252	177	304	169	40	43
1993	19	65	40	79	136	215	97	51	97	60	8	37
1994	28	39	19	47	187	35	103	88	241	60	13	31
1995			27	11	255	83	134		85	39		14
1996	8	11		139	98	229	173	162	38	110		
1997					29	85	103	51	139	78		23
1998	17	15	30	62	158	71	143	35	149	110	25	
1999	19	13		160	164	92	53	147	102	43	82	
2000			26	1	49	96	208	80	128	87	35	
2001				36	73	179	157	76	154	93	31	22
2002			25		2							

Table 31. Monthly distribution of otolith samples king mackerel sexed fish Gulf migratory group.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986						17	177	81	27	1	4	
1987	4	6	37	5	81	180	290	172	118	1	19	12
1988					12	142	405	68	33	12	3	9
1989	9	23	1	2	51	127	281	170	99	47	15	20
1990	42		9	2	63	176	189	105	37	25	5	39
1991	37	18		17	101	303	576	190	97	7	63	191
1992	31	68	19	42	70	267	548	140	86	66	28	48
1993	32	10	28	125	11	126	461	137	173	37	110	43
1994	7	11	10	174	44	67	174	121	187	72	114	19
1995	34	6	1	129	56	61	136	65	106	24	183	225
1996	37	165	93	66	91	162	65	83	325	147	86	431
1997	259	122	260	54	40	72	30	47	203	85	20	18
1998	92	137	64	1	13	28	42	37	3	18	79	129
1999	112	56	27	11	3	80	68	68	10	46	50	56
2000	133	211	186		29	27	52	8	47	19	144	35
2001	412	431	261	5	2	2	70	113	79	160	51	127
2002	667	76	235	9	11	113						

Table 32. Gulf sexed king mackerel otolith samples by main areas.

Year	TX	AL	LA	MS	FL_NW	FL_SW	FL_E
1986	99	69	42	39	58		
1987	334	233	75	55	150		78
1988	319	83	68	84	118		12
1989	355		58	11	353		68
1990	236	18	41	95	207		95
1991	377	4	302	59	550	52	256
1992	361	9	304	47	437	89	166
1993	140	8	569		232	251	93
1994	80		303		317	253	47
1995			187		485	133	221
1996					907	131	713
1997					481	62	667
1998				20	111	94	418
1999		5		66	183	95	238
2000				18	180	53	640
2001		36	214	9	198	57	1199
2002				1	127	30	953

Table 33. Atlantic sexed king mackerel otolith samples by main areas

Year	VA	NC	SC	GA	FL_NE	FL_SE	FL_SW
1986		121	86	29	100	49	
1987		235	123	14	124	2	
1988		91	167	60	55	73	
1989	17	568	109	139		3	
1990		728	93	98	4	3	
1991		656	109	15	1	25	
1992		830	140	81	222	4	
1993		603	80		215	6	
1994		527			333	15	16
1995		306			342		
1996		376	29	49	453	8	53
1997		338		23	147		
1998		453			349	3	10
1999		485			214	176	
2000		523	59		127	1	
2001		504	24		261	32	
2002		25				2	

Table 38. Age-Length-Keys for Atlantic King Males use for ageing mackerel CAS by sex data. Rows: age and year Columns size-bin, values probability of fish age for each size-bin and year.

Data		Size Upbin																	Data		Size Upbin																		
Age	YEAR	35	40	50	55	60	65	70	75	80	85	90	95	100	105	110	120	155	200	Age	YEAR	35	40	50	55	60	65	70	75	80	85	90	95	100	105	110	120	155	200
Age 0	1986	1.000																		1986	1986																		
	1987	1.000																		1987	1987																		
	1988	1.000																		1988	1988																		
	1989	1.000																		1989	1989																		
	1990	1.000																		1990	1990																		
	1991	1.000																		1991	1991																		
	1992	1.000																		1992	1992																		
	1993	1.000																		1993	1993																		
	1994	1.000																		1994	1994																		
	1995	1.000																		1995	1995																		
	1996	1.000																		1996	1996																		
1997	1.000																		1997	1997																			
1998	1.000																		1998	1998																			
1999	1.000																		1999	1999																			
2000	1.000																		2000	2000																			
2001	1.000																		2001	2001																			
Age 1	1986	1.000	1.000	0.714	0.308	0.154	0.032													1986	1986																		
	1987	0.952		0.519	0.778	0.189														1987	1987																		
	1988			0.533	0.077															1988	1988																		
	1989			0.906	0.250															1989	1989																		
	1990	1.000		0.417	0.214	0.030														1990	1990																		
	1991			1.000	0.034															1991	1991																		
	1992			0.571	0.417	0.038	0.012													1992	1992																		
	1993			1.000	0.429	0.045														1993	1993																		
	1994			1.000	0.706	0.385	0.034													1994	1994																		
	1995			1.000	0.400	0.167	0.050													1995	1995																		
	1996			0.929	0.462	0.038														1996	1996																		
1997			0.867	0.136															1997	1997																			
1998			1.000	0.917	0.467	0.133	0.017												1998	1998																			
1999																			1999	1999																			
2000																			2000	2000																			
2001																			2001	2001																			
Age 2	1986		0.048	0.286	0.615	0.846	0.355	0.121												1986	1986																		
	1987			0.444	0.222		0.432	0.045	0.038											1987	1987																		
	1988			0.467	0.923	0.714	0.296	0.118												1988	1988																		
	1989				0.650	0.333	0.034													1989	1989																		
	1990				0.583	0.714	0.121	0.082	0.016											1990	1990																		
	1991				0.931	0.513	0.079													1991	1991																		
	1992			0.428	0.583	0.604	0.289	0.077												1992	1992																		
	1993				0.571	0.465	0.105													1993	1993																		
	1994				0.235	0.615	0.576	0.087												1994	1994																		
	1995				0.600	0.833	0.550	0.082												1995	1995																		
	1996				0.071	0.231	0.594	0.500	0.307											1996	1996																		
1997				0.133	0.818	0.917	0.160												1997	1997																			
1998				0.375	0.679	0.400	0.059												1998	1998																			
1999				0.083	0.533	0.667	0.333	0.051											1999	1999																			
2000				0.867	0.571	0.417													2000	2000																			
2001				0.867	0.733	0.243	0.048												2001	2001																			
Age 3	1986			0.077	0.387	0.303	0.083													1986	1986																		
	1987				0.324	0.500	0.192													1987	1987																		
	1988				0.286	0.630	0.441	0.038												1988	1988																		
	1989				0.100	0.490	0.310	0.008												1989	1989																		
	1990				0.071	0.515	0.131	0.031												1990	1990																		
	1991				0.034	0.410	0.158	0.108												1991	1991																		
	1992				0.359	0.063	0.538	0.076	0.017											1992	1992																		
	1993				0.409	0.614	0.351	0.038												1993	1993																		
	1994				0.059	0.271	0.207	0.032	0.024											1994	1994																		
	1995				0.308	0.406	0.423	0.533	0.129	0.032										1995	1995																		
	1996				0.045	0.083	0.480	0.211	0.038			</																											

Table 43. Ageing protocol used to transform king mackerel Catch at Size by sex to Catch at Age in the last stock assessment for the Atlantic and Gulf migratory groups. Key: Age-Length-Keys. SAR: Stochastic Ageing Method.

Instruction File for King mackerel

Year	Area	Q1	Q2	Q3	Q4	Area	Q1	Q2	Q3	Q4	Area	Q1	Q2	Q3	Q4	
1985	1985	ATL	SAR	SAR	SAR	SAR	EGF	SAR	SAR	SAR	SAR	WGF	SAR	SAR	SAR	SAR
1986	1986	ATL	SAR	KEY	KEY	SAR	EGF	SAR	KEY	KEY	SAR	WGF	SAR	KEY	KEY	SAR
1987	1987	ATL	SAR	KEY	KEY	SAR	EGF	SAR	KEY	KEY	SAR	WGF	SAR	KEY	KEY	SAR
1988	1988	ATL	SAR	KEY	KEY	KEY	EGF	KEY	SAR	SAR	KEY	WGF	KEY	SAR	SAR	KEY
1989	1989	ATL	SAR	KEY	KEY	KEY	EGF	SAR	KEY	KEY	KEY	WGF	SAR	KEY	KEY	KEY
1990	1990	ATL	SAR	KEY	KEY	KEY	EGF	SAR	KEY	KEY	SAR	WGF	SAR	KEY	KEY	SAR
1991	1991	ATL	SAR	KEY	KEY	KEY	EGF	SAR	KEY	KEY	SAR	WGF	SAR	KEY	KEY	SAR
1992	1992	ATL	SAR	KEY	KEY	KEY	EGF	KEY	KEY	KEY	SAR	WGF	SAR	KEY	KEY	SAR
1993	1993	ATL	SAR	KEY	KEY	KEY	EGF	KEY	KEY	KEY	KEY	WGF	SAR	SAR	KEY	SAR
1994	1994	ATL	SAR	KEY	KEY	KEY	EGF	KEY	KEY	KEY	KEY	WGF	SAR	SAR	SAR	SAR
1995	1995	ATL	SAR	KEY	KEY	KEY	EGF	SAR	KEY	KEY	KEY	WGF	SAR	SAR	SAR	SAR
1996	1996	ATL	SAR	KEY	KEY	KEY	EGF	KEY	KEY	KEY	KEY	WGF	SAR	SAR	SAR	SAR
1997	1997	ATL	SAR	KEY	KEY	KEY	EGF	KEY	KEY	KEY	KEY	WGF	SAR	SAR	SAR	SAR
1998	1998	ATL	KEY	KEY	KEY	KEY	EGF	KEY	KEY	KEY	KEY	WGF	SAR	SAR	SAR	SAR
1999	1999	ATL	SAR	KEY	KEY	KEY	EGF	SAR	SAR	KEY	KEY	WGF	SAR	SAR	SAR	SAR
2000	2000	ATL	SAR	KEY	KEY	KEY	EGF	KEY	KEY	KEY	KEY	WGF	SAR	SAR	SAR	SAR
2001	2001	ATL	SAR	KEY	KEY	KEY	EGF	KEY	SAR	KEY	KEY	WGF	SAR	SAR	SAR	SAR
2002	2002	ATL	SAR	SAR	SAR	SAR	EGF	KEY	KEY	SAR	SAR	WGF	SAR	SAR	SAR	SAR

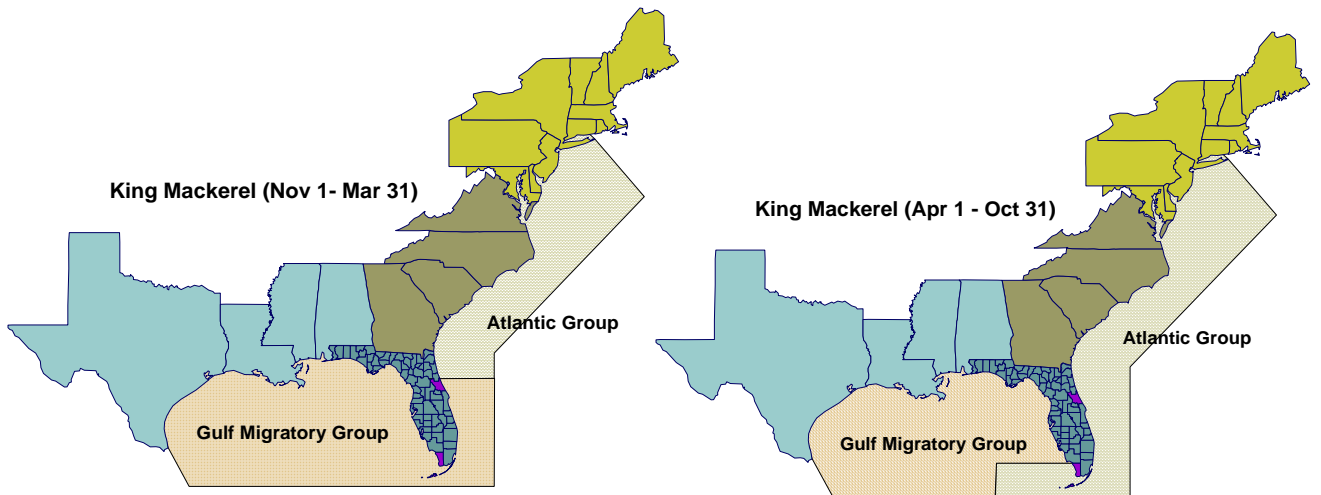


Figure 1. Boundary definitions for the Atlantic and Gulf migratory groups of king mackerel.

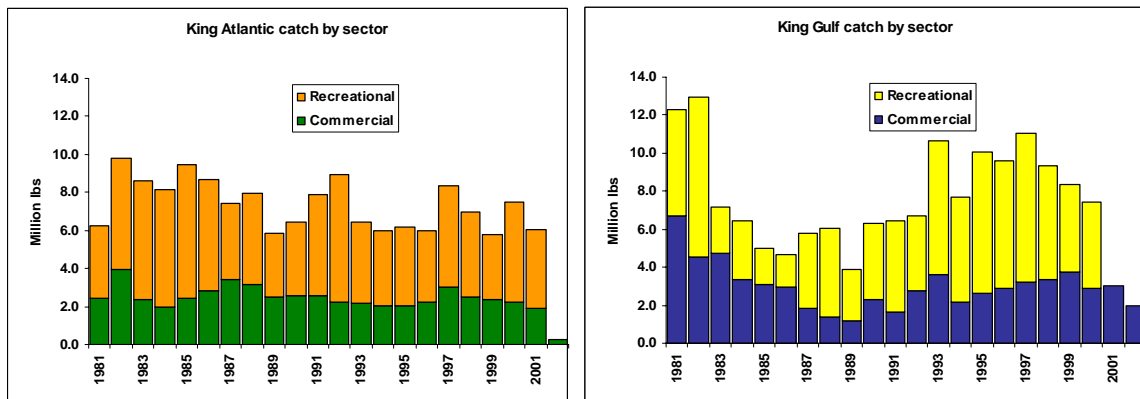


Figure 2. King mackerel catch by sector, calendar year. Data for 2001-02 is partial data.

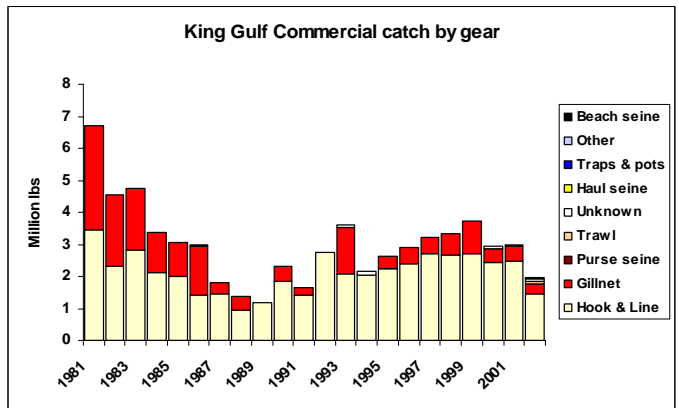
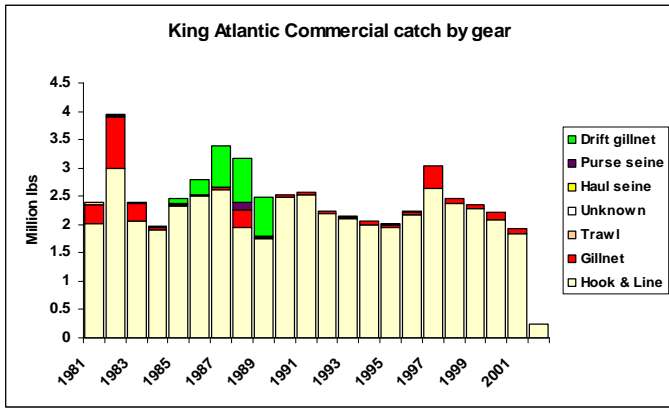


Figure 3. King mackerel catch by gear for the commercial sector.

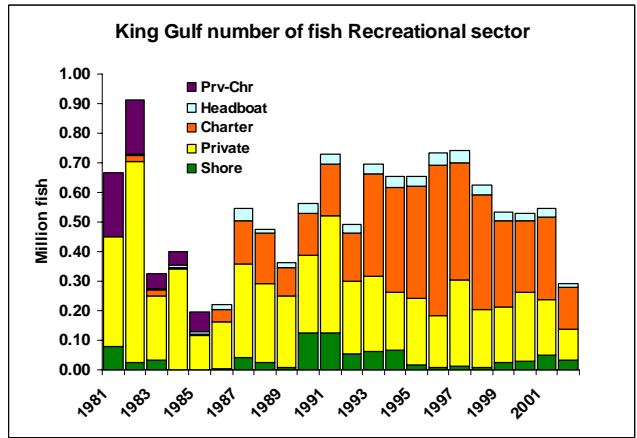
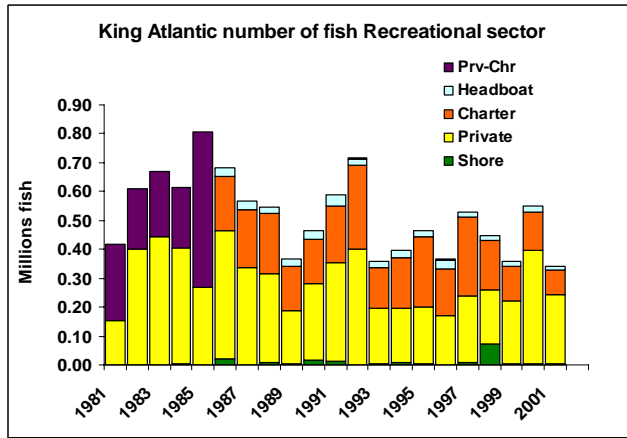


Figure 4. King mackerel catch by mode for the recreational sector.

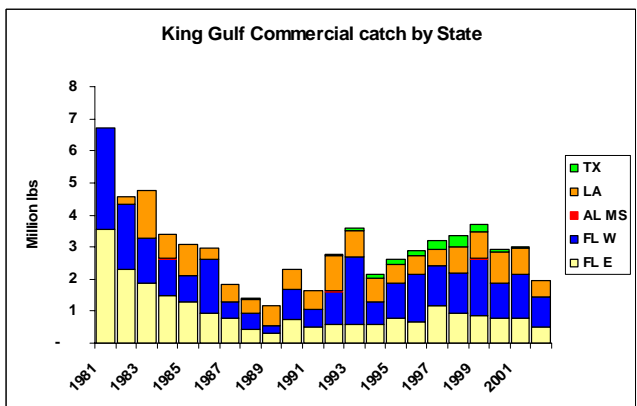
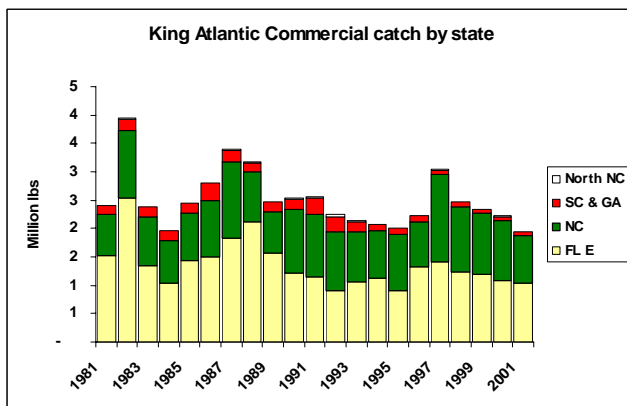


Figure 5 King commercial catches distribution by region.

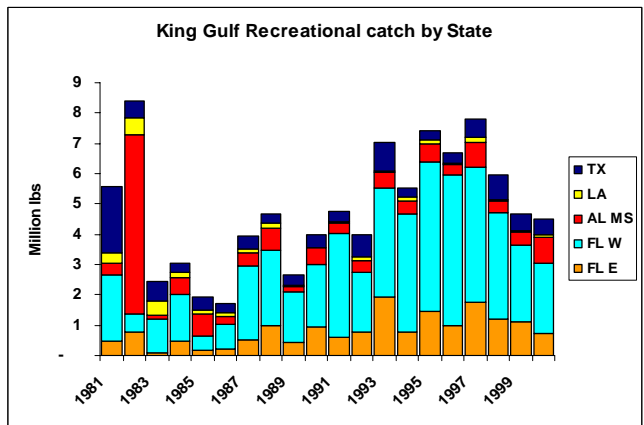
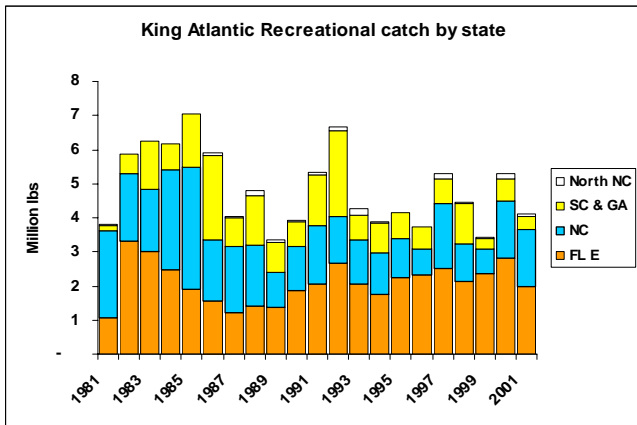


Figure 6. King recreational catch distribution by region.

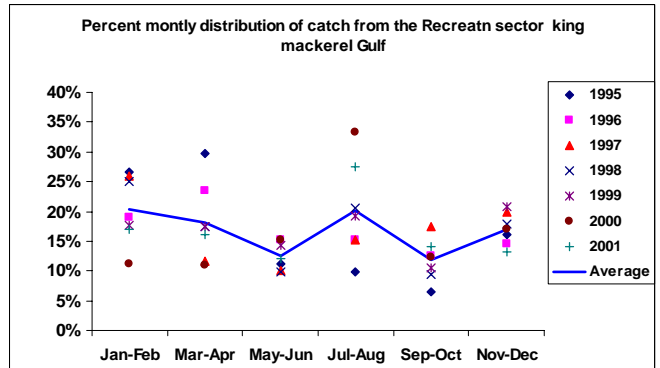
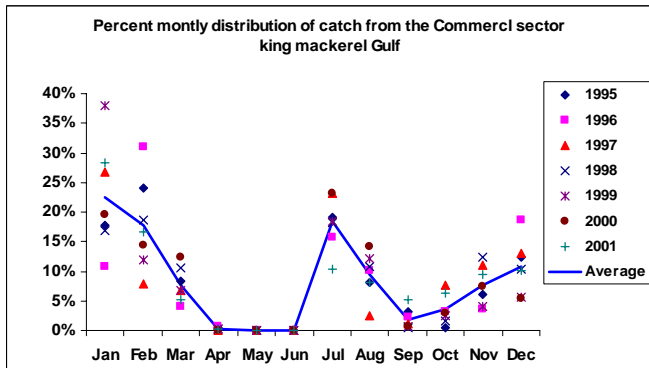


Figure 7. Percent monthly distribution of catch for Gulf king mackerel by sector from 1995 to 2002.

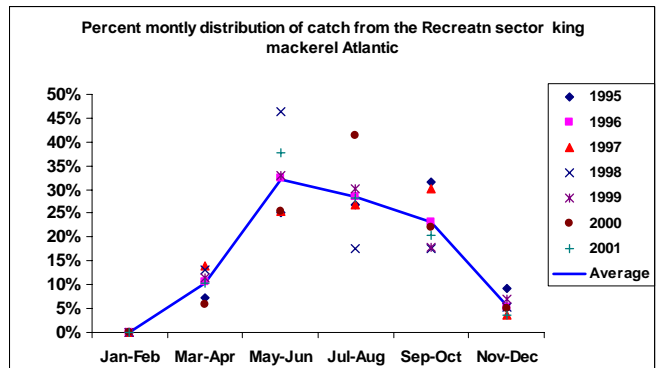
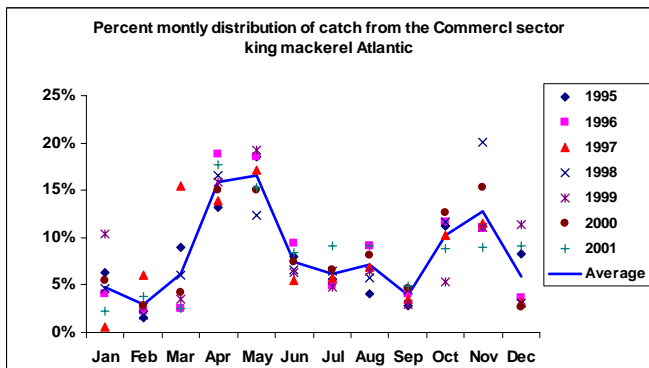


Figure 8. Percent monthly distribution of catch for Atlantic king mackerel by sector from 1995 to 2002.

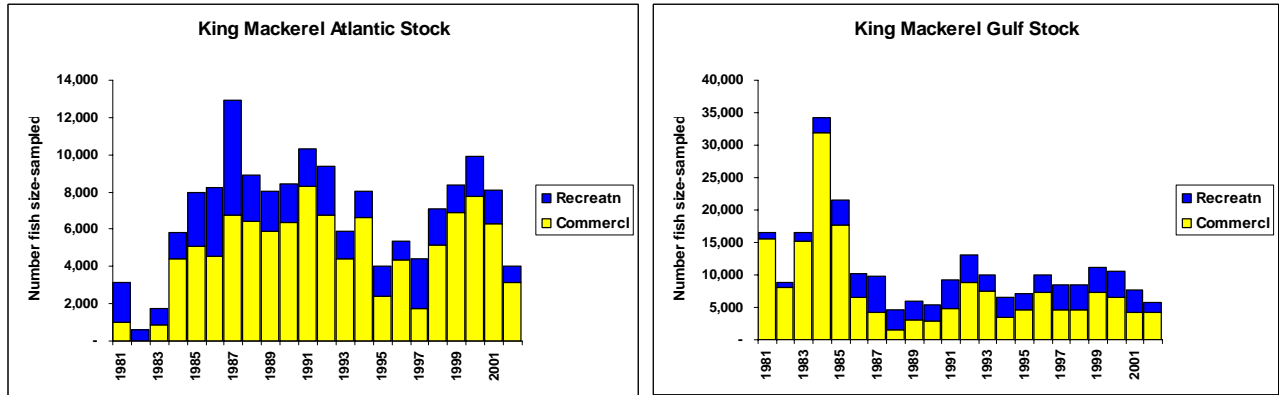


Figure 9. Number of fish size sampled from king mackerel fisheries.

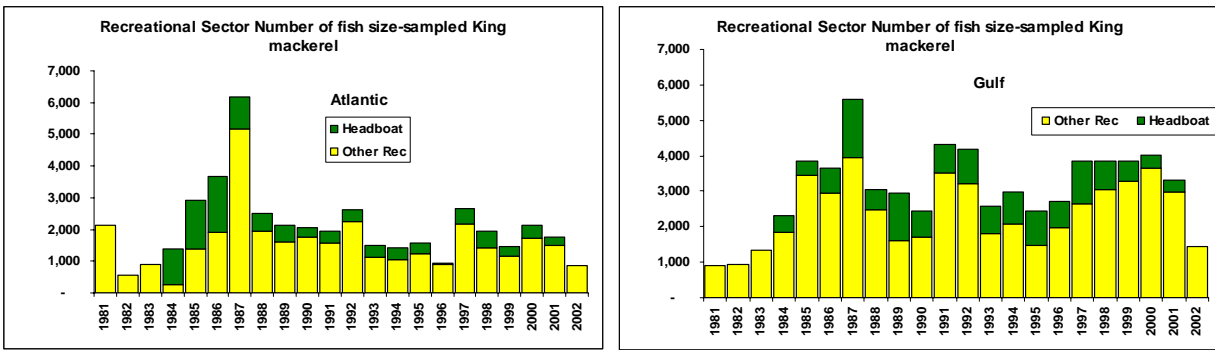


Figure 10. Annual distribution of fish size sampled from king mackerel recreational fisheries.

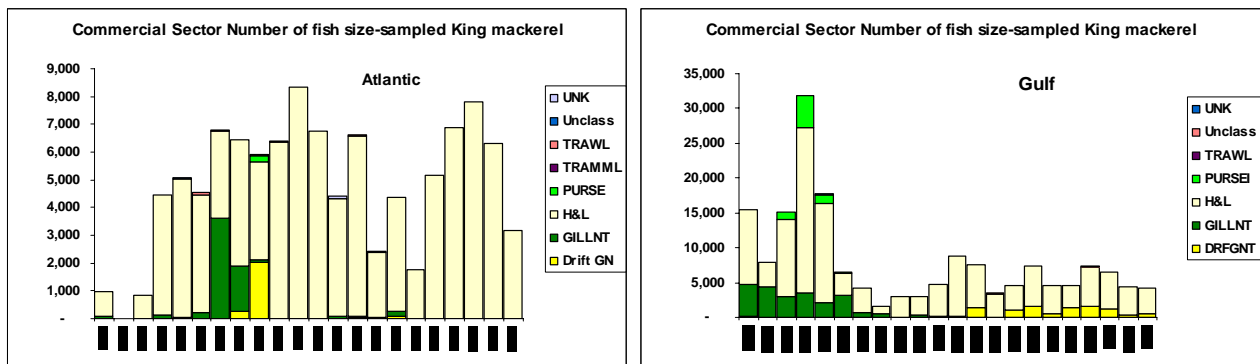


Figure 11. Annual distribution of fish size sampled from king mackerel commercial fisheries by gear.

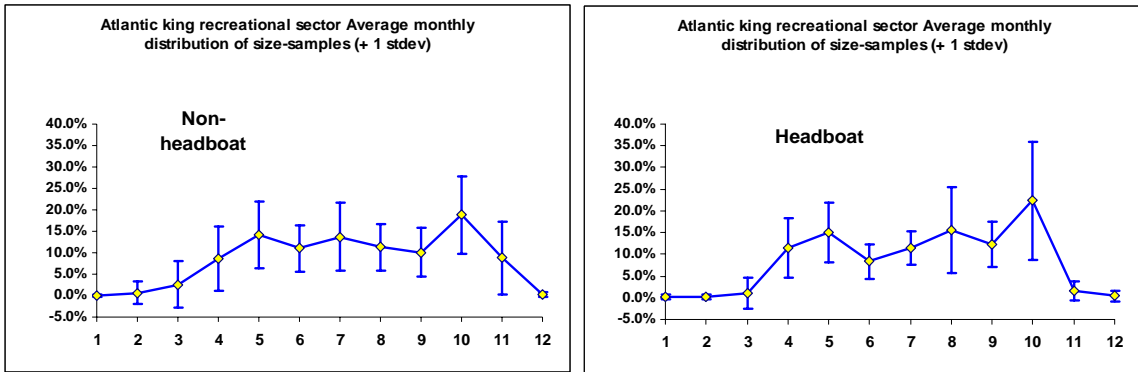


Figure 12. Monthly distribution of size samples of Atlantic king recreational fisheries (1981-2002).

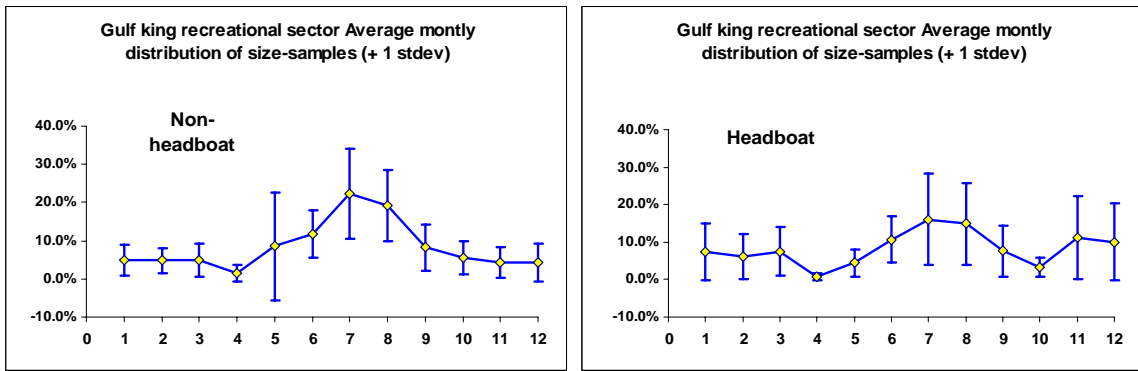


Figure 13. Monthly distribution of size samples of Gulf king recreational fisheries (1981-2002).

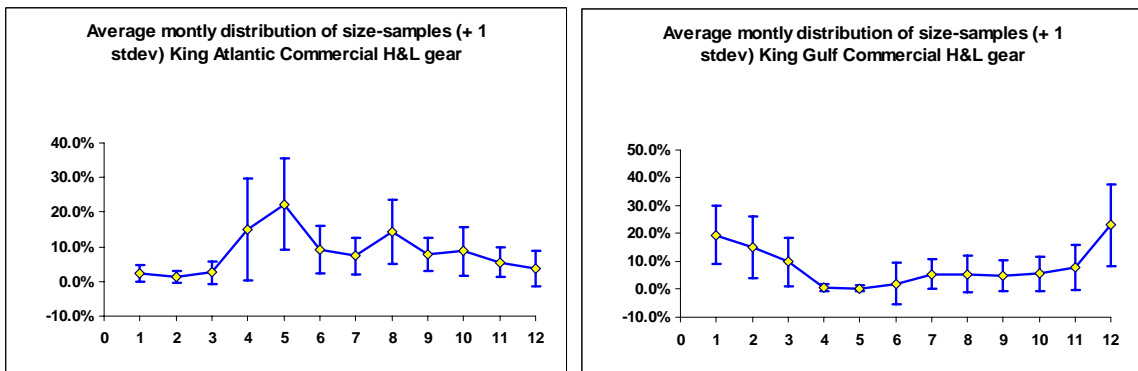


Figure 14. Monthly distribution of size samples of Atlantic and Gulf king commercial fisheries (hook and line gear, 1981-2002).

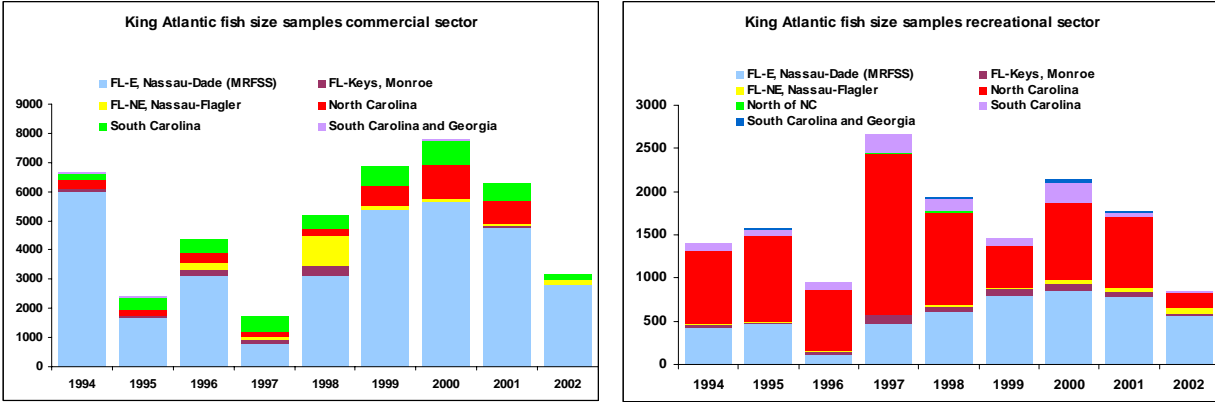


Figure 15. Size samples of Atlantic king by sector and subarea.

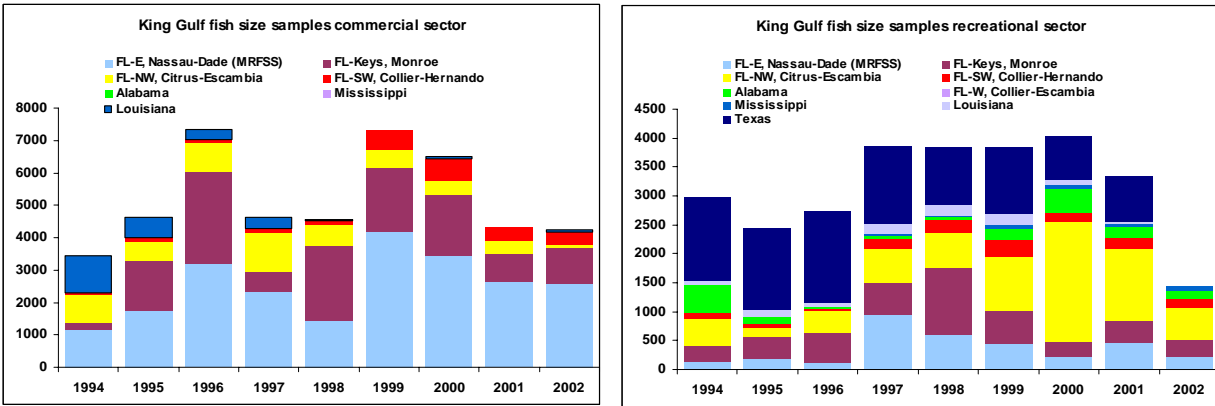


Figure 16. Size samples of Gulf king by sector and subarea.

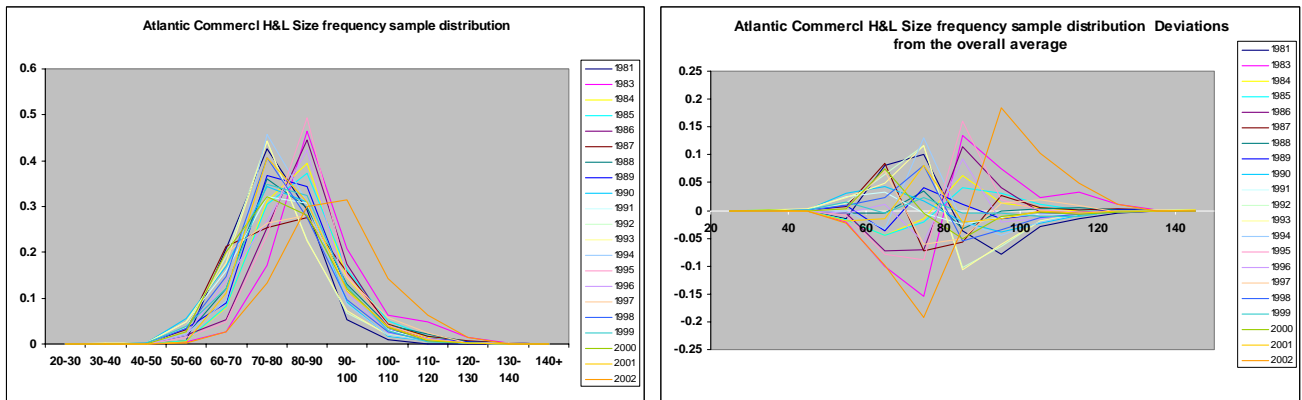


Figure 17. Sample size frequency distributions of Atlantic king for the commercial (hook & line) fisheries.

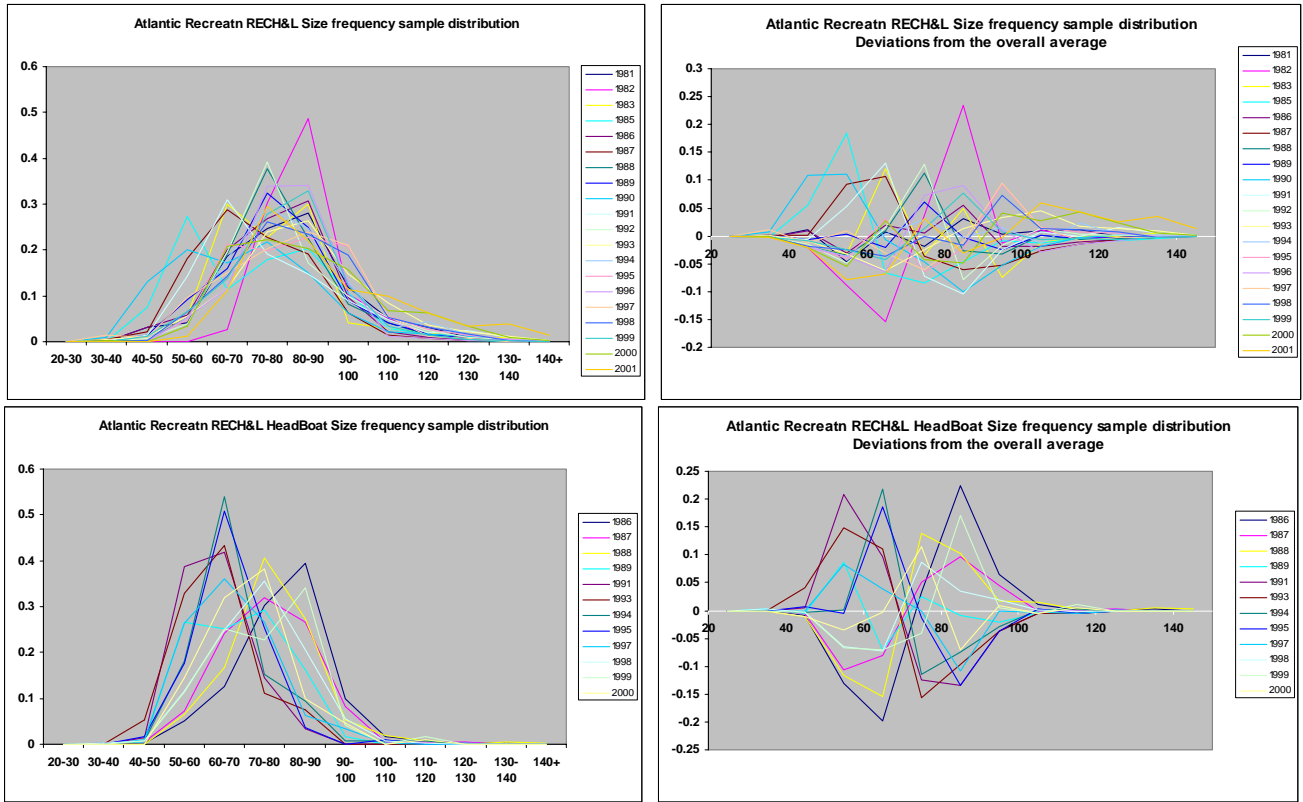


Figure 18. Sample size frequency distributions of Atlantic king for the recreational fisheries.

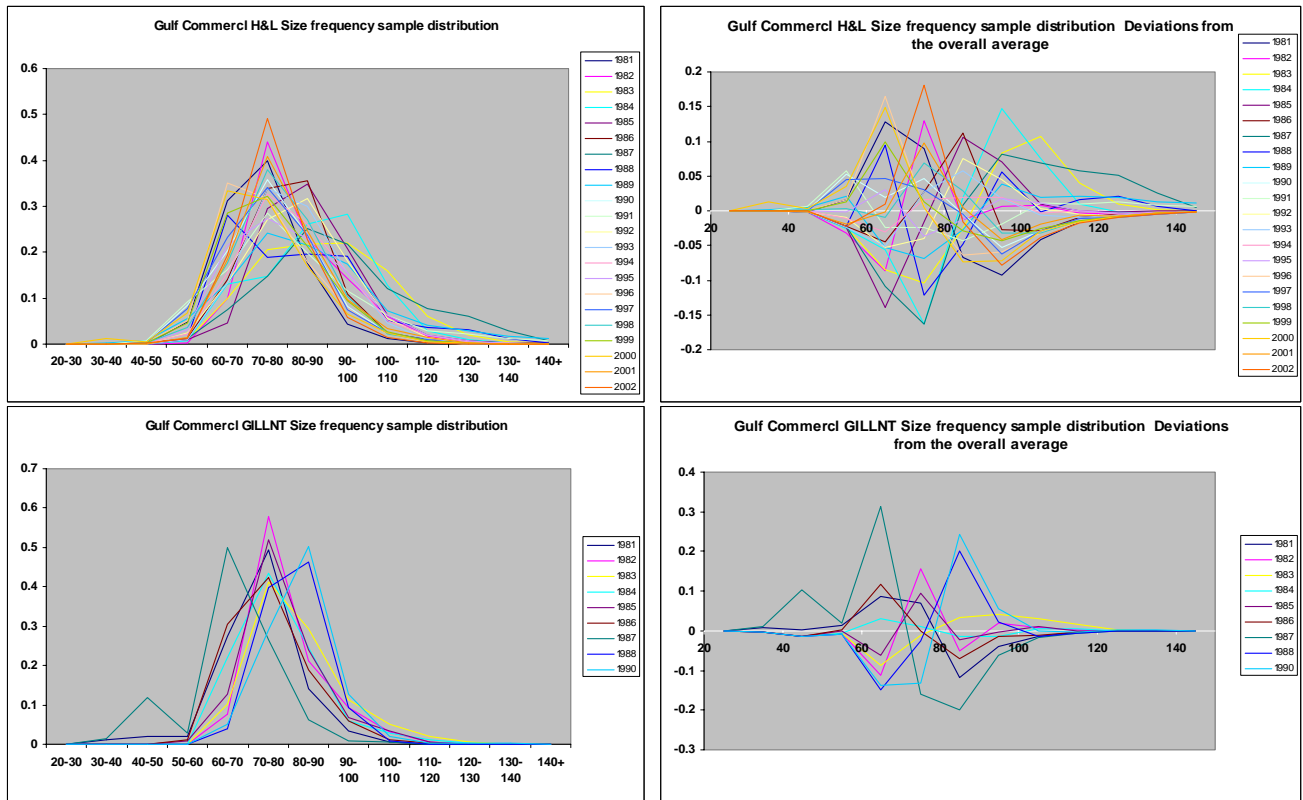


Figure 19. Sample size frequency distributions of Gulf king from the commercial fisheries by gear type; top hook & line, bottom gillnets.

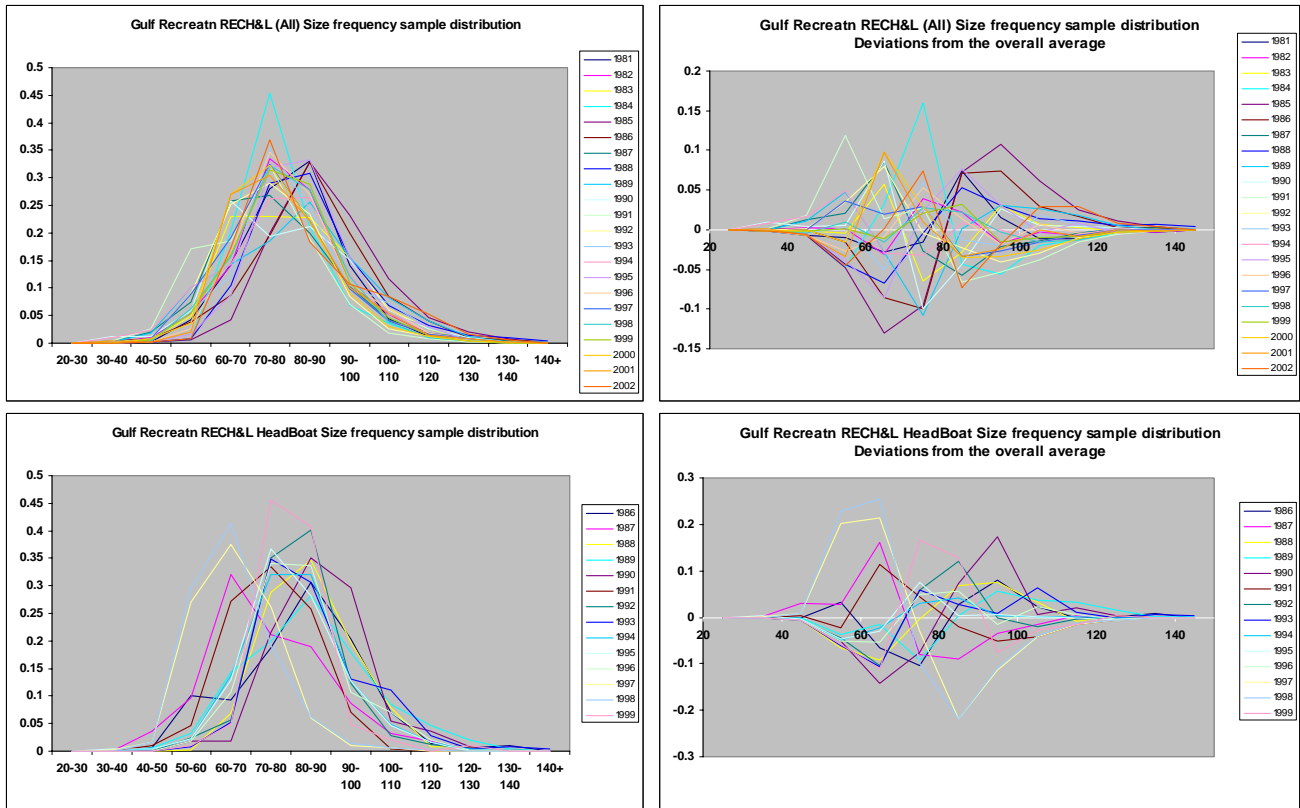


Figure 20. Sample size frequency distributions of Gulf king from the recreational fisheries by mode; top all recreational fisheries, bottom headboat fishery.

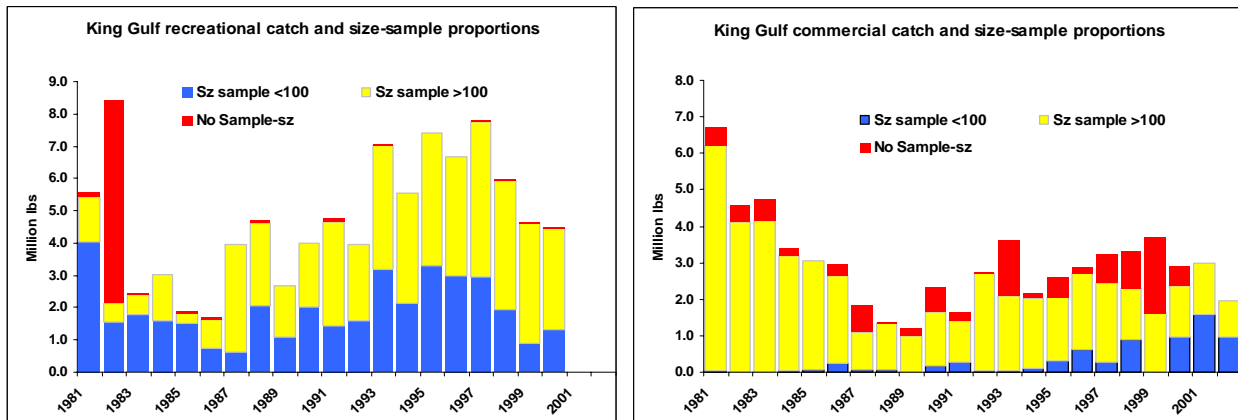


Figure 21. Distribution of catch with direct size frequency sample match for Gulf king by sector.

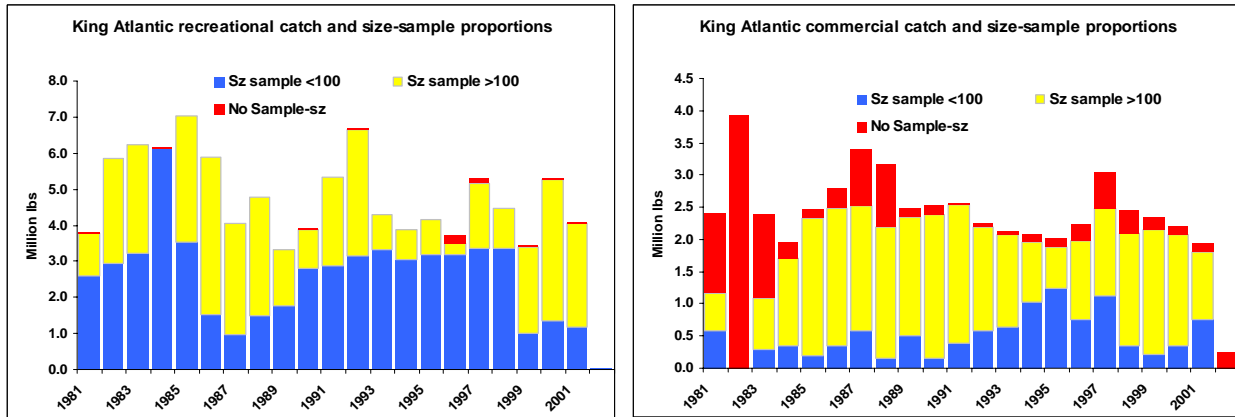


Figure 22. Distribution of catch with direct size frequency sample match for Atlantic king by sector.

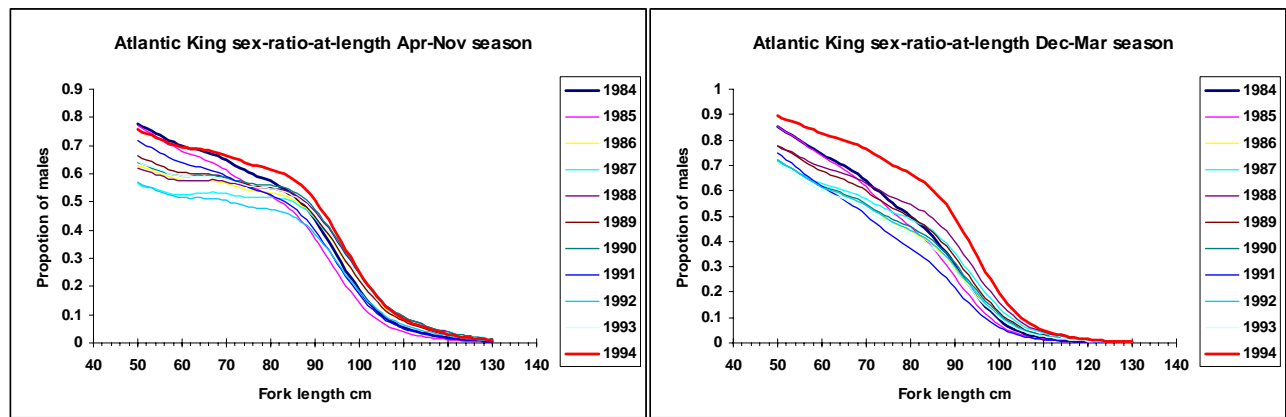


Figure 23.. Sex-ratio-at-length estimates for Atlantic king 1984-1994.

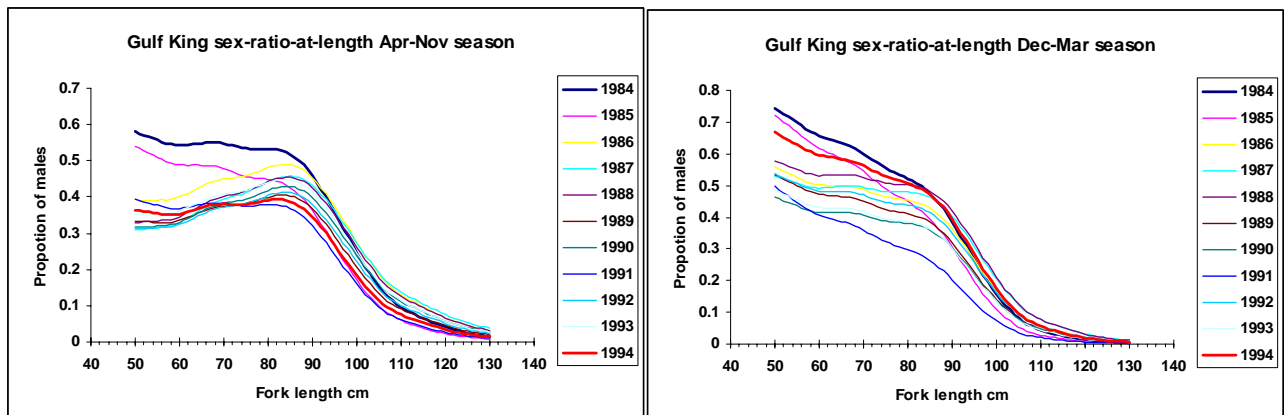


Figure 24 Sex-ratio-at-length estimates for Atlantic king 1984-1994.

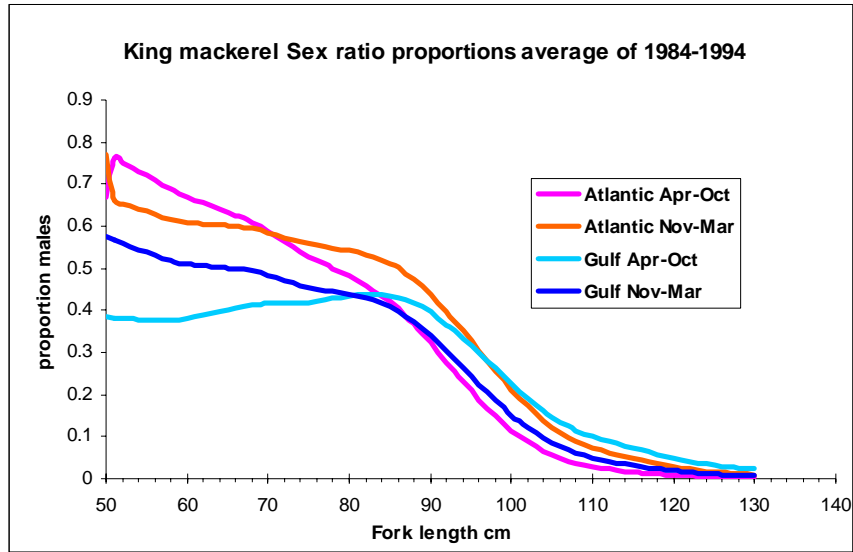


Figure 25. Average sex-ratio-at-length from the estimates of 1984-1994.

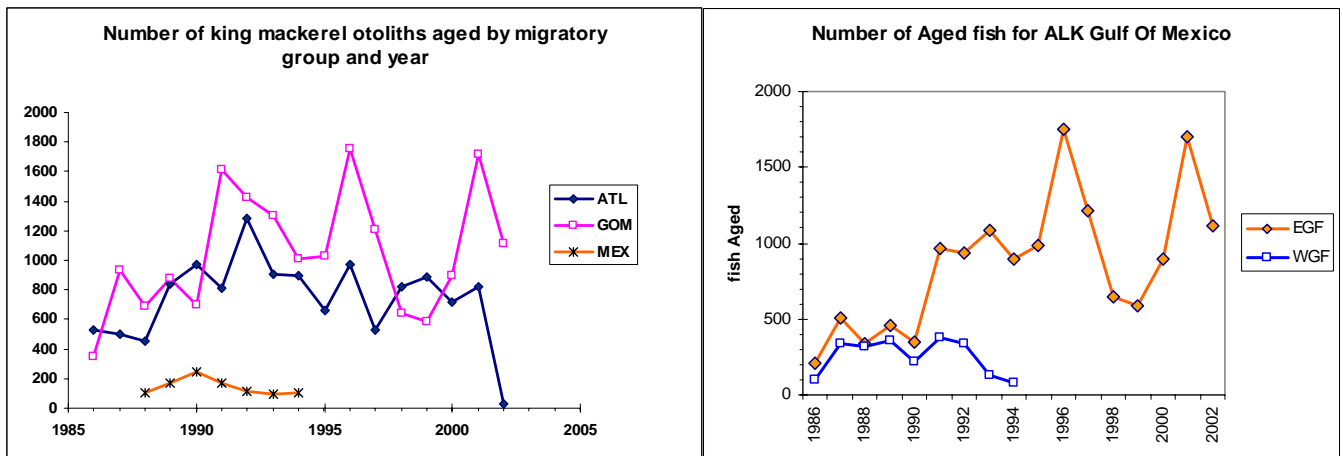


Figure 26. Number of otoliths aged by migratory group and year for king mackerel.

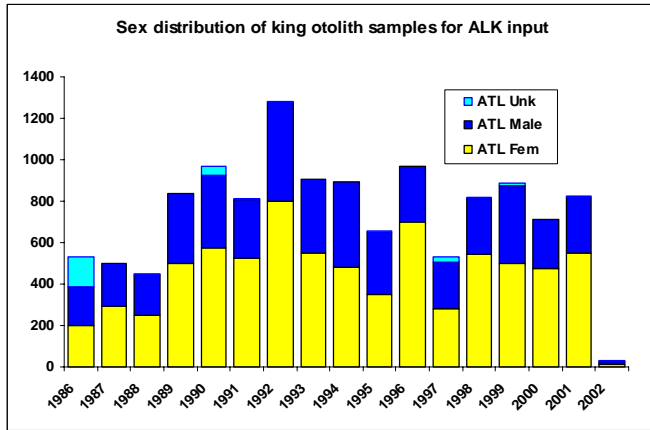


Figure 27. Sex distribution of Atlantic king otolith samples for ALK input

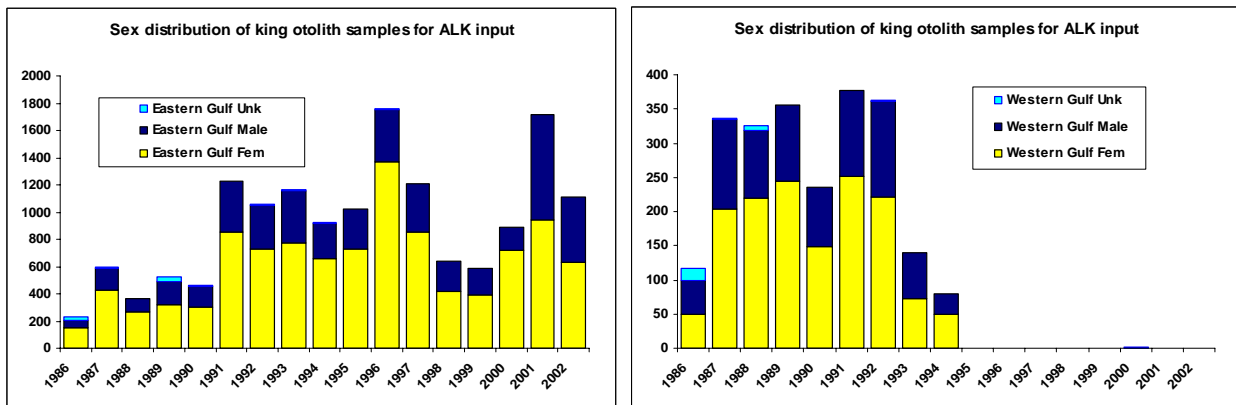


Figure 28. Sex distribution of Gulf king otolith samples for ALK input by main areas of the GOM.

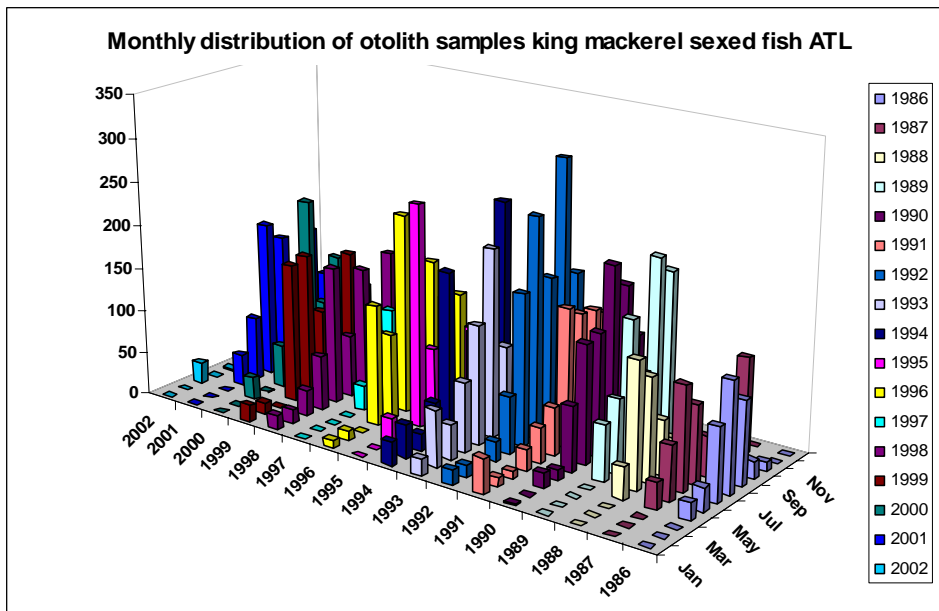


Figure 29. Atlantic king otolith samples by month and year.

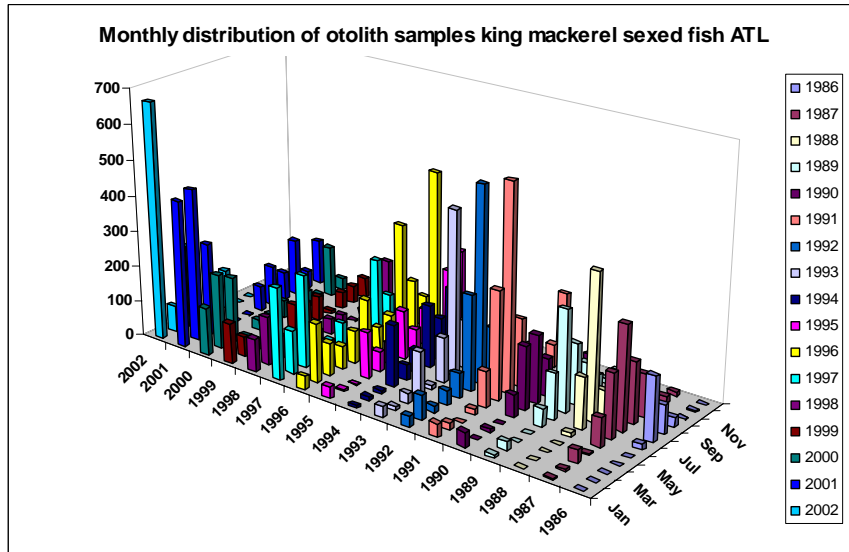
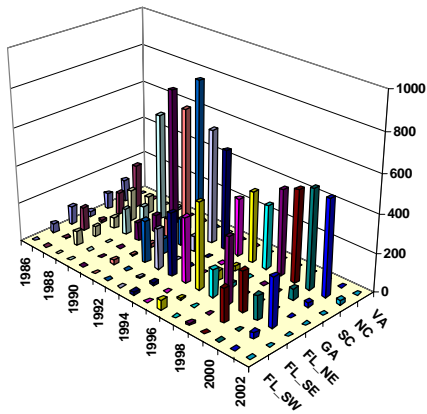


Figure 30. Gulf king mackerel otolith sample distribution by month and year.

ATL Sexed king mackerel otolith samples by main areas



GOM Sexed king mackerel otolith samples by main areas

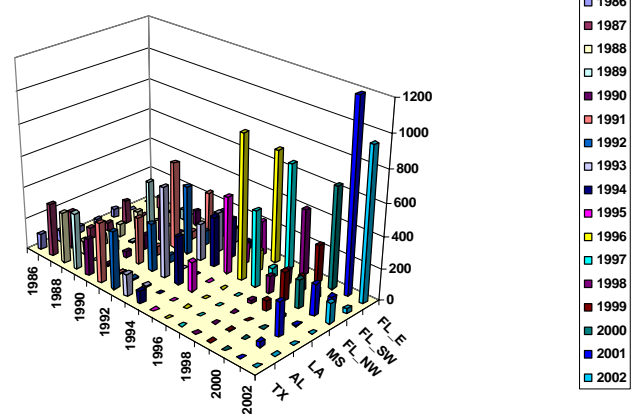


Figure 31. King mackerel otolith samples distribution by area and year for Atlantic and Gulf stocks.

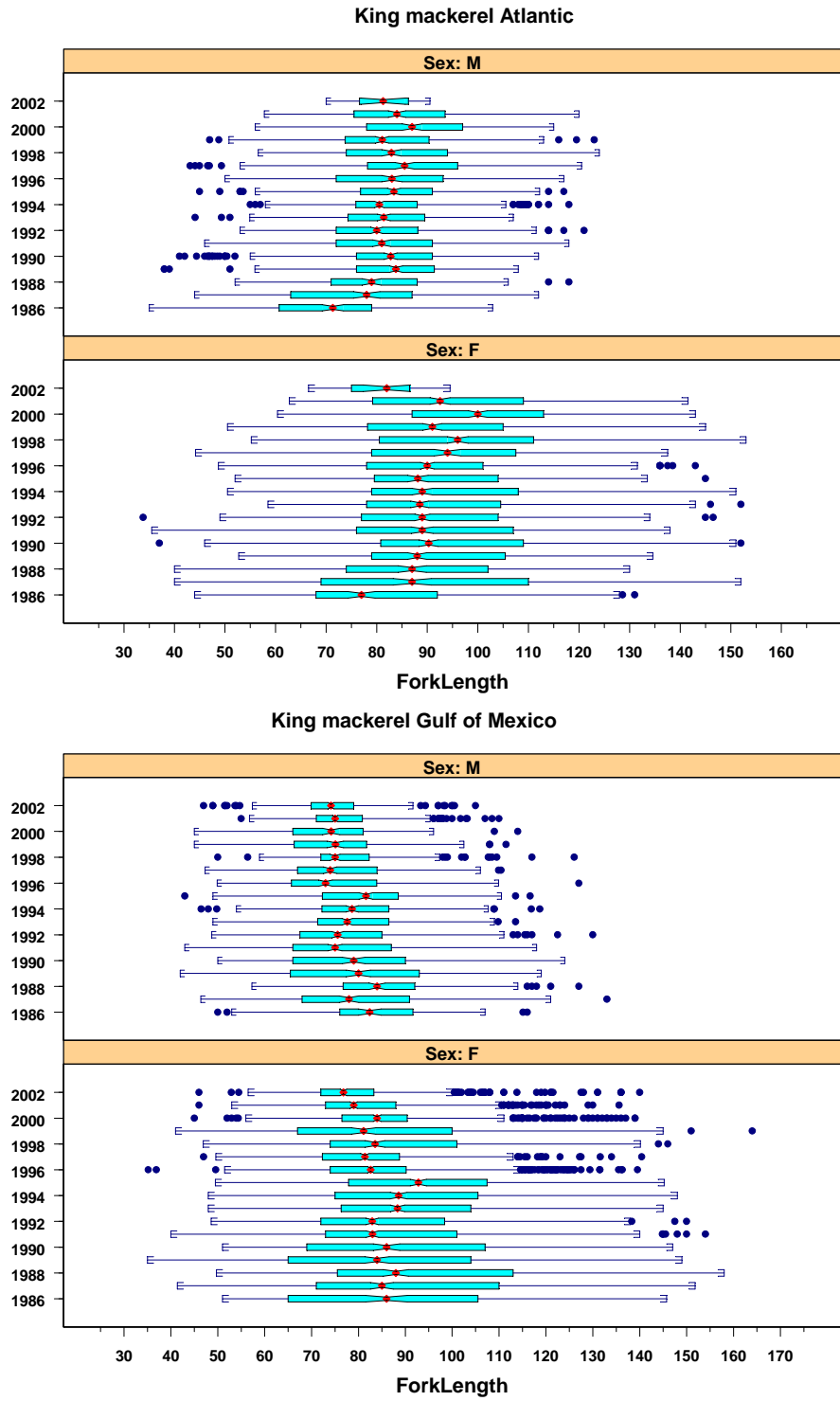


Figure 32. Box plots size distributions of king mackerel otolith aged fish for ALKs by migratory group

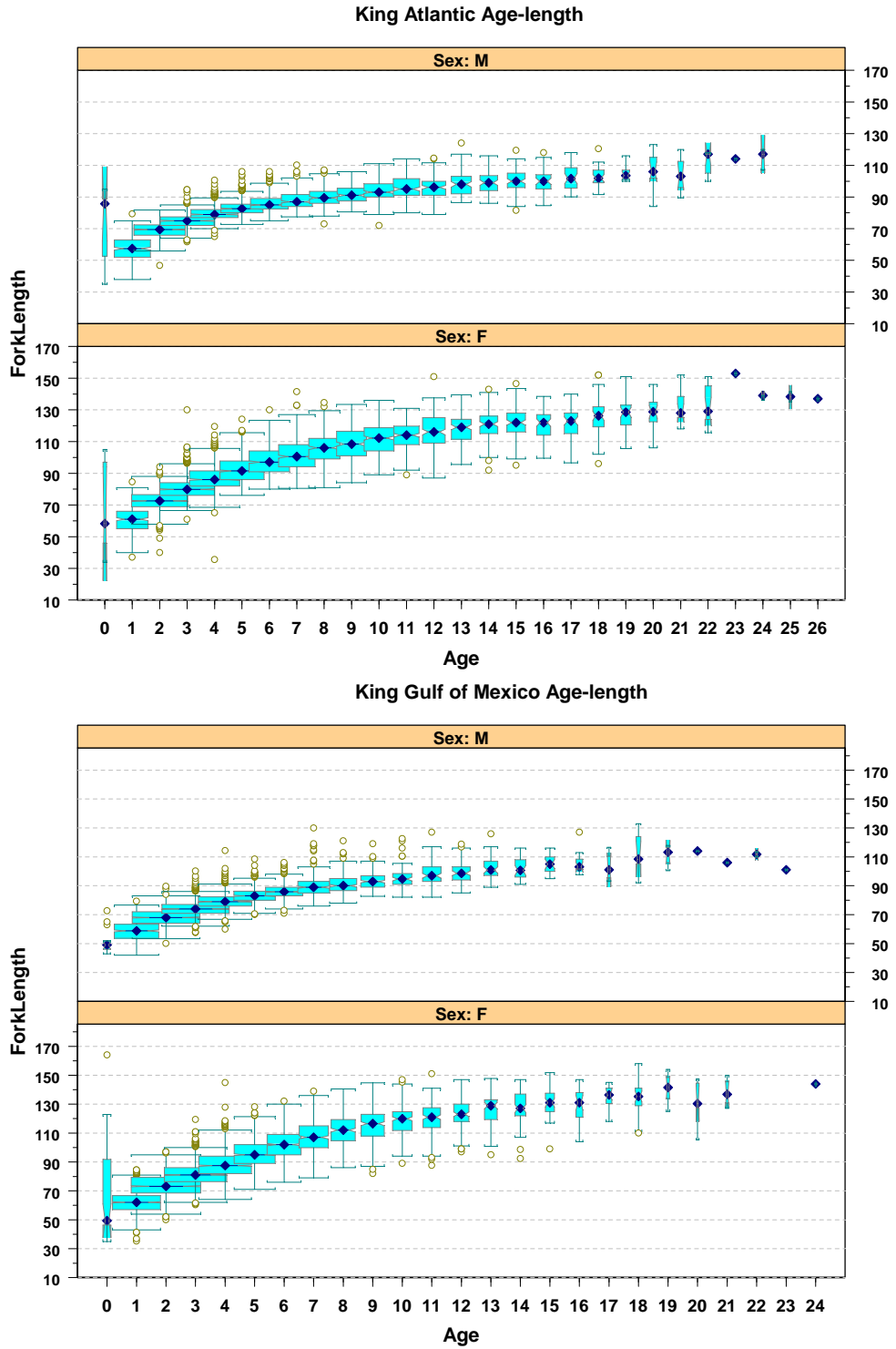


Figure 33. Age-length distribution of king mackerel by migratory group and sex. Box wide is proportional to the number of fish aged.

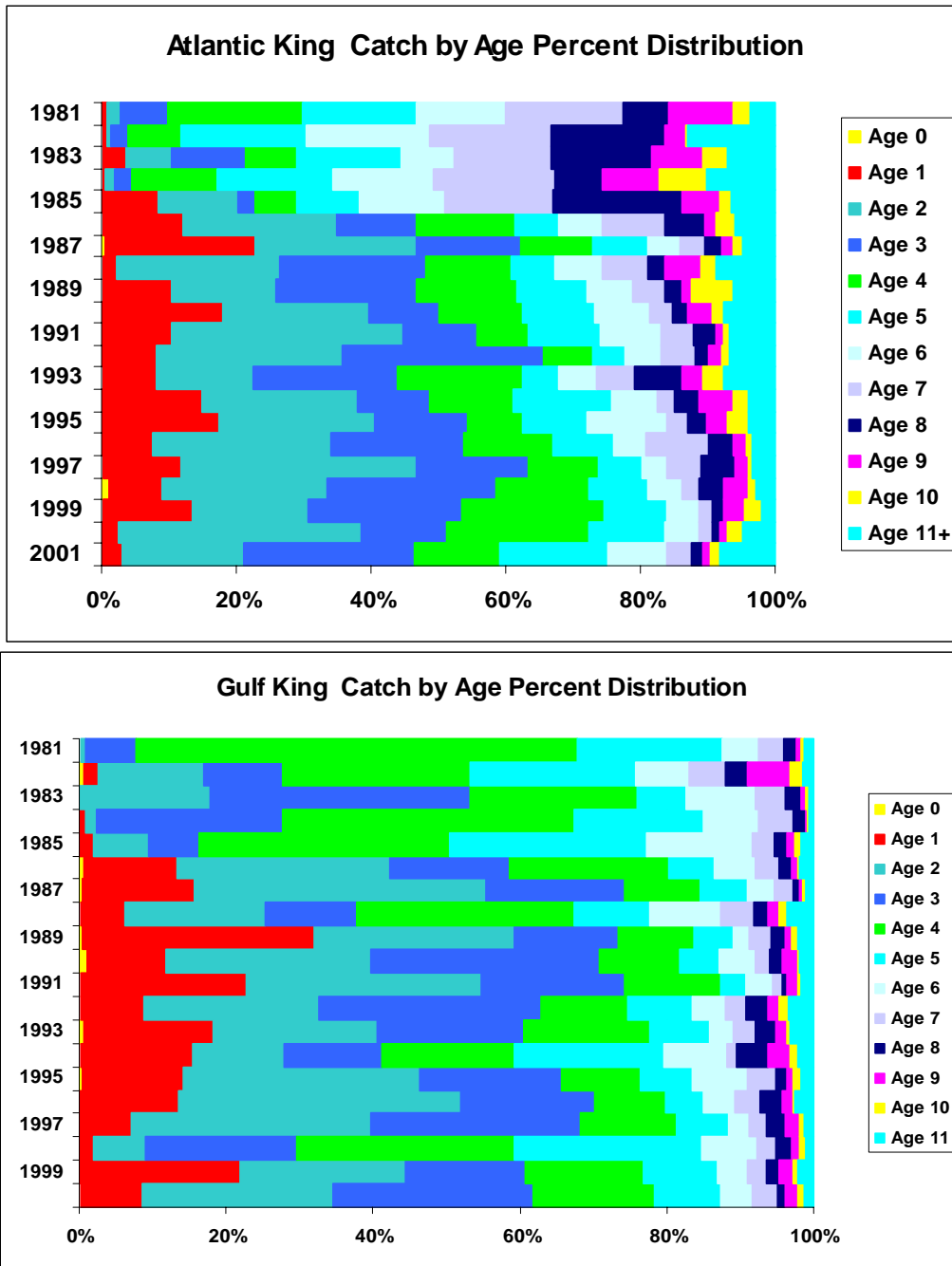


Figure 34. Percent Catch at age distribution for king mackerel by migratory group.

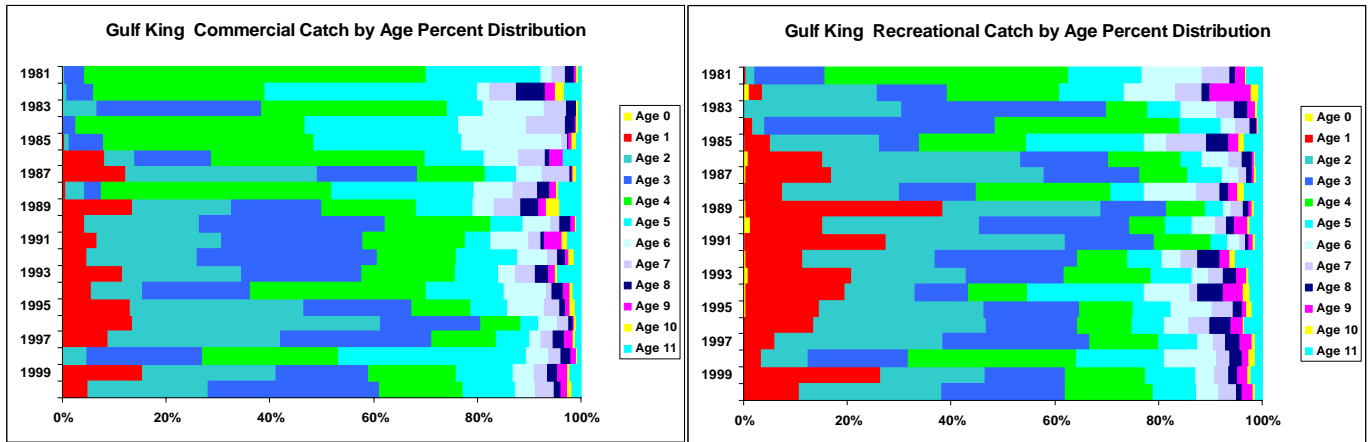


Figure 35. Percent catch at age distribution for Gulf King by sector.