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CATCH PER UNIT EFFORT INFORMATION FROM THE U. S. SWORDFISH FISHERY

by

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SUMMARY

Catch and effort data from the U.S. swordfish fishery are examined from 1981 to 1987. Standardized size-specific indices are developed using General Linear Modeling (GLM) procedures. Changes in gear and operating practices are considered and incorporated into the model along with year, area, quarter, and area-quarter interaction terms. Indices of abundance are developed for the four weight categories used by the commercial industry: 1 to 25 pounds dressed weight, 26 to 49 pounds, 50 to 99 pounds, and 100 pounds or more. Indices are also developed for size categories which relate to the lengths at which 50 percent and 100 percent of males and females mature. These categories include swordfish less than 110 cm LJFL, from 110 to 169 cm LJFL, from 170 to 234 cm LJFL, and those greater than 235 cm LJFL.

RESUME

Les données de capture et d'effort de la pêcherie américaine d'espadon sont examinées pour les années 1981 à 1987. Des indices standardisés spécifiques de la taille sont élaborés selon la méthode du modèle linéraire général. Les modifications des engins et des méthodes de pêche ont été prises en compte et incorporées au modèle, ainsi que les facteurs d'interaction année, zone, trimestre et zone-trimestre. Des indices d'abondance sont élaborés pour les quatre catégories de poids utilisées par l'industrie commerciale: 1 à 25 livres de poids manipulé, 26 à 49 livres, 50 à 99 livres, et 100 livres et plus. Des indices sont également élaborés pour les catégories de taille qui concernent la taille à laquelle 50 % et 100 % des mâles et des femelles sont matures. Ces catégories comprennent l'espadon de moins de 110 cm de longueur maxillaire-fourche, ceux de 110 à 169 cm, ceux de 170 à 234 cm, et ceux de plus de 235 cm.

RESUMEN

Se examinan los datos de captura y esfuerzo de la pesquería norteamericana de pez espada del periodo 1981 a 1987. Se desarrollan índices específicos de talla estandarizados, por medio del Modelo Lineal Generalizado. Se examinan los cambios en los artes y en las operaciones y se incorporan al modelo junto con el año, zona, trimestre, así como las interacciones zona-trimestre. Se desarrollan índices de abundancia para las cuatro categorías de peso empleadas por la industria: 1 a 25 libras de peso eviscerado, 26 a 49 libras, 50 a 99 libras y 100 libras o más. También se desarrollan índices para las categorías de talla que están en relación con la talla a la cual madura el 50% por ciento de machos y hembras. Estas categorías incluyen pez espada de menos de 110 cm de longitud mandibula inferior-longitud horquilla (MILH), de 110 a 169 cm MILH, de 170 a 234 cm MILH y los que presentan una longitud superior a 235 cm MILH.

INTRODUCTION

Catch per unit effort (CPUE) indices, derived from catch and effort data from commercial or research fisheries, have been used to investigate abundance trends. The basic assumption is that CPUE is related to abundance (Richards and Schnute 1986). Robson's (1966) analysis of variance or least squares regression procedure for estimation fishing power is now the standard method for exploring abundance trends (Conser 1985, Kimura 1981, SEFC 1984). In practice, this generalized linear modelling technique is first used to estimate parameter coefficients for data characteristics which influence CPUE and can be described in the available data (month, area, vessel, etc.). Estimates of standardized annual CPUE's are then calculated. These results can yield insight as to trends in relative abundance through time but they do not provide absolute abundance estimates (SEFC 1984). In current application, these abundance indices are quantitatively compared with estimates of population abundance derived from Virtual Population Analysis (VPA's) to select the most likely among many alternatives. The basic assumption is that abundance estimates developed from the catch matrix represent the most comprehensive summarization of age specific abundance trends, and that an abundance index (CPUE) with reasonable variance should correlate well with VPA stock size estimates. This application is generally more robust if sources of variability in the CPUE index resulting from changes in age-class strength or age specific catchability can be minimized. Therefore attention has been directed at developing age (size) specific abundance indices rather than indices based on the total numbers of all sizes of fish caught in a single fishing operation.

Catch per unit effort information from the U.S. swordfish fishery has been summarized through 1986 (Hoey and Bertolino 1988, Hoey and Casey 1988). Recent reports on standardized abundance indices for swordfish either provided indices for all sizes of swordfish caught on single sets (Hoey 1986, Farber 1986) or provided size-specific indices from trips of variable duration without standardizing for trip length (Parrack 1986). Of the indices available at the 1986 Swordfish Assessment Workshop in Miami, Florida (SEFC 1987), the size specific catch per trip correlated most closely with the tuned VPA population estimates. The catch per trip index was recognized as preliminary because the trips were not standardized for duration.

The purpose of this analysis is to develop size specific CPUE trends that will be useful in VPA tuning procedures. The effects of gear and operational factors on the U.S. CPUE are examined.

DATA

Trip records with information on the number of hooks fished and sets made during the trip are available for a subset of the U.S. size-frequency data base (Hoey and Bertolino 1988). The size-frequency data base records individual weights of swordfish landed primarily by pelagic longliners between 1978 and 1985, and individual weights of all species landed by these vessels in 1986 and 1987. Effort data was either voluntarily submitted by captains, collected through interviews by NMFS port samplers, or developed by cross referencing logbooks with tally sheets that record individual weights. Each record includes vessel identification, date, number and weight for each swordfish weight category, total number and weight of swordfish landed, total number of tuna landed, gear, offloading, and fishing area and effort. Swordfish weight categories are as follows: Category 1 - fish 1 to 25 pounds dressed weight, Category 2 - 26 to 49 pounds, Category 3 - 50 to 99 pounds, and Category 4 - 100 pounds or more. Samples of the sex composition of the catch are not generally available because the fish are dressed after haulback and at sea sampling has been limited.

A second set of analyses were run on size classes based on lengths. Estimates of the proportions of mature males and females at different lengths were developed from gonads sampled off the coast of Florida between 1977 and 1980 (Ron Taylor, personal communication). Males started maturing at 90 cm LJFL, 50% were mature at 113 cm and 100% were mature at 165 cm. Females started maturing at 160 cm, 50% were mature at 171 cm and 100% were mature at 235 cm. To examine changes over time with respect to size categories that relate to these maturity values we established the following LJFL categories: fish less than 110 cm, fish from 110 cm to 169 cm, fish from 170 cm to 234 cm, and fish 235 cm or more.

Nominal CPUE values (for weight or length groups) were calculated by dividing the numbers caught in each size group by the number of hooks fished on a trip and multiplying by 1,000. The CPUE units are numbers per 1,000 hooks. Tuna trips which recorded swordfish at offloading are included. Seven geographical areas are referenced: 1) Caribbean Sea - CAR, 2) Gulf of Mexico - GOM, 3) Florida East Coast - FEC, 4) South Atlantic Bight - SAB (off Georgia and South Carolina), 5) Mid-Atlantic Bight - MAB (North Carolina to New York), 6) New England - NEC (Rhode Island to Maine), and 7) Grand Banks - NED (Figure 1).

MODEL DEVELOPMENT

In previous work on swordfish CPUE's from the U.S. data base, year, area, month, and month-area interaction terms were significant. In the size-specific catch-per-trip analysis (Parrack 1986), problems were encountered in many month-area combinations because of small samples or empty cells. In this analysis quarter of the year is substituted for month as a seasonal variable (Quarter 1 - January-March, Quarter 2 - April-June, etc.).

Gear modifications and changes in fishing practices by U.S. vessels may have led to changes in the effectiveness of fishing effort. Significant changes have occurred in the U.S. longline fishery between 1978 and 1987 in the material used for gear construction, in the rigging and dimensions of the different components, in the bait and use of chemical light sticks, and more recently in operational procedures relating to targetting tunas (Berkeley, Irby, and Jolley 1981, Hoey and Bertolino 1988). Unfortunately, detailed trip-specific information on gear characteristics is extremely limited, so that changes in effectiveness cannot be addressed directly. In this analysis, we have restricted the observations to include only trips from 1981 to 1987, because the most dramatic gear changes occurred before that period. Smaller changes in effectiveness probably occurred during 1981-1987 when increasing lengths of gear were set, and the number of hooks per mile was decreased. We have attempted to address this change by defining a set size variable which is the average number of hooks used on a set for a specific trip (total hooks fished on a trip / total number of sets on a trip). Set size intervals of less than 100 hooks per set (set size 1), 100 to 299 (set size 2), 300 to 499 (set size 3), 500 to 899 (set size 4), and greater than 900 hooks/set (set size 5), were used as main effects.

To address the evolution and diversification of the swordfish fishery into yellowfin, bigeye, and mixed species fisheries we have developed a percentage swordfish variable which is used as a main effect after the values are aggregated into intervals of 1% to 9%, 10% to 19%, ...,90% to 99%, and 100%. Preliminary runs utilized main effects of year, area, quarter, set size, and percent swordfish with area-quarter interaction terms. These runs provided background information on size specific trends, the proportion of variability explained by the model, and residual patterns.

Initially there were 228 vessels in the data base and they accounted for 1,845 trip records. Forty two vessels were represented by observations in 3 or more years and fifty five vessels were represented in 2 years. The majority of the vessels (57%) were represented by observation in only one year, and many were represented by small numbers of observations (less than 5) in 1986 or 1987. It was thought that the inclusion of vessels for which little data was available might bias CPUE trends and increase the variability considerably. Therefore the data was restricted to vessels represented in 2 or more years. The 97 selected vessels (43%) accounted for 1,408 trip observations (76%). The number of trips and mean nominal CPUE's by area and year for the vessel subsample are provided in Table 1. The 97 vessels were then grouped into 7 operation categories based primarily on gear, port, and operational information, and secondarily on the vessels history in the fishery and corporate affiliation. We believe this grouping partly defines vessels which may fish together or may fish in similar ways. The operations are characterized as follows: operation 1 - traditional northeast, operation 2 - new distant water, operation 3 - intermittent Gulf, operation 4 - Mid-Atlantic mixed species, operation 5 - new coastal vessels, FL-NY, operation 6 - New coastal southeast, and operation 7 - new Gulf of Mexico.

Analyses were run for each weight category on the subsample of trips with models that included terms for year, area, quarter, set size, percent swordfish, operation type, and area-quarter and operation-area interaction terms. The specific operation-area interaction terms which were included were determined after examining the numbers of observations of a particular operation in each area. Operation-area interaction terms were only specified for those operations which recorded similar numbers of observations in several areas. Those operations which were primarily restricted to a single area with only small numbers of observations outside of that area were not considered for operation-area interaction terms. In general, the pattern in the annual index values for each weight category was similar to the preliminary runs with slight increases in the proportion of variability explained.

In CPUE analyses of this type, a decision must be made regarding how observations of zero catches will be treated. Generally, the decision is based on several factors including; the total number of zero observations, whether the frequencies of zero's have remained constant throughout the time series or have changed significantly, the effect they have on the trends that are detected, and finally whether the model reliably fits the observations when the zero's are included. The zero observations must be evaluated in terms of the information they add to the model. The generalized linear modelling techniques currently used assume that the factors effecting CPUE are multiplicative and the CPUE data are log transformed before analysis. If zeros are included, a small value must be added to all CPUE's before log transformation. The choice of the value to add is subjective but generally it should be an insignificant value with respect to the mean or median CPUE.

In an effort to evaluate the importance of zero observations, separate analytical runs were made for each of the four weight categories utilizing models which included terms for year, area, quarter, set size, percent swordfish, operation type, and area-quarter and operation-area interaction terms. Each run represented a particular treatment of zero values; these were excluding the zero values, adding 1.0, 0.1, or 0.01. The patterns of the annual index values for the different-size treatments were similar. The addition of 1.0 produced index trends which are similar, in terms of the pattern (overall decline or overall increase), r-square values, and mean square error terms, to the runs in which the zeros were eliminated. Residuals from the runs with 1.0 added to the zeros were, however skewed and slightly peaked. The addition of 0.1 and 0.01 to the CPUE's resulted in lower r-squared values, slightly skewed or peaked residuals, and mean square error terms that were double or triple the previous treatments. This indicates that when attempting to use zeros in a log linear model, the variance estimates (i.e. mean squar error) are highly dependent upon the somewhat arbitrary choice of the additive constant (i.e. 1.0, 0.1, 0.01, etc.). Sensitivity analyses of VPA calibrations (Vaughn et al 1988) indicated that indices with mean square error terms similar to those found when adding 0.1 and 0.01 to the observed CPUE, had a low probability of correctly tuning VPA's. Since the trends were similar in the different treatments and the use of zero values did not improve the model, zero values were eliminated from the final indices which are presented.

In the vessel subsample for all years, zero catch rates represented approximately 15% of the observations in the 1 to 25 pound and 100 pound plus categories, 5% in the 26 to 49, and 7% in the 50 to 99 pound categories. An examination of the frequency distribution of CPUE's by category and year indicated that the frequency of zeros for the 1 to 25 pound and 26 to 49 pound decreased from 1982 to 1987. For the 50 to 99 pound category the frequency of zeros remained stable at about 6% or 7% from 1983 through 1987. For the 100 pound plus category, zeros accounted for 7% to 9% of the observations in 1981, 1983, 1984, and 1985 and then increased to about 20% in 1986 and 1987. We partially attributed this increase in the 100 pound plus category to a larger representation of tuna trips in 1986 and 1987 data. This is particularly reflected in the Gulf of Mexico where 50% of the 1986 and 1987 trips produced no swordfish greater than 100 pounds. Our sample from the Gulf is very limited prior to 1986. The increased percentage of zeros in 1986-1987 may be largely attributable to better sampling and the changing nature of the fishery in the Gulf of Mexico. The exclusion of the zero catch rates reduces the representation of tuna trips in the analysis. The frequency distributions also indicate that the increase in the frequency of zeros was accompanied by a shift or skewing of the distributions toward the lower values in recent years. Even though zeros were excluded from the GLM, the increasing number of small positive values over time were incorporated into the model.

RESULTS

WEIGHT ANALYSES

In the weight category analyses, models include terms for 7 years (1981-1987), 4 quarters, 7 areas, 5 set sizes, 11 categories of swordfish percentages, 7 operation types, and quarter-area and operation-area interaction terms. In GLM analyses, a strata (cell) must be defined as an index around which other values can be standardized. In this analysis, the standard cell is defined as 1984, quarter 3, area 5 (Mid-Atlantic Bight), set size 4 (500-899 hooks/set), percentage category 9 (80 to 89%), and operation type 5 (new coastal vessels FL-NY). In each of the size specific analyses different interaction terms were eliminated because observations were not recorded in those cells. Table 2 lists the number of observations, number of terms, R square, mean square error, and F statistic for each weight analysis. The GLM model terms and their estimated coefficients and 90% confidence intervals are provided in the Appendix for each analysis.

100 POUND PLUS (DWT) Index

The analysis of catch rates for swordfish 100 pounds dressed weight or more evaluated 1,196 observations. The regression included 56 parameters and explained 52.9% of the variation. Estimated yearly index values and 90% confidence intervals are presented in Figure 2 with a histogram of the standardized residuals. In general, R squared values (% variation explained) and the residual patterns provide information on the reliability and/or accuracy of the model. In this case, the residuals are acceptable because they do not indicate significant kurtosis or skew and are similar to a normal distribution. The proportion of variance explained (R^2=.529) is reasonable for an analysis of this type on longline data for pelagic species. The annual index values declined by approximately 33% between 1981 and 1982 (8.5 and 6.6) and then dropped an additional 50% in 1983 (3.3). Between 1983 and 1985, the values declined at first (3.3 to 2.7) and then increased slightly in 1985 (2.9). After 1985 the index declined in both 1986 (2.0) and in 1987 (1.8), indicating an overall decline from 1981 to 1987 of approximately 78%.

50 TO 99 POUND (DWT) Index

The analysis of catch rates for swordfish from 50 to 99 pounds dressed weight evaluated 1,310 observations. The regression included 56 parameters and explained 49.9% of the variation. Estimated yearly index values and 90% confidence intervals are presented in Figure 3 with a histogram of the standardized residuals. The annual index value declined 51% from

1981 (6.6) to 1983 (3.2). Between 1983 and 1985 the index increased to 4.1 and then declined in 1986 to 3.4 where it remained in 1987. The overall decline from 1981 to 1987 was approximately 48%.

26 TO 49 POUND (DWT) Index

The analysis of catch rates for swordfish from 26 to 49 pounds dressed weight evaluated 1,338 observations. The regression included 56 parameters and explained 54.8% of the variation. Estimated yearly index values and 90% confidence intervals are presented in Figure 4 with a histogram of the standardized residuals. The annual index values remained between 3.2 and 3.4 between 1981 and 1985. These slight annual differences are not significant because of overlaping confidence intervals. The index then increased to 4.5 in 1986 and 1987 which was 34% greater than the 1981 value and 40% greater than the 1982 value.

1 TO 25 POUND (DWT) Index

The analysis of catch rates for swordfish from 1 to 25 pounds dressed weight evaluated 1,199 observations. The regression included 50 parameters and explained 53.0% of the variation. In this analysis, operation-area interaction terms did not significantly improve the model beyond the main level effects of operation and area separately, so the interaction terms were not included. Estimated yearly index values and 90% confidence intervals are presented in Figure 5 with a histogram of the standardized residuals. The annual index value increased between 1981 and 1982 (1.3 to 1.9) then declined in 1983 (1.6) and 1984 (1.4). The index increased in 1985 (1.8) and in 1986 (2.4) and then remained steady in 1987 (2.4). Overall the index increased 79% from 1981 to 1987.

LENGTH ANALYSES

In the length class analyses, models include terms for 7 years (1981-1987), 4 quarters, 7 areas, 5 set sizes, 7 operation types, and quarter-area and operation-area interaction terms. The standard cell is defined as 1984, quarter 3, area 5 (Mid-Atlantic Bight), set size 4 (500-899 hooks/set), and operation type 5 (new coastal vessels, FL-NY). As in the previous analyses, different interaction terms were eliminated because observations were not recorded in those cells. Zero catch rates were eliminated in all runs. Table 3 lists the number of observations, number of terms, R square, mean square error, and F statistic for each length group analysis. The GLM model terms and their estimated coefficients and 90% confidence intervals are provided in the Appendix for each analysis.

GREATER THAN 234 CM LJFL Index (All Mature)

The analysis of catch rates for swordfish greater than or equal to 235 cm LJFL evaluated 507 observations. The regression included terms for 46 parameters and explained 50.9% of the variation. Estimated yearly index values and 90% confidence intervals are presented in Figure 6 with a histogram of the standardized residuals. The annual index value declines 65% from 1981 (1.20) to 1984 (.42). Between 1984 and 1987 (.41) the annual index values fluctuated from .38 (1986) to .49 (1985), indicating an overall decline of approximately 66%.

170 TO 234 CM LJFL Index (Males Mature - 50-100% Females Mature)

The analysis of catch rates of swordfish greater than 169 cm LJFL but less than 235 cm LJFL evaluated 1,206 observations. The regression included terms for 46 parameters and explained 50.3% of the variation. Estimated yearly index values and 90% confidence intervals are presented in Figure 7 with a histogram of the standardized residuals. The annual index value declines 67% from 1981 (5.5) to 1984 (1.8). The index then increased slightly between 1984 and 1985 (2.0) before declining further in 1986 (1.3) and 1987 (1.2). The overall decline between 1981 and 1987 was 78%.

110 to 169 CM LJFL Index (>50% Males Mature <50% Females Mature)

The analysis of catch rates of swordfish greater than 109 cm LJFL but less than 170 cm LJFL evaluated 1,386 observations. The regression included terms for 46 parameters and explained 53.2% of the variation. Estimated yearly index values and 90% confidence intervals are presented in Figure 8 with a histogram of the standardized residuals. The annual index increased between 1981 (5.4) and 1982 (5.7), it then declined in 1983 (4.4) and remained low in 1984 (4.6). The index increased after 1984 fluctuating between 5.0 and 5.1 from 1985 to 1987. The decline between 1981 and 1987 was 5% and the decline from 1982 to 1987 was 10%.

LESS THAN 110 CM LJFL Index (<50% Males Mature-Females Immature)

The analysis of catch rates of swordfish less than 110 cm LJFL evaluated 1,045 observations. The regression included terms for 40 parameters and explained 47.0% of the variation. Estimated yearly index values and 90% confidence intervals are presented in Figure 9 with a histogram of the standardized residuals. The annual index increased between 1981 (.69) and 1982 (.99), remained between .77 and .84 between 1983 and 1985, and then increased to its peak value in 1986 (1.02). Between 1986 and 1987 the index declined to a value (.91) just slightly lower than the 1982 index.

DISCUSSION

In light of previous work on indices of abundance for swordfish and bluefin tuna, the indices developed in this report explain a high percentage of the total variability of CPUE with R-square values for the 4 weight class analyses ranging from .50 to .55 and for the 4 length classes ranging from .47 to .49. Previous single set CPUE analyses on swordfish data accounted for less than 30% of the variation (Hoey 1986), and the previous catch per trip analysis (Parrack 1986) accounted for 30% to 41% of the variation. In all cases, the current residuals are acceptable with no major departures from normality and the 90% confidence intervals indicate that significant trends have been detected. Estimates of the mean square error indicate that there is a good probability that VPA's tuned to these indices of abundance will be reliable.

The preliminary analyses used to develop the final models indicated that year, area, quarter, and area-quarter interaction terms accounted for the majority of the overall variability that was explained, and that gear, target species, and operation information contributed a smaller proportion. These ancillary variables are important however, in terms of the accuracy of the model and the trends detected, when they address known changes in operation style that have occurred during the time series. Although additional work with these variables may prove informative, the current use of set size, operation type, and percent swordfish has significant increased the amount of variability explained. Further refinement of these variables is not likely to produce dramatically improved results. However, the incorporation of data on temperature and water masses would seem to offer the greatest potential improvement in this approach.

The standardized abundance indices developed for the 4 weight and 4 length categories are comparable, however direct comparisons are complicated by differences in size units. The results for the first weight category (1 to 25 pound DWT index) are similar to results from length category 1 for catch rates of swordfish less than 110 cm LJFL (approximately 26 pounds DWT, Turner 1986). The second length category (catch rates for swordfish from 110 cm to 169 cm LJFL) encompasses a weight range of from approximatley 26 pounds to 99 pounds DWT, which is comparable to a combination of the second (26 to 49 pound) and third (50 to 99 pound) weight categories. The stable trend from

1981 to 1985 and subsequent increase in 1986 and 1987 for the 26 to 49 pound index, and the 1981 to 1983 decline and stable trend thereafter for the 50 to 99 pound index cancel each other. This is reflected in the relatively stable trend of the 110 to 169 cm LJFL index. The 100 pound plus weight index (Category 4) is comparable to a combination of the 170 to 234 cm index (100 to 274 pounds), and the 235 cm LJFL plus index (greater than 275 pounds). The greater similarity between the 100 pound plus index and the 170 to 234 cm LJFL index reflects the relatively small contribution, in terms of numbers of individuals, of swordfish greater than 275 pounds dressed weight to the 100 pound plus index.

The coefficients for the model terms in each analysis are listed in the appendix. The range of coefficient values indicates the importance of standardizing catch rates when you are attempting to investigate abundance trends. Coefficient values provide a measure of relative fishing power. For main level effects which form interaction terms (i.e., area, quarter, and area-quarter), general patterns between terms need to be compared. In the analysis of 1 to 25 and 26 to 49 pound catch rates, no single term or group of terms is clearly dominant. For the 50 to 99 and 100 pound plus catch rates, Caribbean and Grand Banks area terms are larger than other coefficients in the models. This may reflect the higher fishing power produced by efforts to target those valuable size classes. Generally, the relative importance of specific terms in each model agree with qualitative information from the fishery relating to area-time distributions, and the effectiveness of different operation types.

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Table 1. The number of trips and mean CPUE's (number per 1,000 hooks) by area and year for the vessel subsample of U.S. effort data.

NUMBER OF TRIPS

AREA	1981	1982	1983	1984	1985	1986	1987	TOTAL
CAR	0	0	0	0	10	39	72	121
GOM	0	0	6	4	28	32	41	111
FEC	26	29	27	77	64	101	230	554
SAB	3	10	17	5	4	17	30	86
MAB	9	43	57	49	29	65	90	342
NEC	2	13	18	18	12	15	26	104
NED	3	6	9	13	19	18	22	90
TOTAL	43	101	134	166	166	287	511	1,408

MEAN CPUE's (Numbers per 1,000 hooks)

AREA	1981	1982	1983	1984	1985	1986	1987
CAR	-	-	-	-	34.5	51.2	35.7
GOM	-	-	46.1	50.6	21.3	12.8	8.3
FEC	39.6	40.1	27.3	26.4	24.1	32.0	30.5
SAB	110.2	54.0	54.2	42.7	56.9	57.1	71.1
MAB	64.8	51.4	32.1	24.7	35.2	29.4	20.6
NEC	13.6	32.1	18.4	28.0	31.3	26.5	20.1
NED	10.8	20.5	25.0	43.8	80.8	48.7	43.

Table 2. The number of observations, number of terms, R square, mean square error, and F statistic for each weight category analysis.

WEIGHT CLASS	NUMBER OF OBSERVATIONS	NUMBER OF TERMS	R SQUARE	MEAN SQUARE ERROR	F STATISTIC
1 TO 25	1,199	50	.53	.76	26.5
26 TO 49	1,338	56	.55	.44	28.2
50 TO 99	1,310	56	.499	.42	22.7
100 +	1,196	56	.53	.47	23.3

Table 3. The number of observations, number of terms, R square, mean square error, and F statistic for each length category analysis.

LENGTH CLASS	NUMBER OF OBSERVATIONS	NUMBER OF TERMS	R SQUARE	MEAN SQUARE ERROR	F STATISTIC
<110 cm	1,045	40	.47	.77	22.9
110-169 cm	1,386	46	.53	.44	33.8
170-234 cm	1,206	46	.50	.49	26.1
>234 cm	507	46	.51	.45	10.6

Figure 1. Geographical areas used in the analysis of U.S. swordfish catch and effort data.

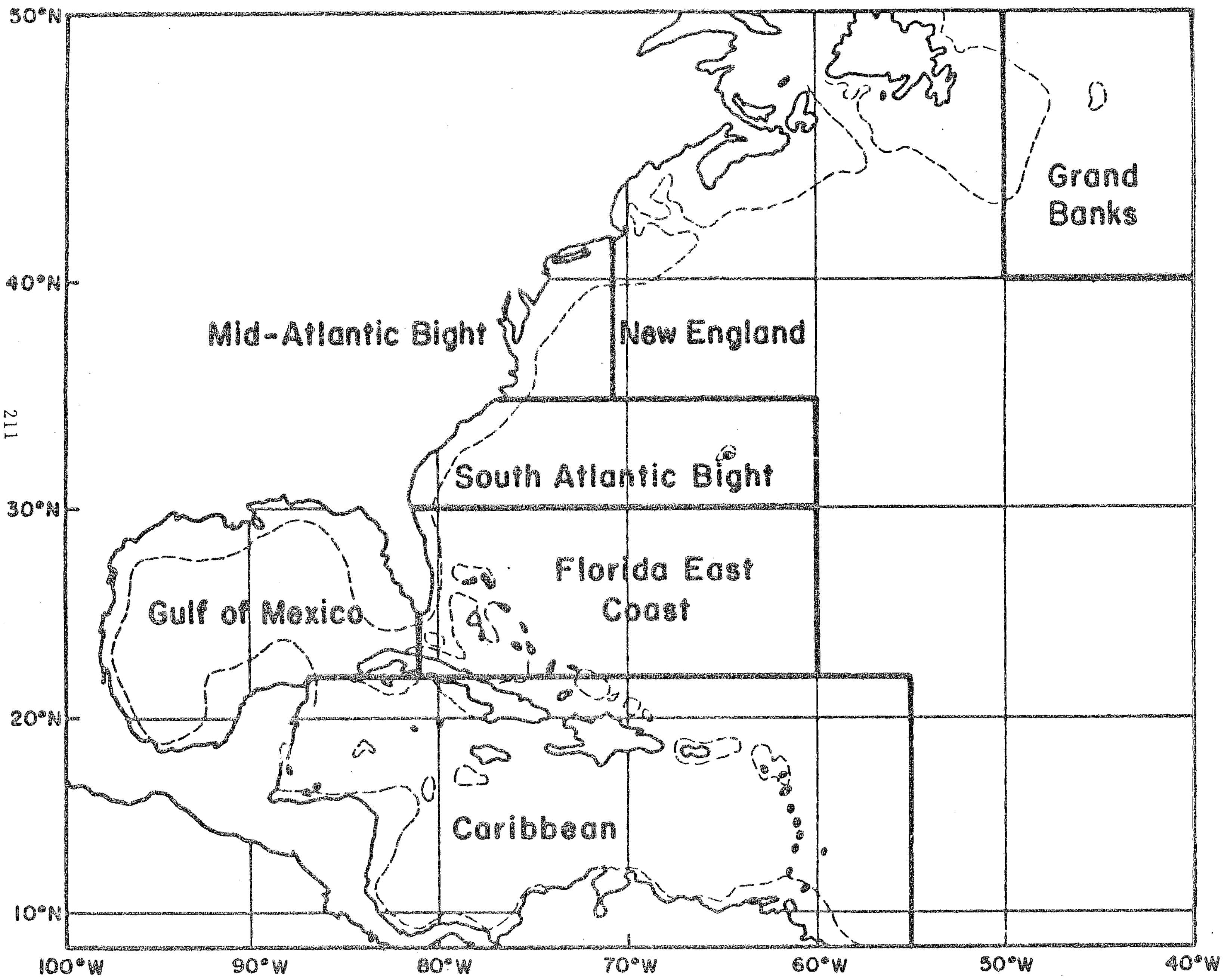
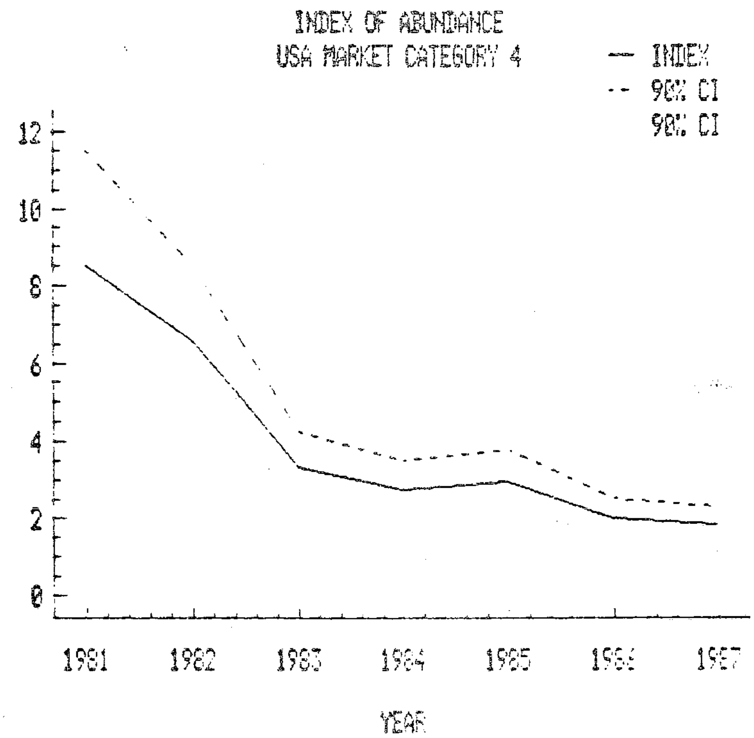


Figure 2. Estimated yearly index of abundance and 90% confidence intervals for swordfish 100 pounds dressed weight or more, with a histogram of standardized residuals.



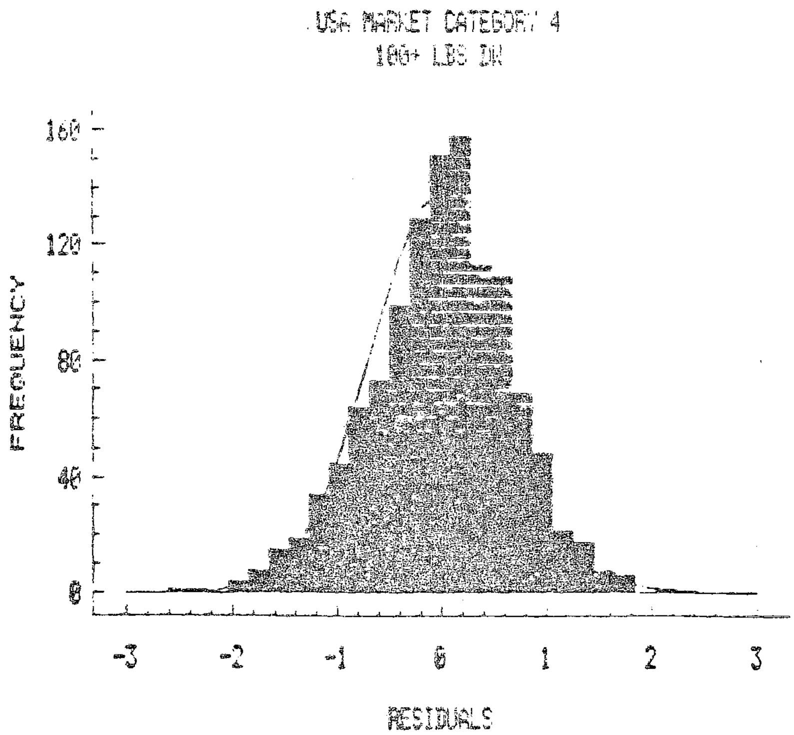
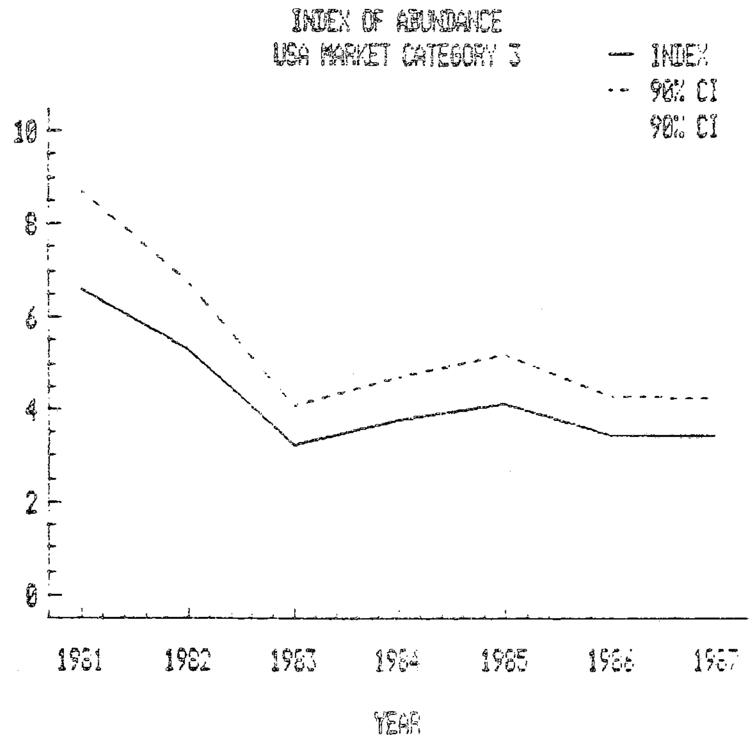


Figure 3. Estimated yearly index of abundance and 90% confidence intevals for swordfish from 50 to 99 pounds dressed weight, with a histogram of standardized residuals.



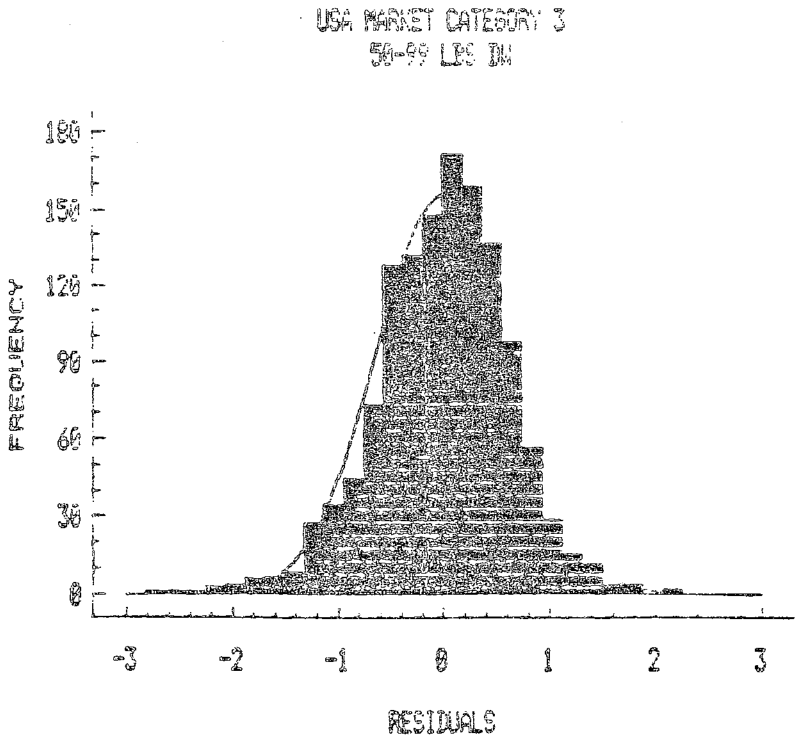
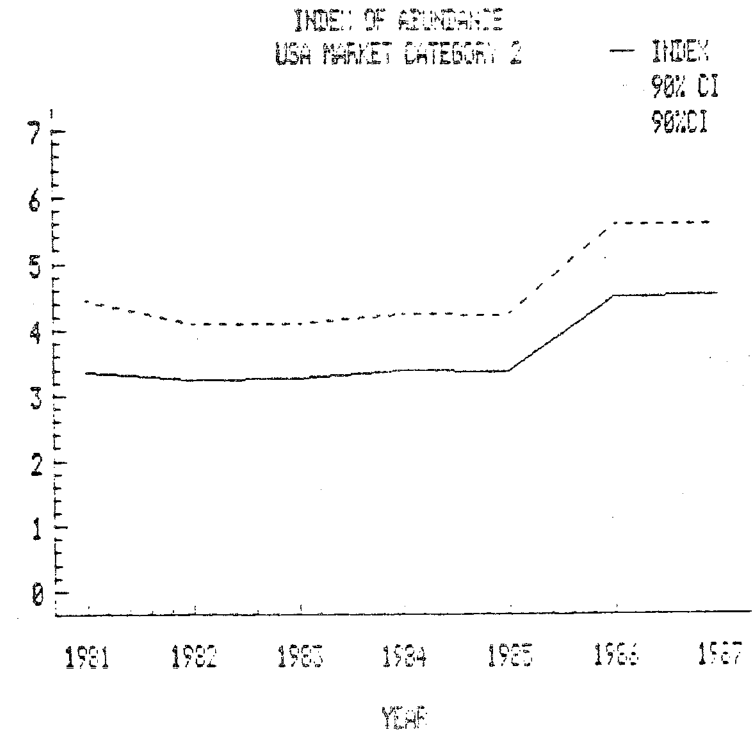


Figure 4. Estimated yearly index of abundance and 90% confidence intervals for swordfish from 26 to 49 pounds dressed weight, with a histogram of standardized residuals.



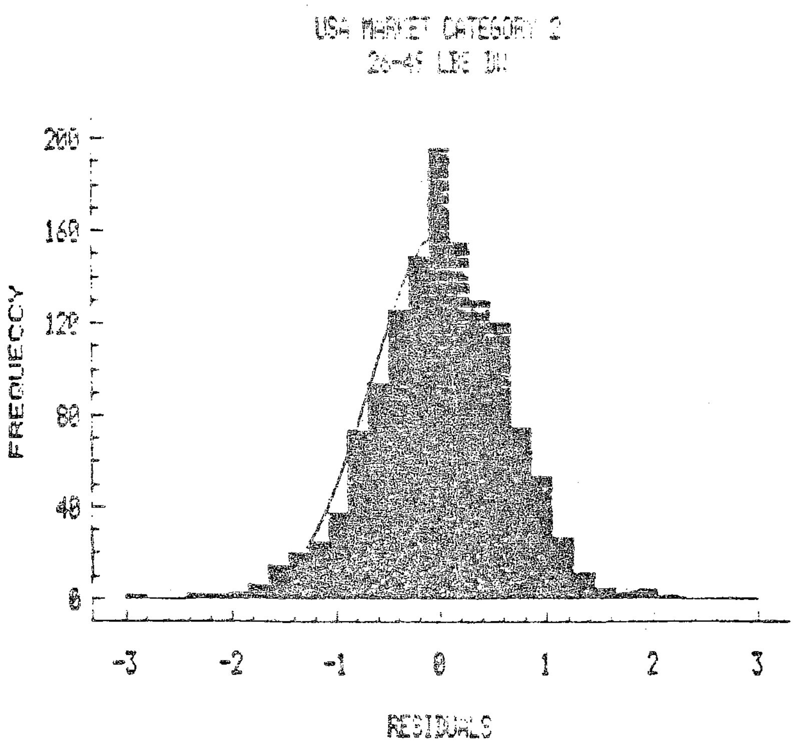
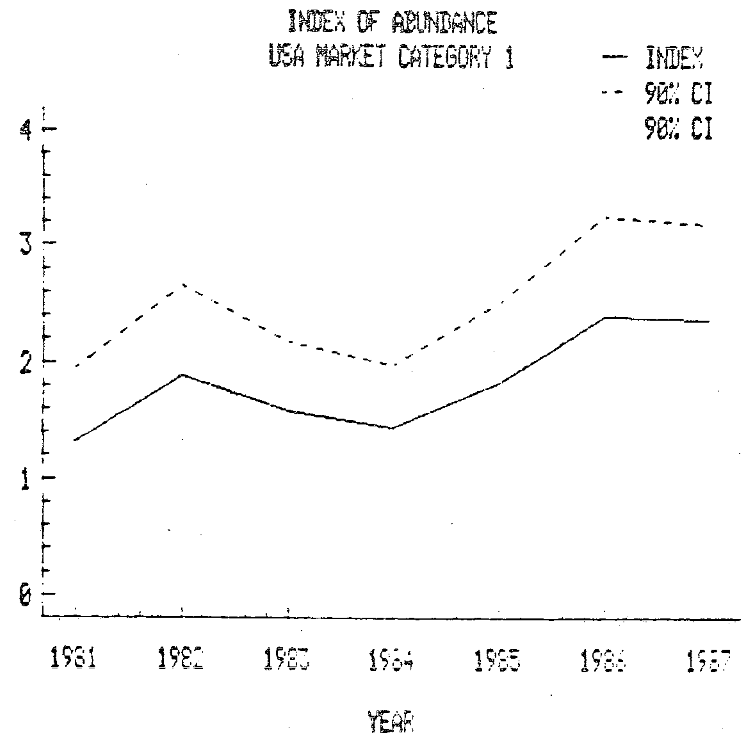


Figure 5. Estimated yearly index of abundance and 90% confidence intervals for swordfish from 1 to 25 pounds dressed weight, with a histogram of standardized residuals.



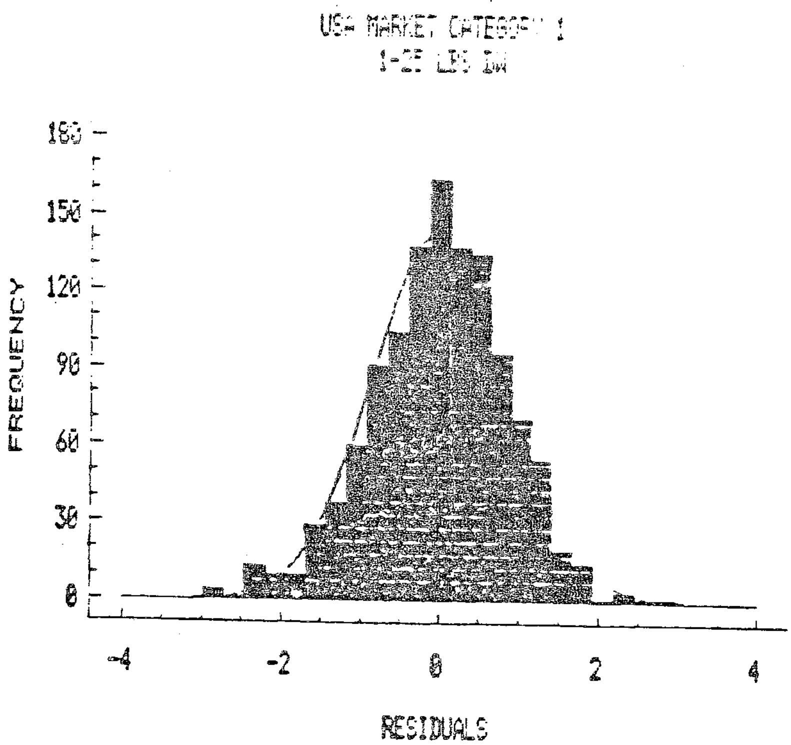
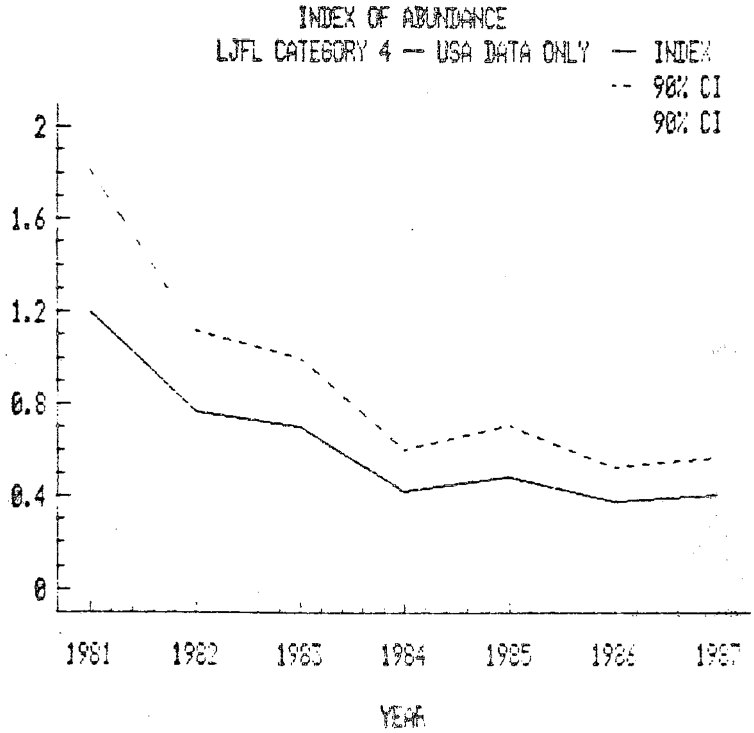


Figure 6. Estimated yearly index of abundance and 90% confidence intervals for swordfish greater than or equal to 235 cm LJFL, with a histogram of standardized residuals.



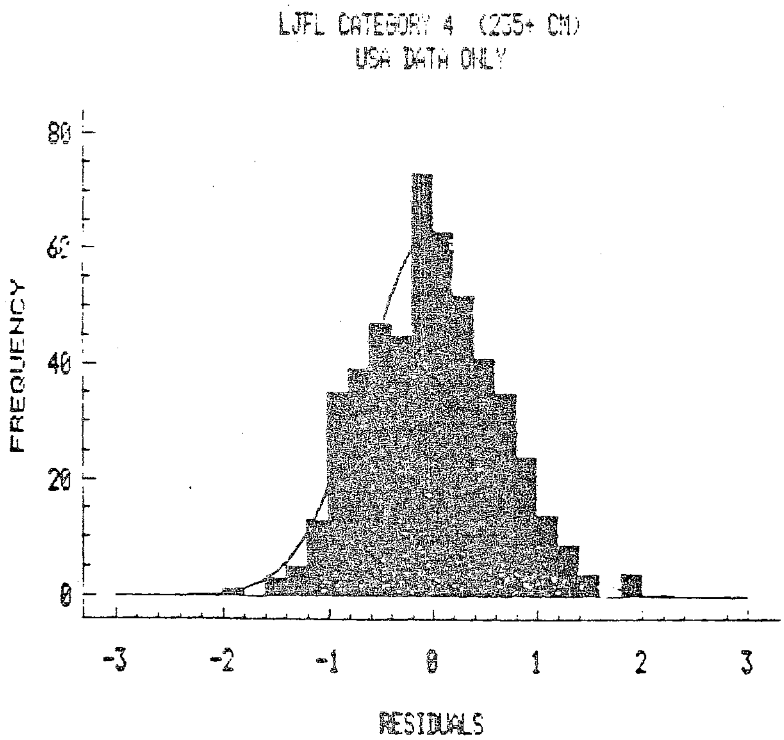
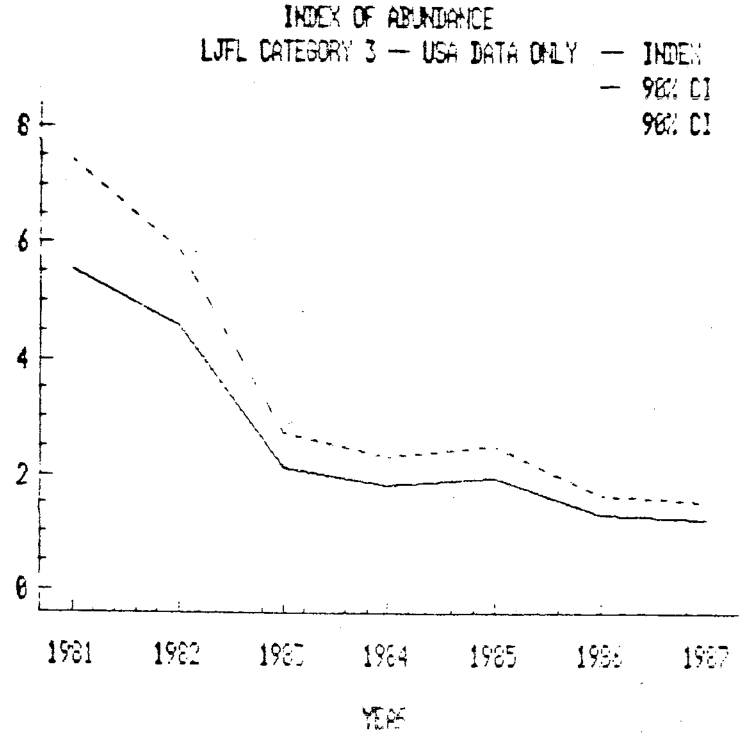


Figure 7. Estimated yearly index of abundance and 90% confidence intervals for swordfish greater than 169 cm LJFL but less than 235 cm LJFL, with a histogram of standardized residuals.



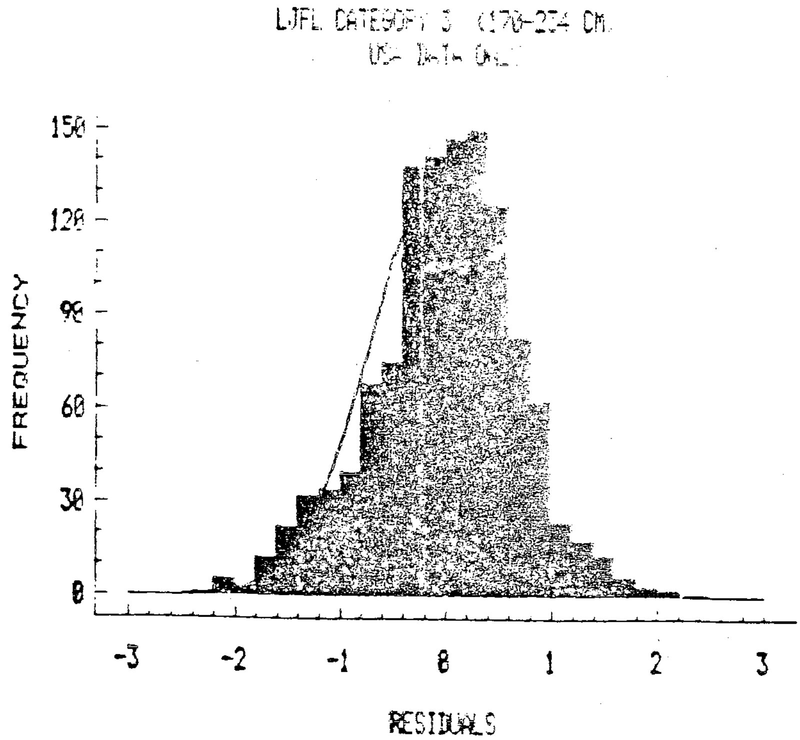
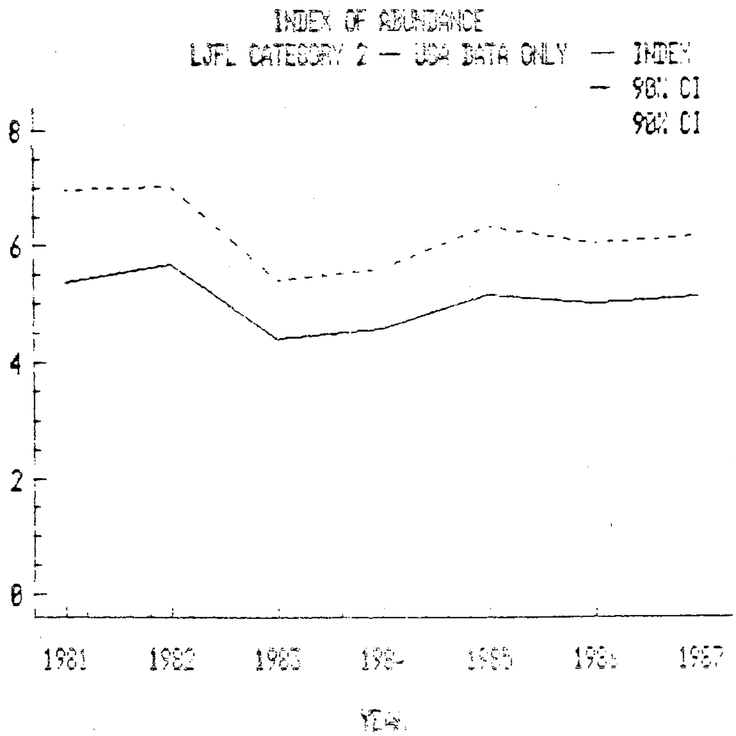


Figure 8. Estimated yearly index of abundance and 90% confidence intervals for swordfish greater than 109 cm but less than 170 cm LJFL, with a histogram of standardized residuals.



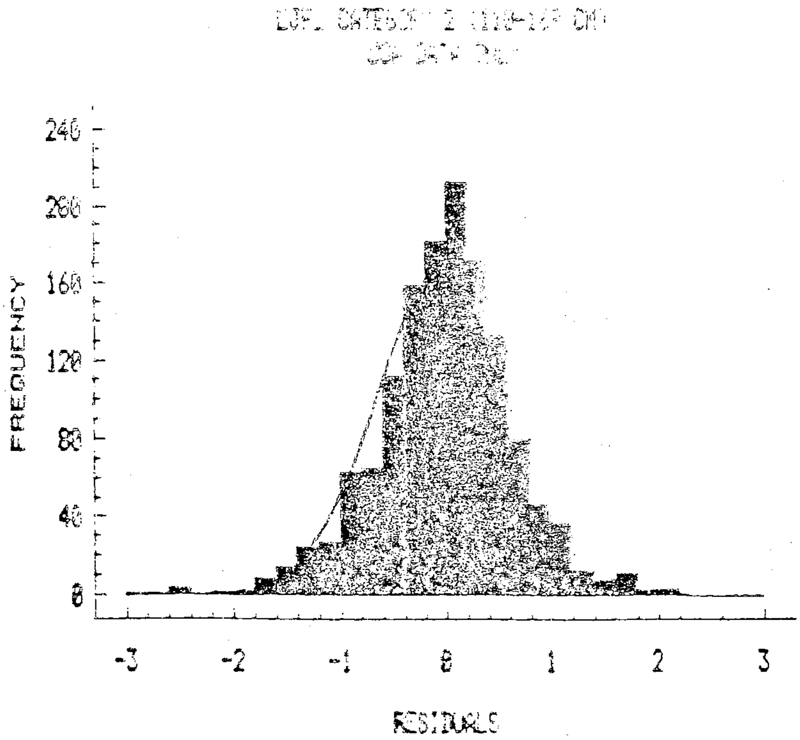
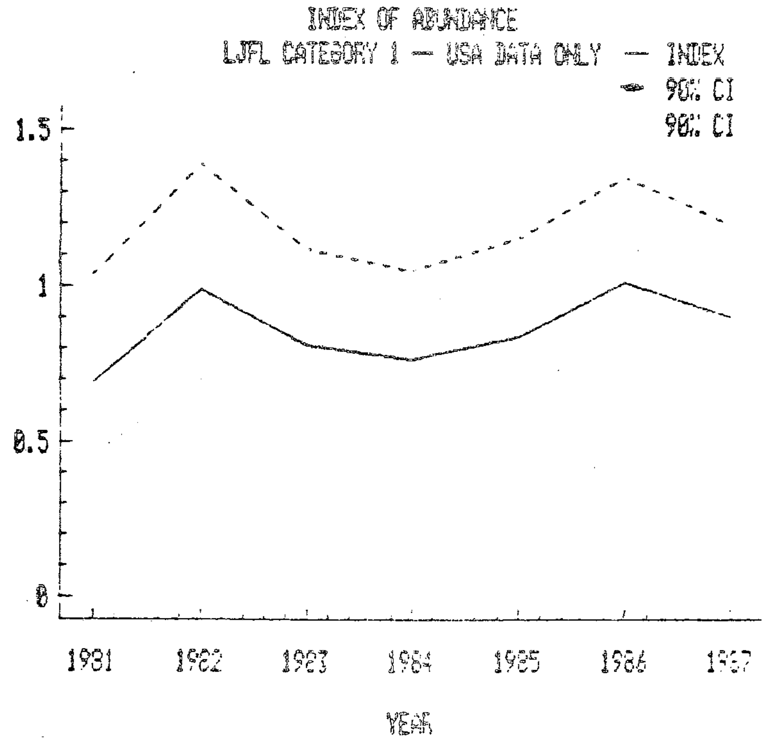
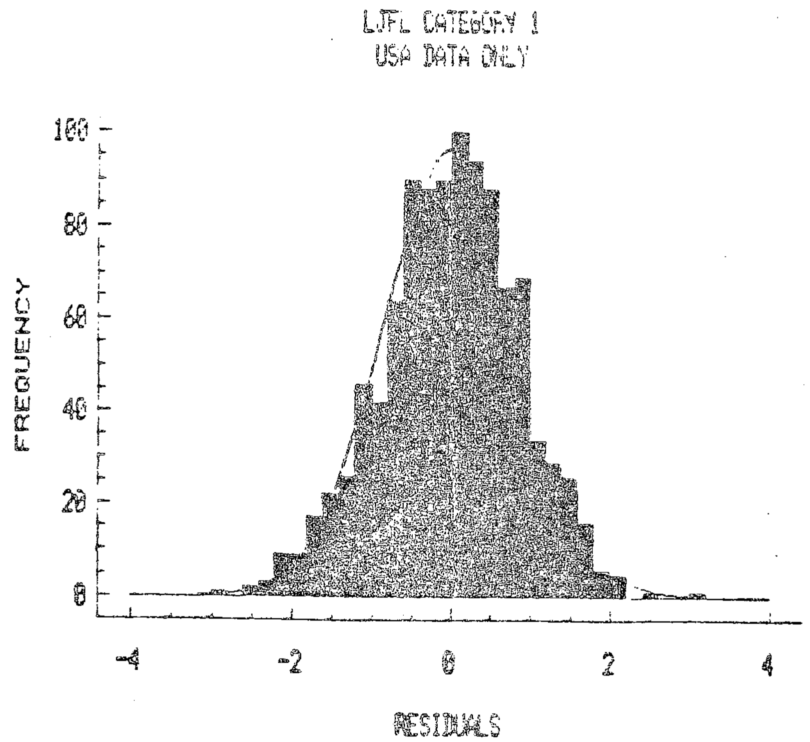


Figure 9. Estimated yearly index of abundance and 90% confidence intervals for swordfish less than 100 cm LJFL, with a histogram of standardized residuals.





1. Parameter estimates and 90% confidence intervals for model terms in the GLM analyses of catch rates of swordfish 100 pounds dressed weight or more.

	CODE	ESTIMATE	LOWER 90% CI	UPPER 90% CI
1	CONST	2.73216	2.13129	3.50244
2	Y81	8.50490	6.29440	11.49168
3	Y82	6.58122	5.08806	8.51258
4	Y83	3.31693	2.57869	4.26652
5	Y85	2.92513	2.26189	3.78286
6	Y86	1.99839	1.56943	2.54460
7	Y87	1.83857	1.45748	2.31931
8	Q1	5.82833	3.83800	8.85083
9	Q2	4.22446	3.21670	5.54794
10	Q4	3.29937	2.57424	4.22876
11	A1	15.02479	7.42994	30.38309
12	A2	2.05826	1.38978	3.04826
13	A3	2.04280	1.55741	2.67946
14	A4	2.77644	2.02939	3.79849
15	A6	3.29121	2.43392	4.45047
16	A7	11.51686	7.80303	16.99828
17	SS1	5.85572	3.60250	9.51825
18	SS2	3.85511	3.26467	4.55233
19	SS3	3.29972	2.78023	3.91627
20	SS5	0.91181	0.63192	1.31566
21	%1	0.77360	0.49685	1.20451
22	%2	0.89925	0.62286	1.29831
23	%3	1.48435	1.05744	2.08362
24	%4	1.59121	1.19780	2.11384
25	%5	2.15555	1.61654	2.87427
26	%6	2.01853	1.53796	2.64927
27	%7	2.15763	1.65750	2.80866
28	%8	2.28527	1.75647	2.97328
29	%10	2.58218	2.00748	3.32139
30	%11	2.24772	1.75496	2.87884
31	OP1	1.03875	0.54560	1.97764
32	OP2	2.29097	1.66804	3.14653
33	OP3	2.36005	1.65650	3.36242
34	OP4	2.69837	2.05169	3.54886
35	OP6	2.73753	2.10182	3.56552
36	OP7	1.58557	1.13787	2.20941
37	Q1A1	0.74093	0.32789	1.67425
38	Q1A2	1.76054	0.93904	3.30071
39	Q1A3	2.56759	1.54245	4.27407
40	Q2A1	0.72982	0.33915	1.57051
41	Q2A2	1.78683	0.90033	3.54621
42	Q2A3	3.82129	2.59079	5.63623
43	Q2A4	1.47100	0.89502	2.41766
44	Q2A6	2.92488	1.89479	4.51497
45	Q2A7	1.20939	0.50101	2.91938
46	Q4A1	0.94535	0.44256	2.01937
47	Q4A2	1.97875	1.16418	3.36326
48	Q4A3	2.94506	2.01223	4.31032
49	Q4A4	2.24658	1.42628	3.53864
50	QAA6	2.28991	1.45486	3.60425
51	Q4A7	2.32395	1.50674	3.58440
52	A1O2	2.68538	1.79641	4.01427
53	A6O1	5.55890	2.72203	11.35234
54	A6O2	2.87156	1.79941	4.58253
55	A7O1	6.88761	3.16382	14.99426
56	A7O2	3.81546	2.20207	6.61093

2. Parameter estimates and 90% confidence intervals for model terms in the GLM analyses of catch rates of swordfish from 50 to 99 pounds dressed weight.

	CODE	ESTIMATE	LOWER 90% CI	UPPER 90% CI
1	CONST	3.73922	2.97968	4.69236
2	Y81	6.59806	5.00612	8.69622
3	Y82	5.30890	4.18612	6.73283
4	Y83	3.23519	2.57023	4.07219
5	Y85	4.09473	3.23870	5.17701
6	Y86	3.44388	2.76728	4.28591
7	Y87	3.44414	2.78643	4.25708
8	Q1	2.80960	1.90120	4.15204
9	Q2	3.89820	3.03686	5.00384
10	Q4	4.15409	3.30303	5.22445
11	A1	21.57560	11.16940	41.67695
12	A2	2.37577	1.68768	3.34441
13	A3	3.49661	2.73893	4.46387
14	A4	4.77902	3.58350	6.37340
15	A6	4.91887	3.73381	6.48005
16	A7	12.66994	8.80264	18.23627
17	SS1	9.40508	5.61562	15.75168
18	SS2	5.95887	5.12744	6.92511
19	SS3	5.18162	4.43685	6.05141
20	SS5	1.19767	0.86911	1.65044
21	%1	1.25321	0.84344	1.86207
22	%2	1.07898	0.79873	1.45756
23	%3	2.11678	1.54778	2.89495
24	%4	2.32107	1.80696	2.98145
25	%5	2.50414	1.93090	3.24754
26	%6	2.74557	2.14191	3.51935
27	%7	2.71728	2.13391	3.46012
28	%8	3.37521	2.65191	4.29578
29	%10	3.72949	2.96447	4.69195
30	%11	3.62459	2.89504	4.53799
31	OP1	0.82631	0.38775	1.76091
32	OP2	3.69476	2.76518	4.93684
33	OP3	2.96862	2.16124	4.07762
34	OP4	3.49733	2.72803	4.48357
35	OP6	3.72058	2.92242	4.73673
36	OP7	1.87865	1.38999	2.53910
37	Q1A1	2.31843	1.08350	4.96087
38	Q1A2	6.02262	3.37715	10.74039
39	Q1A3	5.19014	3.26341	8.25444
40	Q2A1	1.50154	0.73571	3.06457
41	Q2A2	4.93068	2.81355	8.64088
42	Q2A3	4.90197	3.46237	6.94013
43	Q2A4	4.13034	2.66128	6.41034
44	Q2A6	3.52143	2.36529	5.24268
45	Q2A7	2.44768	1.07561	5.56997
46	Q4A1	1.70698	0.84165	3.46199
47	Q4A2	4.31254	2.66390	6.98148
48	Q4A3	3.40534	2.43177	4.76868
49	Q4A4	3.56855	2.38558	5.33813
50	QAA6	3.08065	2.03089	4.67303
51	Q4A7	2.60553	1.75036	3.87851
52	A102	3.23901	2.23283	4.69861
53	A601	13.61058	6.14262	30.15782
54	A602	3.68284	2.39156	5.67141
55	A701	17.73201	7.62994	41.20928
56	A702	4.82781	2.89724	8.04481

3. Parameter estimates and 90% confidence intervals for model terms in the GLM analyses of catch rates of swordfish from 26 to 49 pounds dressed weight.

	CODE	ESTIMATE	LOWER 90% CI	UPPER 90% CI
1	CONST	3.39658	2.71244	4.25328
2	Y81	3.37128	2.54981	4.45740
3	Y82	3.23085	2.54364	4.10372
4	Y83	3.26584	2.59992	4.10233
5	Y85	3.35792	2.66260	4.23482
6	Y86	4.48559	3.60949	5.57435
7	Y87	4.52746	3.67085	5.58396
8	Q1	3.35624	2.26077	4.98252
9	Q2	2.81400	2.19704	3.60421
10	Q4	5.50372	4.39418	6.89341
11	A1	4.11934	2.10189	8.07321
12	A2	2.68694	1.90756	3.78477
13	A3	4.02600	3.16210	5.12592
14	A4	6.20109	4.65959	8.25255
15	A6	3.11606	2.36532	4.10509
16	A7	3.29997	2.27328	4.79035
17	SS1	3.40679	1.40478	8.26197
18	SS2	7.15172	6.13839	8.33233
19	SS3	5.88594	5.02657	6.89223
20	SS5	1.32116	0.95412	1.82938
21	%1	0.69609	0.50367	0.96202
22	%2	1.25181	0.94153	1.66434
23	%3	1.59063	1.17597	2.15151
24	%4	1.98134	1.54245	2.54510
25	%5	2.20362	1.70144	2.85403
26	%6	2.71382	2.12087	3.47253
27	%7	2.79437	2.19468	3.55793
28	%8	3.26220	2.57184	4.13788
29	%10	3.89821	3.10461	4.89467
30	%11	3.62628	2.90277	4.53012
31	OP1	6.21157	2.60244	14.82590
32	OP2	3.08065	2.29337	4.13821
33	OP3	2.34915	1.70525	3.23619
34	OP4	2.68934	2.09618	3.45035
35	OP6	3.50588	2.75625	4.45938
36	OP7	1.40775	1.04991	1.88756
37	Q1A1	2.79899	1.28414	6.10088
38	Q1A2	3.21760	1.82357	5.67730
39	Q1A3	1.84265	1.14986	2.95284
40	Q2A1	3.01015	1.44947	6.25125
41	Q2A2	3.69267	2.19920	6.20033
42	Q2A3	2.09453	1.47358	2.97713
43	Q2A4	4.07842	2.60853	6.37659
44	Q2A6	3.51713	2.34564	5.27369
45	Q2A7	4.44770	1.91236	10.34429
46	Q4A1	2.21212	1.07187	4.56535
47	Q4A2	2.84611	1.78389	4.54083
48	Q4A3	2.14190	1.52786	3.00272
49	Q4A4	2.53690	1.68731	3.81429
50	QAA6	3.70320	2.42629	5.65212
51	Q4A7	1.96242	1.30963	2.94060
52	A102	2.76267	1.89329	4.03126
53	A601	1.38940	0.54281	3.55635
54	A602	2.71877	1.75290	4.21682
55	A701	1.49129	0.55384	4.01549
56	A702	5.61473	3.34543	9.42336

4. **Parameter estimates and 90% confidence intervals for model terms in the GLM analyses of catch rates of swordfish from 1 to 25 pounds dressed weight.**

	CODE	ESTIMATE	LOWER 90% CI	UPPER 90% CI
1	CONST	1.44107	1.04826	1.98109
2	YB1	1.31586	0.88514	1.95617
3	YB2	1.88268	1.33416	2.65673
4	YB3	1.58223	1.14724	2.18217
5	YB5	1.81825	1.31249	2.51891
6	YB6	2.40505	1.77507	3.25860
7	YB7	2.36699	1.76077	3.18192
8	Q1	1.25208	0.70851	2.21268
9	Q2	0.64160	0.44468	0.92573
10	Q4	3.47910	2.54104	4.76346
11	A1	1.31088	0.53732	3.19811
12	A2	0.93809	0.57280	1.53634
13	A3	1.45793	1.04133	2.04119
14	A4	1.77058	1.19226	2.62944
15	A6	1.13101	0.78334	1.63297
16	A7	0.80762	0.57379	1.13673
17	SS2	3.28825	2.65498	4.07256
18	SS3	2.58084	2.06590	3.22414
19	SS5	0.53786	0.33255	0.86993
20	%1	0.42154	0.26865	0.66146
21	%2	0.51668	0.33841	0.78883
22	%3	0.97674	0.63157	1.51053
23	%4	0.79584	0.56103	1.12893
24	%5	1.03860	0.72496	1.48793
25	%6	1.02107	0.72141	1.44520
26	%7	1.01061	0.72287	1.41288
27	%8	1.34155	0.95974	1.87526
28	%10	1.59583	1.15641	2.20221
29	%11	1.60596	1.16916	2.20596
30	OP1	0.58150	0.38427	0.87996
31	OP2	1.47538	1.03936	2.09432
32	OP3	0.83177	0.53463	1.29406
33	OP4	1.06353	0.74791	1.51233
34	OP6	1.79820	1.27677	2.53258
35	OP7	0.79244	0.52449	1.19727
36	Q1A1	0.53126	0.18460	1.52895
37	Q1A2	3.08172	1.36630	6.95086
38	Q1A3	0.86532	0.44034	1.70044
39	Q2A1	2.69097	1.00605	7.19777
40	Q2A2	5.09945	2.40044	10.83316
41	Q2A3	1.20045	0.72284	1.99363
42	Q2A4	2.50590	1.34086	4.68285
43	Q2A6	1.80244	1.00679	3.22687
44	Q2A7	8.90989	2.86911	27.66932
45	Q4A1	0.68382	0.26000	1.79849
46	Q4A2	1.98577	1.02478	3.84796
47	Q4A3	1.01548	0.63454	1.62511
48	Q4A4	1.16837	0.66932	2.03891
49	Q4A6	2.22881	1.24819	3.97985
50	Q4A7	0.59936	0.34235	1.04931

5. **Parameter estimates and 90% confidence intervals for model terms in the GLM analyses of catch rates of swordfish greater than or equal to 235 cm LJFL.**

	CODE	ESTIMATE	LOWER 90% CI	UPPER 90% CI
1	CONST	0.42271	0.29568	0.60433
2	Y81	1.19862	0.79282	1.81213
3	Y82	0.76370	0.52246	1.11635
4	Y83	0.70025	0.49305	0.99453
5	Y85	0.48701	0.33471	0.70863
6	Y86	0.37544	0.26657	0.52875
7	Y87	0.40564	0.29043	0.56655
8	Q1	1.12880	0.65362	1.94944
9	Q2	0.99382	0.68105	1.45023
10	Q4	0.51575	0.36371	0.73136
11	A1	0.34499	0.10786	1.10345
12	A2	0.23011	0.11294	0.46888
13	A3	0.42288	0.27297	0.65511
14	A4	0.53619	0.33224	0.86534
15	A6	0.38591	0.23524	0.63308
16	A7	0.40683	0.25984	0.63697
17	SS1	4.16434	1.82263	9.51468
18	SS2	0.65632	0.51784	0.83183
19	SS3	0.47243	0.37099	0.60165
20	SS5	0.14052	0.08717	0.22651
21	OP1	0.54460	0.23277	1.27417
22	OP2	0.26127	0.15489	0.44073
23	OP3	0.28810	0.16439	0.50491
24	OP4	0.27394	0.17972	0.41755
25	OP6	0.54661	0.37225	0.80264
26	OP7	0.65159	0.35135	1.20836
27	Q1A1	0.23617	0.06419	0.86889
28	Q1A2	0.17388	0.06189	0.48853
29	Q1A3	0.23616	0.11355	0.49117
30	Q2A1	0.25582	0.07233	0.90480
31	Q2A2	0.36491	0.09497	1.40220
32	Q2A3	0.20328	0.11015	0.37514
33	Q2A4	0.08581	0.03681	0.20007
34	Q2A6	0.32122	0.17109	0.60308
35	Q2A7	0.13063	0.03689	0.46252
36	Q4A1	0.68775	0.19728	2.39759
37	Q4A2	0.41254	0.14499	1.17380
38	Q4A3	0.46947	0.24346	0.90529
39	Q4A4	0.40699	0.19789	0.83702
40	QAA6	0.42263	0.20776	0.85972
41	Q4A7	0.42162	0.23126	0.76866
42	A1O2	0.50691	0.27410	0.93747
43	A6O1	0.16006	0.06211	0.41246
44	A6O2	0.53379	0.26064	1.09319
45	A7O1	0.24331	0.08897	0.66541
46	A7O2	0.64720	0.30691	1.36482

6. **Parameter estimates and 90% confidence intervals for model terms in the GLM analyses of catch rates of swordfish greater than 169 cm but less than 235 cm LJFL.**

	CODE	ESTIMATE	LOWER 90% CI	UPPER 90% CI
1	CONST	1.83187	1.44520	2.32198
2	Y81	5.52883	4.12557	7.40939
3	Y82	4.58867	3.59016	5.86490
4	Y83	2.14229	1.68461	2.72431
5	Y85	1.97227	1.54608	2.51595
6	Y86	1.32497	1.05837	1.65872
7	Y87	1.24238	1.00257	1.53955
8	Q1	3.91524	2.57334	5.95688
9	Q2	2.45030	1.88022	3.19324
10	Q4	1.98083	1.56512	2.50696
11	A1	13.09234	6.42666	26.67163
12	A2	1.31453	0.89963	1.92074
13	A3	1.47548	1.13256	1.92224
14	A4	1.80762	1.33528	2.44704
15	A6	2.38681	1.77910	3.20211
16	A7	10.17844	6.89417	15.02728
17	SS1	3.71835	2.24247	6.16557
18	SS2	3.21039	2.76117	3.73270
19	SS3	2.69252	2.30460	3.14573
20	SS5	0.60362	0.42042	0.86665
21	OP1	0.85526	0.40284	1.81577
22	OP2	1.62001	1.19540	2.19542
23	OP3	1.45744	1.03748	2.04741
24	OP4	1.71824	1.32848	2.22235
25	OP6	1.82877	1.41545	2.36279
26	OP7	0.75893	0.56025	1.01996
27	Q1A1	0.47174	0.20640	1.07819
28	Q1A2	1.14255	0.61441	2.12469
29	Q1A3	1.51262	0.92373	2.47692
30	Q2A1	0.54134	0.24840	1.18059
31	Q2A2	1.42024	0.71566	2.81850
32	Q2A3	2.82275	1.93270	4.12269
33	Q2A4	1.24990	0.76416	2.04439
34	Q2A6	2.24919	1.45960	3.46591
35	Q2A7	1.02725	0.41993	2.51291
36	Q4A1	0.61491	0.28450	1.32903
37	Q4A2	1.32780	0.78280	2.25224
38	Q4A3	1.96855	1.36024	2.84891
39	Q4A4	1.90756	1.20768	3.01304
40	QAA6	1.71593	1.09418	2.69099
41	Q4A7	1.70971	1.10994	2.63357
42	A1O2	1.65186	1.10884	2.46082
43	A6O1	3.46319	1.55462	7.71486
44	A6O2	1.86063	1.16980	2.95943
45	A7O1	3.90683	1.65893	9.20070
46	A7O2	2.32473	1.33982	4.03367

7. **Parameter estimates and 90% confidence intervals for model terms in the GLM analyses of catch rates of swordfish greater than 109 cm but less than 170 cm LJFL.**

	CODE	ESTIMATE	LOWER 90% CI	UPPER 90% CI
1	CONST	4.55270	3.71529	5.57885
2	Y81	5.37456	4.14990	6.96062
3	Y82	5.67333	4.58199	7.02460
4	Y83	4.38361	3.56369	5.39218
5	Y85	5.12645	4.15956	6.31809
6	Y86	4.98611	4.11768	6.03770
7	Y87	5.11937	4.26888	6.13929
8	Q1	5.53808	3.76321	8.15005
9	Q2	4.26052	3.38409	5.36394
10	Q4	7.10812	5.78656	8.73149
11	A1	14.86753	7.66149	28.85125
12	A2	3.21052	2.35024	4.38571
13	A3	6.33504	5.04868	7.94914
14	A4	9.34655	7.15664	12.20658
15	A6	5.60003	4.31379	7.26980
16	A7	12.89050	8.95874	18.54781
17	SS1	11.92934	7.20159	19.76079
18	SS2	11.89660	10.43916	13.55752
19	SS3	9.78590	8.54024	11.21325
20	SS5	1.75150	1.30170	2.35673
21	OP1	2.49620	1.32042	4.71899
22	OP2	4.55318	3.46782	5.97824
23	OP3	3.39426	2.51278	4.58497
24	OP4	3.47015	2.77467	4.33994
25	OP6	4.99302	4.00349	6.22712
26	OP7	1.11624	0.86560	1.43947
27	Q1A1	2.36298	1.09618	5.09376
28	Q1A2	4.02726	2.35814	6.87781
29	Q1A3	2.12018	1.36336	3.29713
30	Q2A1	2.85863	1.38877	5.88415
31	Q2A2	3.29331	2.04548	5.30235
32	Q2A3	3.51703	2.53411	4.88120
33	Q2A4	5.35297	3.48025	8.23339
34	Q2A6	4.06111	2.75709	5.98191
35	Q2A7	4.44111	1.93071	10.21564
36	Q4A1	1.99653	0.97770	4.07708
37	Q4A2	3.42228	2.22011	5.27540
38	Q4A3	2.97725	2.17411	4.07708
39	Q4A4	3.62309	2.45322	5.35084
40	QAA6	4.33791	2.89347	6.50342
41	Q4A7	2.38590	1.61998	3.51392
42	A1O2	3.53829	2.46568	5.07751
43	A6O1	7.88993	3.90199	15.95363
44	A6O2	3.87399	2.53562	5.91881
45	A7O1	8.68369	4.04638	18.63551
46	A7O2	5.53514	3.34340	9.16364

8. **Parameter estimates and 90% confidence intervals for model terms in the GLM analyses of catch rates of swordfish less than 110 cm LJFL.**

	CODE	ESTIMATE	LOWER 90% CI	UPPER 90% CI
1	CONST	0.76538	0.55849	1.04890
2	Y81	0.68797	0.45565	1.03873
3	Y82	0.98827	0.70135	1.39256
4	Y83	0.81081	0.58943	1.11534
5	Y85	0.83688	0.60782	1.15227
6	Y86	1.01572	0.76145	1.35491
7	Y87	0.90700	0.68653	1.19828
8	Q1	0.75995	0.41464	1.39285
9	Q2	0.32803	0.21953	0.49017
10	Q4	1.66576	1.22179	2.27105
11	A1	0.55689	0.22752	1.36310
12	A2	0.72673	0.43915	1.20263
13	A3	1.00977	0.71725	1.42160
14	A4	1.13697	0.76099	1.69872
15	A6	0.68762	0.46975	1.00654
16	A7	0.60665	0.42521	0.86550
17	SS2	2.18407	1.77509	2.68728
18	SS3	1.56911	1.26407	1.94776
19	SS5	0.30784	0.18335	0.51687
20	OP1	0.31718	0.20196	0.49812
21	OP2	0.79036	0.55855	1.11837
22	OP3	0.38311	0.24464	0.59997
23	OP4	0.48265	0.34437	0.67644
24	OP6	0.96541	0.68393	1.36275
25	OP7	0.34995	0.23909	0.51223
26	Q1A1	0.48190	0.16369	1.41871
27	Q1A2	1.23333	0.52915	2.87462
28	Q1A3	0.34475	0.17397	0.68316
29	Q2A1	2.71686	0.99359	7.42892
30	Q2A2	2.08810	0.95260	4.57712
31	Q2A3	0.66877	0.39260	1.13922
32	Q2A4	1.33120	0.69023	2.56743
33	Q2A6	0.95459	0.51559	1.76738
34	Q2A7	6.95716	2.20217	21.97926
35	Q4A1	0.47684	0.17985	1.26426
36	Q4A2	0.75087	0.37912	1.48716
37	Q4A3	0.50055	0.31074	0.80631
38	Q4A4	0.57274	0.32330	1.01465
39	QAA6	1.09648	0.60994	1.97118
40	Q4A7	0.44651	0.24444	0.81561