



KING, *Scomberomorus cavalla*, AND SPANISH,
Scomberomorus maculatus, MACKEREL
MIGRATION AND STOCK ASSESSMENT STUDY IN
THE SOUTHERN GULF OF MEXICO

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PREFACE

The following information constitutes the Final Report (March 1, 1993-July 31, 1994) by Mte Marine Laboratory (MML) on the King and Spanish Mackerel Migration and Stock Assessment Study in the Southern Gulf of Mexico. This project was conducted by Mte Marine Laboratory under the MARFIN Program

Presentations are made by task, beginning with movement and migration of mackerel, followed by length/frequency and CPUE data for mackerel, and stock identification.

Each task presentation follows the format developed by NOAA/NMFS Panama City Laboratory and Mte Marine Laboratory.

PREFACIO

La siguiente información constituye el Informe Final (1 marzo 1993-31 julio 1994) sobre el estudio King and Spanish Mackerel Migration and Stock Assessment in the Southern Gulf of Mexico. Este proyecto fue conducido por Mte Marine Laboratory con la patrocinación del programa MARFIN.

La presentación es hecha por tarea, comenzando con movimiento y emigración de la macarela, seguido por longitud/frecuencia y datos de CPUE y la identificación de los stocks.

La presentación de cada tarea sigue el formato desarrollado por NOAA/NMFS, Panama City y Mte Marine Laboratory.

INTRODUCTION

This study was undertaken as part of an attempt to understand the migration and stock identity of the king mackerel, *Scomberomorus cavalla*, and the Spanish mackerel, *S. maculatus*, in the Southern Gulf of Mexico. This study was funded by the MARFIN Program. Mte Marine Laboratory works under the auspices of the Mexus-Gulf Agreement to report length/frequency distributions, catch per unit effort (CPUE) information, and to collect otoliths for stock assessment at specific Mexican locations (Figures 1-4). This report outlines MML's success in achieving the above-mentioned goals.

INTRODUCCION

Este estudio se realizó como parte de un intento de entender la emigración e identidad de los stocks de peto (carito) *Scomberomorus cavalla* y sierra, *S. maculatus*, en el sur del Golfo de México. Este estudio fue financiado por el Programa MARFIN. Los biólogos del Mte Marine Laboratory han trabajado con los biólogos del Instituto Nacional de la Pesca (INP) Mexicano, bajo los auspicios del Acuerdo MEX-US GOLFO con el fin de reportar distribuciones de frecuencia de longitudes, reunir datos sobre captura por unidad de esfuerzo (CPUE), y coleccionar otolitos en localidades Mexicanas específicas (Figuras 1-4). Este informe delinea el éxito de MML para alcanzar las metas mencionadas anteriormente.

I. MOVEMENT AND MIGRATION OF MACKEREL

Tag Returns

Although no fish were tagged under this award, tag returns from king (KM) and Spanish (SM) mackerel tagged during previous studies (3,079 total tagged, [1,848 KM 1,231 SM]) continued to be monitored and reported, and tag rewards were paid. One king mackerel (tag # 11459) was recovered from a fish tagged on May 22, 1987, off Las Barrancas, Veracruz. It was recaptured off Punta Delgado, Veracruz, 50 miles away, on April 24, 1993, after 2,164 days of freedom. Another king mackerel tagged with a Fish Trackers tag (tag # C07800) was tagged 15 miles south of Sargent, Texas, on September 26, 1992, and was recaptured off Las Barrancas, Veracruz, on April 7, 1993. It had been at large for 259 days and traveled 748 miles. These two tags are listed in Table 1, along with all other king and Spanish mackerel returns obtained to date.

Two other Fish Trackers tags were returned, one from an amberjack (Tag # 70566) and one from a Cobia (tag # 14729). A sailfish tag from the Billfish Foundation (B.F. # 02202 and NMFS # 209531) was also recovered. Data on these tags as well as the two king mackerel tags are listed in Table 2.

Table 1 lists all the king and Spanish mackerel returns obtained during the eight years Mote Marine Laboratory has conducted this study. Original tag data are listed in numerical order in Appendix I. Returned tags are listed in numerical order in Appendix II. Significant tag returns for both king and Spanish mackerel since 1986 within Mexico and between the United States and Mexico are shown as Figures 5-12.

II. LENGTH/FREQUENCY DISTRIBUTION - CATCH AND VALUE DATA - CPUE

A. Length/Frequency Data Collection

Length/frequency data were collected in October 1993 in Veracruz and during January and February 1994 in Yucatan when mackerel were abundant off Mexico. MML and PESCA personnel worked together to accomplish this task. Length/frequency data from Veracruz and Yucatan are illustrated as Figures 13 and 14. The combined length/frequency data are shown in Figure 15. Additional measurements were taken in Yucatan during December 1992 by CRIP-Yucalpetén personnel. All data were included in the quarterly reports as well as sent to the NMFS-Panama City Laboratory. Summary statistics for length/frequency data collected off the states of Veracruz and Yucatan are included as Tables 3-5. Figure 16, which includes length/frequency data from 1986-1994 and Table 6 (mean lengths) show no significant change in the size of the mackerel in the Mexican fishery.

Length/frequency data (Figure 17) obtained from the states of Yucatan and Quintana Roo from 1990-1994 were analyzed with regard to the problem of both Spanish mackerel and cero being reported as Spanish mackerel in the Mexican landings. Only data from Yucatan and Quintana Roo were used in the analyses because cero rarely occur in the mackerel catches off the state of Veracruz. These data were used in an attempt to determine the percent contribution of each of these species to the Mexican Spanish mackerel catch. During 1990-1994, no bias occurred in the mackerel sampling. All available mackerel in the catch were measured. Table 7 shows the results of the analysis by year. Figure 18 illustrates the percentage and the contribution by weight of each species.

B. Catch per Unit Effort (CPUE)

CPUE data were collected from 35 lanchas from the fishing villages of Anton Lizardo and Las Casitas in the state of Veracruz in October 1993 and from 12 lanchas from the fishing village of Celestún in the state of Yucatán in January and February 1994. Data from three lanchas sampled off Celestún by PESCA personnel on December 18, 1992, were given to MML biologists during

the 1994 winter field effort. All data were entered into TIP. These data appear as Tables 8-11.

C. Catch and Value Data

Catch data were collected from the fishing villages of Celestún, Coloradas, Holchit, Norte, San Felipe, and Rio Lagartos in the state of Yucatan.

The data consist of a list of species landed along with king and Spanish mackerel. Some of these species are caught concurrently with mackerel in the gill nets or with hand lines. A few species, such as octopus, lobster, stone crab and conch are targeted instead of mackerel and although the same type of boat is used, the gear type is different. For lobster or conch, the fishermen use scuba gear during the day to catch them and deploy gill nets overnight to catch finfishes. Data pertaining to these species, along with the total number of kilos and values from the Celestún fish house during December 1992, the mackerel run of 1993, January and February of 1994, and the 1993 landings from Coloradas, Holchit, Norte, San Felipe and Rio Lagartos are presented as Tables 12-25. It should be noted that these data are NOT the totals for these fishing villages. Some of the fishermen from each of these villages bring their fish to the Atlántida del Sur fish house in Mérida. The fish brought to Mérida are not included in these totals. The prices listed in these tables reflect the price paid to the fishermen, not the price paid by Mexican consumers or U.S. importers. In all tables, weight is in kilograms (kg) and value has been converted from Mexican pesos to US dollars. The conversion rate used was 3.0562 Mexican pesos to one (1) US dollar.

The purpose of providing these data is to demonstrate the importance (by weight and value) of the mackerel fishery during the mackerel runs. Data were only collected when mackerel were present. During the months of April through November, fishermen targeted other species. Some fishermen never target mackerel, preferring to fish for more inshore species such as red grouper (the largest and most important finfish fishery off Yucatan), shark or octopus. Even mackerel fishermen do not fish exclusively for mackerel during the months of peak abundance. During inclement weather (Nortes), and during periods of the full moon, mackerel fishermen target other species.

Most fishing is conducted from 18-20 lanchas (small open boats). During inclement weather, it would be very dangerous to travel far from shore in the lanchas, so more inshore species are targeted.

Off Yucatan, mackerel are almost exclusively caught in gill nets. During the full moon, the mackerel can see the nets and avoid capture; consequently, mackerel fishermen target other species - such as red grouper, octopus, shark, spiny lobster, etc.

It should be noted that unless otherwise stated, whenever the term "Spanish mackerel" is used, it refers to a combined catch of both Spanish mackerel and cero. Neither Mexican fishermen nor Mexican fish house workers distinguish between the two species. Both Spanish mackerel and cero are marketed in Mexico and exported to the US under the name "Spanish mackerel".

The other important factors to understand when interpreting these data are 1) that the data from Celestún and the other five fishing villages do not represent the entire catch; some of the fishing cooperatives truck their catch to Mérida or Progreso and those fish are not included in the data presented in this report, 2) the mackerel fishery, even during months of peak abundance is not nearly as important as the reef fish fishery (red grouper and red snapper), and 3) that the term bycatch as used in this report not only refers to other species caught simultaneously with mackerel in the gill nets but also other species targeted by mackerel fishermen during Nortes and during periods of the full moon.

During the month of December 1992, mackerel accounted for 86.6 percent of the catch by weight and 92.6 percent of the catch by value of fisheries products recorded at the Celestún fish house (Figure 19).

Figure 20 shows the amount of mackerel (king, Spanish and cero) vs. other species landed by fishermen from Celestún, Coloradas, Holchit, Norte, San Felipe, and Rio Lagartos during the 1993 mackerel run. These data are broken down by month in Figure 21. The data do not include fish trucked to Mérida or catches by fishermen who exclusively fish for reef fishes. The "other" species in the data set consist mainly of actual bycatch or species targeted by mackerel fishermen when they were unable to fish for mackerel because of bad weather or the full moon. The small remainder of the "bycatch" consisted of the catch of a few independent fishermen who did not

belong to the fishing cooperatives and were not contracted by the fish house owner.

The contributions of each of the six fishing villages to the total catch, broken down by percent of weight and values and by weight and value per month during the 1993 mackerel run, appear as Figures 22-33.

Data were also collected during January and February 1994 from the Celestún fish house. The contribution of mackerel vs. bycatch to the total catch by weight and value is shown in Figure 34.

Catch data from the Celestún fish house from December 1992 were broken down not only by weight and value (Table 26) but also by weight and value per boat day (Table 27). Most of the fish were caught in gill nets which fish overnight and are hauled in during the early morning.

The combined landings data, listing the various species from Celestún, Coloradas, Holchit, Norte, San Filipe and Rio Lagartos catches during the 1993 mackerel run, are shown in Table 28. These data are ranked by weight and value in Table 29. The total weight and value per boat day are shown in Table 30. The slight discrepancy in the total weight and value for some of the species in Tables 28 and 30 is due to the fact that effort data (number of boats and hours fishing) were not available for all the fish listed so these data could not be included in Table 30.

Weight and value per boat day from all six locations are graphically displayed per each individual fishing village in Figures 35-40. Data displayed show the position of king and Spanish mackerel in relation to the highest ranking bycatch species caught during the 1993 mackerel run at each location. In all cases, the Spanish mackerel category contains both Spanish mackerel and cero.

The last of the catch data available was for January and February of 1994 from fish landed at the Celestún fish house. Table 31 lists the species by weight and value. Table 32 shows the weight and value per boat day for those species that had effort data available. The discrepancy for the weight and value for fish found in Tables 31 and 32 is the result of the lack of effort data (boat time) for some of the fish which had to be left out of Table 32.

III. STOCK IDENTIFICATION

Adult king and Spanish mackerel were purchased to obtain biological samples for stock identification. A total of 107 specimens of each species from Veracruz was purchased from fish captured off the state of Veracruz. Size range is shown in Figure 41. MML and PESCA personnel worked together to extract the otoliths and obtain the accompanying data. The left otoliths from both species were retained at the CRIP-Veracruz laboratory to be analyzed by PESCA personnel; the right otoliths from both species were sent to NMFS-Panama City for analyses.

While working in Yucatan, king mackerel specimens were chosen by MML personnel, and represented samples from the fishing villages of Celestún, Rio Lagartos and El Cuyo. One-hundred nine king mackerel were sampled over the entire size range available. There was a paucity of Spanish mackerel during the field effort, and MML personnel were obliged to purchase Spanish mackerel sight unseen from boxed, frozen fish caught earlier in the winter, and as a result, 34 of the 99 so-called Spanish mackerel turned out to be cero. Mexican fishermen and fish dealers do not differentiate between the two species.

The mackerel arrived at MML on 19 April 1994. All of the fish were processed at MML during the months of April and May. Size range per species is shown in Figure 42. Data were entered into TIP and sent to NMFS-Panama City. Both otoliths from each fish were delivered to NMFS-Panama City. The right otoliths were to be processed at NMFS-Panama City; the left otoliths were sent by NMFS-Panama City to the INP-Veracruz PESCA personnel for processing. Summary statistics from specimens of king and Spanish mackerel from the state of Veracruz are presented as Tables 33-35 and summary statistics for king, Spanish, and cero mackerel collected from the state of Yucatan for otolith extraction are presented in Tables 36-38.

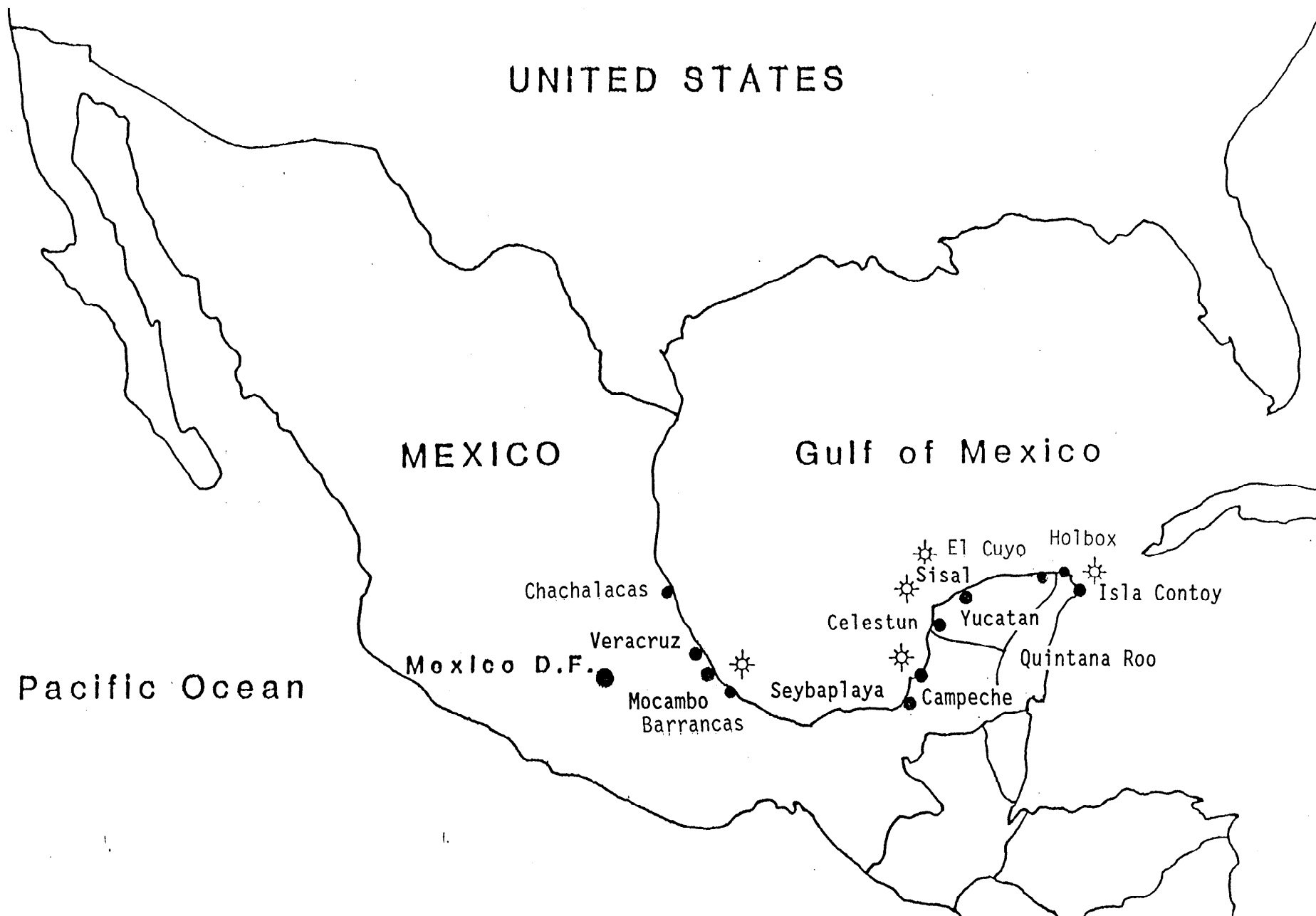


Figure 1. Important mackerel landing sites in Mexico.

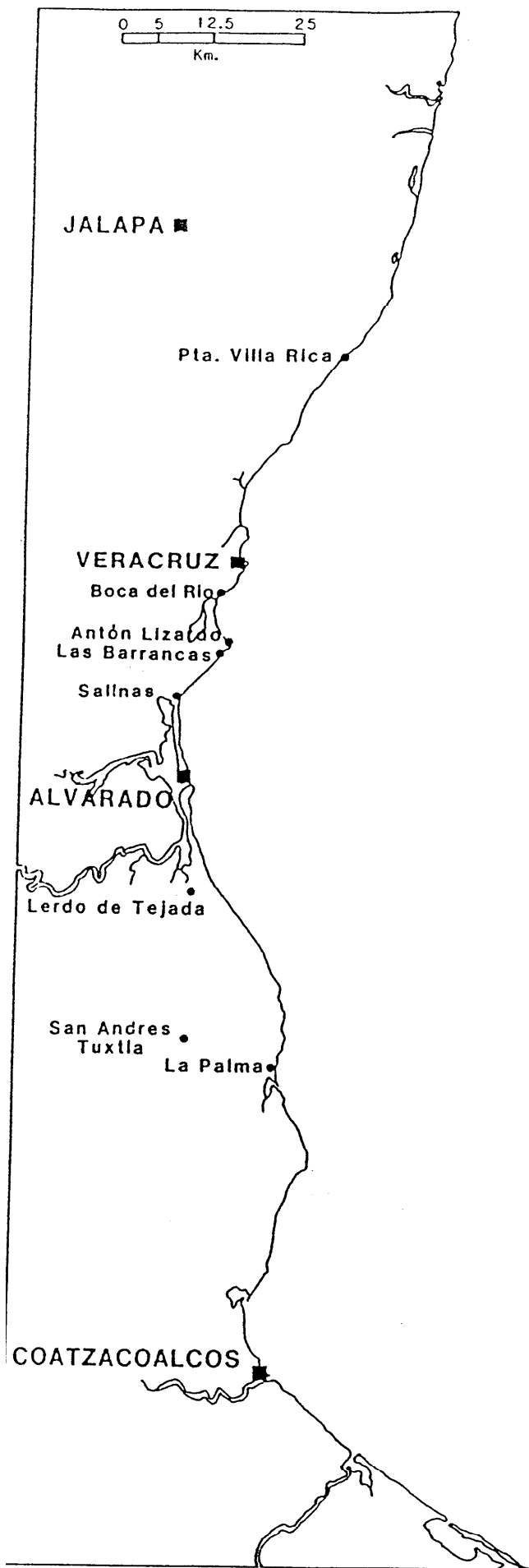


Figure 2. Important mackerel landing sites in the state of Veracruz, 1993.

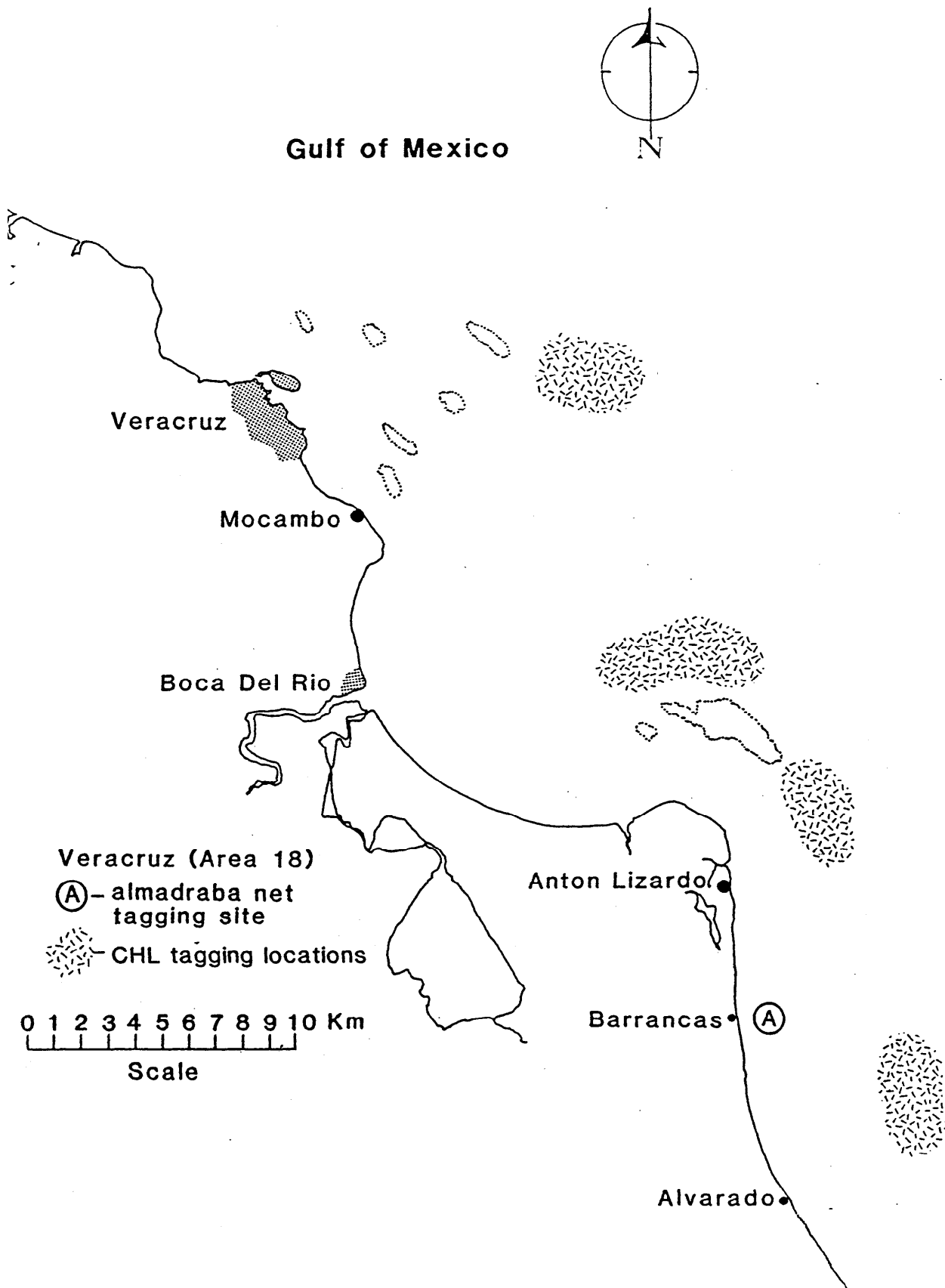


Figure 3. Mackerel length/frequency and catch per unit of effort (CPUE) locations for Veracruz, 1993.

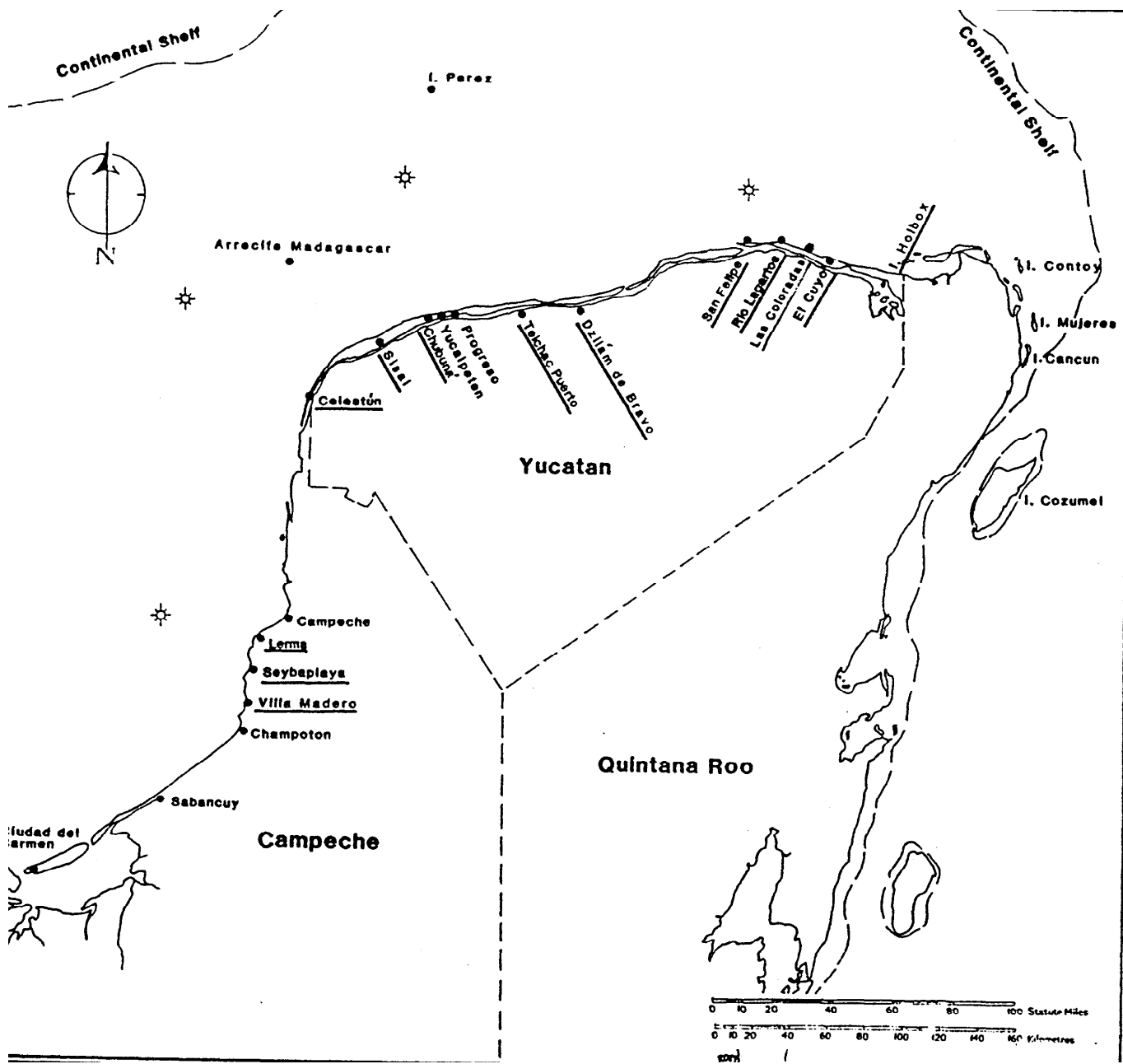


Figure 4. Mackerel length/frequency and catch per unit of effort (CPUE) locations for Yucatán, 1993/94.

- Figure 5. Number of mackerel tagged off Mexican Gulf Coast states (1986-1994).
 Figure 6. Important tag returns from Texas to Mexico (1986-1994).
 Figure 7. Significant long distance tag returns from Louisiana to Mexico (1986-1994).
 Figure 8. Significant tag returns from Florida to Mexico (1986-1994).

Fig. 5

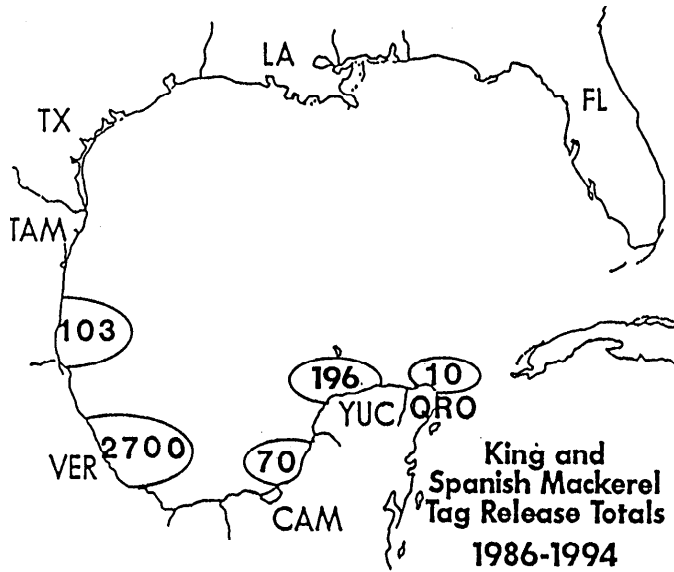


Fig. 6

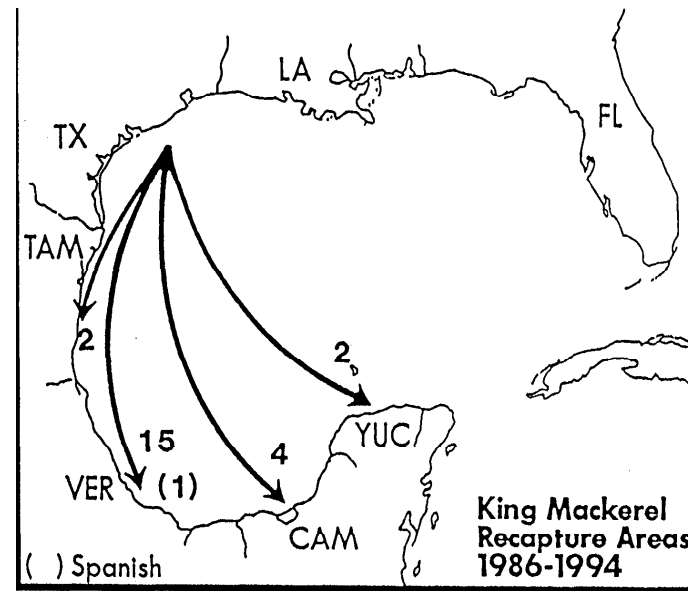


Fig. 7

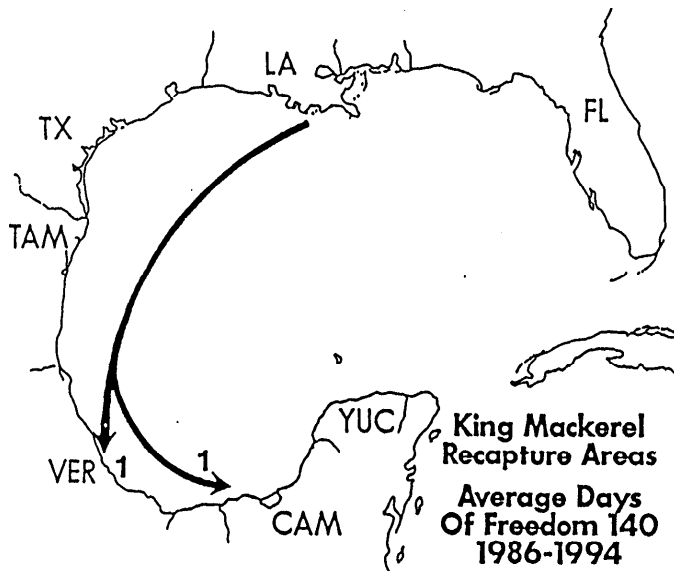
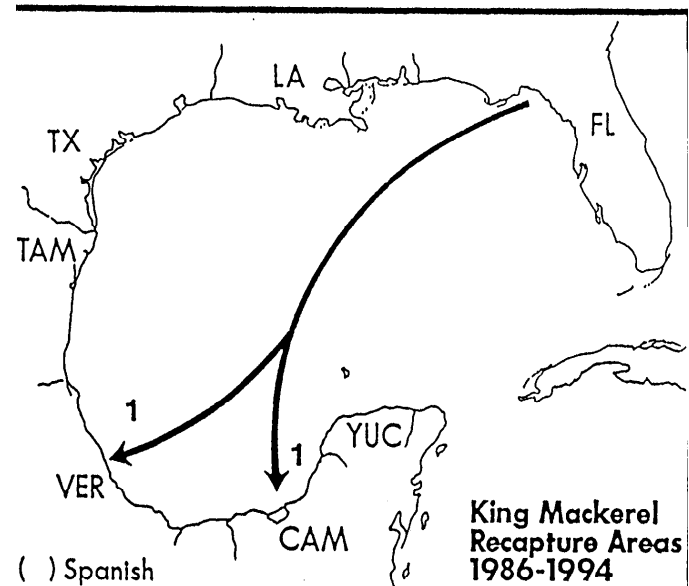


Fig. 8



- Figure 9.** Significant tag returns within Mexico and from Veracruz, Mexico to the U.S. (1986-1994)
Figure 10. Important long distance tag returns from Tamaulipas to other Mexican states (1986-1994).
Figure 11. Significant long distance tag returns from Campeche to other Mexican states (1986-1994).
Figure 12. Important tag returns from Yucatán to Veracruz (1986-1994).

Fig. 9

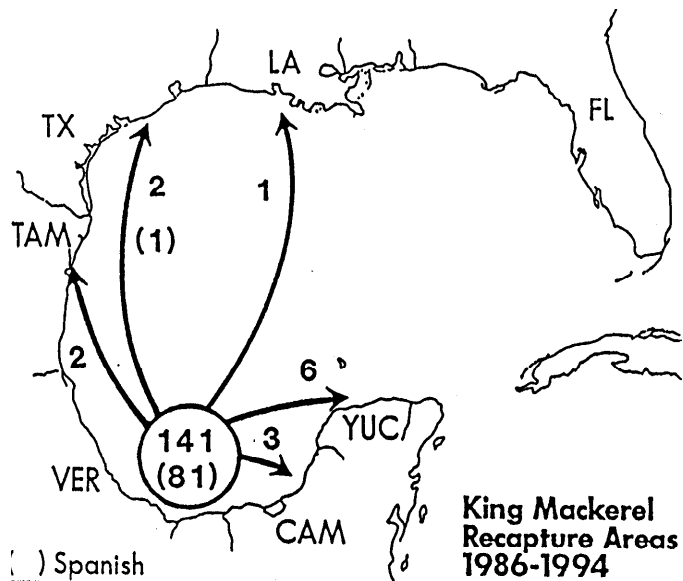


Fig. 10

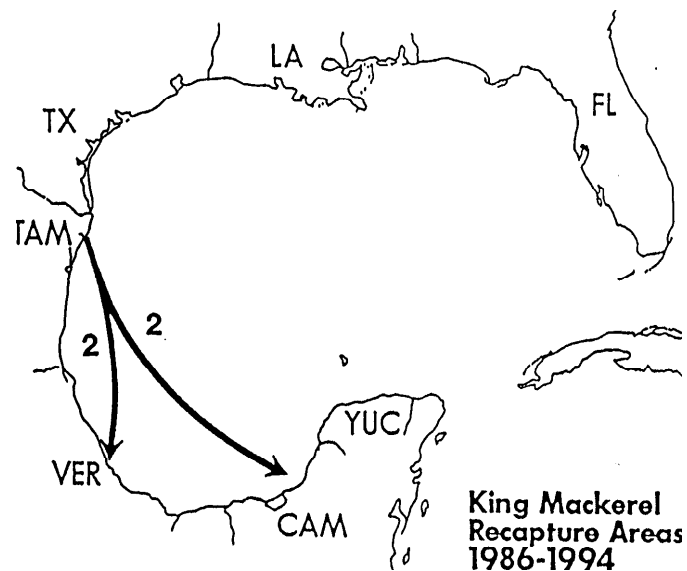


Fig. 11

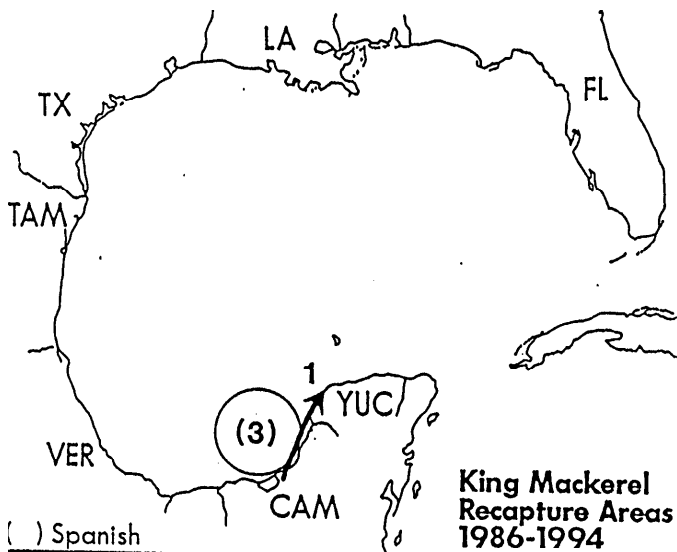
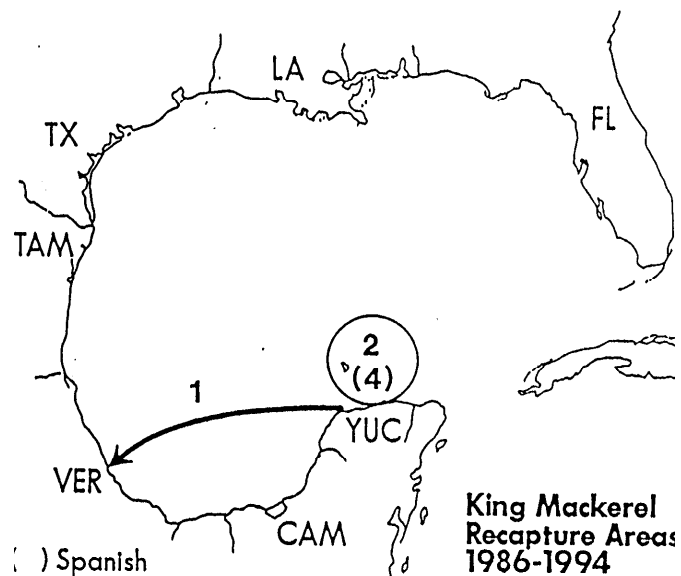


Fig. 12



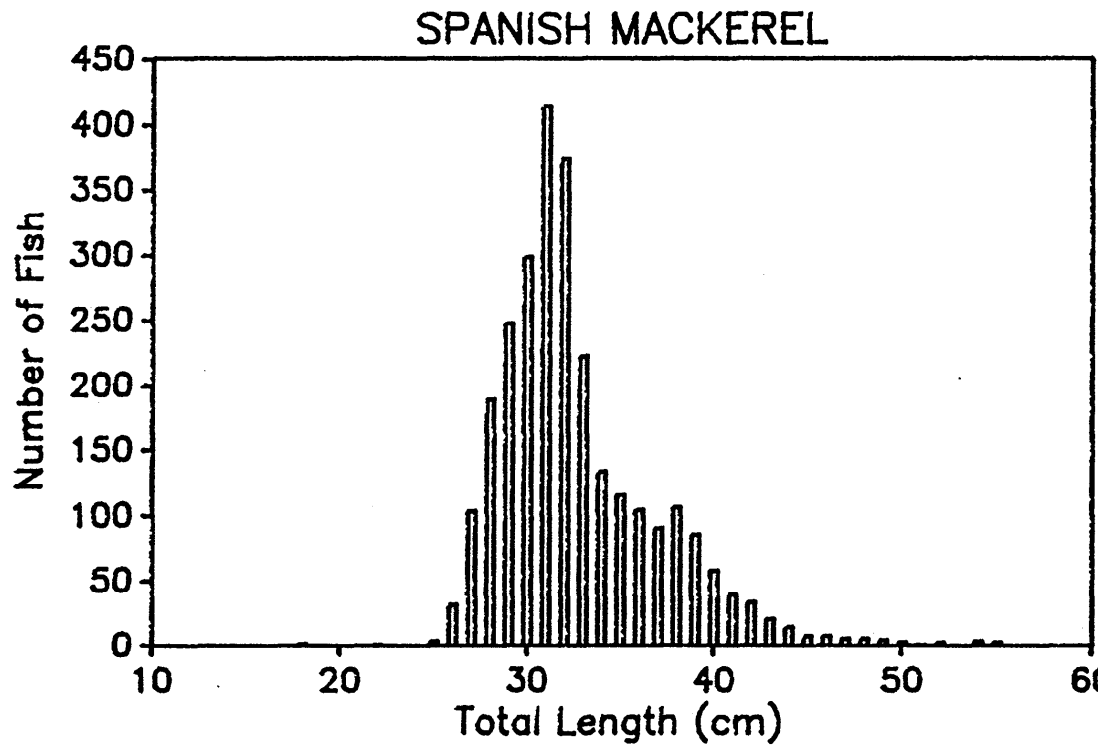
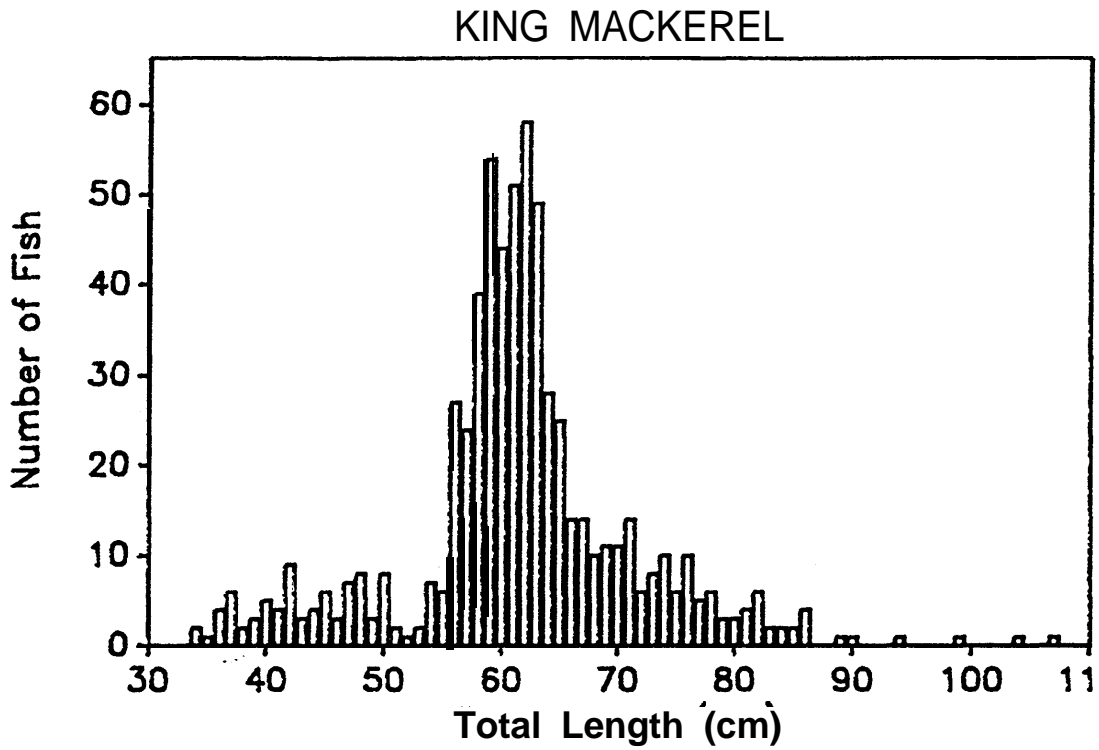


Figure 13. Length/frequency histograms for king and Spanish mackerel from Veracruz, October, 1993.

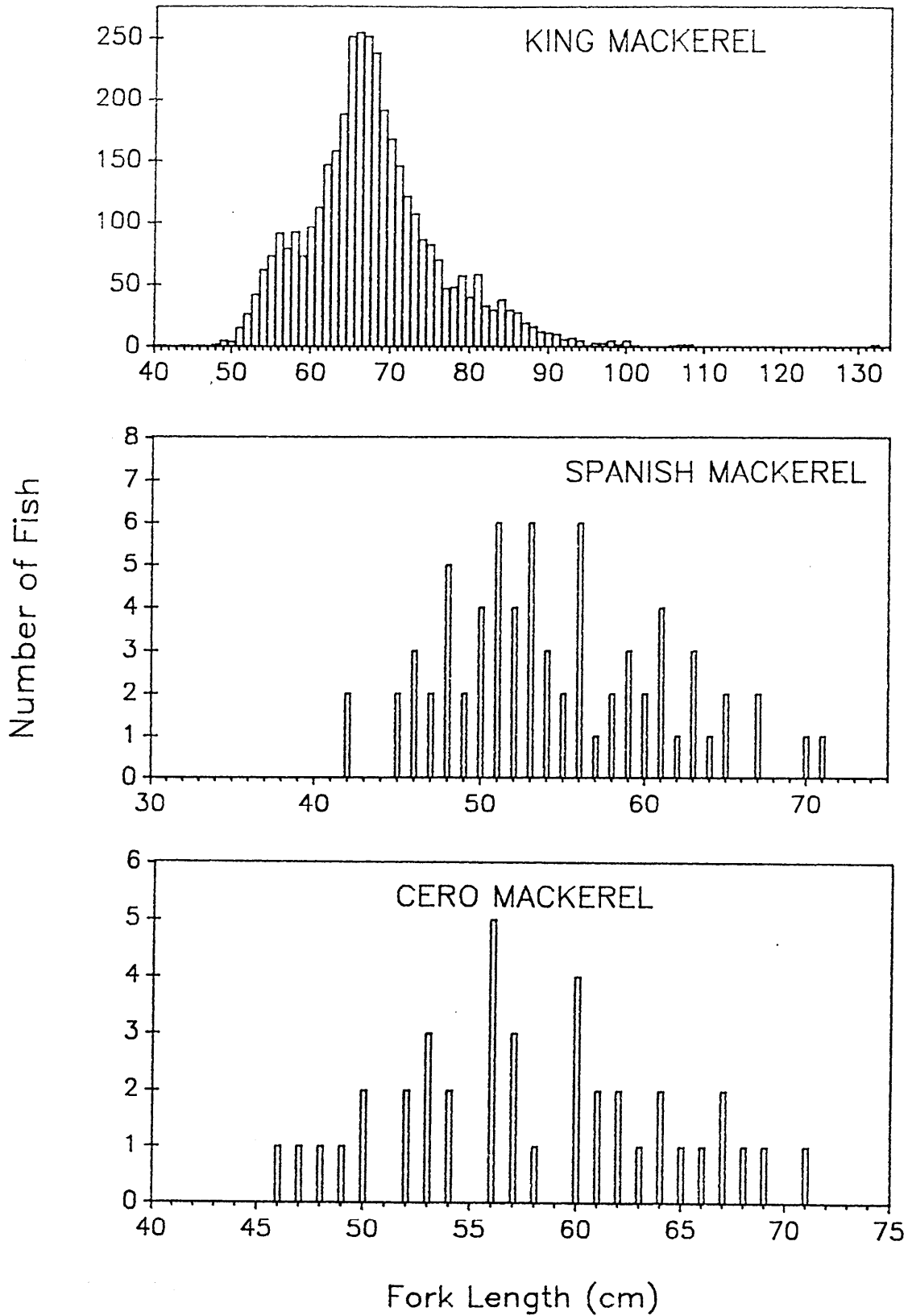


Figure 14. Length/frequency histograms for king, Spanish and cero mackerel from Yucatan, January and February, 1994.

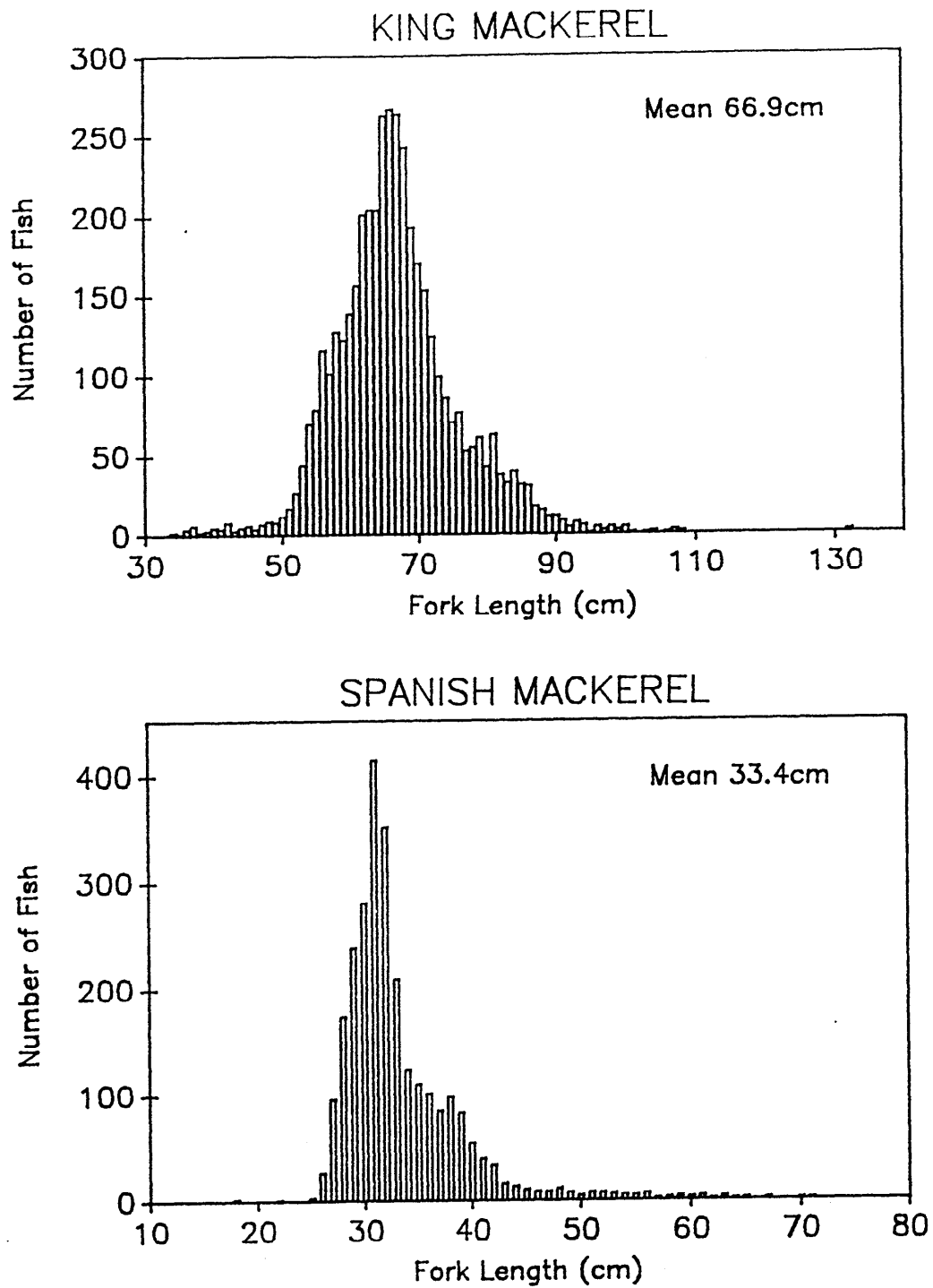


Figure 15. Compilation of king and Spanish mackerel length/frequency data from fish measured off Mexico, 1993/94.

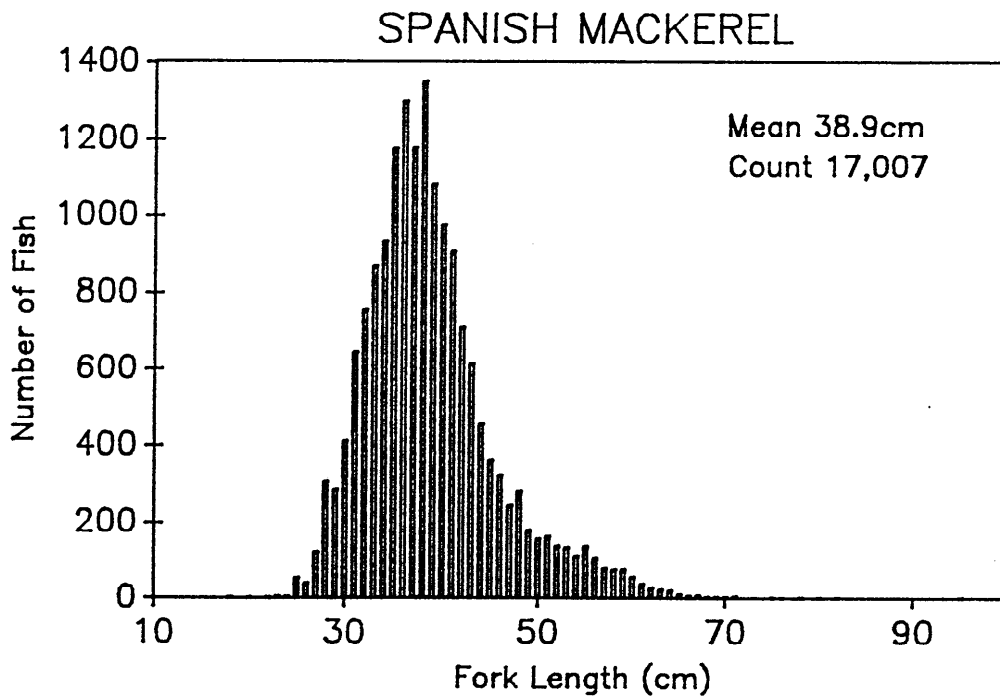
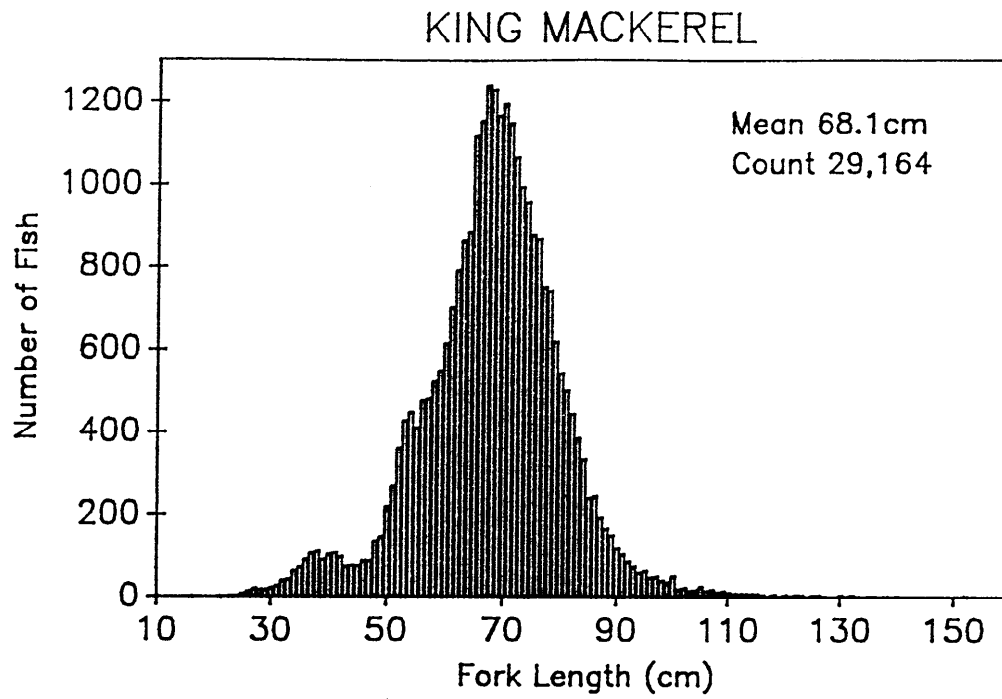


Figure 16. Compilation of king and Spanish mackerel length/frequency data from fish measured off Mexico, 1986-1994.

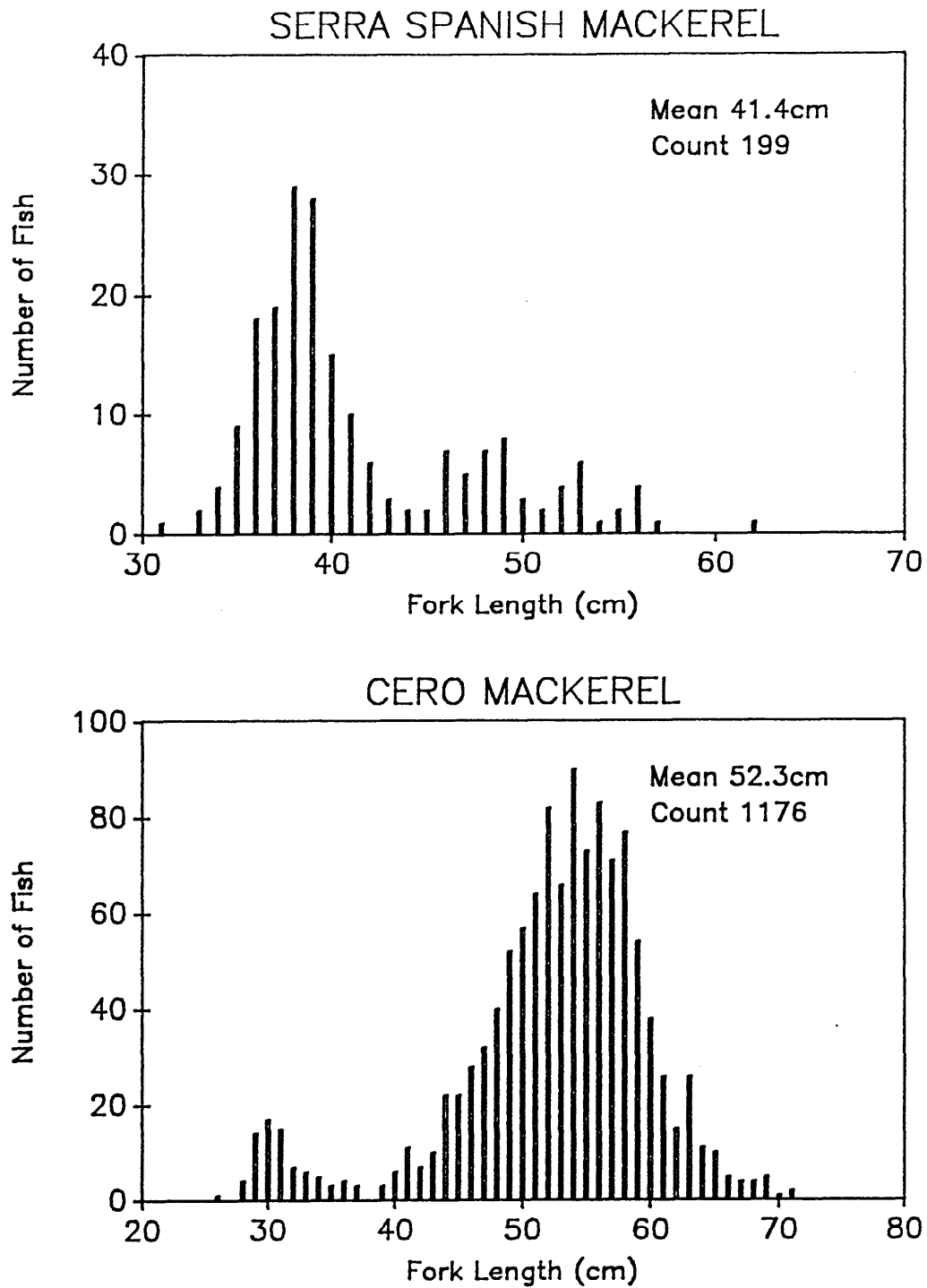


Figure 17. Compilation of length/frequency data from cero measured off Mexico, 1990-1994, and from serra Spanish mackerel measured off Mexico, 1990-1992.

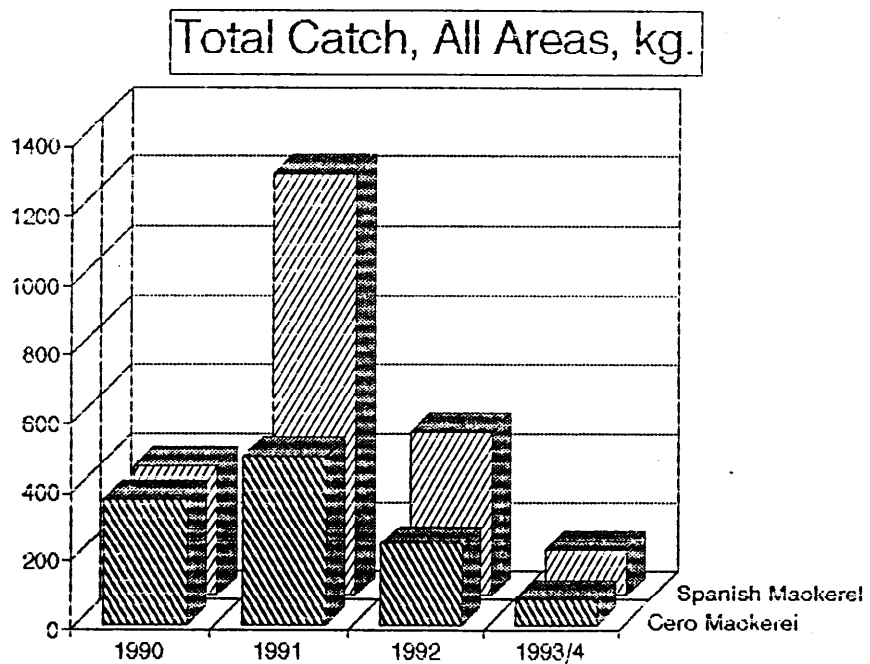
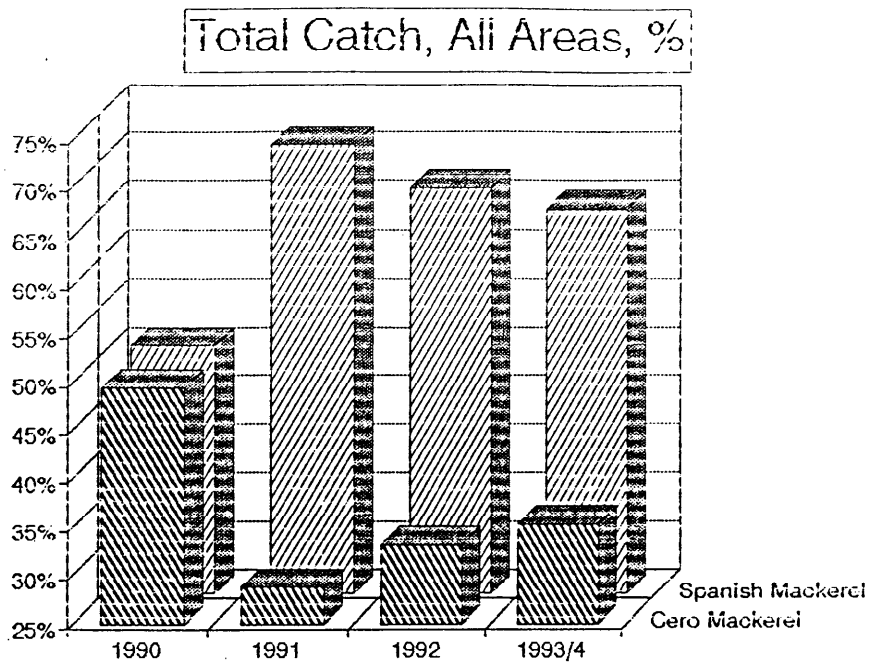
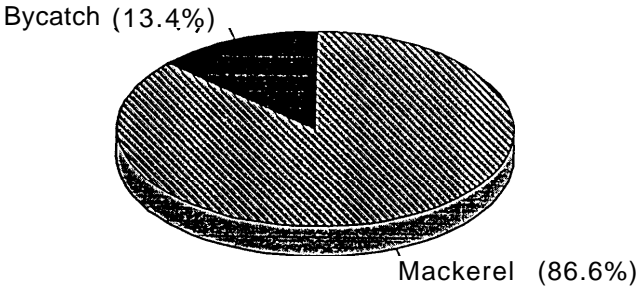


Figure 18. Percent and contribution by weight of cero and Spanish mackerel in the "Spanish mackerel catches". from fish measured off the Mexican states of Yucatán and Quintana Roo, 1990-1994.

Mackerel vs bycatch by weight Celestún, 1992



Mackerel vs bycatch by value Celestún, 1992

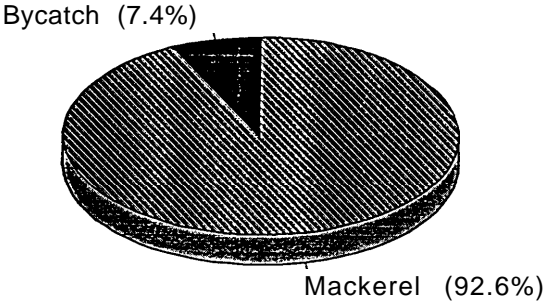
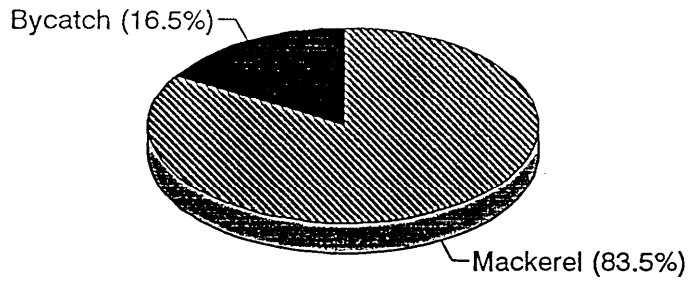


Figure 19. Percent contribution of mackerel (king, Spanish and cero) catch by weight (kg) and value (\$US) vs. bycatch, brought to the Celestún fish house during December 1992.

Mackerel vs bycatch by weight

All locations, 1993



Mackerel vs bycatch by value

All locations, 1993

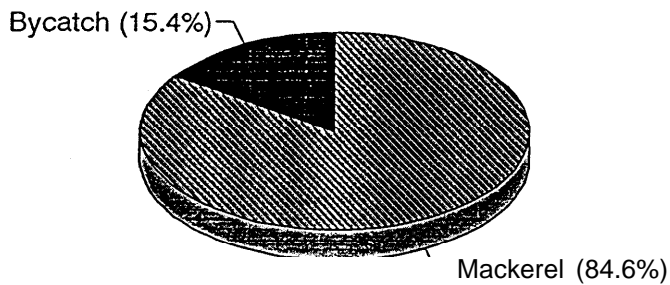
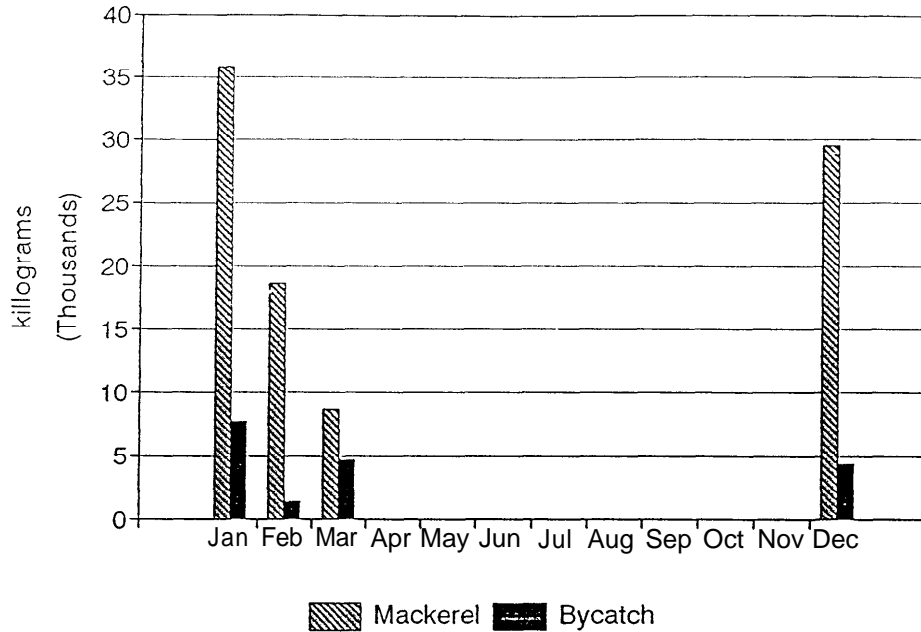


Figure 20. Percent contribution of mackerel (king, Spanish and cero) catch by weight (kg) and value (\$US) vs. bycatch, landed at all six fishing villages during the 1993 mackerel run. Data do not include fish trucked to Mérida.

Monthly catch by weight All locations, 1993



Monthly catch by value All locations, 1993

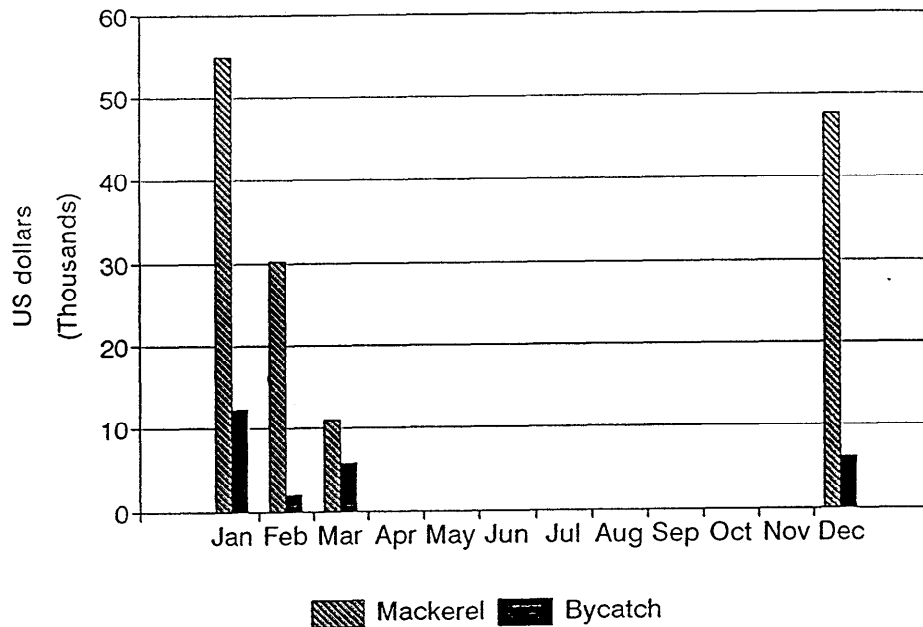
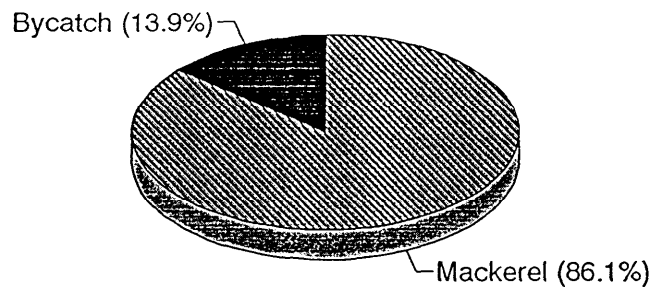


Figure 21. Monthly breakdown of mackerel (king, Spanish and cero) catch vs. bycatch by weight (kg) and value (\$US), landed at all six fishing villages during the 1993 mackerel run. Data do not include fish trucked to Mérida.

Mackerel vs bycatch by weight Celestún, 1993



Mackerel vs bycatch by value Celestún, 1993

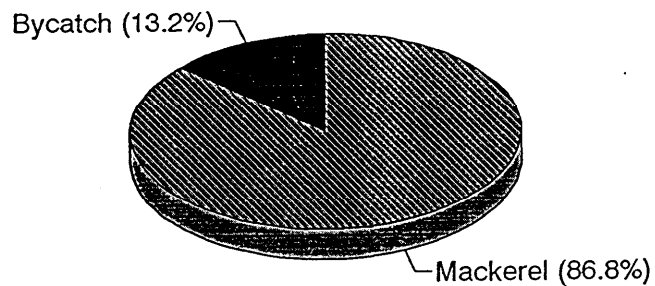
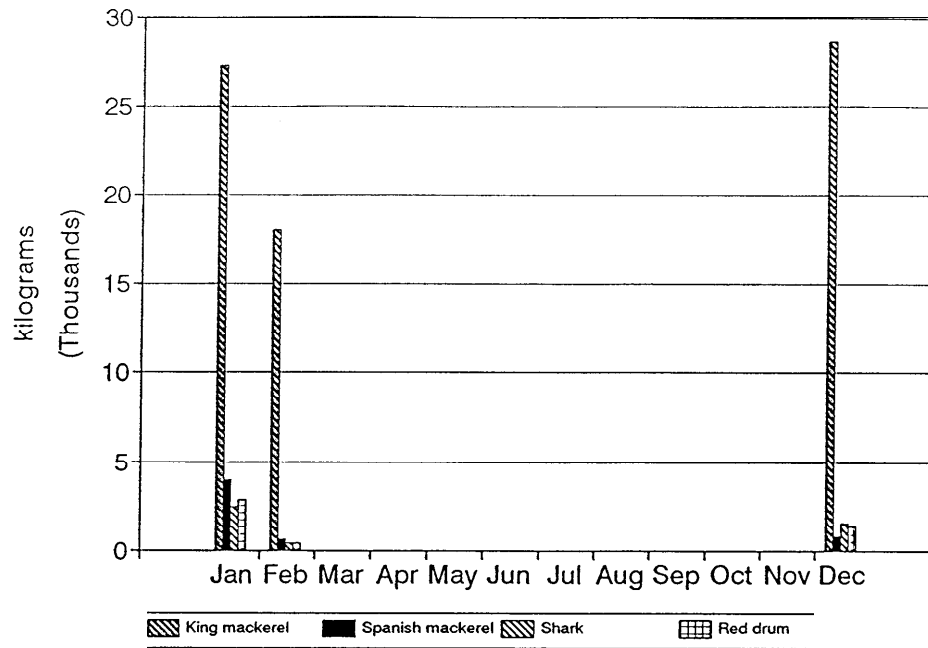


Figure 22. Percent contribution of mackerel (king, Spanish and cero) catch by weight (kg) and value (\$US) vs. bycatch, landed at the Celestún fish house during the mackerel run of 1993. Data do not include fish trucked to Mérida.

Monthly catch by weight Celestún, 1993



Monthly catch by value Celestún, 1993

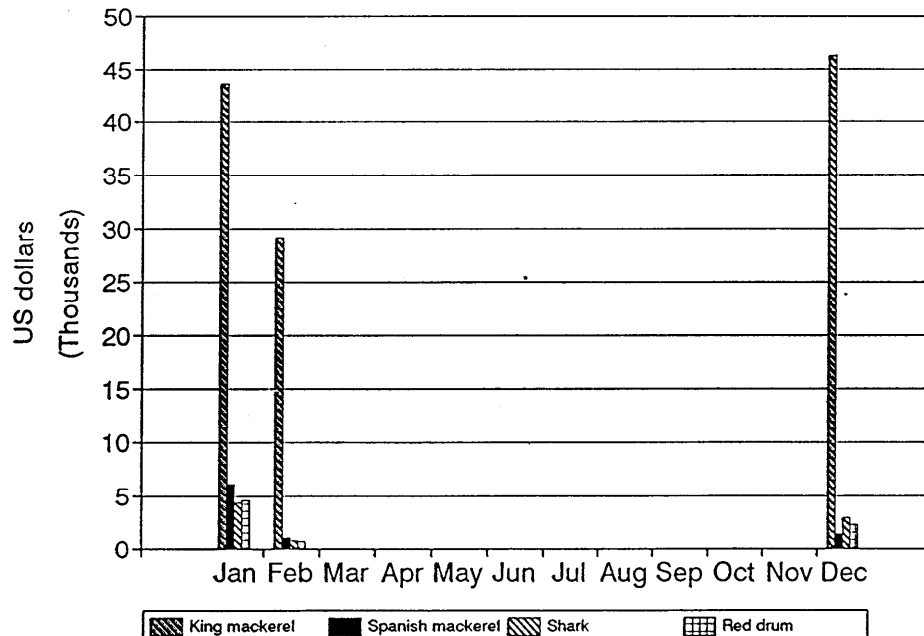
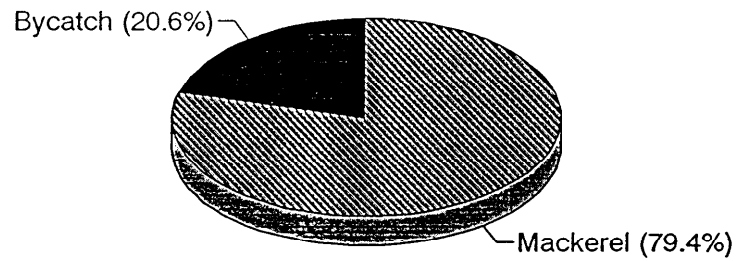


Figure 23. Monthly breakdown of mackerel catch vs. highest ranked bycatch by weight (kg) and value (\$US), landed at Celestún during the 1993 mackerel run. Spanish mackerel include both Spanish mackerel and cero. Data do not include fish trucked to Mérida.

Mackerel vs bycatch by weight Coloradas, 1993



Mackerel vs bycatch by value Coloradas, 1993

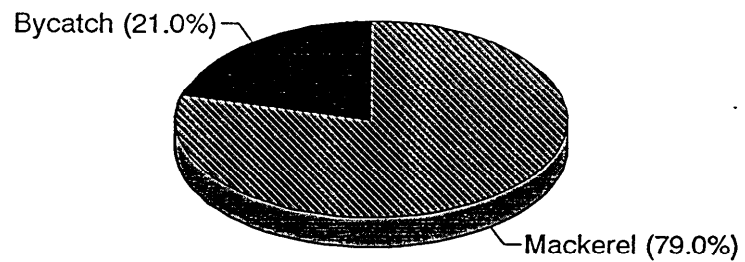
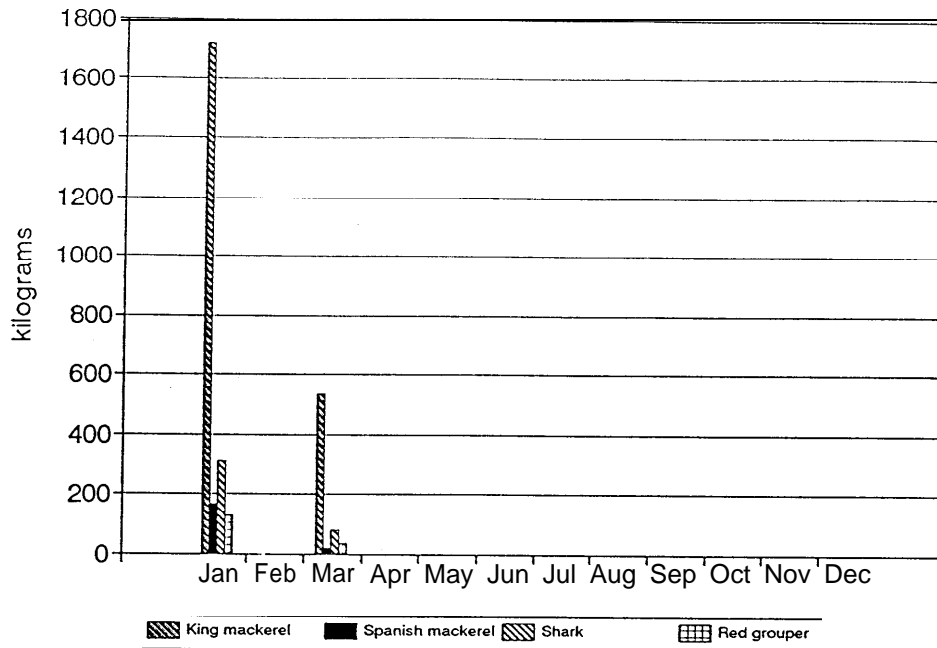


Figure 24. Percent contribution of mackerel (king, Spanish and cero) catch by weight (kg) and value (\$US) vs. bycatch landed at Coloradas during the 1993 mackerel run. Data do not include fish trucked to Mérida.

Monthly catch by weight Coloradas, 1993



Monthly catch by value Coloradas, 1993

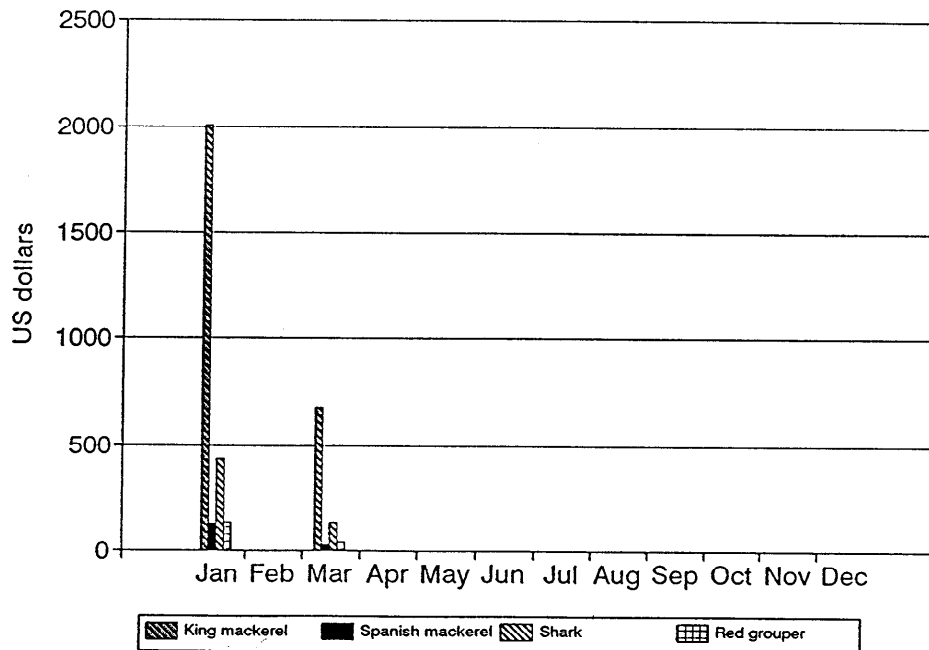
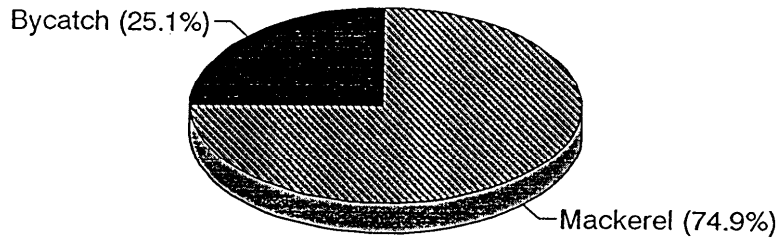


Figure 25. Monthly breakdown of mackerel catch vs. highest ranked bycatch by weight (kg) and value (\$US), landed at Coloradas during the 1993 mackerel run. Spanish mackerel include both Spanish mackerel and cero. Data do not include fish trucked to Mérida.

Mackerel vs bycatch by weight

Holchit, 1993



Mackerel vs bycatch by value

Holchit, 1993

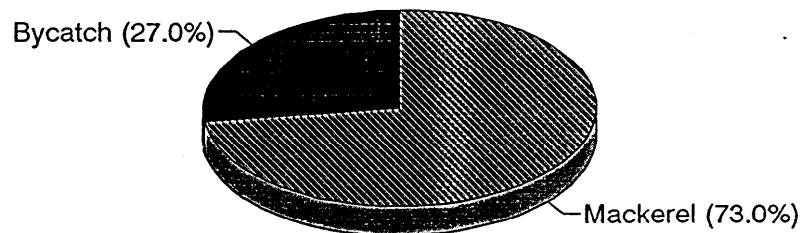
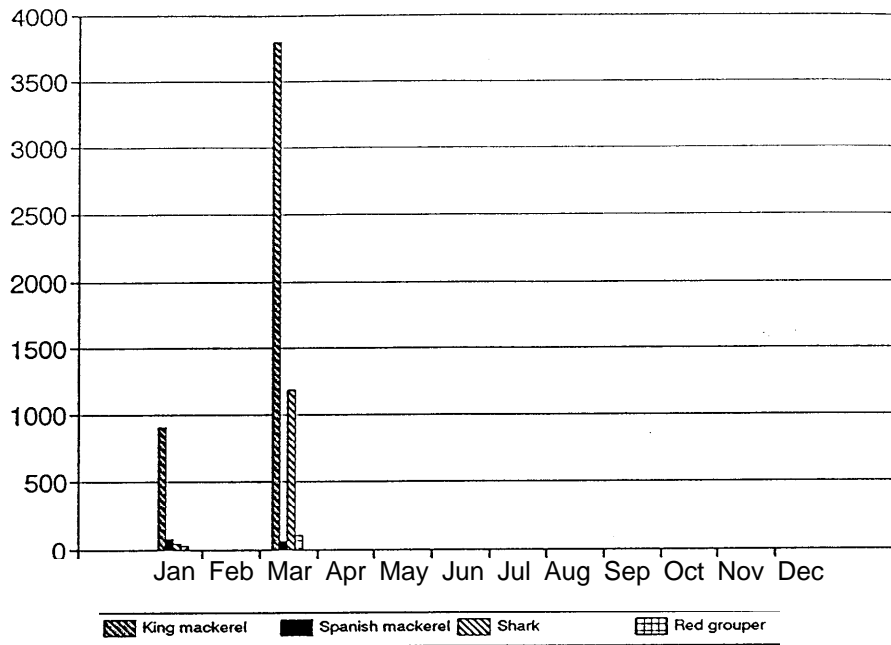


Figure 26. Percent contribution of mackerel (king, Spanish and cero) catch by weight (kg) and value (\$US) vs. bycatch caught off Holchit during the 1993 mackerel run. Data do not include fish trucked to Mérida.

Monthly catch by weight Holchit, 1993



Monthly catch by value Holchit, 1993

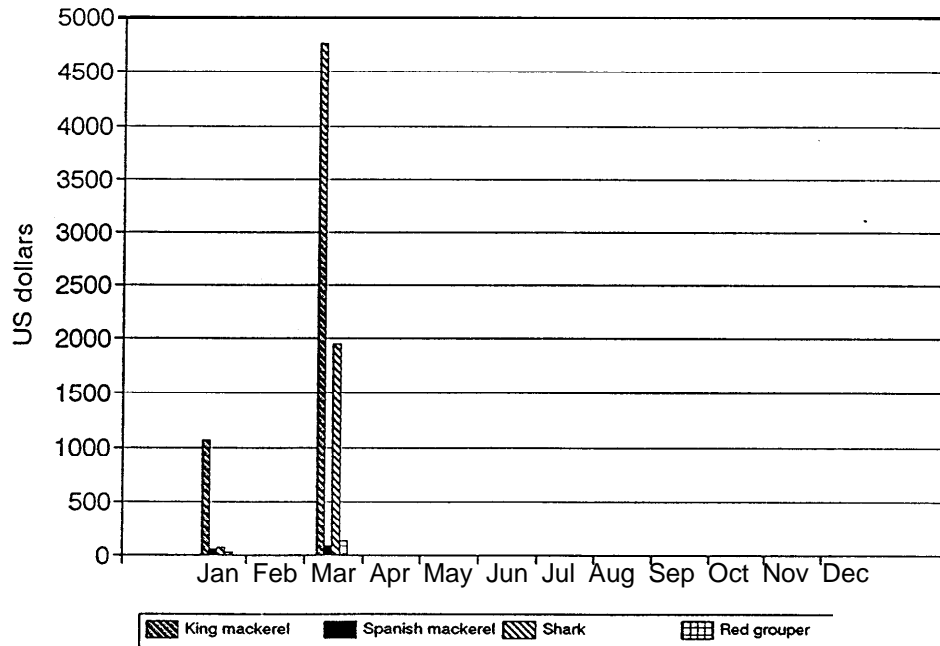
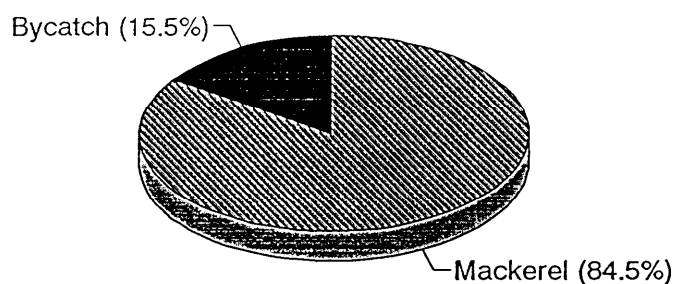


Figure 27. Monthly breakdown of mackerel catch vs. highest ranked bycatch by weight (kg) and value (\$US), landed at Holchit during the 1993 mackerel run. Spanish mackerel include both Spanish mackerel and cero. Data do not include fish trucked to Mérida.

Mackerel vs bycatch by weight

Norte, 1993



Mackerel vs bycatch by value

Norte, 1993

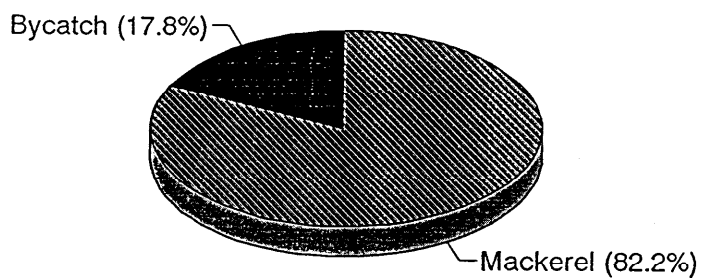
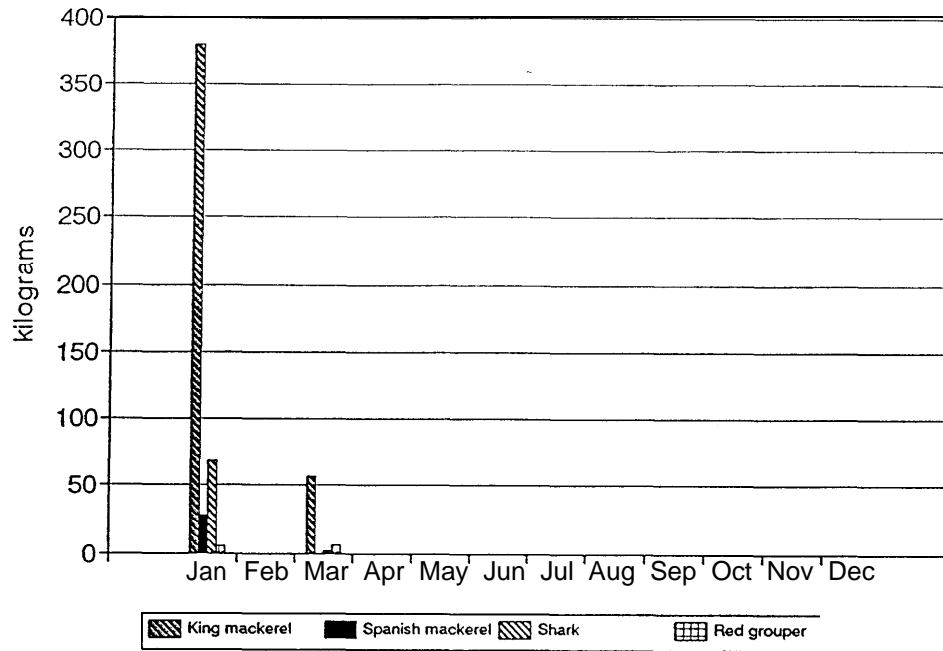


Figure 28. Percent contribution of mackerel (king, Spanish and cero) catch by weight (kg) and value (\$US) vs. bycatch landed at Norte during the 1993 mackerel run. Data do not include fish trucked to Mérida.

Monthly catch by weight Norte, 1993



Monthly catch by value Norte, 1993

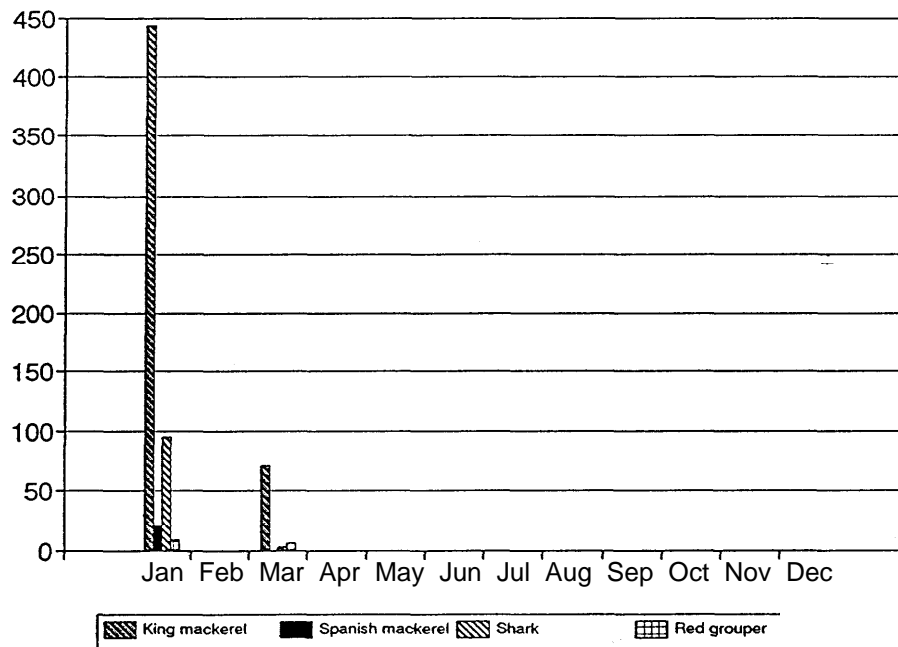
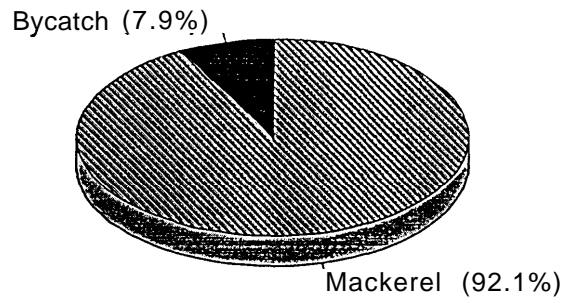


Figure 29. Monthly breakdown of mackerel catch vs. highest ranked bycatch by weight (kg) and value (\$US), landed at Norte during the 1993 mackerel run. Spanish mackerel include both Spanish mackerel and cero. Data do not include fish trucked to Mérida.

Mackerel vs bycatch by weight San Felipe, 1993



Mackerel vs bycatch by value San Felipe, 1993

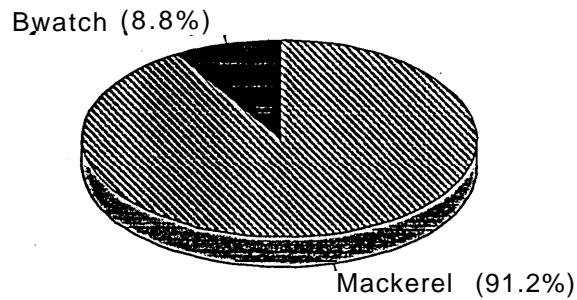
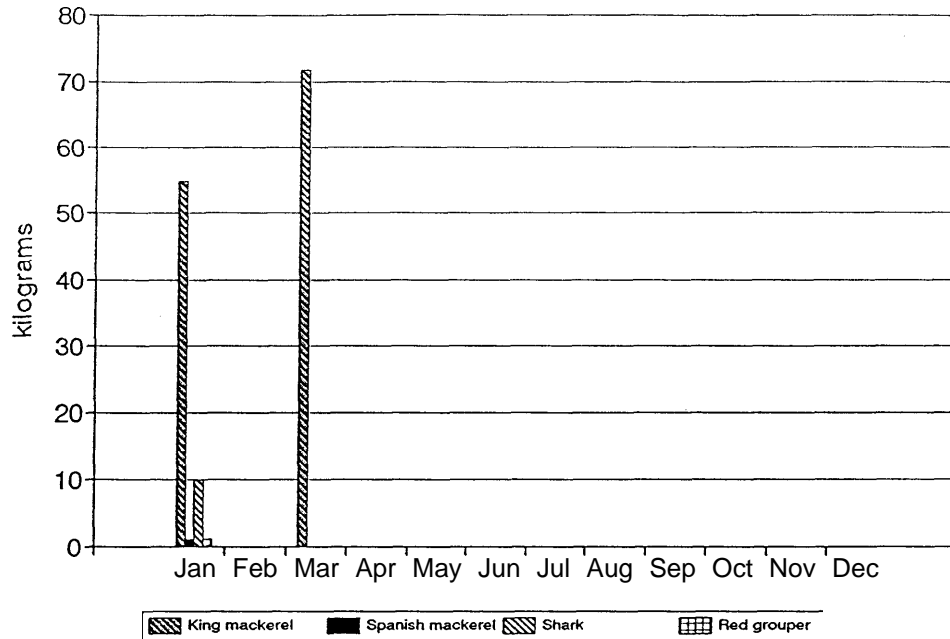


Figure 30. Percent contribution of mackerel (king, Spanish and cero) catch by weight (kg) and value (\$US) vs. bycatch landed during the mackerel run of 1993. Data do not include fish trucked to Mérida.

Monthly catch by weight San Felipe, 1993



Monthly catch by value San Felipe, 1993

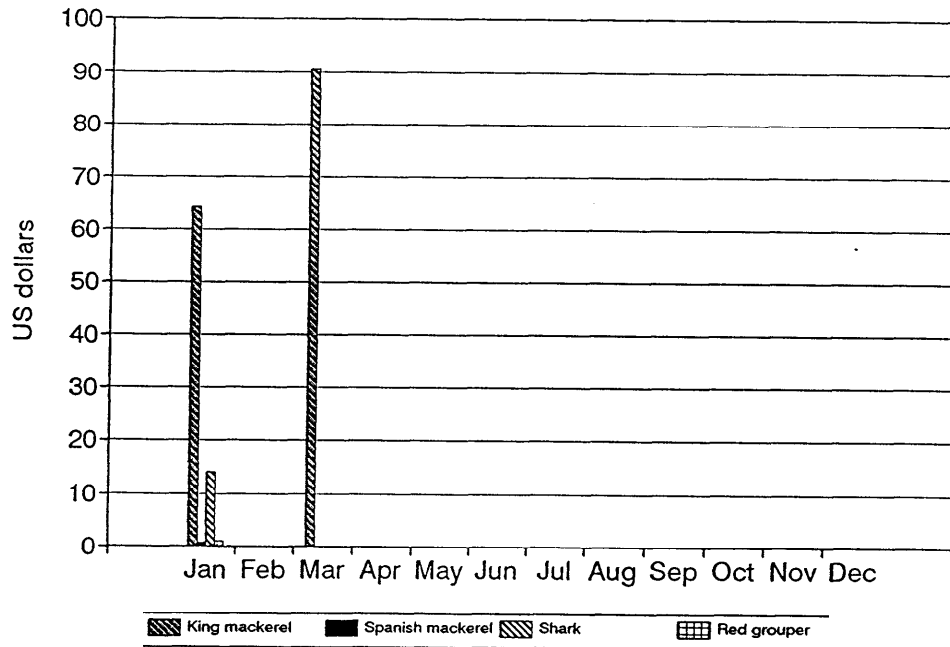
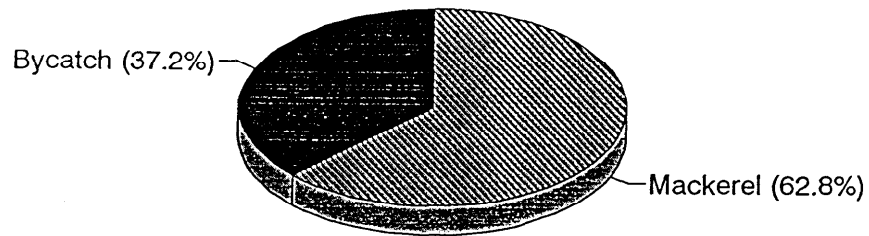


Figure 31. Monthly breakdown of mackerel catch vs. highest ranked bycatch by weight (kg) and value (\$US), landed at San Felipe during the 1993 mackerel run. Spanish mackerel include both Spanish mackerel and cero. Data do not include fish trucked to Mérida.

Mackerel vs bycatch by weight Rio Lagartos, 1993



Mackerel vs bycatch by value Rio Lagartos, 1993

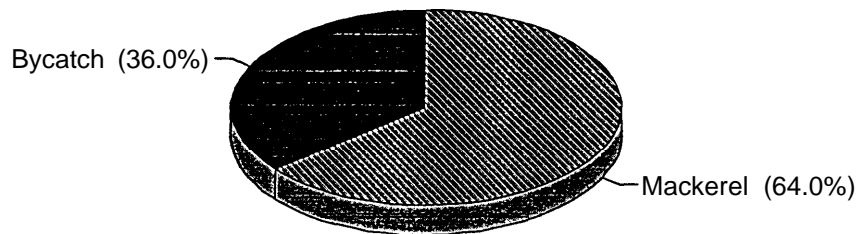
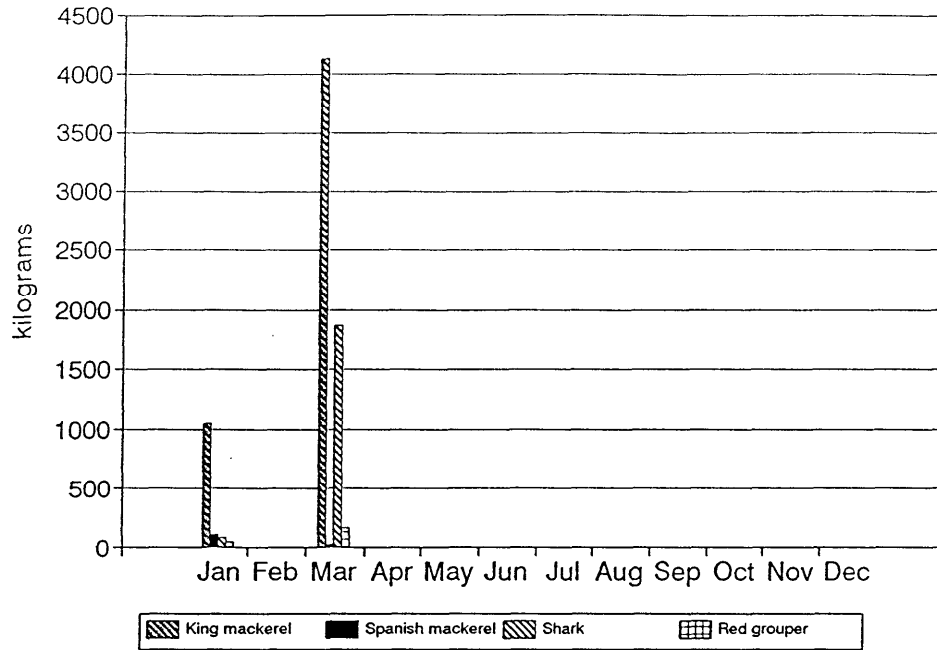


Figure 32. Percent contribution of mackerel (king, Spanish and cero) catch by weight (kg) and value (\$US) vs. bycatch landed at Rio Lagartos during the 1993 mackerel run. Data do not include fish trucked to Mérida.

Monthly catch by weight Rio Lagartos, 1993



Monthly catch by value Rio Lagartos, 1993

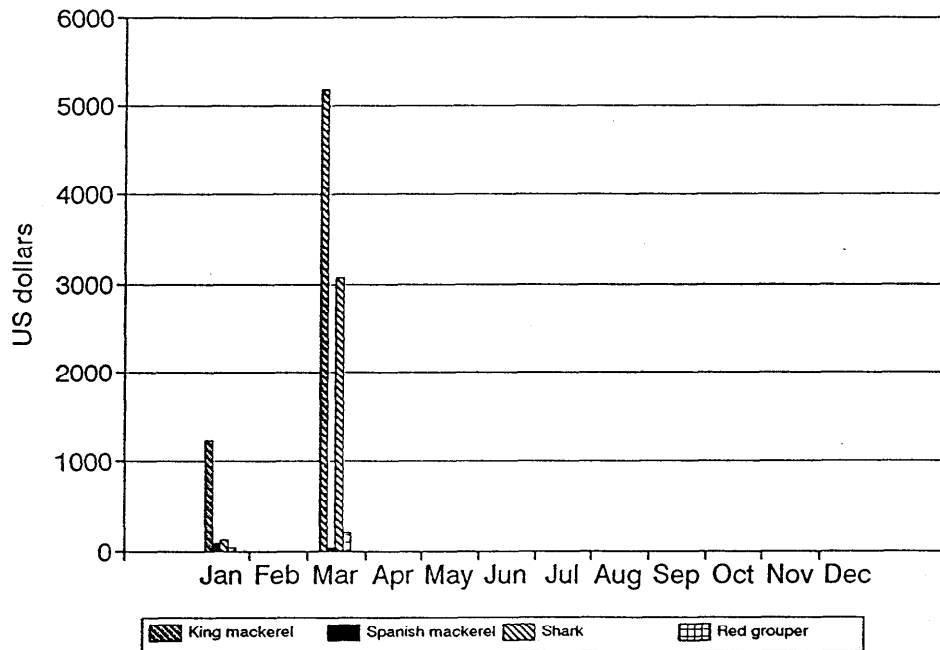
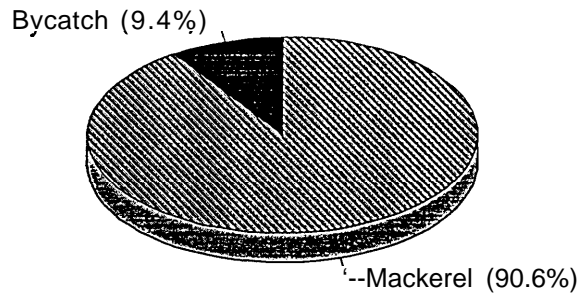


Figure 33. Monthly breakdown of mackerel catch vs. highest ranked bycatch by weight (kg) and value (BUS), landed at Rio Lagartos during the 1993 mackerel run. Spanish mackerel include both Spanish mackerel and cero. Data do not include fish trucked to Mérida.

Mackerel vs bycatch by weight Celestún, 1994



Mackerel vs bycatch by value Celestún, 1994

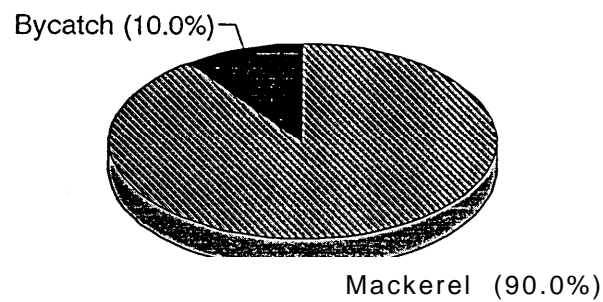


Figure 34. Percent contribution of mackerel (king, Spanish and cero) catch by weight (kg) and value (\$US) vs. bycatch brought to the Celestún fish house during January and February 1994.

Weight & value per boat-day Celestún, 1993

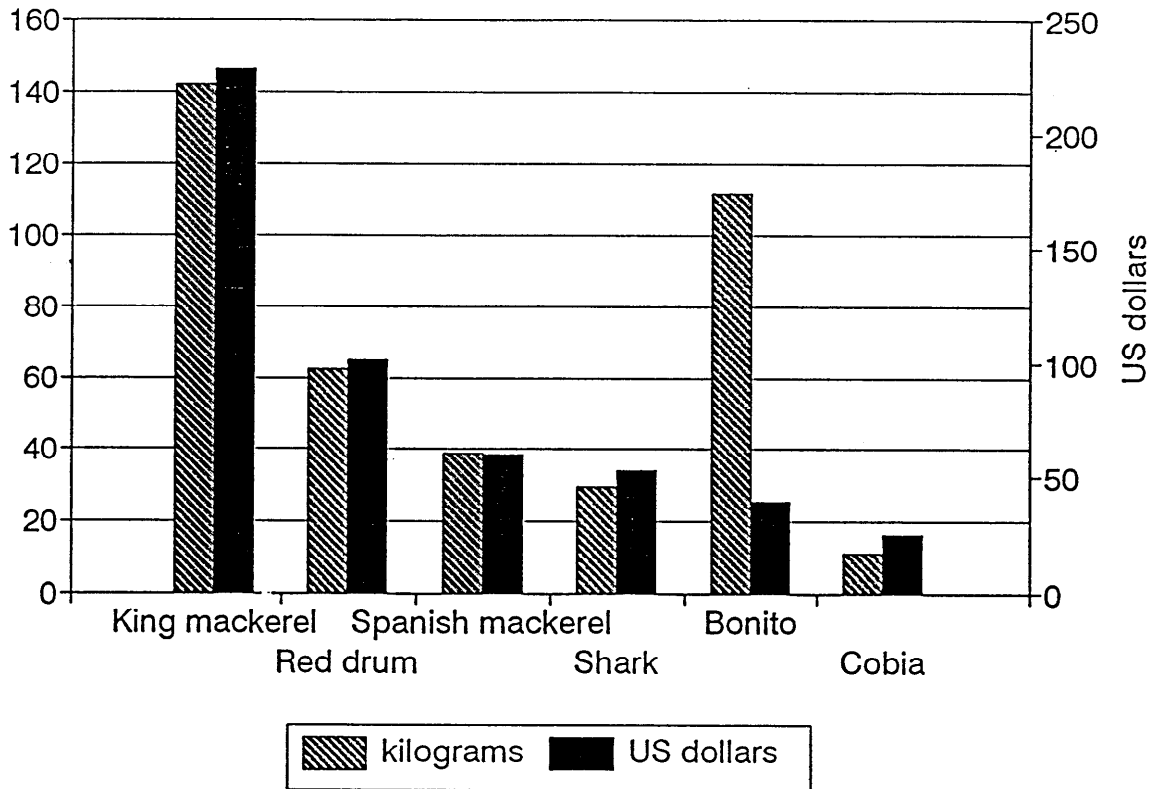


Figure 35. **Weight (kg) and value (\$US) of the mackerel vs. bycatch per boat-day during the 1993 mackerel run off Celestún. Data do not include fish trucked to Mérida. Spanish mackerel include both Spanish mackerel and cero.**

Weight & value per boat-day Coloradas, 1993

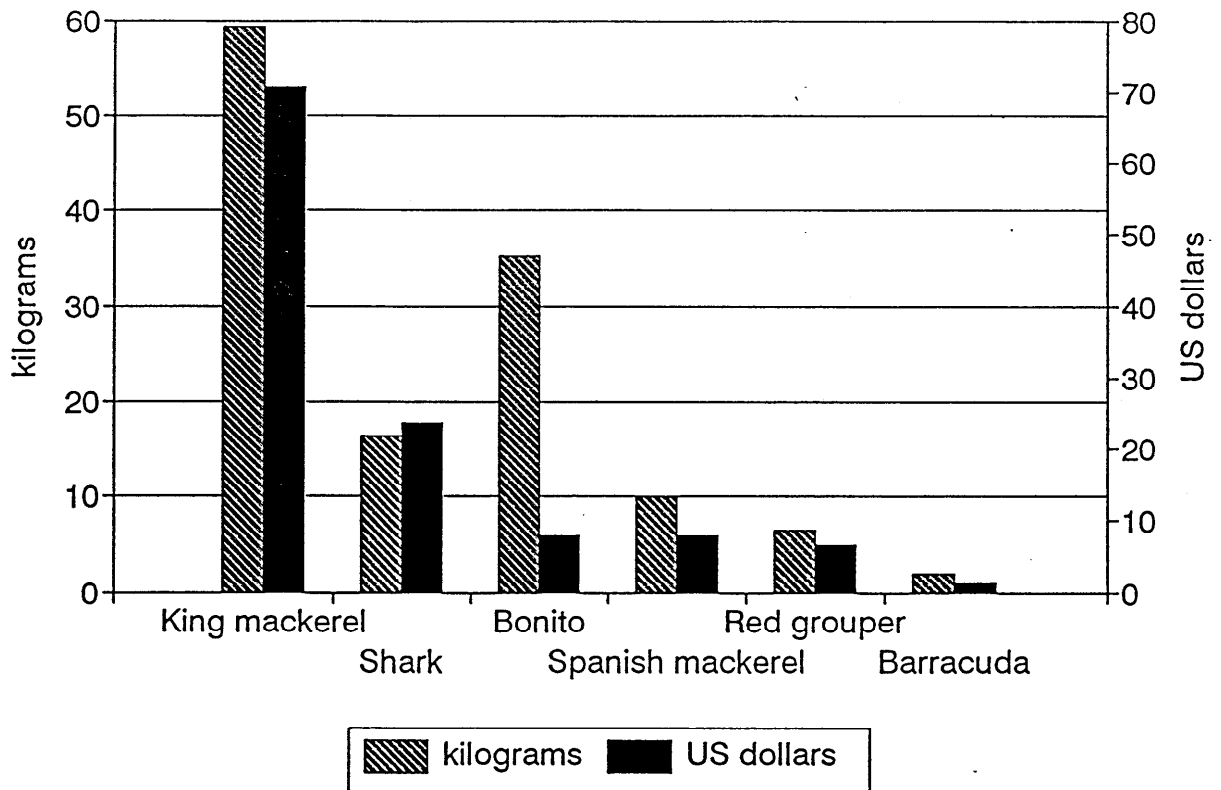


Figure 36. Weight (kg) and value (\$US) of the mackerel vs. bycatch per boat-day during the 1993 mackerel run off Coloradas. Data do not include fish trucked to Mérida. Spanish mackerel include both Spanish mackerel and cero.

Weight & value per boat-day Holchit, 1993

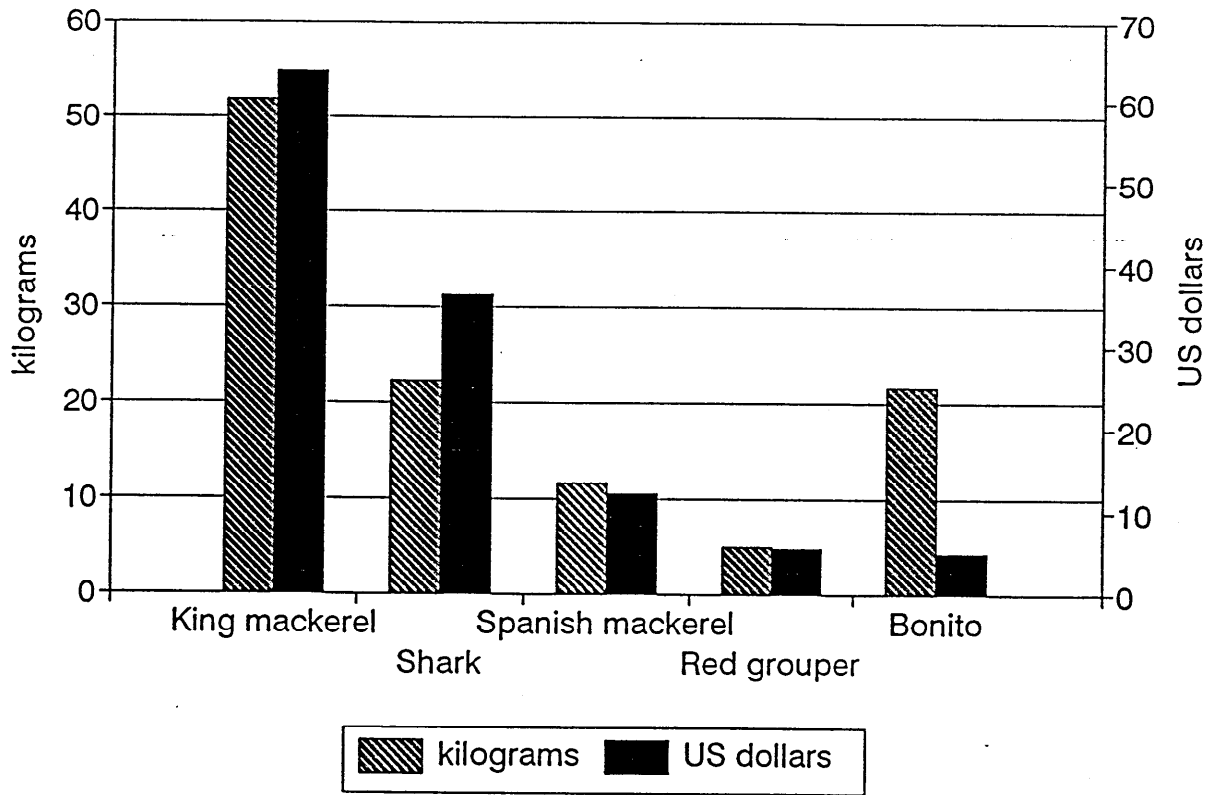


Figure 37. Weight (kg) and value (\$US) of the mackerel vs. bycatch per boat-day during the 1993 mackerel run off Holchit. Data do not include fish trucked to Mérida. Spanish mackerel include both Spanish mackerel and cero.

Weight & value per boat-day Norte, 1993

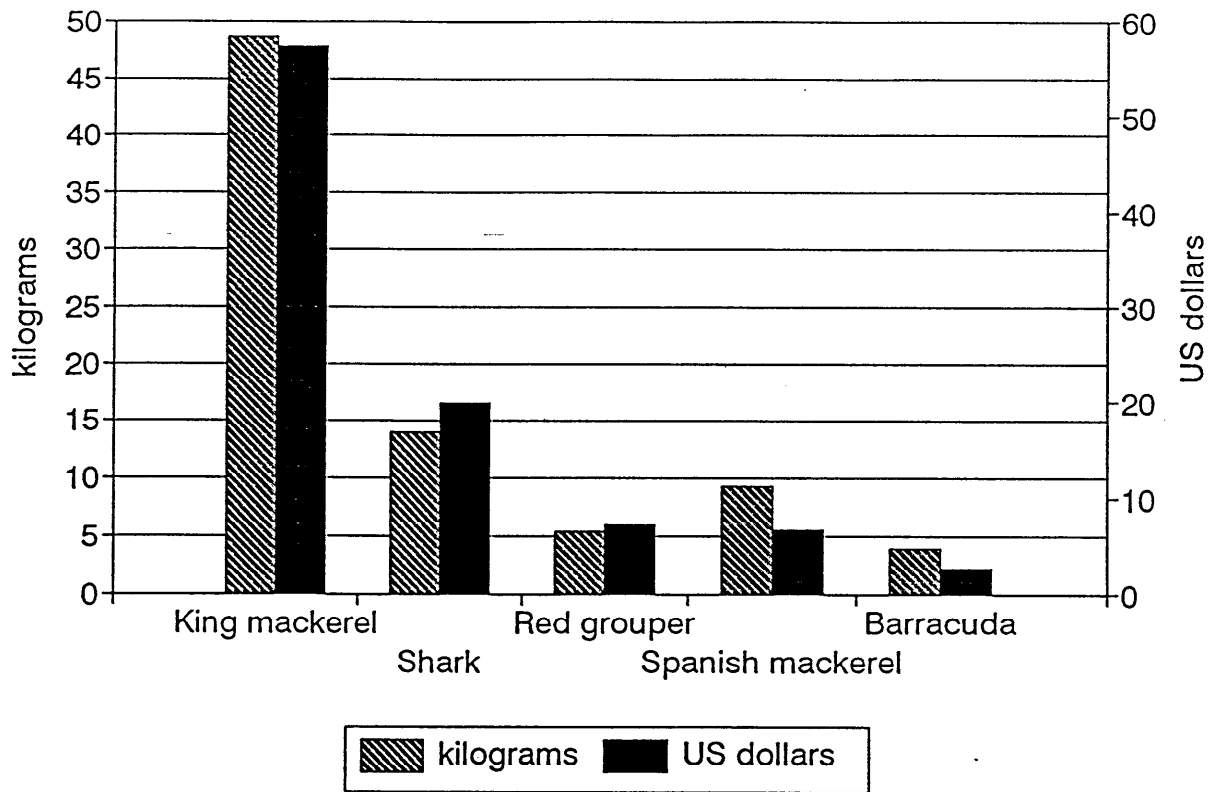


Figure 38. Weight (kg) and value (\$US) of the mackerel vs. bycatch per boat-day during the 1993 mackerel run off Norte. Data do not include fish trucked to Mérida. Spanish mackerel include both Spanish mackerel and cero.

Weight & value per boat-day San Felipe, 1993

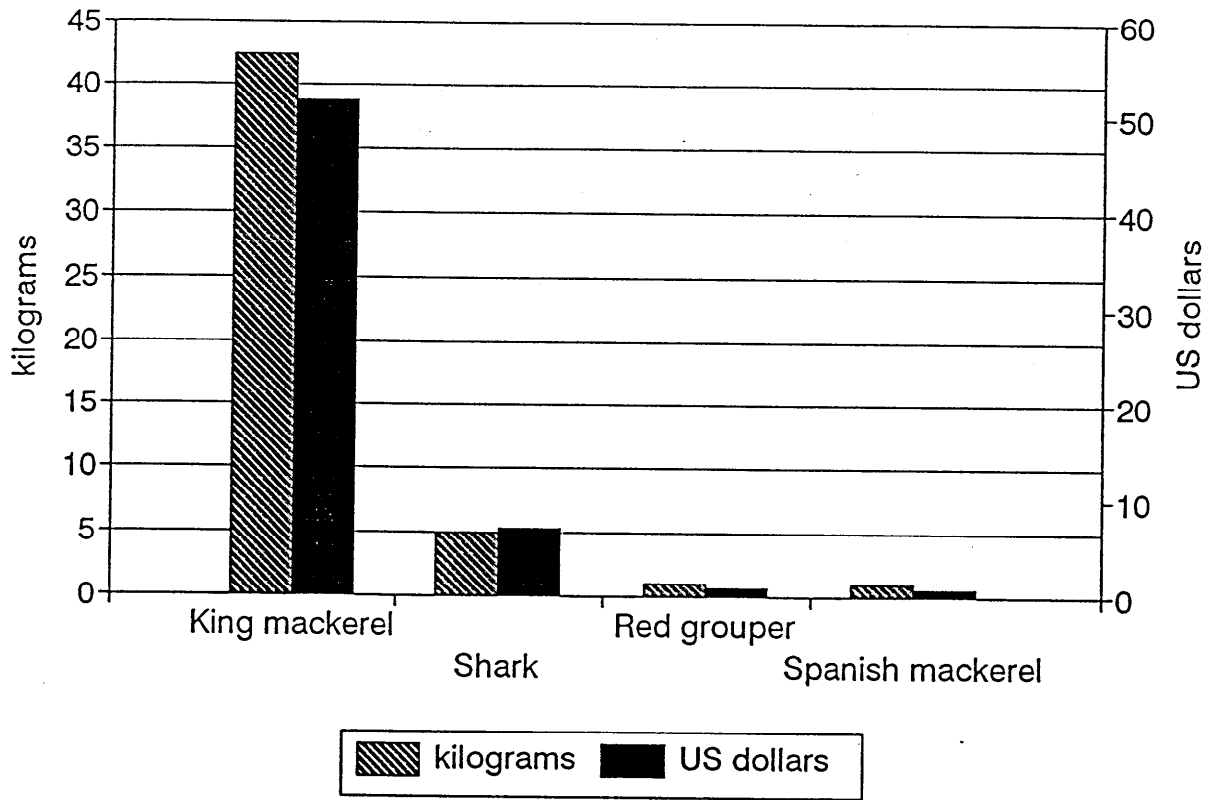


Figure 39. **Weight (kg) and value (\$US) of the mackerel vs. bycatch per boat-day during the 1993 mackerel run off San Felipe. Data do not include fish trucked to Mérida. Spanish mackerel include both Spanish mackerel and cero.**

Weight & value per boat-day Rio Lagartos, 1993

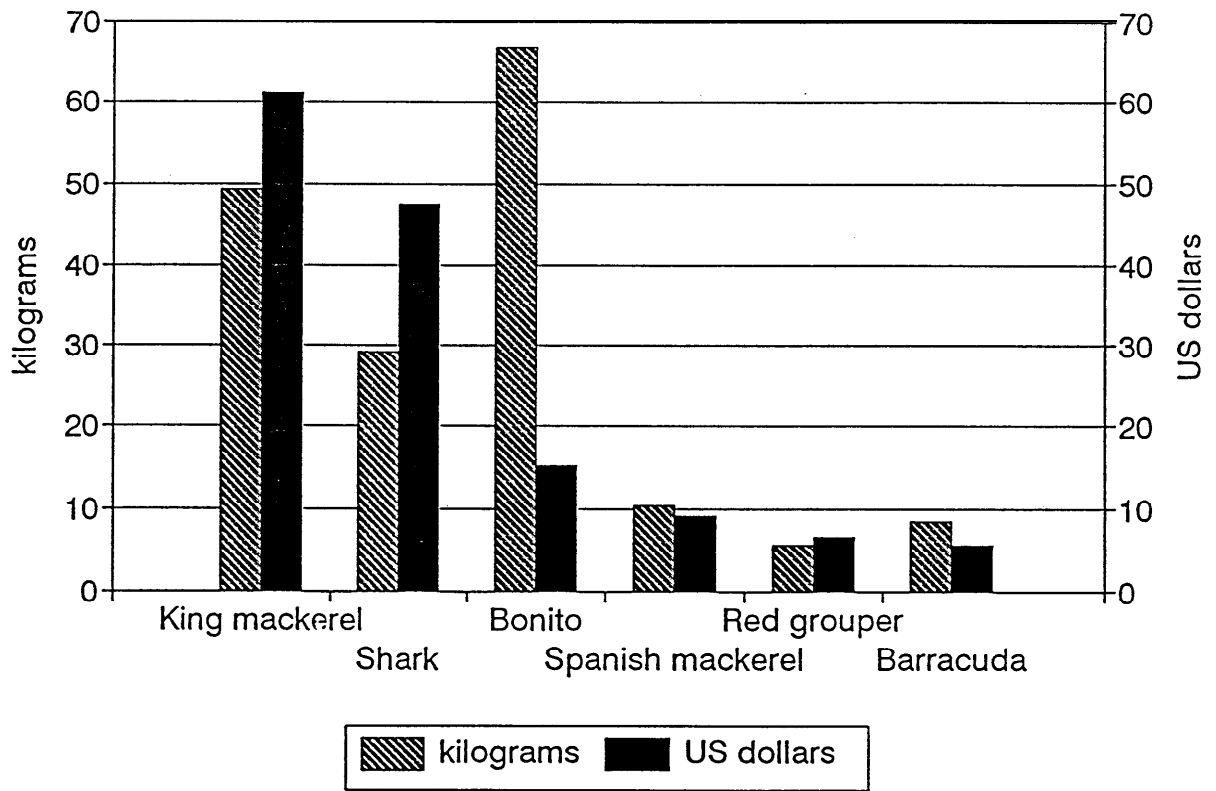


Figure 40. Weight (kg) and value (\$US) of the mackerel vs. bycatch per boat-day during the 1993 mackerel run off Rio Lagartos. Data do not include fish trucked to Mérida. Spanish mackerel include both Spanish mackerel and cero.

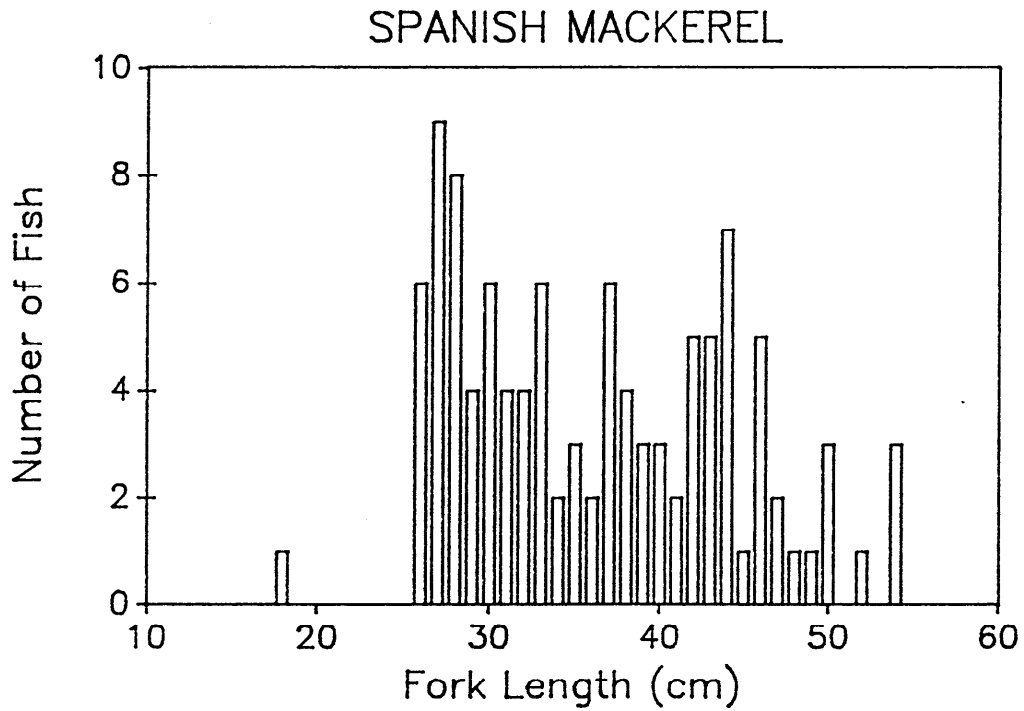
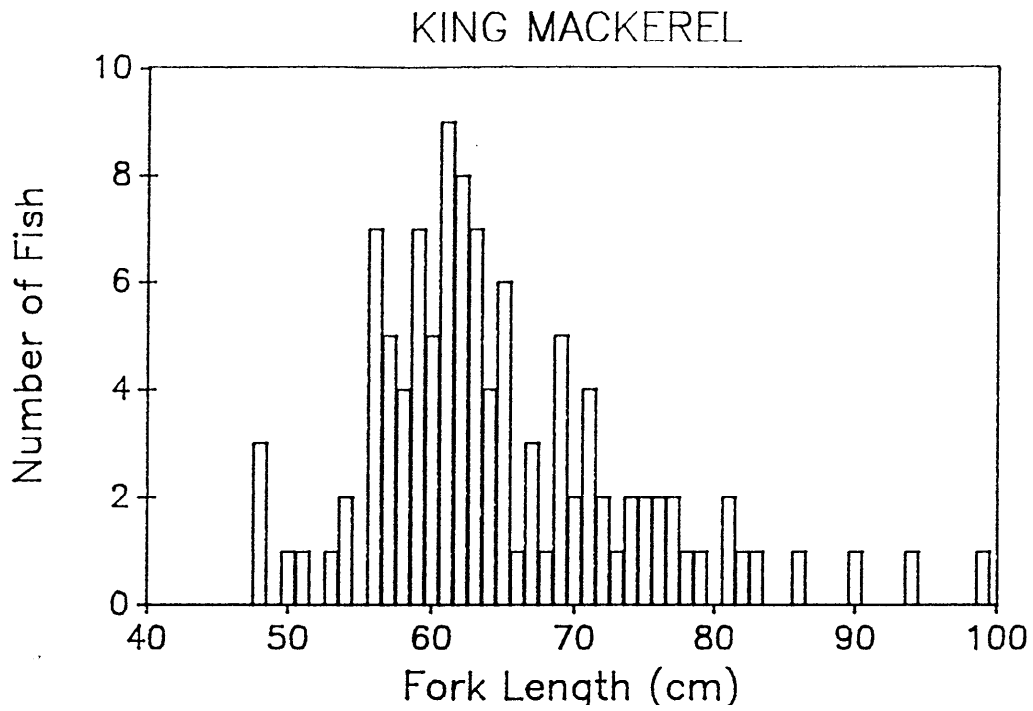


Figure 41. Length/frequency histograms for king and Spanish mackerel used in stock identity study (October 1993).

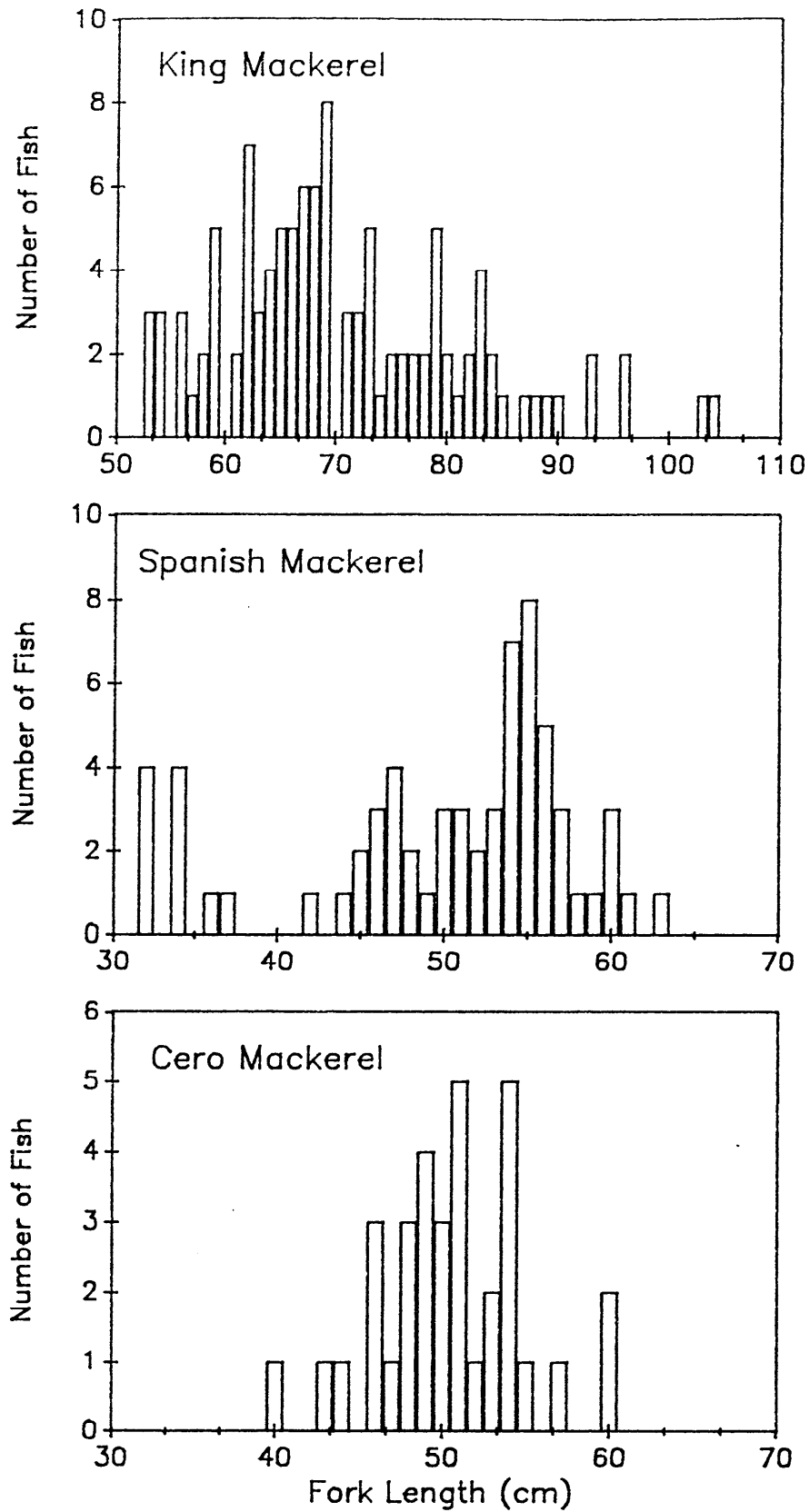


Figure 42. Length/frequency histograms for king, Spanish and cero mackerel used in stock identity study (February 1994).

Table 1. King (KM) and Spanish (SM) mackerel returns from Mexico 1986-1994.

STATE	TAG #	SP	RELEASE DATE	CAPTURE DATE	DAYS OF FREEDOM	DISTANCE (MLES)	CAPTURE AREA	SUB-AREA
FLORIDA								
	5141	KM	06-Sep-88	02-Aug-91	1060	1375	VER	BOCA DEL RIO
	15286	KM	03-Sep-86	-Feb-89	"896"	1390	CAM	ISLA AGUADA
LOUISIANA								
	12099	KM	25-Jun-85	15-Feb-86	235	1340	CAM	C. CARMEN
	16383	KM	26-Sep-87	20-Apr-88	207	1140	VER	VERACRUZ
TEXAS								
	C07800	KM	26-Sep-92	07-Apr-93	259	748	VER	LAS BARRANCAS
	E46301	KM	19-Jun-90	12-Dec-90	176	740	VER	COATZACOALCOS
	E46335	KM	16-Aug-90	17-Jan-91	154	1100	CAM	SABANCUY
	E46361	KM	29-Jul-90	21-Nov-90	115	740	VER	COATZACOALCOS
	9146	KM	28-Jun-87	29-Jan-91	1311	578	VER	LA BLANQUILLE
	10729	KM	24-Jun-87	21-Oct-87	119	1200	YUC	TELCHAC
	12425	KM	29-Aug-87	09-Dec-87	102	800	VER	ALVARADO
	14003	KM	14-Jun-88	22-Mar-90	646	600	VER	TECOLUTLA
	14005	KM	14-Jun-88	01-Feb-89	232		CAM	UNK
	14016	KM	15-Aug-88	14-Sep-89	395	425	VER	TECOLUTLA
	14112	KM	20-Jul-87	25-Mar-88	249	870	CAM	SEYBAPLAYA
	14122	KM	20-Jul-87	1a-Jan-90	913	600	VER	ANTON LIZARDO
	14131	KM	23-Jul-87	26-Aug-89	765	770	VER	ANTON LIZARDO
	14479	KM	18-Aug-86	10-Feb-87	176	640	VER	VERACRUZ
	15511	KM	20-Aug-87	31-Oct-87	72	525	VER	TECOLUTLA
	15513	KM	20-Aug-87	21-May-88	275	680	VER	ALVARADO
	15972	KM	SUMMER 87	09-Apr-88			VER	ALVARADO
	15990	SM	09-Oct-87	30-Nov-87	52	500	VER	ARBOLI
	17163	KM	07-Aug-87	04-Sep-89	759	400	TAM	TAMPICO
	17273	KM	12-Aug-88	29-Dec-88	139	1020	CAM	SEYBAPLAYA
	17419	KM	03-Jul-88	07-Feb-89	219	1140	YUC	P. PALMER
	17421	KM	03-Jul-88	09-Jul-89	371	400	TAM	TAMPICO
	17435	KM	28-Jul-88	02-May-89	278	630	VER	CHACHALACUS
	17462	KM	01-Aug-88	13-Feb-89	196	600	VER	NAUTLA
TAMULIPAS								
	13723	KM	29-Apr-87	04-Feb-88	281	560	CAM	ISLA AGUADA
	13820	KM	18-May-87	06-Dec-87	202	300	VER	ALVARADO
	13856	KM	22-May-87	25-Jan-89	614	570	CAM	ISLA AGUADA
	13857	KM	22-May-87	14-Apr-89	693	160	VER	LA ANTIGUA
VERACRUZ								
	10002	KM	18-Apr-85	27-May-85	39	5	VER	BOCA DEL RIO
	10050	KM	20-Apr-85	25-May-85	35	5	VER	BOCA DEL RIO
	10071	KM	19-Apr-85	15-May-85	26	10	VER	VERACRUZ
	10085	KM	19-Apr-85	17-May-85	28	40	VER	ALVARADO
	10381	KM	02-May-85	06-May-86	369	20	VER	CHACHALACAS
	10417	KM	05-May-85	13-May-85	8	5	VER	BOCA DEL RIO
	10422	KM	05-May-85	10-Apr-86	340	5	VER	ISLA DE AMDR
	10426	KM	05-May-85	12-May-88	1103	5	VER	VERACRUZ
	10988	KM	05-May-89	12-May-89	7	40	VER	ALVARADO
	11064	KM	28-May-87	30-May-87	2	50	VER	ALVARADO
	11073	KM	29-May-87	03-Aug-87	66	15	VER	BARRANCAS

Table 1. Continued.

STATE	TAG #	SP	RELEASE DATE	CAPTURE DATE	DAYS OF FREEDOM	DISTANCE (MLES)	CAPTURE AREA	SUB-AREA
	11074	KM	29-May-87	08-Jun-87	10	0	VER	BARRANCAS
	11081	KM	29-May-87	27-Jul-87	59	15	VER	BOCA DEL RIO
	11082	KM	29-May-87	16-Jun-87	18	10	VER	ANTON LIZARDO
	11089	KM	10-May-89	02-May-90	357	15	VER	ALVARADO
	11344	KM	11-May-89	26-Nov-89	199	10	VER	ALVARADO
	11442	KM	21-May-87	02-Jun-87	12	50	VER	ALVARADO
	11444	KM	21-May-87	29-May-87	8	10	VER	ALVARADO
	11450	KM	21-May-87	18-Sep-87	120	450	YUC	TELCHAC
	11455	KM	22-May-87	30-May-87	8	0	VER	BARRANCAS
	11459	KM	22-May-87	24-Apr-93	2164	50	VER	PUNTA DELGADA
	11468	KM	22-May-87	15-Jun-87	24	0	VER	BARRANCAS
	11469	KM	22-May-87	18-Feb-88	272	450	YUC	CHUBURNA
	11472	KM	22-May-87	12-Jun-87	21	40	VER	ALVARADO
	11473	KM	22-May-87	23-Dec-87	215	450	YUC	CELESTUN
	11481	KM	21-May-87	25-May-87	4	40	VER	ALVARADO
	11493	KM	22-May-87	15-Jun-87	24	15	VER	ANBOLI
	11806	KM	16-Apr-86	30-Apr-86	14	UNK	VER	SANTIA
	11816	KM	18-Apr-86	30-Apr-87	377	15	VER	ANTON LIZARDO
	11904	KM	24-Apr-86	20-Jun-86	57	625	TEX	P. ARANSAS
	11909	KM	30-Apr-86	31-Mar-88	701	15	VER	BARRANCAS
	11912	KM	30-Apr-86	03-Mar-87	307	10	VER	ANTON LIZARDO
	11947	SM	24-Apr-86	22-May-86	28	5	VER	BOCA DEL RIO
	11977	KM	30-Apr-86	21-Jun-86	52	50	VER	ALVARADO
	11991	KM	30-Apr-86	02-Dec-86	216	450	YUC	P. PALMAR
	13018	KM	02-May-89	15-May-91	"743"	20	VER	ANTON LIZARDO
	13029	KM	02-May-89	18-Aug-89	108	10	VER	ALVARADO
	13031	KM	02-May-89	09-May-89	7	40	VER	ALVARADO
	13042	KM	29-Apr-89	28-Feb-90	305	400	CAM	CAMPECHE
	13067	KM	02-May-89	21-May-90	384	5	VER	ANTON LIZARDO
	13079	KM	02-Apr-89	15-Apr-91	"716"	20	VER	ANTON LIZARDO
	13081	KM	29-Apr-89	15-Feb-90	292	120	VER	TECOLUTLA
	13082	KM	29-Apr-89	18-Nov-89	203	10	VER	ALVARADO
	13101	KM	03-May-89	29-Jun-90	422	1	VER	LA CUELA
	13252	KM	20-May-87	20-Aug-87	92	20	VER	VERACRUZ
	13255	KM	20-May-87	09-May-90	1085	0	VER	ANTON LIZARDO
	13292	KM	12-May-87	20-May-87	8	40	VER	ALVARADO
	13313	KM	02-May-87	29-Jan-89	638	220	VER	COATZACO
	13317	KM	02-May-87	31-Aug-87	121	260	TAM	TAMPACHI CHI
	13329	KM	04-May-87	23-Dec-87	233	50	VER	ALVARADO
	13471	KM	15-May-87	16-May-87	1	40	VER	SALINAS
	13489	KM	16-May-87	16-Jun-87	31	40	VER	ALVARADO
	13508	KM	03-May-89	22-Apr-90	354	20	VER	LERDO TEJADA
	13525	KM	05-May-89	22-Apr-90	352	60	VER	COATZACOALCOS
	13531	KM	09-May-89	06-Sep-89	120	15	VER	VERACRUZ
	13540	KM	03-May-89	11-Jul-89	69	450	CAM	SEYBAPLAYA
	13545	KM	03-May-89	02-Nov-90	548	1	VER	ARBOLINO
	13562	KM	03-May-89	22-Aug-89	111	10	VER	ALVARADO
	13574	KM	08-May-89	23-May-89	15	0	VER	BARRANCAS

Table 1. Continued.

STATE	RELEASE	CAPTURE	DAYS OF	DISTANCE	CAPTURE		
TAG #	SP DATE	DATE	FREEDOM	(MLES)	AREA	SUB-AREA	
13578	KM	08-May-89	15-Jul-90	433	1	VER	CABEZOS
13598	KM	08-May-89	01-Jun-89	24	10	VER	ALVARADO
13602	KM	02-May-89	18-Aug-90	473	8	VER	SALINAS
13606	KM	02-May-89	18-Aug-89	108	40	VER	ALVARADO
13614	KM	02-May-89	03-May-89	1	0	VER	BARRANCAS
13620	KM	28-Oct-79	01-Feb-85	1923	600	YUC	PUERTO TELCHAC
13637	KM	03-May-89	05-Aug-89	94	5	VER	ANTON LIZARDO
13686	KM	09-May-89	23-Mar-90	318	60	VER	COATZACOALCOS
13700	KM	09-May-89	16-Feb-90	283	2	VER	ANTON LIZARDO
13749	KM	09-May-89	13-Jul-90	430	255	TAM	DEL RIO PANUCA
13790	KM	16-May-87	18-Jun-87	33	5	VER	BOCA DEL RIO
13955	KM	09-May-89	29-Jun-89	51	10	VER	BOCA DEL RIO
21640	SM	05-Mar-91	06-Mar-91	1	1	VER	LA SALERNA
24214	SM	23-Apr-90	07-May-90	14	1	VER	BOCA DEL RIO
24230	SM	26-Apr-90	27-Apr-90	1	1	VER	BOCA DEL RIO
24261	SM	04-May-90	14-May-90	10	15	VER	ALVARADO
24274	SM	04-Mar-91	05-Mar-91	1	13	VER	LAS BARRANCAS
24525	KM	02-May-88	19-May-88	17	40	VER	ALVARADO
24529	KM	04-May-88	06-May-88	2	40	VER	ALVARADO
24531	KM	04-May-88	22-May-88	18	40	VER	ALVARADO
24545	KM	05-May-88	07-Jun-88	33	40	VER	ALVARADO
24546	KM	05-May-88	17-May-88	12	40	VER	ALVARADO
24553	KM	06-May-88	17-May-88	11	40	VER	ALVARADO
24555	KM	06-May-88	17-May-88	11	40	VER	ALVARADO
24557	KM	06-May-88	17-May-88	11	40	VER	ALVARADO
24562	KM	06-May-88	14-May-88	8	40	VER	ALVARADO
24565	KM	06-May-88	18-May-88	12	40	VER	ALVARADO
24566	KM	06-May-88	14-May-88	8	120	VER	CASITAS
24567	KM	06-May-88	18-May-88	12	40	VER	ALVARADO
24572	KM	07-May-88	07-Jul-88	61	85	VER	COATZACOALCOS
24588	KM	17-May-88	09-Jun-88	23	40	VER	ALVARADO
24591	KM	17-May-88	02-Jun-88	16	40	VER	ALVARADO
24596	KM	17-May-88	18-May-88	1	40	VER	ALVARADO
24598	KM	18-May-88	24-Aug-88	98	3	VER	VERACRUZ
24630	KM	03-May-88	10-Jul-89	433	900	LA	CAMERON
24634	KM	03-May-88	07-Jun-88	35	40	VER	ALVARADO
24635	KM	03-May-88	17-May-88	14	40	VER	ALVARADO
24647	KM	04-May-88	19-May-88	15	40	VER	ALVARADO
24704	SM	29-Mar-90	30-Mar-90	1	1	VER	BOCA DEL RIO
24713	SM	30-Mar-90	01-Apr-90	2	1	VER	MOCAMBO
24724	SM	05-Apr-90	10-Jun-90	66	5	VER	ANTON LIZARDO
24725	SM	05-Apr-90	16-Apr-90	11	1	VER	BOCA DEL RIO
24759	KM	07-May-88	11-May-88	4	40	VER	ALVARADO
24762	KM	07-May-88	28-Jun-88	52	50	VER	LERDO TEJADA
24763	KM	07-May-88	09-Jun-88	33	10	VER	BOCA DEL RIO
24767	SM	05-Apr-90	06-Apr-90	1	1	VER	BOCA DEL RIO
24776	KM	17-May-88	28-Aug-88	103	20	VER	CARAEI
24777	KM	18-May-88	27-Mar-90	678	60	VER	COATZACOALCOS

Table 1. Continued.

STATE	TAG #	SP	RELEASE DATE	CAPTURE DATE	DAYS OF FREEDOM	DISTANCE (MLES)	CAPTURE AREA	SUB-AREA
	13578	KM	08-May-89	15-Jul-90	433	1	VER	CABEZOS
	13598	KM	08-May-89	01-Jun-89	24	10	VER	ALVARADO
	13602	KM	02-May-89	18-Aug-90	473	8	VER	SALINAS
	13606	KM	02-May-89	18-Aug-89	108	40	VER	ALVARADO
	13614	KM	02-May-89	03-May-89	1	0	VER	BARRANCAS
	13620	KM	28-Oct-79	01-Feb-85	1923	600	YUC	PUERTO TELCHAC
	13637	KM	03-May-89	05-Aug-89	94	5	VER	ANTON LIZARDO
	13686	KM	09-May-89	23-Mar-90	318	60	VER	COATZACOALCOS
	13700	KM	09-May-89	16-Feb-90	283	2	VER	ANTON LIZARDO
	13749	KM	09-May-89	13-Jul-90	430	255	TAM	DEL RIO PANUCA
	13790	KM	16-May-87	18-Jun-87	33	5	VER	BOCA DEL RIO
	13955	KM	09-May-89	29-Jun-89	51	10	VER	BOCA DEL RIO
	21640	SM	05-Mar-91	06-Mar-91	1	1	VER	LA SALERNA
	24214	SM	23-Apr-90	07-May-90	14	1	VER	BOCA DEL RIO
	24230	SM	26-Apr-90	27-Apr-90	1	1	VER	BOCA DEL RIO
	24261	SM	04-May-90	14-May-90	10	15	VER	ALVARADO
	24274	SM	04-Mar-91	05-Mar-91	1	13	VER	LAS BARRANCAS
	24525	KM	02-May-88	19-May-88	17	40	VER	ALVARADO
	24529	KM	04-May-88	06-May-88	2	40	VER	ALVARADO
	24531	KM	04-May-88	22-May-88	18	40	VER	ALVARADO
	24545	KM	05-May-88	07-Jun-88	33	40	VER	ALVARADO
	24546	KM	05-May-88	17-May-88	12	40	VER	ALVARADO
	24553	KM	06-May-88	17-May-88	11	40	VER	ALVARADO
	24555	KM	06-May-88	17-May-88	11	40	VER	ALVARADO
	24557	KM	06-May-88	17-May-88	11	40	VER	ALVARADO
	24562	KM	06-May-88	14-May-88	8	40	VER	ALVARADO
	24565	KM	06-May-88	18-May-88	12	40	VER	ALVARADO
	24566	KM	06-May-88	14-May-88	8	120	VER	CASITAS
	24567	KM	06-May-88	18-May-88	12	40	VER	ALVARADO
	24572	KM	07-May-88	07-Jul-88	61	85	VER	COATZACOALCOS
	24588	KM	17-May-88	09-Jun-88	23	40	VER	ALVARADO
	24591	KM	17-May-88	02-Jun-88	16	40	VER	ALVARADO
	24596	KM	17-May-88	18-May-88	1	40	VER	ALVARADO
	24598	KM	18-May-88	24-Aug-88	98	3	VER	VERACRUZ
	24630	KM	03-May-88	10-Jul-89	433	900	LA	CAMERON
	24634	KM	03-May-88	07-Jun-88	35	40	VER	ALVARADO
	24635	KM	03-May-88	17-May-88	14	40	VER	ALVARADO
	24647	KM	04-May-88	19-May-88	15	40	VER	ALVARADO
	24704	SM	29-Mar-90	30-Mar-90	1	1	VER	BOCA DEL RIO
	24713	SM	30-Mar-90	01-Apr-90	2	1	VER	MDCAMBO
	24724	SM	05-Apr-90	10-Jun-90	66	5	VER	ANTON LIZARDO
	24725	SM	05-Apr-90	16-Apr-90	11	1	VER	BOCA DEL RIO
	24759	KM	07-May-88	11-May-88	4	40	VER	ALVARADO
	24762	KM	07-May-88	28-Jun-88	52	50	VER	LERDO TEJADA
	24763	KM	07-May-88	09-Jun-88	33	10	VER	BOCA DEL RIO
	24767	SM	05-Apr-90	06-Apr-90	1	1	VER	BOCA DEL RIO
	24776	KM	17-May-88	28-Aug-88	103	20	VER	CARAEI
	24777	KM	18-May-88	27-Mar-90	678	60	VER	COATZACOALCOS

Table 1. Continued.

STATE	TAG #	SP	RELEASE DATE	CAPTURE DATE	DAYS OF FREEDOM	DISTANCE (MLES)	CAPTURE AREA	SUB-AREA
	24784	KM	18-May-88	02-Jul-88	45	0	VER	BARRANCAS
	24796	KM	23-May-88	10-Mar-89	291	570	YUC	CELESTUN
	24810	SM	21-Mar-90	24-Mar-90	3	7	VER	BARRANCAS
	24840	KM	17-May-88	26-May-88	9	40	VER	ALVARADO
	24845	KM	19-May-88	28-May-88	9	50	VER	ALVARADO
	24846	SM	22-Mar-90	24-Mar-90	2	1	VER	VERACRUZ
	24895	KM	05-May-88	17-May-88	12	40	VER	ALVARADO
	24903	KM	02-May-88	18-May-88	16	40	VER	ALVARADO
	24917	KM	04-May-88	06-Jun-88	33	0	VER	BARRANCAS
	24919	KM	05-May-88	25-May-88	20	40	VER	ALVARADO
	24919	SM	10-Apr-90	12-Apr-90	2	15	VER	ALVARADO
	24928	KM	06-May-88	10-Jun-88	35	5	VER	ANTON LIZARDO
	24929	KM	06-May-88	02-Jun-88	27	50	VER	ALVARADO
	24933	KM	06-May-88	22-May-88	16	10	VER	BOCA DEL RIO
	24934	KM	06-May-88	20-May-88	14	10	VER	BOCA DEL RIO
	24940	KM	06-May-88			15	VER	ANTON LIZARDO
	24947	SM	19-Apr-90	21-Apr-90	2	1	VER	VERACRUZ
	24950	KM	18-May-88	14-Apr-89	331	10	VER	ANTON LIZARDO
	24952	KM	05-May-88	17-May-88	12	0	VER	BARRANCAS
	24954	KM	05-May-88	25-May-88	20	85	VER	COATZACOALCOS
	24960	KM	05-May-88	21-May-88	16	40	VER	ALVARADO
	24967	KM	05-May-88	12-May-88	7	40	VER	ALVARADO
	24969	KM	05-May-88	16-May-88	11	40	VER	ALVARADO
	24982	KM	06-May-88	17-May-88	11	40	VER	ALVARADO
	24986	KM	06-May-88	17-May-88	11	40	VER	ALVARADO
	24996	KM	12-May-88	17-May-88	5	40	VER	ALVARADO
	25003	KM	05-May-88	21-May-88	16	40	VER	ALVARADO
	25007	KM	05-May-88	17-May-88	12	10	VER	BOCA DEL RIO
	25011	KM	05-May-88	20-Aug-89	472	50	VER	ALVARADO
	25015	KM	06-May-88	04-Jun-88	29	40	VER	ALVARADO
	25029	KM	06-May-88	07-Jun-88	32	85	VER	COATZACOALCOS
	25033	KM	06-May-88	07-Jun-88	32	40	VER	ALVARADO
	25034	KM	06-May-88	07-Jun-88	32	40	VER	ALVARADO
	25038	KM	06-May-88	17-May-88	11	40	VER	ALVARADO
	25040	KM	07-May-88	15-May-88	8	40	VER	ALVARADO
	25041	KM	08-May-88	12-May-88	4	40	VER	ALVARADO
	25044	KM	11-May-88	17-May-88	6	40	VER	ALVARADO
	25049	KM	06-May-88	14-Mar-89	312	85	VER	COATZACOALCOS
	25052	KM	11-May-88	13-Jun-88	33	5	VER	ANTON LIZARDO
	25111	KM	11-May-88	09-Jun-88	30	50	VER	ALVARADO
	25121	KM	16-May-88	03-Jun-88	1a	40	VER	ALVARADO
	25128	KM	16-May-88	07-Jun-88	22	40	VER	ALVARADO
	25129	KM	16-May-88	11-Jun-88	26	10	VER	BOCA DEL RIO
	25130	KM	16-May-88	01-Jun-88	16	40	VER	ALVARADO
	25162	KM	16-May-88	14-Aug-89	455	40	VER	ALVARADO
	25172	KM	16-May-88	13-May-89	362	30	VER	VERACRUZ
	25199	KM	17-May-88	07-Jun-88	21	40	VER	ALVARADO
	25256	KM	19-May-88	14-Nov-88	179	10	VER	ALVARADO

Table 1. Continued.

STATE	RELEASE	CAPTURE	DAYS OF	DISTANCE	CAPTURE		
TAG #	SP DATE	DATE	FREEDOM	(MLES)	AREA	SUB-AREA	
25308	KM	18-May-88	28-May-88	10	40	VER	ALVARADO
25312	KM	18-May-88	28-May-88	10	40	VER	ALVARADO
25316	KM	18-May-88	27-Jun-88	40	30	VER	PLAYA NORTE
25316	KM	18-May-88	01-Aug-90	805	30	VER	ANTIGUA
25324	KM	19-May-88	28-May-88	9	40	VER	ALVARADO
25325	KM	19-May-88	30-May-88	11	0	VER	BARRANCAS
25328	KM	19-May-88	07-Jun-88	19	40	VER	ALVARADO
25446	KM	08-May-89	23-May-89	15	40	VER	ALVARADO
25455	KM	02-May-89	18-Aug-89	108	12	VER	CHACHALACUS
25465	KM	02-May-89	11-May-89	9	30	VER	VERACRUZ
25472	KM	02-May-89	06-Aug-91	826	500	TEX	S. PADRE ISLAND
25483	KM	02-May-89	14-Jun-89	43	20	VER	VERACRUZ
25493	KM	03-May-89	17-May-89	14	40	VER	ALVARADO
25494	KM	03-May-89	30-Jan-90	272	390	CAM	SEYBAPLAYA
25496	KM	03-May-89	30-May-89	27	40	VER	ALVARADO
29711	SM	05-Mar-90	08-Mar-90	3	1	VER	BOCA DEL RIO
29713	SM	05-Mar-90	06-Mar-90	1	1	VER	BOCA DEL RIO
29718	SM	05-Mar-90	10-Mar-90	5	7	VER	BARRANCAS
29720	SM	05-Mar-90	06-Mar-90	1	5	VER	ANTON LIZARDO
29734	SM	05-Mar-90	06-Mar-90	1	1	VER	BOCA DEL RIO
29738	SM	05-Mar-90	06-Mar-90	1	1	VER	BOCA DEL RIO
29739	SM	05-Mar-90	22-Mar-90	17	5	VER	ANTON LIZARDO
29740	SM	05-Mar-90	06-Mar-90	1	1	VER	BOCA DEL RIO
29768	SM	05-Mar-90	22-Mar-90	17	550	TEX	BRAZ SANT PS
29778	SM	05-Mar-90	07-Mar-90	2	1	VER	BOCA DEL RIO
29813	SM	05-Mar-90	08-Mar-90	3	1	VER	BOCA DEL RIO
29824	SM	06-Mar-90	08-Jun-90	94	1	VER	BOCANA
29826	SM	06-Mar-90	08-Mar-90	2	1	VER	BOCA DEL RIO
29831	SM	06-Mar-90	14-Mar-90	8	5	VER	VERACRUZ
29925	SM	07-Mar-90	07-Mar-90	0	1	VER	BOCA DEL RIO
29961	SM	07-Mar-90	09-Mar-90	2	1	VER	BOCA DEL RIO
29968	SM	07-Mar-90	08-Mar-90	1	5	VER	VERACRUZ
29996	SM	07-Mar-90	08-Mar-90	1	1	VER	BOCA DEL RIO
29999	SM	07-Mar-90	09-Mar-90	2	1	VER	BOCA DEL RIO
30008	SM	07-Mar-90	08-Mar-90	1	1	VER	BOCA DEL RIO
30016	SM	07-Mar-90	09-Mar-90	2	1	VER	BOCA DEL RIO
30026	SM	08-Mar-90	09-Mar-90	1	1	VER	BOCA DEL RIO
30032	SM	08-Mar-90	08-Mar-90	0	1	VER	BOCA DEL RIO
30034	SM	08-Mar-90	10-Mar-90	2	1	VER	BOCA DEL RIO
30037	SM	08-Mar-90	10-Mar-90	2	5	VER	VERACRUZ
30038	SM	08-Mar-90	10-Mar-90	2	1	VER	BOCA DEL RIO
30062	SM	09-Mar-90	11-Mar-90	2	1	VER	BOCA DEL RIO
30068	SM	09-Mar-90	10-Mar-90	1	1	VER	BOCA DEL RIO
30071	SM	09-Mar-90	11-Mar-90	2	1	VER	BOCA DEL RIO
30076	SM	09-Mar-90	23-Mar-90	14	15	VER	ALVARADO
30088	SM	09-Mar-90	10-Mar-90	1	1	VER	BOCA DEL RIO
30107	SM	09-Mar-90	12-Mar-90	3	1	VER	BOCA DEL RIO
30110	SM	09-Mar-90	10-Mar-90	1	1	VER	BOCA DEL RIO

Table 1. Continued.

STATE	TAG #	SP	RELEASE DATE	CAPTURE DATE	DAYS OF FREEDOM	DISTANCE (MLES)	CAPTURE AREA	SUB-AREA
	30119	SM	10-Mar-90	11-Mar-90	1	1	VER	BOCA DEL RIO
	30125	SM	10-Mar-90	11-Mar-90	1	1	VER	BOCA DEL RIO
	30145	SM	10-Mar-90	11-Mar-90	1	1	VER	BOCA DEL RIO
	30147	SM	10-Mar-90	11-Mar-90	1	1	VER	BOCA DEL RIO
	30152	SM	10-Mar-90	11-Mar-90	1	1	VER	BOCA DEL RIO
	30187	SM	10-Mar-90	12-Mar-90	2	1	VER	BOCA DEL RIO
	30189	SM	10-Mar-90	11-Mar-90	1	1	VER	BOCA DEL RIO
	30211	SM	12-Mar-90	13-Mar-90	1	1	VER	BOCA DEL RIO
	30228	SM	12-Mar-90	14-Mar-90	2	15	VER	VERACRUZ
	30242	SM	13-Mar-90	14-Mar-90	1	1	VER	BOCA DEL RIO
	30252	SM	13-Mar-90	14-Mar-90	1	5	VER	ANTON LIZARDO
	30260	SM	13-Mar-90	14-Mar-90	1	1	VER	BOCA DEL RIO
	30262	SM	13-Mar-90	20-Mar-90	7	5	VER	ANTON LIZARDO
	30274	SM	13-Mar-90	14-Mar-90	1	5	VER	ANTON L IZARDO
	30278	SM	13-Mar-90	14-Mar-90	1	15	VER	ALVARADO
	30314	SM	06-Mar-91	07-Mar-91	1	1	VER	UNTA DEL MORRA
	30322	SM	06-Mar-91	11-Mar-91	5	25	VER	ALVARADO
	30328	SM	06-Mar-91	08-Mar-91	2	1	VER	BARRA
	30333	SM	06-Mar-91	10-Mar-91	4	18	VER	LAS BARRANCAS
	30336	SM	06-Mar-91	07-Mar-91	1	1	VER	BOCA DEL RIO
	30337	SM	06-Mar-91	08-Mar-91	2	1	VER	BARRA
	30338	SM	06-Mar-91	08-Mar-91	2	1	VER	BARRA
	30347	SM	06-Mar-91	08-Mar-91	2	1	VER	BARRA
	30348	SM	06-Mar-91	18-Mar-91	12	1	VER	ARBOLILLO
	30364	SM	12-Mar-91	16-Mar-91	4	1	VER	BARRA
	30383	SM	12-Mar-91	15-Mar-91	3	1	VER	QUIOSEO
	30391	SM	12-Mar-91	13-Mar-91	1	1	VER	CHACHALACAS
	30409	SM	13-Mar-91	15-Mar-91	2	1	VER	BAJOS PAJAROS
	30410	SM	13-Mar-91	15-Mar-91	2	1	VER	LOS PINOS
	30434	SM	04-Apr-91	05-Apr-91	1	1	VER	LOGENIERO
	30437	SM	04-Apr-91	05-Apr-91	1	1	VER	FRENTE ANTENO
	30441	SM	05-Apr-91	13-Apr-91	8	1	VER	LA BOCANA
	30455	SM	06-Apr-91	11-Apr-91	5	1	VER	LA SALERA
	30457	SM	06-Apr-91	07-Apr-91	1	1	VER	MANDINGA
CAMPECHE								
	24505	SM	08-Mar-88	- Dec-88	"282"	85	CAM	ISLA AGUADA
	24509	KM	08-Mar-88	23-Mar-90	745	260	YUC	PORT COLORADAS
	25230	SM	20-Mar-89	28-Apr-89	39	50	CAM	SABANCUY
	25237	SM	20-Mar-89	30-Apr-89	41	65	CAM	ISLA AGUADA
YUCATAN								
	11150	KM	07-Mar-86	25-Aug-86	171	UNK	VER	BEGA DEL TORRE
	11235	KM	03-Mar-86	08-Apr-86	36	60	YUC	EL CUYO
	24617	SM	02-Feb-88	19-Feb-88	17	10	YUC	SISAL
	24624	KM	03-Feb-88	22-Nov-90	1023	0	YUC	SISAL
	24625	SM	03-Feb-88	18-Feb-88	15	10	YUC	TELCHAC
	24626	SM	03-Feb-88	23-May-88	110	0	YUC	SISAL
	30706	SM	21-Feb-91	04-Jan-92	318	0	YUC	CELESTUN

Table 2. Tag returns from 1993/94 based on days of freedom and/or distance traveled. (KM = king mackerel, SM = Spanish mackerel, COB = Cobia, GAM = Greater Amberjack, BLL = Billfish)

<u>TAG #</u>	<u>SPECIES</u>	<u>RELEASE DATE</u>	<u>RECAPTURE DATE</u>	<u>DAYS OF FREEDOM</u>	<u>DIST. /M.</u>	<u>RECAPTURE AREA SUBAREA</u>	
11459	KM	22-May-87	24-Apr-93	2,164	50	VER	PUNTA DELGADO
C07800	KM	26-Sep-92	07-Apr-93	259	748	VER	LAS BARRANCAS
14729	COB	29-May-91	02-Apr-93	308	2,063	YUC	PROGRESO
70566	GAM	13-Jun-91	28-Aug-93	805	1,578	VER	ANTON LIZARDO
	SLF	19-Nov-90	03-May-91	160	1,845	VER	LASBARRANCAS

Table 3. Summary statistics of length/frequency data for king and Spanish mackerel measured in Veracruz, Mexico (October 1993).

	<u>NO.</u>	<u>X</u> (cm)	<u>MIN</u>	<u>MAX</u>
King mackerel	652	61.6	34	107
Spanish mackerel	2,747	32.7	18	55

Table 4. Summary statistics of length/frequency data for king, Spanish and cero mackerel measured in Yucatán, Mexico (January and February 1994).

	<u>NO.</u>	<u>X</u> (cm)	<u>MIN</u>	<u>MAX</u>
King mackerel	3,862	67.8	41	132
Spanish mackerel	70	54.5	42	71
Cero	40	58.0	46	71

Table 5. Summary statistics of length/frequency data for king and Spanish mackerel and cero from fish measured in Mexico during 1993/94.

<u>Species</u>	<u>Count</u>	<u>Minimum</u>	<u>Maximum</u>
King mackerel	4, 275	34	132
Spanish mackerel	2, 683	18	71
Cero	55	40	71

Length/frequency breakdown by state:

<u>State</u>	<u>King Mackerel</u>	<u>Spanish Mackerel</u>	<u>Cero</u>
Veracruz	597	2, 591	0
Yucatan	3, 678	92	55

Table 6. Mean length of king and Spanish mackerel, 1986-1994.

<u>KING MACKEREL</u>			<u>SPANISH MACKEREL</u>		
<u>Year</u>	<u>Count</u>	<u>Mean</u>	<u>Year</u>	<u>Count</u>	<u>Mean</u>
1986	1, 341	69. 44	1986	633	40. 4
1987	3, 688	67. 84	1987	116	42. 7
1988	5, 213	63. 90	1988	2, 088	40. 7
1989	4, 903	69. 00	1989	2, 777	39. 1
1990	876	68. 95	1990	1, 948	36. 1
1991	5, 926	70. 84	1991	3, 242	40. 8
1992	2, 703	70. 00	1992	3, 321	41. 4
1993	652	61. 55	1993	2, 747	32. 7
1994	3, 862	67. 88	1994	135	52. 3

Table 7. Spanish mackerel (SM) and cero (CM) measured from the entire available mackerel catch off the Mexican states of Yucatan and Quintana Roo from 1990-1994.

<u>YEAR</u>	<u>NO. INDIVIDUALS</u> <u>SM</u>	<u>% SM</u>	<u>NO. INDIVIDUALS</u> <u>CM</u>	<u>% CM</u>
1990	378	50. 7	368	49. 3
1991	1223	71. 3	492	28. 9
1992	476	66. 9	236	33. 1
1993	----	----	---	----
1994	135	64. 6	74	35. 4

Table 8. Summary of the catch per unit effort (CPUE) data for king and Spanish mackerel from the state of Veracruz, October 1993. *

KING MACKEREL

Number lanchas	17	
Hours	110	
Number caught	166	363.5 kg
Average lines/boat	3.35	
Average hours/boat	6.47	
Average catch	9.76 fish/lancha = 0.09 fish/line/hour	

SPANISH MACKEREL

Number lanchas	18	
Hours	65	
Number caught	872	313.1 kg
kg/hour	5.49	
Fish/hour	15.25	

* All lancha data are not complete, so simple division doesn't give these numbers (i.e., some records are not included)

Table 9. Summary of the catch per unit effort (CPUE) data for king mackerel from the state of Yucatan, January and February 1994.

KING MACKEREL

Number of lanchas	10	
Hours	80	
Number caught	243	
kg/hour	6.92	553.5 total kg
Fish/hour	3.04	
Average hours/boat	8.00	
Average catch	55.35 kg	

Table 10. Summary of the catch per unit effort (CPUE) data for two lanchas with combined king and Spanish mackerel from the state of Yucatan, January and February 1994. *

KING AND SPANISH MACKEREL

Number of lanchas	2	
Hours	16	
Number caught	30	
kg/hour	4.13	66.0 total kg
Fish/hour	1.88	
Average hours/boat	8.00	
Average catch	33.00 kg	

* These data are combined into one table because the weights of both species were combined.

Table 11. Summary of the catch per unit effort (CPUE) from three lanchas from Celestún, in the state of Yucatan, December 18, 1992.

	<u>King Mackerel</u>	<u>Spanish Mackerel</u>	<u>Total Weight (kg)</u> Spanish
Hours fished	18	18	
Number caught	33	218	
Kilograms/hour *	N/A	13.22	238
Fish/hour	1.83	12.11	
Average hours/boat	8	6	
Average catch/boat	11	72.66	

* Weight unavailable for king mackerel from one of the lanchas.

Table 12. Weight in kg of fish caught off Celestún during December 1992. (Data do not include fish trucked to Mérida).

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
King mackerel	0	0	0	0	0	0	0	0	0	0	0	16623	16623
*Spanish mackerel	0	0	0	0	0	0	0	0	0	0	0	847	847
Mackerel Total	0	0	0	0	0	0	0	0	0	0	0	17470	17470
Bonito	0	0	0	0	0	0	0	0	0	0	0	1747	1747
Shark	0	0	0	0	0	0	0	0	0	0	0	742	742
Red drum	0	0	0	0	0	0	0	0	0	0	0	202	202
Grunt	0	0	0	0	0	0	0	0	0	0	0	13	13
Red snapper	0	0	0	0	0	0	0	0	0	0	0	11	11
Bycatch Total	0	0	0	0	0	0	0	0	0	0	0	2714	2714
Overall Total	0	0	0	0	0	0	0	0	0	0	0	20183	20183

*** Spanish mackerel include both Spanish mackerel and cero.**

Table 13. Value in US dollars of fish caught off Celestún during the month of December 1992. (Value = price paid to Mexican fishermen). Data do not include fish trucked to Mérida.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
King mackerel	0	0	0	0	0	0	0	0	0	0	0	27195	27195
*Spanish mackerel	0	0	0	0	0	0	0	0	0	0	0	1386	1386
Mackerel Total	0	0	0	0	0	0	0	0	0	0	0	28580	28580
Shark	0	0	0	0	0	0	0	0	0	0	0	1500	1500
Bonito	0	0	0	0	0	0	0	0	0	0	0	400	400
Red drum	0	0	0	0	0	0	0	0	0	0	0	330	330
Red snapper	0	0	0	0	0	0	0	0	0	0	0	41	41
Grunt	0	0	0	0	0	0	0	0	0	0	0	21	21
Bycatch Total	0	0	0	0	0	0	0	0	0	0	0	2293	2293
Overall Total	0	0	0	0	0	0	0	0	0	0	0	30874	30874

* Spanish mackerel include both Spanish mackerel and cero.

Table 14. Monthly catch by weight (kg) of fish caught off Celestún, Coloradas, Holchit, Norte, San Felipe and Rio Lagartos, during the 1993 mackerel run. (Data do not include fish trucked to Mérida).

<u>Species</u>	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>	<u>Total</u>
King mackerel	31473	18036	8591	0	0	0	0	0	0	0	0	28708	86807
*Spanish mackerel	4403	652	112	0	0	0	0	0	0	0	0	837	6003
Mackerel Total	35875	18687	8703	0	0	0	0	0	0	0	0	29545	92810
Shark	2995	392	3136	0	0	0	0	0	0	0	0	1543	8065
Red drum	2824	391	0	0	0	0	0	0	0	0	0	1371	4585
Bonito	389	292	1132	0	0	0	0	0	0	0	0	979	2792
Red grouper.	273	70	308	0	0	0	0	0	0	0	0	53	704
Grunt	497	95	0	0	0	0	0	0	0	0	0	98	690
Crevalle jack	240	70	36	0	0	0	0	0	0	0	0	0	346
Pompano	231	25	0	0	0	0	0	0	0	0	0	18	273
Barracuda	45	21	72	0	0	0	0	0	0	0	0	118	255
Cobia	101	13	0	0	0	0	0	0	0	0	0	54	168
Snook	81	4	0	0	0	0	0	0	0	0	0	60	144
Millet	18	49	0	0	0	0	0	0	0	0	0	17	84
Lane snapper	2	27	0	0	0	0	0	0	0	0	0	21	49
Butterfish	0	18	0	0	0	0	0	0	0	0	0	31	49
Blue runner	0	0	39	0	0	0	0	0	0	0	0	0	39
White grunt	6	0	24	0	0	0	0	0	0	0	0	0	29
Tripletail	20	0	0	0	0	0	0	0	0	0	0	0	20
Black drum	6	0	0	0	0	0	0	0	0	0	0	0	6
Stone crab claws	5	0	0	0	0	0	0	0	0	0	0	0	5
Anchovy	4	0	0	0	0	0	0	0	0	0	0	0	4
Anberjack	0	0	3	0	0	0	0	0	0	0	0	0	3
Mbjarra	3	0	0	0	0	0	0	0	0	0	0	0	3
Shrimp	0	2	0	0	0	0	0	0	0	0	0	0	2
Red snapper	2	0	0	0	0	0	0	0	0	0	0	0	2
Bycatch Total	7738	1466	4748	0	0	0	0	0	0	0	0	4361	18313
Overall Total	43613	20153	13450	0	0	0	0	0	0	0	0	33906	111122

* Spanish mackerel include both Spanish mackerel and cero.

Table 15. Value in US dollars of fish landed at Celestún, Coloradas, Holchit, Norte, San Felipe and Rio Lagartos during the mackerel run of 1993. (Value = price paid to Mexican fishermen). Data do not include fish trucked to Mérida.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
King mackerel	48469	29166	10786	0	0	0	0	0	0	0	0	46282	134703
*Spanish mackerel	6373	1066	159	0	0	0	0	0	0	0	0	1369	8968
Mackerel Total	54842	30232	10945	0	0	0	0	0	0	0	0	47652	143671
Shark	5119	763	5140	0	0	0	0	0	0	0	0	2939	13962
Red drum	4590	636	0	0	0	0	0	0	0	0	0	2243	7469
Grunt	812	155	0	0	0	0	0	0	0	0	0	160	1127
Red grouper	324	134	372	0	0	0	0	0	0	0	0	101	932
Pompano	756	81	0	0	0	0	0	0	0	0	0	57	894
Bonito	89	67	256	0	0	0	0	0	0	0	0	295	706
Cobia	230	30	0	0	0	0	0	0	0	0	0	124	384
Barracuda	46	20	48	0	0	0	0	0	0	0	0	116	230
Snook	110	5	0	0	0	0	0	0	0	0	0	80	195
Crevalle jack	79	23	0	0	0	0	0	0	0	0	0	0	101
Millet	18	48	0	0	0	0	0	0	0	0	0	17	82
Stone crab claws	47	0	0	0	0	0	0	0	0	0	0	0	47
Lane snapper	1	20	0	0	0	0	0	0	0	0	0	16	37
Butterfish	0	12	0	0	0	0	0	0	0	0	0	20	32
Tripletail	20	0	0	0	0	0	0	0	0	0	0	0	20
Shrimp	0	12	0	0	0	0	0	0	0	0	0	0	12
White grunt	1	0	5	0	0	0	0	0	0	0	0	0	7
Red snapper	6	0	0	0	0	0	0	0	0	0	0	0	6
Black drum	2	0	0	0	0	0	0	0	0	0	0	0	2
Mjarra	2	0	0	0	0	0	0	0	0	0	0	0	2
Anchovy	0	0	0	0	0	0	0	0	0	0	0	0	0
Amberjack	0	0	0	0	0	0	0	0	0	0	0	0	0
Blue runner	0	0	0	0	0	0	0	0	0	0	0	0	0
Bycatch Total	12251	2006	5821	0	0	0	0	0	0	0	0	6167	26246
Overall Total	67093	32239	16766	0	0	0	0	0	0	0	0	53819	169917

* Spanish mackerel include both Spanish mackerel and cero.

Table 16. Weight in kg of fish caught off Celestún during January and February 1994. (Data do not include fish trucked to Mérida).

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
King mackerel	41551	6756	0	0	0	0	0	0	0	0	0	0	48306
*Spanish mackerel	489	64	0	0	0	0	0	0	0	0	0	0	553
Mackerel Total	42039	6820	0	0	0	0	0	0	0	0	0	0	48859
Shark	2193	724	0	0	0	0	0	0	0	0	0	0	2917
Red drum	126	376	0	0	0	0	0	0	0	0	0	0	502
Lane snapper	100	247	0	0	0	0	0	0	0	0	0	0	347
Grunt	161	162	0	0	0	0	0	0	0	0	0	0	322
Bonito	264	0	0	0	0	0	0	0	0	0	0	0	264
Pompano	50	114	0	0	0	0	0	0	0	0	0	0	164
Cobia	117	18	0	0	0	0	0	0	0	0	0	0	134
Barracuda	109	16	0	0	0	0	0	0	0	0	0	0	125
White grunt	0	124	0	0	0	0	0	0	0	0	0	0	124
Red grouper	0	59	0	0	0	0	0	0	0	0	0	0	59
Snook	9	49	0	0	0	0	0	0	0	0	0	0	58
Conch	37	0	0	0	0	0	0	0	0	0	0	0	37
Millet	18	0	0	0	0	0	0	0	0	0	0	0	18
Filefish	0	13	0	0	0	0	0	0	0	0	0	0	13
Butterfish	3	0	0	0	0	0	0	0	0	0	0	0	3
Bycatch Total	3183	1900	0	0	0	0	0	0	0	0	0	0	5083
Overall Total	45222	8720	0	0	0	0	0	0	0	0	0	0	53942

*** Spanish mackerel include both Spanish mackerel and cero.**

Table 17. Value in US dollars of fish landed at Celestún during January and February 1994. (Value = price paid to Mexican fishermen). Data do not include fish trucked to Mérida.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
King mackerel	67977	11052	0	0	0	0	0	0	0	0	0	0	79030
*Spanish mackerel	799	105	0	0	0	0	0	0	0	0	0	0	904
Mackerel Total	68777	11157	0	0	0	0	0	0	0	0	0	0	79933
Shark	4305	1421	0	0	0	0	0	0	0	0	0	0	5727
Red drum	205	615	0	0	0	0	0	0	0	0	0	0	820
Pompano	162	373	0	0	0	0	0	0	0	0	0	0	535
Grunt	263	264	0	0	0	0	0	0	0	0	0	0	527
Lane snapper	98	234	0	0	0	0	0	0	0	0	0	0	332
Cobia	267	40	0	0	0	0	0	0	0	0	0	0	307
Conch	242	0	0	0	0	0	0	0	0	0	0	0	242
Barracuda	107	16	0	0	0	0	0	0	0	0	0	0	122
Snook	12	75	0	0	0	0	0	0	0	0	0	0	86
Red grouper	0	68	0	0	0	0	0	0	0	0	0	0	68
Bonito	60	0	0	0	0	0	0	0	0	0	0	0	60
White grunt	0	28	0	0	0	0	0	0	0	0	0	0	28
Millet	17	0	0	0	0	0	0	0	0	0	0	0	17
Filefish	0	9	0	0	0	0	0	0	0	0	0	0	9
Butterfish	2	0	0	0	0	0	0	0	0	0	0	0	2
Bycatch Total	5740	3142	0	0	0	0	0	0	0	0	0	0	8882
Overall Total	74516	14299	0	0	0	0	0	0	0	0	0	0	88815

*** Spanish mackerel include both Spanish mackerel and cero.**

Table 18. Weight (kg) vs. value (\$US) of mackerel vs. other species landed at Celestún fish house, December 1992. Data do not include fish trucked to Mérida.

Species	Kilosrams	Percent (kg)	US Dollars	Percent (\$US)
King mackerel	16622.5	95.02%	27194.72	94.94%
*Spanish mackerel	847.0	4.84%	1385.71	4.84%
Mackerel Total	17469.5	99.87%	28580.40	99.78%
Shark	741.5	4.24%	1500.23	5.24%
Bonito	1746.5	9.98%	400.19	1.40%
Red drum	202.0	1.15%	330.48	1.15%
Red snapper	10.5	0.06%	41.23	0.14%
Grunt	13.0	0.07%	21.27	0.07%
Bycatch Total	2713.5	13.44%	2293.40	7.43%
Overall Total	20183.0	100.00%	30873.80	100.00%

* Spanish mackerel include both Spanish mackerel and cero.

Table 19. Weight (kg) vs. value (\$US) of mackerel vs. other species landed at Celestún fish house during the 1993 mackerel run. Data do not include fish trucked to Mérida.

Species	Kiloqrans	Percent (kg)	US Dollars	Percent (\$US)
King mackerel	74097.0	80.19%	119105.92	80.97%
*Spanish mackerel	5497.0	5.95%	8519.89	5.79%
Mackerel Total	79594.0	86.14%	127625.81	86.76%
Shark	4406.0	4.77%	8087.58	5.50%
Red drum	4585.0	4.96%	7468.59	5.08%
Grunt	689.5	0.75%	1126.81	0.77%
Pompano	273.3	0.30%	894.25	0.61%
Bonito	1660.0	1.80%	450.56	0.31%
Cobi a	167.5	0.18%	383.65	0.26%
Red grouper	185.5	0.20%	352.89	0.24%
Snook	143.8	0.16%	195.18	0.13%
Barracuda	172.5	0.19%	175.22	0.12%
Crevall e jack	310.0	0.34%	101.43	0.07%
Millet	84.0	0.09%	82.45	0.06%
Stone crab claws	4.6	0.00%	46.66	0.03%
Lane snapper	49.0	0.05%	37.30	0.03%
Butterfish	49.0	0.05%	32.07	0.02%
Tripletail	20.0	0.02%	19.63	0.01%
Shrimp	1.7	0.00%	11.68	0.01%
Red snapper	1.5	0.00%	5.89	0.00%
Black drum	5.5	0.01%	2.16	0.00%
Bycatch Total	12808.4	13.86%	19474.00	13.24%
Overall Total	92402.4	100.00%	147099.81	100.00%

* Spanish mackerel include both Spanish mackerel and cero.

Table 20. Weight (kg) vs. value (\$US) of mackerel vs. other species landed at Coloradas during the 1993 mackerel run. Data do not include fish trucked to Mérida.

Species	Kilograms	Percent (kg)	US Dollars	Percent (\$US)
King mackerel	2254.0	73.22%	2686.81	74.82%
*Spanish mackerel	189.5	6.16%	151.15	4.21%
Mackerel Total	2443.5	79.37%	2837.96	79.03%
Shark	391.0	12.70%	567.46	15.80%
Red grouper	160.5	5.21%	165.09	4.60%
Bonito	70.5	2.29%	15.92	0.44%
White grunt	8.0	0.26%	1.81	0.05%
Mbjarra	3.0	0.10%	1.56	0.04%
Barracuda	2.0	0.06%	1.33	0.04%
Bycatch Total	635.0	20.63%	753.17	20.97%
Overall Total	3078.5	100.00%	3591.13	100.00%

* Spanish mackerel include both Spanish mackerel and cero.

Table 21. Weight (kg) vs. value (\$US) of mackerel vs. other species landed at Holchit during the 1993 mackerel run. Data do not include fish trucked to Mérida.

Species	Kilograms	Percent (kg)	US Dollars	Percent (\$US)
King mackerel	4711.5	72.76%	5824.12	71.16%
*Spanish mackerel	140.0	2.16%	147.65	1.80%
Mackerel Total	4851.5	74.93%	5971.77	72.96%
Shark	1228.5	18.97%	2003.15	24.47%
Red grouper	133.5	2.06%	151.70	1.85%
Bonito	258.5	3.99%	58.36	0.71%
Anberjack	3.0	0.05%	N/A	N/A
Bycatch Total	1623.5	25.07%	2213.21	27.04%
Overall Total	6475.0	100.00%	8184.98	100.00%

* Spanish mackerel include both Spanish mackerel and cero.

Table 22. Weight (kg) vs. value (\$US) of mackerel vs. other species landed at Norte during the 1993 mackerel run. Data do not include fish trucked to Mérida.

Species	Kilograms	Percent (kg)	US Dollars	Percent (\$US)
King mackerel	437.0	79.45%	515.50	79.08%
*Spanish mackerel	28.0	5.09%	20.34	3.12%
Mackerel Total	465.0	84.55%	535.84	82.20%
Shark	70.0	12.73%	98.73	15.15%
Red grouper	11.0	2.00%	14.62	2.24%
Barracuda	4.0	0.73%	2.67	0.41%
Bycatch Total	85.0	15.45%	116.02	17.80%
Overall Total	550.0	100.00%	651.86	100.00%

* Spanish mackerel include both Spanish mackerel and cero.

Table 23. Weight (kg) vs. value (\$US) of mackerel vs. other species landed at San Felipe during the 1993 mackerel run. Data do not include fish trucked to Mérida.

Species	Kilograms	Percent (kg)	US Dollars	Percent (\$US)
King mackerel	127.0	91.37%	154.71	90.82%
*Spanish mackerel	1.0	0.72%	0.73	0.43%
Mackerel Total	128.0	92.09%	155.44	91.25%
Shark	10.0	7.19%	14.04	8.24%
Red grouper	1.0	0.72%	0.87	0.51%
Bycatch Total	11.0	7.91%	14.91	8.75%
Overall Total	139.0	100.00%	170.35	100.00%

* Spanish mackerel include both Spanish mackerel and cero.

Table 24. **Weight (kg) vs. value (\$US) of mackerel vs. other species landed at Rio Lagartos during the 1993 mackerel run. Data do not include fish trucked to Mérida.**

Species	Kilograms	Percent (kg)	US Dollars	Percent (\$US)
King mackerel	5180.5	61.11%	6415.85	62.79%
*Spanish mackerel	147.0	1.73%	128.13	1.25%
Mackerel Total	5327.5	62.84%	6543.98	64.04%
Shark	1959.0	23.11%	3190.76	31.23%
Red grouper	212.0	2.50%	246.76	2.41%
Bonito	803.0	9.47%	181.29	1.77%
Barracuda	76.4	0.90%	50.96	0.50%
White grunt	21.0	0.25%	4.74	0.05%
Blue runner	38.5	0.45%	N/A	N/A
Crevalle jack	36.0	0.42%	N/A	N/A
Anchovy	4.0	0.05%	N/A	N/A
Bycatch Total	3149.9	37.16%	3674.51	35.96%
Overall Total	8477.4	100.00%	10218.49	100.00%

* Spanish mackerel include both Spanish mackerel and cero.

Table 25. Weight (kg) vs. value (\$US) of mackerel vs. other species landed at Celestún fish house, January and February 1994. Data do not include fish trucked to Mérida.

Species	Kilograms	Percent (kg)	US Dollars	Percent (\$US)
King mackerel	48306.0	89.55%	79029.51	88.98%
*Spanish mackerel	552.5	1.02%	903.90	1.02%
Mackerel Total	48858.5	90.58%	79933.41	90.00%
Shark	2917.0	5.41%	5726.72	6.45%
Red drum	501.5	0.93%	820.46	0.92%
Pompano	163.5	0.30%	534.98	0.60%
Grunt	322.0	0.60%	526.80	0.59%
Lane snapper	347.0	0.64%	331.79	0.37%
Cobia	134.0	0.25%	306.92	0.35%
Conch	37.0	0.07%	242.13	0.27%
Barracuda	124.5	0.23%	122.21	0.14%
Snook	57.8	0.11%	86.12	0.10%
Red grouper	58.5	0.11%	67.73	0.08%
Bonito	264.0	0.49%	60.47	0.07%
White grunt	123.5	0.23%	28.29	0.03%
Millet	17.5	0.03%	17.18	0.02%
Filefish	13.0	0.02%	8.51	0.01%
Butterfish	2.5	0.00%	1.64	0.00%
Bycatch Total	5083.3	9.42%	8881.95	10.00%
Overall Total	53941.8	100.00%	88815.36	100.00%

* Spanish mackerel include both Spanish mackerel and cero.

Table 26. Breakdown of mackerel and bycatch by weight and value of the December 1992 landings at the Celestún fish house. Data do not include fish trucked to Mérida or the catch by reef fish fishermen.

Species	Kilograms	Percent (kg)	US Dollars	Percent (\$US)
King mackerel	16622.5	95.02	27194.72	94.94
*Spanish mackerel	847.0	4.84	1385.71	4.84
Mackerel Total	17469.5	99.87%	\$28580.40	99.78%
Shark	741.5	4.24	1500.23	5.24
Bonito	1746.5	9.98	400.19	1.40
Red drum	202.0	1.15	330.48	1.15
Red snapper	10.5	0.06	41.23	0.14
Grunt	13.0	0.07	21.27	0.07
Bycatch Total	2713.5	13.44%	\$2293.40	7.43%
Overall Total	20183.0	100.00%	\$30873.80	100.00%

* Spanish mackerel include both Spanish mackerel and cero.

Table 27. Weight (kg) and value (\$US) per boat-day of the December 1992 catch from the Celestún fish house.

Species	Kilograms	Kg/Boat-day	US Dollars	US\$/Boat-day
King mackerel	\$16622.5	82.70	\$27194.72	\$135.30
*Spanish mackerel	847.0	16.94	1385.71	27.71
Mackerel total	\$17469.5		\$28580.43	
Red drum	202.0	202.00	330.48	330.48
Red snapper	10.5	10.50	41.23	41.23
Shark	741.5	13.48	1500.23	27.28
Grunt	13.0	13.00	21.27	21.27
Bonito	1746.5	56.34	400.19	12.91
Bycatch Total	\$ 2713.5		\$ 2293.40	
Overall Total	\$20183.0		\$30873.83	

* Spanish mackerel include both Spanish mackerel and cero.

Table 28. Breakdown of mackerel and bycatch by weight and value of the December 1993 landings at the Celestún fish house. Data do not include fish trucked to Mérida or the catch by reef fish fishermen.

Species	Kilograms	Percent (kg)	US Dollars	Percent (US)
King mackerel	86807.0	78.12	\$134702.91	79.28
*Spanish mackerel	6002.5	5.40	8967.89	5.28
Mackerel Total	92809.5	83.52%	\$143670.8	84.55%
Shark	8064.5	7.26	\$ 13961.71	8.22
Red drum	4585.0	4.13	7468.59	4.40
Grunt	689.5	0.62	1126.81	0.66
Red grouper	703.5	0.63	931.93	0.55
Pompano	273.3	0.25	894.25	0.53
Bonito	2792.0	2.51	706.13	0.42
Cobia	167.5	0.15	383.65	0.23
Barracuda	254.9	0.23	230.19	0.14
Snook	143.8	0.13	195.18	0.11
Crevalle jack	346.0	0.31	101.43	0.06
Millet	84.0	0.08	82.45	0.05
Stone crab claws	4.6	0.00	46.66	0.03
Lane snapper	49.0	0.04	37.30	0.02
Butterfish	49.0	0.04	32.07	0.02
Tripletail	20.0	0.02	19.63	0.01
Shrimp	1.7	0.00	11.68	0.01
White grunt	29.0	0.03	6.55	0.00
Red snapper	1.5	0.00	5.89	0.00
Black drum	5.5	0.00	2.16	0.00
Mjarra	3.0	0.00	1.56	0.00
Blue runner	38.5	0.03	N/A	N/A
Anchovy	4.0	0.00	N/A	N/A
Anberjack	3.0	0.00	N/A	N/A
Bycatch Total	18312.8	16.48%	\$ 26245.82	15.45%
Overall Total	111122.3	100.00%	\$169916.62	100.00%

* Spanish mackerel include both Spanish mackerel and cero.

Table 29. Combined catch from all six fishing villages ranked by weight (kg) and value (\$US) per boat-day during the 1993 mackerel run.

Species	Kg/Boat-day	Rank	US\$/Boat-day	Rank
King mackerel	113.05	1	\$175.39	1
Red drum	62.25	2	101.70	2
Bonito	54.55	3	14.64	7
*Spanish mackerel	31.15	4	46.43	3
Shark	26.47	5	45.09	4
Crevalle jack	14.00	6	1.64	11
Cobia	11.00	7	25.20	5
Blue runner	7.70	8		
Barracuda	7.11	9	5.32	10
Red grouper	5.55	10	6.23	9
Grunt	5.25	11	8.59	8
Pompano	5.00	12	16.36	6
White grunt	4.83	13	1.09	12
Anchovy	4.00	14		
Amberjack	3.00	15		
Mjarra	1.50	16	0.78	13

* Spanish mackerel include both Spanish mackerel and cero.

Table 30. Weight (kg) and value (\$US) per boat-day of the combined catch from all six fishing villages during the 1993 mackerel run.

Species	Kilograms	Kg/Boat-day	US Dollars	US\$/Boat-day
King mackerel	86484.5	113.05	\$ 134175.87	\$175.39
*Spanish mackerel	5794.5	31.15	8636.68	46.43
Mackerel total	92279.0		\$ 142812.55	
Red drum	622.5	62.25	\$ 1016.95	101.70
Shark	7464.0	26.47	12716.37	45.09
Cobia	11.0	11.00	25.20	25.20
Pompano	10.0	5.00	32.72	16.36
Bonito	1691.0	54.55	453.96	14.64
Grunt	10.5	5.25	17.18	8.59
Red grouper	521.5	5.55	585.91	6.23
Barracuda	85.4	7.11	63.80	5.32
Crevalle jack	56.0	14.00	6.54	1.64
White grunt	29.0	4.83	6.55	1.09
Mjarra	3.0	1.50	1.56	0.78
Blue runner	38.5	7.70		
Anchovy	4.0	4.00		
Amberjack	3.0	3.00		
Bycatch Total	10549.4		\$ 14926.74	
Overall Total	102828.4		\$157739.29	

* Spanish mackerel include both Spanish mackerel and cero.

Table 31. Breakdown of mackerel and bycatch by weight and value of the December 1994 landings at the Celestún fish house. Data do not include fish trucked to Mérida or the catch by reef fish fishermen.

1994 Species	Kilograms	Percent (kg)	US Dollars	Percent (\$US)
King mackerel	48306.0	89.55%	\$ 79029.51	88.98%
*Spanish mackerel	552.5	1.02	903.90	1.02
Mackerel Total	48858.5	90.58%	\$79933.41	90.00%
Shark	2917.0	5.41%	\$ 5726.72	6.45
Red drum	501.5	0.93	820.46	0.92
Pompano	163.5	0.30	534.98	0.60
Grunt	322.0	0.60	526.80	0.59
Lane snapper	347.0	0.64	331.79	0.37
Cobia	134.0	0.25	306.92	0.35
Conch	37.0	0.07	242.13	0.27
Barracuda	124.5	0.23	122.21	0.14
Snook	57.8	0.11	86.12	0.10
Red grouper	58.5	0.11	67.73	0.08
Bonito	264.0	0.49	60.47	0.07
White grunt	123.5	0.23	28.29	0.03
Millet	17.5	0.03	17.18	0.02
Filefish	13.0	0.02	8.51	0.01
Butterfish	2.5	0.00	1.64	0.00
Bycatch Total	5083.3	9.42%	\$ 8881.95	10.00%
Overall Total	53941.8	100.00%	\$88815.36	100.00%

* Spanish mackerel include both Spanish mackerel and cero.

Table 32. Weight (kg) and value (\$US) per boat-day of the January and February 1994 catch from the Celestún fish house.

Species	Kilograms	Kg/Boat-day	US Dollars	US\$/Boat-day
King mackerel	48091.0	132.48	\$78677.77	\$216.74
*Spanish mackerel	372.0	21.88	608.60	35.80
Mackerel total	48463.0		\$79286.37	
Shark	2668.0	33.77	\$ 5237.88	\$ 66.30
Barracuda	27.0	27.00	26.50	26.50
Bonito	64.0	64.00	14.66	14.66
Bycatch Total	2759.0		\$ 5279.04	
Overall Total	51222.0		\$84565.41	

* Spanish mackerel include both Spanish mackerel and cero.

Table 33. Summary statistics from specimens of king (KM) and Spanish (SM) mackerel collected from the state of Veracruz for otolith extraction.

STATE	SPECIES	NUMBER	SIZE RANGE (mm FL)	SEX		
				F	M	U
Veracruz	KM	101	480-990	55	46	--
	SM	103	180-540	73	22	8

Table 34. Breakdown by size (cm) and sex of king and Spanish mackerel from fish sampled for stock identification from Veracruz.

	COUNT	MEAN	SD	MIN	MAX
<u>King Mackerel</u>					
Overall	101	64.8	9.3	48	99
Male	44	61.8	7.0	48	76
Female	57	67.3	10.2	48	99
Unknown	--	--	a-	--	--
<u>Spanish Mackerel</u>					
Overall	103	36.4	8.1	18	54
Male	23	35.4	6.2	27	48
Female	72	37.6	8.1	26	54
Unknown	8	28.1	6.9	18	42

Table 35. Breakdown by weight (kg) of king and Spanish mackerel from fish sampled for stock identification from Veracruz.

	COUNT	MEAN	SD	MIN	MAX
<u>King Mackerel</u>					
Overall	101	2.18	0.97	0.90	6.68
Male	44	1.88	0.53	0.90	3.05
Female	57	2.42	1.15	0.93	6.68
Unknown	--	--	--	--	--
<u>Spanish Mackerel</u>					
Overall	103	0.50	0.31	0.06	1.50
Male	23	0.43	0.21	0.20	1.00
Female	72	0.55	0.33	0.15	1.50
Unknown	8	0.23	0.17	0.06	0.60

Table 36. Summary statistics from specimens of king (KM), Spanish (SM) and cero (CM) mackerel collected from the state of Yucatan for otolith extraction in 1994.

STATE	SPECIES	NUMBER	SIZE RANGE (mm FL)	SEX		
				F	M	U
YUCATAN	KM	109	530-1040	77	29	3
	SM	65	320- 630	42	21	2
	CM	34	400- 600	23	10	1

Table 37. Breakdown by size (cm) of king (KM), Spanish (SM) and cero (CM) mackerel from fish collected from the state of Yucatan for otolith extraction.

SPECIES	COUNT	MEAN	S.D.	MIN	MAX
King mackerel	109	70.7	11.0	53	104
Spanish mackerel	65	49.8	8.2	32	63
Cero mackerel	34	50.5	4.4	40	60

Table 38. Breakdown by weight (kg) of king (KM), Spanish (SM) and cero (CM) mackerel from fish collected from the state of Yucatan for otolith extraction.

SPECIES	COUNT	MEAN	S. D.	MIN	MAX
King mackerel	109	5.77	3.26	2.00	18.50
Spanish mackerel	65	2.32	1.09	0.30	4.75
Cero mackerel	34	2.32	0.71	0.75	4.00

APPENDIX I
TAGGING DATA/DATOS DE MARCANDO

APPENDIX II
TAG RETURNS/MARCAS RECAPTURADAS

APPENDIX III
CATCH PER UNIT EFFORT/CAPTURADO
POR UNIDAD DE ESFUERZO

Information available
upon request