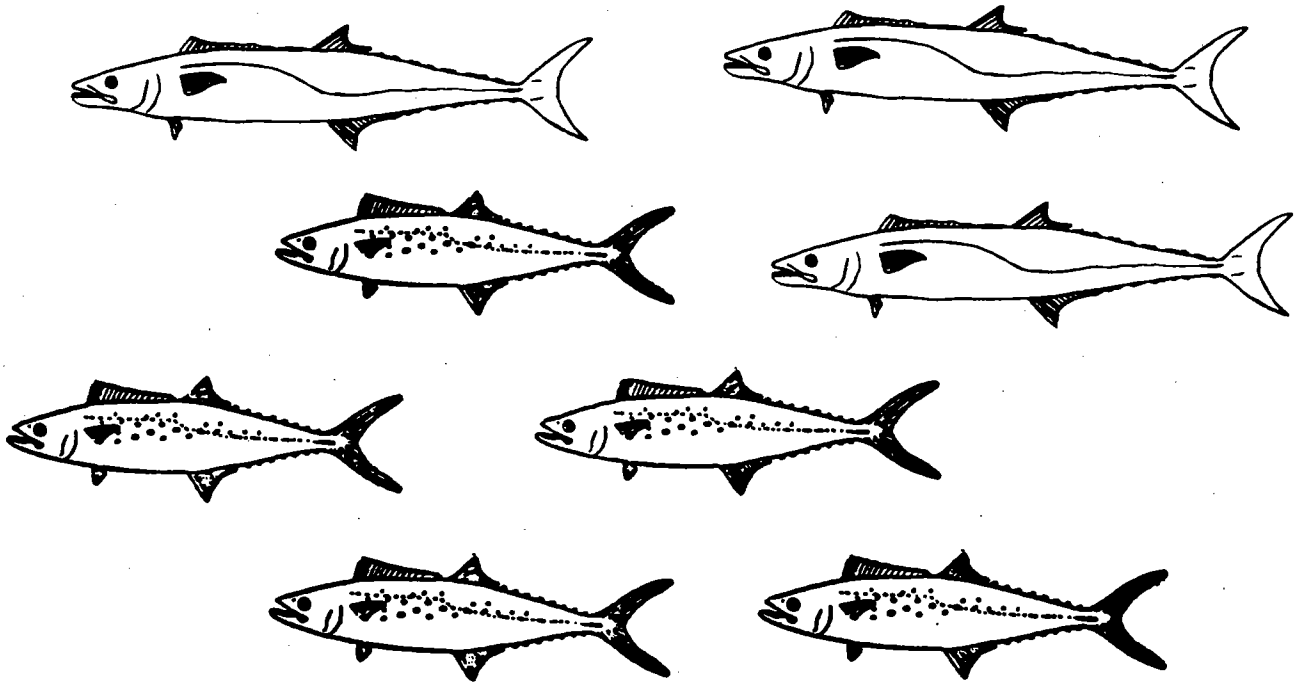
FINAL
AMENDMENT 1
FISHERY MANAGEMENT PLAN
ENVIRONMENTAL IMPACT STATEMENT
FOR THE
COASTAL MIGRATORY PELAGIC RESOURCES
(MACKERELS)



THE GULF OF MEXICO AND SOUTH ATLANTIC
FISHERY MANAGEMENT COUNCILS

APRIL, 1985

FINAL

AMENDMENT 1

FISHERY MANAGEMENT PLAN

AND

ENVIRONMENTAL IMPACT STATEMENT

FOR

COASTAL MIGRATORY PELAGIC RESOURCES (MACKERELS)

IN

THE GULF OF MEXICO

AND

SOUTH ATLANTIC REGION

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National Oceanic and Atmospheric Administration,
under Public Law 94-265,
the Magnuson Fishery Conservation and Management Act of 1976

1.0 Environmental Impact Statement for Amendment 1 for the Fishery Management Plan for Coastal Migratory Pelagic Resources in the Gulf of Mexico and South Atlantic.

( ) Draft (x) Final

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1.2 Name of Action: (x) Administrative

1.3 Description of Action:

The proposed action will amend an existing fishery management plan in response to new scientific findings particularly with respect to the king mackerel stock. This stock is to be divided into migratory groups for management purposes. The plan is to be provided with more flexibility to address changes in the fish populations. In the initial plan years restrictions are proposed for the Gulf migratory group of king mackerel to restore reduced populations resulting from overfishing.

1.4 Date by Which Comments Must Be Received:

1.5 List of Preparers

The original FMP/EIS was prepared for the Gulf and South Atlantic Fishery Management Councils by Centaur Associates, Inc., under contract. This amended version was prepared by the Councils with principal input from Council staff and with the assistance of the Miami Fisheries Center of the National Marine Fisheries Service.

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Department of Commerce
Department of the Interior
Department of State
Environmental Protection Agency
State resources agencies:

Texas
Louisiana
Mississippi
Alabama
Florida
Georgia
South Carolina
North Carolina

All fishery management councils
Southeastern Fisheries Association
Louisiana Shrimp Association
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Gulf States Marine Fisheries Commission

Sea Grant Advisory Services:

Texas
Mississippi-Alabama
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Louisiana
Georgia
South Carolina
North Carolina

Sport Fishing Institute
Organized Fishermen of Florida
Key West Charter Boat Association
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National Coalition for Marine Conservation
Louisiana Coastal Fishermens' Association
Gulf Coast Conservation Association

Coast Zone Mangement Offices:

Louisiana
Alabama-Mississippi
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South Carolina
North Carolina

1.7 Public hearings were held as follows:

1984:

July 9 - Panama City, Florida, and Brownsville, Texas;
July 10 - Mobile, Alabama, and Corpus Christi, Texas;
July 11 - Gulfport, Mississippi, and Freeport, Texas;
July 17 - Key West, Florida;
July 19 - Miami, Florida;
July 23 - Fort Pierce, Florida, and Lafayette, Louisiana;
July 24 - Daytona Beach, Florida, and Raceland, Louisiana;
July 25 - St. Petersburg, Florida, and Jacksonville, Florida;
July 26 - Savannah, Georgia;
July 27 - Charleston, South Carolina;
July 30 - Myrtle Beach, South Carolina;
July 31 - Wilmington, North Carolina;
August 1 - Morehead City, North Carolina;
August 2 - Manteo, North Carolina.

1985:

January 9 - Brownsville, Texas;
January 16 - Tampa, Florida;
January 30 - Charleston, South Carolina;
February 11 - Ft. Pierce, Florida;
February 12 - Key West, Florida.

1.8 This integrated document contains all elements of the Fishery Management Plan Amendment and Environmental Impact Statement. To aid the reviewer a table of contents for the EIS elements is provided separately referencing corresponding sections of the FMP.

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2.0 SUMMARY

A 1983 reassessment of the king mackerel stock by fishery scientists developed a maximum sustainable yield for this species at 26.2 million pounds, well below the 37 million pounds set in the original plan. The researchers also established the existence of two migratory groups, one of which was being overfished to the level where stock was declining. The plan was, therefore, failing to prevent overfishing and to achieve optimum yield as provided by the first National Standard set forth in the Magnuson Act. The Councils, therefore, determined that it is urgent to amend the plan accordingly, to restore the stock and achieve a more valid level of optimum yield based on the recent findings. Because stock recovery will be gradual and because changes in fishing effort and fishing patterns cannot be anticipated, a flexible plan is proposed. The amended plan would provide for annual stock assessments for king and Spanish mackerels and provide needed control to restore and maintain the fish populations near MSY.

2.1 Fishery Definition

The coastal migratory pelagic resources (mackerels) are those species in the coastal waters and fishery conservation zone (FCZ) of the Gulf of Mexico and off the South Atlantic coast as specified below.

2.2 Management Area and Fishing Year

2.2.1 Area For Management

Federal regulation pursuant to this plan will apply to the FCZ within the jurisdiction of the Gulf and South Atlantic Councils. However, maximum sustainable yield and optimum yield are based on the stocks in the U.S. FCZ, the territorial sea, and internal waters of the various states. Consequently, the allocations to various gear types include catches both from the FCZ and waters landward thereof. The states bordering the areas of jurisdiction of the Gulf of Mexico and South Atlantic Councils are urged to adopt regulations which are compatible with those applying in the FCZ. Regulations are not applied in the area of jurisdiction of the Mid-Atlantic Council because the catches there and the quantities of regulated species occurring there are so small that regulation would not be cost effective and is not necessary to accomplish the objectives of the plan. Similarly, catches there are not included in OY or in catch allocations. Should a fishery develop which significantly affects the stocks and is in the FCZ beyond the area for management, the management area may be extended by plan amendment.

2.2.2 Fishing Year

The fishing year for the Gulf migratory group of king mackerel is July 1 through June 30; and for the Atlantic group, April 1 through March 31. For other species in the fishery, the fishing year is January 1 through December 31.

2.3 Species

2.3.1 Species in the Management Unit (for which regulations are proposed)

King mackerel	*Scomberomorus cavalla*
Spanish mackerel	*Scomberomorus maculatus*
Cobia	*Rachycentron canadum*

2.3.2 Species in the Fishery but not in the Management Unit (no regulation proposed)

Cero mackerel	*Scomberomorus regalis*
Little tunny	*Euthynnus alletteratus*
Dolphin	*Coryphaena hippurus*
Bluefish (Gulf of Mexico only)	*Pomatomus saltatrix*

2.4 Statement of MSY, OY, TAC, EDAH and TALFF

The long-term goal of optimum yield (OY) from mackerels is maximum sustainable yield (MSY). The amount of optimum yield which may be harvested annually for each species, defined as total allowable catch (TAC) may vary due to fluctuating recruitment, fluctuating abundance by area or unit of stock, intensity of fishing effort by area or unit of stock, social, economic, or ecological factors, and improving estimates of MSY.

Best point estimates for these are in millions of pounds:

	MSY	OY	FIRST YEAR TAC	EDAH (1985)	TALFF
Spanish mackerel	27	27	27	27	0
King mackerel	26.2	26.2			
Gulf Group			14.225	14.225	0
Atlantic Group			11.812	11.812	0

For cobia, optimum yield is defined as all cobia equal to or larger than 33 inches in length from the tip of the head to the center of the tail (fork length) (37 inches in TL) which can be harvested by U.S. fishermen. MSY is estimated at 1,057,000 pounds, estimated domestic annual harvest (EDAH) is estimated as 1,000,000 pounds, and total allowable level of foreign fishing (TALFF) is zero.

2.5 Problems

1. Fishing effort is jeopardizing the biological integrity of the king mackerel fishery. That portion of the stock which inhabits the Gulf of Mexico during the summer and supports the winter fishery in southeast Florida appears to be severely overfished, and fishing mortality on this group needs to be reduced. That portion of the stock which inhabits the Atlantic coast has been exploited to a lesser degree, and fishing mortality rate on that group is below the level which will produce maximum yield.

2. Adequate management has been hindered by lack of current and accurate biological and statistical and economic information. The present system does not provide a mechanism which insures rapid incorporation of new data into stock assessments. Further, there is no coordinated plan to generate stock assessment data.

3. Intense conflicts and competition exist between recreational and commercial users of the mackerel stocks; and between commercial users employing different gears.

4. The existence of separate state and federal jurisdiction and lack of coordination between the two makes biological management difficult, since in some instances, the resource may be fished beyond the allocation in state waters.

5. Cobia are presently harvested at a size below that necessary for maximum yield and may be overfished in some areas beyond the management area. Most southeastern states have not yet adopted the recommended minimum size limit. Also, no management action has been taken by states which have jurisdiction over cobia populations in Chesapeake Bay, which appear to have been overfished. Federal enforcement capability is limited and not believed to be very effective in this case.

6. Development of a fishery targeting large, mature king mackerel in the wintertime off Louisiana may eventually reduce recruitment to the resource. Total catch of large, mature king mackerel has greatly increased due to development of a commercial fishery in Louisiana during the winter months. Reported commercial catch increased from zero during 1981-82 to 1.2 million pounds during the 1982-83 winter season. Given the already excessive fishing effort on smaller fish in the Gulf of Mexico, increasing fishing effort on the spawning population could result in recruitment declines.

2.6 Management Objectives

1. To stabilize yield at MSY, allow recovery of overfished populations and maintain population levels sufficient to ensure adequate recruitment.

2. To provide a flexible management system for the resource which minimizes regulatory delay while retaining substantial Council and public input into management decisions and which can rapidly adapt to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups or by area.

3. To provide necessary information for effective management and establish a mandatory statistical reporting system for monitoring catch.

4. To minimize gear and user group conflicts.

2.7 Proposed Management Measures

2.7.1 Annual Stock Assessment Procedure (king and Spanish mackerel)

1. An assessment group appointed by the Councils will reassess the condition of each stock of king and Spanish mackerel in the management area annually.

2. Following reviews and a hearing, the Councils will determine if changes are needed in the MSYs, TACs, quotas, bag limits, or permits and so advise the Regional Director (RD).

3. Following a review for consistency with the FMP and applicable law, the RD may reject or may implement changes by notice in the Federal Register to be effective for the next fishing season.

2.7.2 Measures to Prevent Exceeding TAC

Allocations and permits may be used to distribute fairly the TAC between recreational and commercial users. Quotas and seasonal closures may be used to limit the commercial catch. Bag limits may be used to limit the catch of recreational fishermen aboard private and charter vessels.

2.7.2.1 Allocations

A. King Mackerel

1. Migratory Groups

For management purposes the resource is divided into two migratory groups, the Gulf and the Atlantic groups. During the "summer period" (April 1st to October 31st), the Monroe/Collier County Boundary in Florida separates the groups. During the "winter period" (November 1st to March 31st) the Flagler/Volusia County line Florida separates the two groups.

2. The total allowable catch (TAC)

a. For the initial years of the amended plan:

Gulf Group	14.225 million pounds (M)
Atlantic Group	11.812 M

b. For subsequent years

TACs for each stock or group of fish should be managed separately, as identified in the FMP. The TAC may be increased not to exceed 30 percent annually when warranted by new information. Any number of increases may be made so long as they do not exceed 30 percent in any year and provided that no TAC shall exceed the best point estimate of MSY by more than ten percent. Downward adjustments of any percentage are allowed in order to protect the stock and prevent overfishing. Reductions or increases in allocations as a result of changes in the TAC are to be as equitable as may be practical utilizing similar percentage changes to all participants in a fishery. (Changes in bag limit cannot always accommodate the exact desired level of change).

c. Allocations

1. Allocation of the Gulf migratory group for the initial years of the amended plan:

Recreational Catch = 9.673 M
Commercial Catch = 4.552 M
  Eastern Zone (FL) = 2.94M
  Western Zone (AL, MS, LA, TX) = 1.328 M
  Purse Seine = 0.284 M

2. Method of allocation for the Gulf group in future assessments:

The largest number of years beginning in 1979 for which concurrent recreational and commercial catch data are available will be used to calculate the average percent distribution of the catch between recreational and commercial fishermen. Two percent of the recreational catch is to be transferred to the commercial allocation provided the bag limit does not change as a result.

The Gulf commercial quota is to be distributed with six percent but no more than 0.4 M for purse seine quota; of the remainder 69 percent is allocated to the eastern zone and 31 percent to the western zone.

d. Method of allocation for the Atlantic Group:

1. The largest numbers of years beginning in 1979 for which concurrent recreational and commercial catch data are available will be used to calculate the average percent distribution of the catch between commercial and recreational fishermen. For the first plan year the ratio is calculated to be 62.9 percent for recreational fishery and 37.1 percent for commercial fishermen.

2. An allocation for purse seine study purposes is to come from the commercial quota and is not to exceed 400,000 pounds from the South Atlantic Council area of jurisdiction.

B. Spanish Mackerel and Cobia

1. There are no allocations or quotas on the catch of cobia.

2. For Spanish mackerel in the initial years the season will close for the remainder of the fishing year when the TAC of 27 million pounds is reached.

Within the TAC for Spanish mackerel a purse seine allocation for research purposes is allowed annually but is not to exceed 300,000 pounds from the Gulf and 300,000 pounds from the South Atlantic Council area of jurisdiction.

2.7.2.2 Permits

In the initial years the permit requirements apply only to boats fishing for Gulf group king mackerel.

A. Boats are presumed to be recreational unless they possess a commercial permit. All charter and headboats carrying passengers for hire are subject to the king mackerel bag limits of the FMP and shall not fish under the commercial quota.

B. Annual commercial king mackerel fishing permits are required for any boat taking in excess of the recreational bag limit in the Gulf group. Permits are valid for a fishing year and are available only in the two months (May and June) preceding the season. All fishermen who apply for permits (except charter and headboat operators who are ineligible) must be able to show they derive more than ten percent of their earned income from commercial fishing. Owners of newly registered or documented boats, however, are allowed a 60-day period after registration or documentation to obtain a permit. Permits are transferable on sale of a vessel or may be issued at other times in event of hardship.

2.7.2.3 Seasonal Closures

King Mackerel, Gulf Group - Boats with commercial permits must cease fishing for Gulf group king mackerel for the remainder of the fishing year when the commercial quota is reached for that zone or allocation. King mackerel caught after the quota is reached for that zone or allocation may not be sold. For the initial years this quota is 4.55 million pounds for the Gulf group with 2.94 million pounds for the eastern zone, 1.328 million pounds for the western zone, and 284,000 pounds for purse seines.

King Mackerel, Atlantic Group - Commercial fishing for Atlantic group king mackerel must cease for the remainder of the fishing year when the commercial quota is reached for that group. King mackerel caught after the quota is reached for that group may not be sold. For the initial years this quota is 4.382 million pounds.

Spanish Mackerel - Fishing for Spanish mackerel will cease for the remainder of the fishing year when the TAC is reached. For the initial years the TAC is 27 million pounds.

2.7.2.4 Bag Limits

King Mackerel - The recreational quotas will be controlled by bag limits for anglers per boat trip and may be set separately for private and charter boats. For only Gulf group king mackerel in initial years, the catch limit for private boats is two fish, per person, per trip. For charter boats the bag limit is two fish, per person, per trip for all persons on board, or three fish per angler, per trip, exclusive of captain and crew, whichever is greater.

2.7.2.5 Size Limits

King Mackerel - None.

Spanish Mackerel - Minimum size limit is 12 inches fork length or 14 inches total length. An undersized catch of up to five percent by weight of the boat catch of Spanish mackerel is allowed.

Cobia - Minimum size is 33 inches fork length or 37 inches total length.

2.7.2.6 Gear Restrictions

Gill Nets for King Mackerel - Minimum mesh size is not less than 4-3/4 inches stretched measure. A bycatch of no more than ten percent king mackerel as compared by number with Spanish mackerel is allowed in smaller mesh net catches.

Purse Seines for King and Spanish Mackerel - Owners or operators must:

A. Owners or operators must:

1. Notify the Regional Director in writing of intent to fish for king or Spanish mackerel 30 days in advance of fishing year and include number of vessels and area to be fished, and

2. Notify Center Director 48 hours in advance of trip, and

3. Report catch to Center Director, and

4. Accommodate observers for scientific and statistical purposes for the first three years of plan operation, and

5. Possess a commercial quota permit if required for that group of fish.

B. A bycatch by weight or number whichever is less of no more than ten percent Spanish mackerel and or one percent king mackerel is allowed in nondirected operations; however, the catch is to be counted in the appropriate quotas.

2.7.3 Measures to Resolve User Conflict

A. To resolve user or gear conflicts for king and Spanish mackerel the Secretary of Commerce, after consultation with the affected Councils and states, may by regulatory amendment:

1. When conflict arises from expansion of a historical fishery in a traditional fishing area, the Secretary may separate users or gear by area or time, assign local quotas based on historic catch, or limit use of gear.

2. When conflict arises from introduction of gear into nontraditional fishing areas, the Secretary may prohibit use of the gear, allow limited use for evaluation, limit number of units in conflict area, or allow unrestricted use of gear.

3. When conflict arises as a result of circumstances in the fishery other than as described in (1) or (2) above, the Secretary may implement the measures described above or take other appropriate action to resolve the conflict in a manner consistent with the goals and objectives of the plan, National Standards, MFCMA, and other applicable law.

B. To resolve user or gear conflicts for king mackerel in the area off southeast Florida between 27°0.6'N latitude and 27°50'N latitude in the vicinity of Fort Pierce, the Secretary, after consultation with Council Chairmen and State officials, may by notice in the Federal Register establish fishing windows to separate gillnet and hook and line fishermen by area or time. He may close the area to fishing for king mackerel to all fishermen if the conflict results in death, serious bodily injury, or significant gear loss.

2.7.4 Statistical Reporting Measures

A. The Councils conceptually accept a landings survey system and creel census data system that would provide sufficient information for fishery management. Provisions of the system are to be developed by National Marine Fisheries Service for Councils' approval.

B. Require a reporting system for all user groups and processors based on statistical sampling whereby it would be mandatory for a selected respondent to provide answers to the sampling questionnaire on a recurring basis that is not of great frequency.

2.8 Recommendations

2.7.5 Special Recommendations to the Secretary

The Councils recommend several areas where special research is needed. These are listed in priority order in FMP Section 14.4.

2.8.2 Special Recommendations to the States

A. Effective and equitable management requires a workable means of differentiating true commercial from true recreational fishermen. This is particularly important in implementing allocations to user groups. Therefore:

> The Councils recommend to each state in their area that consideration be given to requiring all persons who catch and sell fish to have a commercial license, that the commercial license be of significant dollar value and that severe penalties be levied against any commercial dealer purchasing fish from an individual not possessing a commercial license.

B. The Councils recommend that the states implement the management measures proposed in this plan within their jurisdiction where applicable. The Councils further encourage the states to assist the Secretary in addressing and supporting the research and other special recommendations.

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4.0 INTRODUCTION

The Magnuson Fishery Conservation and Management Act gave responsibility to the Regional Fishery Management Councils to prepare and submit fishery management plans for fisheries within their geographical area. The South Atlantic and Gulf of Mexico Fishery Management Councils, in accordance with their legislative mandate, prepared a joint plan for the coastal migratory pelagic resources (mackerels) management unit.

This plan was approved in November of 1982 and was implemented by federal regulations in February, 1983. The Councils recognized that severe problems were developing in the king mackerel fishery. Stocks in some areas appeared to be depleted. A new commercial fishery for large female king mackerel developed off Louisiana, and over a million pounds were landed in the first season. The commercial hook and line fishery reached its quota and closed before the end of the first year.

The Councils requested a reassessment of king mackerel stocks utilizing new data which had been recently developed. On receipt and after review of assessment, the Councils have developed an amendment to its management plan to address new problems and issues and to provide more flexible and timely management response.

5.0 DESCRIPTION OF STOCKS COMPRISING MANAGEMENT UNIT

5.1 Description of Species and Their Distribution

The Coastal Pelagic Species Fishery Management Plan for the South Atlantic and Gulf of Mexico fishery management regions covers the following seven species: Spanish mackerel (Scomberomorus maculatus), king mackerel (Scomberomorus cavalla), cero mackerel (Scomberomorus regalis), bluefish (Pomatomus saltatrix), cobia (Rachycentron canadum), little tunny (Ethynnus alletteratus), and the common dolphin-fish (Coryphaena hippurus). Following are summaries of the information on the distribution and biology of each species. Additional and more detailed information may be obtained in a Resource Document available through the Gulf of Mexico Fishery Management Council.

5.1.1 Description of King Mackerel (Scomberomorus cavalla)

The king mackerel is the largest Scomberomorus species in the western Atlantic and may achieve 5.5 feet in length, weighing 100 pounds. The form of the king mackerel is elongate and laterally compressed. The body is covered with rudimentary scales. The color is bluish or iron gray dorsally and silvery on the sides and belly (Berrien and Finan, 1977).

5.1.1.1 Distribution and Migration

The king mackerel inhabits the waters of the western Atlantic from the Gulf of Maine to Rio de Janiero, Brazil, including the Gulf of Mexico and the Caribbean. The species occurs regularly as far north as Virginia and North Carolina. It is a coastal species which is not normally found beyond the continental shelf.

Seasonal movement along the Gulf of Mexico and Atlantic coastlines of the United States is apparent, and the species is more abundant in the northern part of its range during the summer and in south Florida during the winter. The movements are probably related to water temperature. Annual or long term changes in temperature may affect seasonal migration patterns or their timing. King mackerel occur in the northern Gulf later in the year during years of low mean air temperature than in years when the temperature was high (W. Fable, NMFS, Panama City Lab. pers. comm.). In the areas off St. Petersburg, Florida, the timing of the spring "run" of king mackerel is correlated with winter air temperature and limited by a minimum offshore water temperature of 20°C (68°F) (Williams and Taylor, in prep.).

Migratory patterns of king mackerel change with increasing size or age. Such behavioral changes are common to many scombrid species (Beaumariage, 1973). In a given area different size classes are present at different times of the year. This has been observed off Fort Pierce, Florida, (R. Williams, FDNR, pers. comm.) and can be inferred from monthly change in the average size of fish caught in North Carolina (Manooch and Laws, 1979). Very large individuals are present off Louisiana during the entire year. Such large fish are abundant in winter off Louisiana when small fish are less abundant. It has been suggested that these concentrations of large fish are separate stocks. This seems unlikely given the narrow size distribution (Trent, et al., in prep.).

There are at least two exploited migratory groups of king mackerel in U.S. waters as indicated by recent tagging data. The following is excerpted from Powers and Eldridge (1983b):

"Powers and Eldridge (1983a) analyzed the available tagging data to determine relative migration rates of king mackerel within the waters of the southeastern United States. The conclusions of that analysis were that the rates of mixing were sufficient to provide genetic interchange between areas of the

Gulf of Mexico and the Atlantic; however, the rates are relatively slow, such that local depletions could occur. Thus, management strategies should guard against such an event. The most biologically efficient way of managing the resource would be to keep the fishing mortality rate constant between areas. Therefore, maximum sustainable yield can be allocated by area such that the F values are equal.

"Size frequency information, tagging results, the CPUE (catch per unit of effort) index, and historical commercial landings data all lead to the conclusion that king mackerel in the Gulf of Mexico have been exploited at a higher rate than those in the Atlantic (Powers and Eldridge, 1983a). For that reason, separate management strategies are suggested for the two areas. Theoretically, these areas could be further divided. However, this is not recommended for the following two reasons:

(1) the data are not sufficient to determine if any smaller areas are being truly depleted or are going through variations in availability; and (2) the estimates of F (fishing mortality) needed to manage a smaller area would be so instable as to be useless.

"Our criteria for separating the groups of fish are based primarily on biological considerations and upon the way available data are collected."

Members of the Gulf migratory group support a winter fishery in south Florida from late November to mid-March. Many of these fish over-winter in the Sebastian to Fort Pierce area of Florida's east coast. Tagging data show many of these fish migrate from Florida along the Gulf coast in April and May. Most of this group have left Florida by May. Some are found in the western Gulf off Texas from May through September. Limited tag returns from Mexico indicate some interaction with Mexican stocks, but the extent of this is unknown.

The Atlantic migratory group moves south along the Atlantic coast in the winter months, and there is a mixing with the Gulf stock south of Cape Canaveral, particularly during severely cold winters. In spring, some of this group moves northward and are found in inshore waters of North Carolina in late April and May. Those fish contributing to a summer fishery on Florida's east coast are part of the Atlantic group (Powers and Eldridge, 1983b).

There appears to be a size differential in the migration pattern. Fish tagged in Fort Pierce and recaptured in the northern Gulf are larger (approximately 8.75 pounds), and probably sexually mature, while those recaptured in south Florida during the summer averaged 5.5 pounds and were probably not sexually mature (Williams, unpub. man., 1977).

Size selective migration of larger fish to the northern extremes of the range does not adequately explain size of fish caught in these areas. Catches of king mackerel by the charter boat fleet in Panama City and Destin are primarily small fish averaging four to six pounds (Captain H. L. Hilpert, pers. comm.). Catches by the North Carolina charter boat fleet are primarily small fish in April and May. Mean weight was 5.6 pounds during those months in 1977 (Manooch and Laws, 1979). In that area, mean weight of the catch increases steadily during the season. The season average weight in 1977 was 8.43 pounds (Manooch and Laws, in prep.). Large fish are caught off Louisiana in winter. Most fish caught by commercial methods in a NMFS tagging program in 1983 were from 12 to 24 pounds (NMFS Panama City Laboratory report, in prep.). A possible explanation for this may be that some immature fish remain in south Florida, while others continue with the larger fish. The four to six pound fish caught in the northern Gulf of Mexico and along the North Carolina and Virginia coasts are approximately one year of age. They may not have been large enough for very many to have been captured during tagging the previous winter. If a smaller percentage of smaller fish than larger fish migrate northward, the average size of the recaptures from the northern areas will be larger.

5.1.1.2 General Behavior

Smaller individuals of this species form immense schools, while larger individuals are often solitary. Schools are comprised of similar sized individuals, and small king mackerel sometimes run in schools of Spanish mackerel of the same size.

Schools of king mackerel tend to congregate in areas of bottom relief such as holes or reefs. Older, solitary individuals, in particular, are often found around structures such as wrecks and oil rigs.

5.1.1.3 Age and Growth Parameters

a) Growth

The following table developed from Beaumariage (1973) shows average standard length and weight at each age.

	Males		Females	
	SL (mm)	W (g)	SL (mm)	W (g)
I	594	1867	614	2025
II	679	2765	699	3038
III	718	3258	777	4228
IV	760	3850	819	4984
V	777	4109	882	6282
VI	789	4298	956	8082
VII	811	4660	999	9273

Johnson et al. (1983) found fish to be smaller at all age groups except one (seven year old males). They compared mean back-calculated fork length (mm) with Beaumariage's findings converted to fork length in the following table:

	Males		Females (except La.)	
Age	Beaumariage	Johnson et al.	Beaumariage	Johnson et al.
1	457	414	491	434
2	643	613	703	652
3	705	689	793	747
4	752	734	857	807
5	795	777	928	854
6	822	809	986	899
7	839	851	1,033	939

b) Age-Frequency Distribution

Although precise age-frequency data are not available, length-frequency distribution in two different commercial king mackerel fisheries, the trolling fishery on the southeast coast of Florida and the gill-net fishery on the southwest coast of Florida, has been determined by Beaumariage (1973). King mackerel taken by gill net are slightly larger than those taken by hook and line. Eighty-eight point six percent of the gill-net catch was between 650 and 900 mm standard length, while 88.8 percent of hook and line landings were between 600 and 850 mm.

An analysis of the recreational king mackerel fishery off Grand Isle, Louisiana, showed 90 percent of the catch throughout the year was composed of females. The fish in the catch were larger in the spring (30 to 50 pounds) and smaller in the fall (15 to 30 pounds) (Fischer, 1980). Fish tagged using commercial trolling methods in the same area were in the 12 to 24 pound range in fall and winter (NMFS Panama City Laboratory report, in prep.).

c) Age at Recruitment

King mackerel cohorts in Florida become fully vulnerable to capture at Age II and Age III in the handline fishery of Florida, and at Age III and IV in the gill-net fisheries (Beaumariage, 1973). Full recruitment to the recreational fishery probably occurs at or before Age I.

d) Life Expectancy

King mackerel can achieve an age of at least 14 years; a 90 pound female of that age was caught off Key West (Beaumariage, pers. comm.).

e) Survival

Beaumariage (1973) determined survival rate for Florida king mackerel from catch curves based on length frequency distributions. Annual survival rate calculated from the catch of the east coast trolling fishery was S = 0.46, and for the west coast gill-net fishery, S = 0.52.

5.1.1.4 Reproduction

a) Sex Ratios

No precise estimate of sex ratio exists. Recent work indicates that sex ratios vary significantly from a 1:1 ratio both spatially and temporally (Trent, et al., in prep.).

b) Age at Maturity

Age at first maturity is not well understood. Beaumariage (1973), studying gonadal development in king mackerel from Florida waters, concluded that major spawning occurs at Age IV and over in females and at Age III and over in males, although some Age III females and Age II males are reproductively active. Hook and line fishermen report that ripe ovaries are commonly found in five to six pound fish (R. Farlow, pers. comm.). This suggests that significant spawning may occur in females as young as Age II. However, histological examination of developing gonads from Age II and III females indicated that those fish did not spawn (Beaumariage, pers. comm.). Recent work by NMFS indicates that some fish collected in the northeastern Gulf of Mexico off Panama City had maturing ovaries as young as Age I+ which suggests that some females spawn in their second year (J. Finucane, pers. comm.).

c) Fecundity

No fecundity studies have been made on king mackerel in Florida. Fecundity equations based on measurements from 39 king mackerel in Brazilian waters were developed by Ivo (1974). These may not be valid for Florida.

d) Spawning Season (Excerpted from Berrien and Finan, 1977a)

The spawning season in this species is protracted (Beaumariage, 1973; Ivo, 1972; Wollam, 1970) with several spawning peaks (Beaumariage, 1973). Along the Florida west coast the season is from April

through November with a peak in May (Beaumariage, 1973). However, NMFS 1978 king mackerel data from Panama City indicates spawning peak in the northwest Florida area occurs in the late summer and fall (J. Finucane, pers. comm.).

Larvae and juveniles are found from May to November in U.S. waters (Berrien and Finan, 1977). Ivo (1972) observed spawning stage gonads in Brazilian waters the year round; although Menezes (1969) said the species spawns in Brazil during the first and fourth quarters.

Gonadal development and spawning appear to be correlated with some seasonally varying environmental factor such as photoperiod or temperature (Beaumariage, 1973).

e) Spawning Area

The outward boundary of spawning in king mackerel is probably the landward edge of oceanic currents such as the Gulf Stream and the Loop Current, and the shoreward edge is probably bounded by inshore areas of high turbidity and low salinity. This generalized statement is based on examination of the larval distribution patterns of Wollam (1970), Schekter (1972), Mayo (1973), and Dwinell and Futch (1973). King mackerel apparently spawn further offshore than Spanish mackerel (Wollam, 1970; Dwinell and Futch, 1973; and McEachran and Finucane, 1979). There does not appear to be any small, well defined areas for spawning. Larval distribution indicates spawning occurs in the western Atlantic off the Carolinas, Cape Canaveral (Wollam, 1970), and Miami (Schekter, 1972, and Mayo, 1973); in the eastern Gulf of Mexico off the Dry Tortugas (Wollam, 1970); in the northern Gulf of Mexico off the Florida panhandle (Wollam, 1970, and Dwinell and Futch, 1973), and the Texas coast (McEachran and Finucane, 1979); and in the Yucatan Channel (Wollam, 1970). Relative abundance of larvae off the Texas coast suggests that area may be a major spawning site (McEachran and Finucane, 1979). The abundance of very large king mackerel off Louisiana suggests that this may also be a significant spawning area. There is little spawning in the eastern Gulf between Naples and Apalachicola (Houde, et al., 1979).

5.1.1.5 Larvae

Larvae and juveniles have been found off southwestern Florida in May, in the Yucatan Channel in June and July, off eastern Florida and in the northern Gulf of Mexico in September, and off Cape Hatteras, North Carolina, in August, September, and November (Wollam, 1970). Dwinell and Futch (1973) found *S. cavalla* larvae off Florida and Alabama every month that they sampled, from June through October. Juvenile *S. cavalla* were collected off Louisiana during June and September (Perret, et al., 1971) and in St. Andrew Bay, Florida (Nakamura, 1976). Larvae of king mackerel were captured from 1975 through 1977 off the Texas coast from May through October with the greatest number occurring over the outer continental shelf during September (McEachran and Finucane, 1979). Schekter (1971) and Mayo (1973) found king mackerel larvae in the Florida current over a 16-month period, but did not report periodicity.

Dwinell and Futch (1973) collected more king mackerel larvae at mid-depths than at the surface in June, but more at the surface than at mid-depths in September. Sampling occurred during the evening and at night at most stations. Salinities where *S. cavalla* larvae were collected by Dwinell and Futch (1973) ranged from 25.85 ppt. to 34.47 ppt.

5.1.2 Description of Spanish Mackerel (*Scomberomorus maculatus*)

5.1.2.1 Distribution and Seasonal Movements

The species *S. maculatus*, as redefined by Collette and Russo (1979), is restricted to the western Atlantic coast of the U.S. and the Gulf of Mexico. The southward extent of its range is the Florida

Keys and the northward extent in the Atlantic is normally New York or southern New England, although occasional strays are found to the Gulf of Maine (Berrien and Finan, 1977).

Spanish mackerel make seasonal migrations along the Atlantic and eastern and northern Gulf coasts and appear to be much more abundant in Florida during the winter. They move northward each spring to occur off the Carolinas by April, off Chesapeake Bay by May, and, in some years, as far north as Narragansett Bay by July (Berrien and Finan, 1977). In the eastern Gulf of Mexico they migrate to the west of Cape San Blas. They remain in the north until September and migrate south in the fall (Beaumariage, 1970; Wollam, 1970). Seasonal north-south movements of Spanish mackerel along the Mexican and south Texan Gulf coasts are suggested by one fish tagged in Port Aransas, Texas, whose tag was returned from Vera Cruz, Mexico. Genetic differences in Spanish mackerel from the Atlantic and Gulf were detected in biochemical studies by Collette and Chittenden (M. Chittenden, pers. comm.). This suggests that migration patterns of Spanish mackerel may be different from those of king mackerel, which circumnavigate the Florida peninsula (R. Williams, unpub. man., 1977).

5.1.2.2 General Behavior

The Spanish mackerel is a fast-moving surface-feeding fish that forms immense schools of similar sized individuals. Schools are often known to pass very near to the beach on their seasonal migration journeys. They frequently enter tidal estuaries, bays, and lagoons (Berrien and Finan, 1977; and others).

5.1.2.3 Age and Growth Parameters

a) Growth Equation

Female Spanish mackerel grow faster and reach a larger size than males (Powell, 1975). According to Powell's (1975) growth equations, the theoretical maximum length of the female of the species is approximately 645 mm while the theoretical maximum length of males is about 515 mm.

The following tables prepared from the data and equations of Powell (1975) show average standard length and calculated weight at each age.

Age	Males		Females	
	SL (mm)	W (g)	SL (mm)	W (g)
I	362	492	404	714
II	405	688	459	1065
III	445	911	528	1653
IV	476	1113	559	1922
V	497	1266	598	2443

b) Age Frequency Distribution

Powell (1975) determined age of 2,060 fish from the commercial and sport catch in Florida in 1968 and 1969. It can be inferred from Powell (1975) that 42.7 percent of the sample was Age I fish, 93 percent was fish three years old or younger, and 99.08 percent was fish Age V or younger. One eight year old fish, a female, was found. Length-frequency information could also be obtained from catch curves published by Powell (1975); however, the curves are based on the catch obtained from gill nets of different mesh sizes and all are based on relatively small samples.

c) Age at Recruitment

According to Powell (1975), Age I fish were the most abundant size class in the commercial and sport catches of 1968 and 1969. Few Age 0 fish were taken possibly because Florida law prohibits taking Spanish mackerel less than 12 inches (304.8 mm) in fork length.

d) Survival Rate

Based on Powell's (1975) observation of one Age VIII fish in a sample of 2,060 individuals, 42.7 percent of which were Age I fish, it can be estimated that the survival rate (S) of Spanish mackerel is 0.38 (38 percent of the population) per year. The instantaneous rate of total mortality (Z) is 0.9686.

Doi and Mendizabal (1979) determined the instantaneous total mortality (Z = 0.903), natural mortality (M = 0.693), and fishing mortality (F = 0.210) of Spanish mackerel on the Mexican coast on the basis of age-length relationships and length frequencies. The annual survival rate for this fishery can be calculated to be 0.41.

5.1.2.4 Reproduction

a) Sex Ratio

Percent of female Spanish mackerel caught in south Florida by gill nets was 51 percent and by hook and line 80 percent (Klima, 1959). Different feeding behavior between sexes was suggested as a likely reason for the high percent of female fish caught by hook and line.

b) Age at Maturity

Although Powell (1975) found maturing oocytes in Age I and Age II females his analytical results suggested that very few of these actually spawned. This interpretation is questionable (Houde, pers. comm.) because of the small number of ripe fish in his sample. Given a high mortality rate and short life span, it is more likely that Age II females make a significant contribution to the spawning potential of the stock.

c) Fecundity

Earll's (1883) report from the Chesapeake Bay area appears to provide the only existing information on fecundity in *S. maculatus*. He estimated that a six pound (2.7 kg) mackerel carried 1,500,000 eggs. He counted the number of eggs in the ovaries of one immature female weighing one pound 13 ounces (823 g) and 18.5 inches (470 mm) in length and determined that the ovaries contained approximately 525,000 eggs. Gesteira (1972) studied fecundity in the mackerel in Brazil that is now known to be a separate species (Collette and Russo, 1979).

d) Spawning Season

Spawning of Spanish mackerel occurs repeatedly during a prolonged spawning season from about April until September (Powell, 1975).

e) Spawning Areas

The prolonged spawning season of individual Spanish mackerel may allow spawning to be distributed over a wide area, which should reduce the chances of fluctuations in year class strength due to environmental variations caused by nature or man.

Indirect evidence of spawning areas comes from larval collecting studies. Wollam (1970) found Spanish mackerel larvae in the Gulf of Mexico along the west coast of Florida from Naples to Panama City. Dwinell and Futch (1973) found them widely distributed in the northern Gulf from Mobile, Alabama, to Cedar Key, Florida. McEachran and Finucane (1979) found them off the Texas coast. Larval abundance of Spanish mackerel is greatest in the eastern Gulf of Mexico (McEachran and Finucane, 1979). Spanish mackerel spawn closer to shore and in more shallow water than king mackerel (Dwinell and Futch, 1973; McEachran and Finucane, 1979).

It seems likely that Spanish mackerel spawn in the Atlantic off North Carolina and Virginia, although Spanish mackerel larvae were not found in the western Atlantic in the few sites examined by Wollam (1970), Schekter (1971) and May (1973), and the only published evidence of spawning by Spanish mackerel in the western Atlantic comes from the early observations of ripe females in Chesapeake Bay by Earll (1883) and Ryder (1887).

5.1.2.5 Larval Distribution

Spanish mackerel larvae have been found in nearshore shallow water environments of the Gulf of Mexico from Florida to south Texas (Wollam, 1970; Dwinell and Futch, 1973; McEachran and Finucane, 1979). Abundance appears to be greatest in the northeastern Gulf (McEachran and Finucane, 1979).

5.1.3 Description of Cobia (*Rachycentron canadum*)

5.1.3.1 Distribution and Migration

Cobia has a circumtropical distribution (Briggs, 1960). The species is found in the northern part of its range in summer and it winters in south Florida (Austin, et al., 1978) and the West Indies (Richards, 1967). Charterboat fishermen in the area from Mexico Beach, Florida, to Mobile, Alabama, report that their catch of cobia is heaviest during the spring, from late March to the first of May, when the species passes very close to the beach on a westward migration (Austin, et al., 1978). This latter observation is somewhat at variance with the statement by Reid (1954) that May to August is the season of occurrence of the species around Cedar Key, Florida. In the Bahamas, cobias are principally known from the Bimini area or the Grand Bahama Bank (Bohlke and Chaplin, 1968).

According to Bohlke and Chaplin (1968), cobia are found in open water, in inlets, in bays, and in mangroves. Briggs (1960) describes cobia as a "shore species." In the Florida Keys it is often caught by sports fishermen in waters only 20 feet (6 m) deep (Austin, et al., 1978).

5.1.3.2 General Behavior

According to Bohlke and Chaplin (1968) young cobia, with their black and white stripes, bear a striking resemblance to remoras and sometimes behave very much like them by swimming along with a shark or a ray. Both young and adult cobia often associate with floating objects (Baughman, 1950; Reid, 1954). Cobia often swim around pilings, buoys and wrecks.

5.1.3.3 Age and Growth Parameters

a) Length-weight Relation

Female cobia grow faster and attain a larger size than male cobia. By Age VII, female cobia are twice the weight of males the same age (Richards, 1967). There is, however, no significant difference in the relationship of weight to length in the two sexes.

b) Growth

Age of cobia in Chesapeake Bay is presented in the following table from Richards (1967) gives the calculated fork length and weight of cobia for each age in the range of the samples.

Length and weight solutions for cobia growth equations. [1]

t in years	Females				Males			
	Fork Length		Weight		Fork Length		Weight	
	in	cm	lbs	kg	in	cm	lbs	kg
1	14.0	36	0.85	0.4	12.2	31	0.6	0.3
2	24.2	61	5.2	2.4	20.8	53	3.4	1.5
3	32.3	82	13.3	6.0	27.3	69	8.2	3.7
4	38.8	99	24.0	10.9	32.3	82	13.9	6.3
5	44.0	112	35.7	16.2	36.0	91	19.6	8.9
6	48.1	122	47.5	21.5	38.8	99	24.8	11.2
7	51.4	131	58.6	26.6	40.9	104	29.3	13.3
8	54.0	137	68.7	31.2	42.5	108	33.1	15.0

[1] Adapted from Richards, 1967.

c) Age-Frequency Distribution

The following table adapted from a table in Richards (1967) shows the age frequency distribution of his sample.

Age	Number Males	Number Females	Total
I	4	6	10
II	37	15	52
III	18	30	48
IV	10	20	30
V	13	39	52
VI	12	22	34
VII	4	14	18
VIII	0	7	7
IX	2	3	5
X	1	0	1
	101	156	257

The samples were from the commercial pound catch of cobia in Chesapeake Bay from 1960-1964.

d) Age at Recruitment

According to Richards (pers. comm.) sport catches of 15 inches (381 mm) cobia (Age I) are common for the average fishermen, but more knowledgeable fishermen usually return fish of that length to the water and predominantly take fish Age II or older. Cobia are not fully recruited to the pound net fishery in Chesapeake Bay until Age III (based on the age-frequency distribution from Richards, 1967).

e) Life Expectancy

The maximum life expectancy of cobia is at least ten years (Richards, 1967) and may be 15 years or more.

f) Survival

No published estimates of survival in cobia are available. Data on age-frequency of 257 fish from Chesapeake Bay taken between 1960 and 1964 (Richards, 1967) were used to calculate a survival rate using the methodology of Robson and Chapman (1961). Annual survival rate for sexes combined and associated 95 percent confidence limits of: $S = 0.66 \pm 0.04$.

5.1.3.4 Reproduction

a) Sex Ratios

The ratio of females to males in the Chesapeake sample of Richards (1967) was 1.54:1.

b) Age at Maturity

Male cobia are sexually mature at Age II and females are sexually mature at Age III (Richards, 1967).

c) Spawning Season and Areas

Cobia spawn at least from late June through mid-August in the Chesapeake Bay area (Richards, 1967). Spawning starts earlier in the year in the northern Gulf of Mexico (Dawson, 1971). Larval collections of cobia off south Texas indicate that spawning occurs in late summer and early fall (Finucane, et al., 1978a) and off Galveston, Texas in July (Finucane, et al., 1978b).

According to Richards (1967), spawning of cobia probably occurs along or near Virginia's eastern shore in Chesapeake Bay or the Atlantic.

The presence of cobia under 150 mm SL in the northern Gulf of Mexico indicates cobia spawn in that area (Dawson, 1971). Finucane, et al. (1978a) report larvae as small as 5.1 mm SL in their ichthyoplankton study in the northwestern Gulf of Mexico.

5.1.3.5 Larvae

Juvenile cobia have been collected from the Chesapeake Bay area, off North Carolina and South Carolina on the Atlantic, and from Florida to Louisiana in the Gulf. Fairly small cobia (less than 770 mm) are not uncommon in the Gulf of Campeche in the winter. Until recently, it was thought that cobia was an inshore spawner due to the occurrence of eggs in Chesapeake Bay (Ryder, 1887); however, according to D. Hammond (pers. comm.), cobia spawn well offshore (52 miles off the coast of South Carolina) and the larvae move into inshore waters of low salinity (15-20 ppt) as soon as they are mobile. Hassler (Hassler and Rainville, 1975a) found cobia eggs when he was searching for dolphin eggs in the Gulf Stream. The cobia that were hatched from the eggs were raised in the laboratory (Hassler and Rainville, 1975a).

Dawson (1971) noted that the specimens he identified showed a preponderance of smaller individuals (13-15 mm) in collections made 30-40 miles offshore and larger individuals (45-140 mm) had been most frequently collected in inshore localities. There were, however, so few specimens and the specimens were taken by so many different collectors, that Dawson could not definitely attribute his observation to a differential onshore-offshore distribution of sizes. D. Hammond (pers. comm.) obtained all the

specimens for his collection at marinas. They were invariably associated with floating debris.

5.1.4 Description of Cero Mackerel (Scomberomorus regalis)

Cero mackerel is the third member of the genus Scomberomorus to occur in the Gulf of Mexico and South Atlantic regions. This species is between the Spanish and the king mackerel in size. It is not distinguished from king mackerel in landings so no catch information is available on cero mackerel. The cero is silvery below and dark blue above. A blackish longitudinal band on the side runs from the base of the pectoral nearly to the base of the caudal, crossing the lateral line (Evermann, 1899). Below the band are rows of oblong gold spots resembling short dashes or stripes.

Biological information on the cero mackerel in the literature apears to be limited to brief mentions and short descriptions (Cervigon, 1966). Apparently nothing is known about the population dynamics of this species. Howell-Rivero (1953) discussed the importance of this species to the Cuban fishery.

5.1.4.1 Distribution and Seasonal Movements

The range of cero mackerel is thought to be more restricted to the tropics than that of the other two Scomberomous species. The cero is not normally found in abundance north of Dade County, Florida. In Cuba, the landings of this species are slightly greater than the landings of king mackerel (Howell-Rivero, 1953). Cero is the species of Scomberomorus most frequently encountered near shore in the Bahamas (Bohlke and Chaplin, 1968).

5.1.4.2 General Behavior

The cero mackerel is primarily a reef species. It is found in small schools or as individuals.

5.1.4.3 Other

Specific information is not available on growth, demography, or reproduction.

5.1.5 Description of Bluefish (Pomatomus saltatrix)

5.1.5.1 Distribution and Migration

The bluefish generally occurs in temperate and warm temperate continental shelf waters (Briggs, 1960). In the eastern side of the New World, bluefish have been reported from Nova Scotia to Texas, Brazil to Uruguay, in Bermuda, Cuba, and Venezuela. They also are reported from Portugal to Senegal, Angola to South Africa, in the Azores, the Mediterranean, the Black Sea, the Indian Ocean, the east coast of southern Africa, Madagascar, the Malay peninsula, Tasmania, and Australia. On our Atlantic coast, the bluefish aggregations migrate seasonally - northward in spring and summer and southward in fall and early winter. In winter much of the population remains offshore (Lund and Maltezos, 1970). Groups of larger fish not only travel farther and faster but tend to congregate in the northern part of their range.

Bluefish in the Gulf of Mexico appear to be a different stock from those in the Atlantic. Extensive tagging in the Atlantic has been done, and no returns have been recorded from the Gulf. On the west coast of Florida commercial fishermen catch bluefish year around at different locations, but the fish are less abundant than on the east side of the peninsula. In addition, it is common knowledge among fishermen that the bluefish caught in the Gulf of Mexico are smaller than those caught in the Atlantic and at Key West.

5.1.5.2 General Behavior

The fish school by size and swim continuously at speeds varying with water temperature and body size. These groups are loosely associated into larger aggregations.

5.1.5.3 Age and Growth Parameters

Relationship between age, length, and weight of bluefish was studied by Kendall and Walford (1979) and is shown graphically in Wilk, (1977). There is no evidence of sexual variation in size in this species.

There are large variations in length and weight in each age group due to the bimodal nature of spawning (Wilk, 1977).

a) Age-Frequency Distribution

Age I through Age IV fish made up the bulk of the bluefish sampled in one study by Kendall and Walford (1979); however, fish older than Age IV were quite evident especially in the area from Maryland to southern New England. Year classes 1962 through 1966 all appeared to be equal in strength.

b) Age at Recruitment

It can be inferred from Wilk (1977) that Age 0 fish are not important in the catch and recruitment effectively occurs at Age I.

c) Life Expectancy

Out of 25,000 fish aged at the National Marine Fisheries Service's Sandy Hook Laboratory, the oldest was Age IX; however, larger, presumably older fish have been reported to Age XIV (Wilk, 1977).

d) Survival Rate

An estimate could probably be developed from information in Kendall and Walford (1979). It would be necessary to calculate separate survival rates for fish tagged in different areas because separate populations exist that may have entirely different survival characteristics (Wilk, 1977).

5.1.5.4 Reproduction

a) Sex Ratios

According to Wilk (1977) the sex ratio is 1:1. Bluefish do not appear to school by sex at any time of life (Wilk, 1977).

b) Age at Maturity

Bluefish become sexually mature in their second year of life (Wilk, 1977). Males mature at a smaller size than females.

c) Fecundity

Number of eggs produced is a function of age and size (Lassiter, 1962). A bluefish 20.8 inches (528 mm) long contained about 900,000 maturing eggs; one 23.0 inches (585 mm) long contained about 1,100,000 eggs (Wilk, 1977).

d) Spawning Season

There are two different groups of spawners in the western Atlantic. The first group spawns in the spring and the other group spawns in the summer. Spawning of both groups probably proceeds in waves (Wilk, 1977). Collections of bluefish larvae in November off the Texas coast suggests that spawning occurs in the fall in the northwestern Gulf of Mexico (Barger, et. al., 1978). A spring spawning also probably occurs in the northeastern Gulf of Mexico off Louisiana and Panama City, Florida (H.A. Brusher, pers. comm.).

e) Spawning Areas

Separate areas for spring and summer spawning groups have been defined. The spring spawning area is in the offshore area of the South Atlantic Bight, roughly between Cape Canaveral and Cape Hatteras. The summer spawning area is in the inshore area of the Mid-Atlantic Bight, between Cape Hatteras and Cape Cod. Although not well documented, spawning undoubtedly occurs in the northern Gulf of Mexico.

5.1.5.5 Larval Distribution

Larvae from the spring spawning area in the South Atlantic Bight move into the estuaries of the Mid-Atlantic Bight to grow up. Larvae from the summer spawning area in the Mid-Atlantic Bight develop in the area where they were spawned and winter in the South Atlantic (Kendall and Walford, 1979). In the Gulf of Mexico, bluefish larvae have been collected off the Texas coast (Barger, et al., 1978). They probably occur through much of the northern Gulf of Mexico.

5.1.6 Description of Little Tunny (*Euthynnus alletteratus*)

The little tunny is one of the most common scombrids in the western Atlantic (Rivas, 1951) accounting for 40 percent of the fishes taken in a trolling survey off the southeastern U.S. coast (Anderson, 1954). This species also is abundant in the Gulf of Mexico where many fishermen confuse it with the less common Atlantic bonito, *Sarda sarda*. In collections of young fishes in the Gulf of Mexico, this was the species that was the best represented (Klawe and Shimada, 1959).

5.1.6.1 Distribution and Seasonal Movements

The little tunny is found on both sides of the Atlantic throughout tropical and subtropical areas including the Mediterranean. It is a coastal species (de Sylva and Rathjen, 1961; Marchal, 1963; Postel, 1950; Whiteleather and Brown, 1945; and Zhudova, 1969) which may be found in open ocean waters in small numbers.

The available literature indicates that the majority of the stock or stocks of little tunny found in U.S. waters remain within U.S. jurisdiction throughout spring, summer, and fall and may remain in U.S. waters during winter (Davis, 1979). Little tunny migrate seasonally, moving south and offshore during fall and winter, then returning northward in the spring (de Sylva and Rathjen, 1962). In summer, little tunny is abundant in the Gulf of Mexico and Atlantic at least as far north as Cape Hatteras. In winter, large numbers of little tunny are found off south Florida, primarily in the Gulf, south and west of Naples (C. Carter, pers. comm.), and in the Tortugas (de Sylva and Rathjen, 1962). At the same time, some are found offshore in more northern regions such as off Georgia (Carlson, 1952). Some fraction of the stock(s) may extend into the Caribbean in winter; however, there is no available data to document such an extension (Davis, 1979).

5.1.6.2 Other Data

More detailed biological data is contained in a Resource Document which is available through the Gulf

of Mexico Fishery Management Council. This material is not included in the FMP because no management measures are proposed at this time.

5.1.7 Description of Dolphin (*Coryphaena hippurus*)

The dolphin is the larger of two open-ocean pelagic congenetors that are cosmopolitan in distribution in tropical and subtropical waters (Bohlke and Chaplin, 1968). It is a valuable commercial species in Japan, China, and Hawaii and is an important source of food in many islands of the Pacific and Caribbean (Beardsley, 1967). In Florida the dolphin is an important sport fish and is taken on more trips and in greater numbers by Florida east coast charterboats than any other species (Ellis, 1967). It is also an important sport fish in North Carolina (Rose and Hassler, 1969).

5.1.7.1 Distribution and Migration

According to Shcherbachev (1973), *C. hippurus* penetrates temperature latitudes to range above 40°N in the summer. Gibbs and Collette (1959) give the latitudinal limit of the species in the Atlantic as the 45° line, which corresponds to the poleward limits of the 15°C (59°F) isotherm. Rose and Hassler (1968) give Prince Edward Island, Nova Scotia, and the southern tip of Africa as the range limits of the dolphin in the Atlantic. Sightings in the extreme limits of the range reportedly are rare, and the general range of this species probably is best described by the 20°C (68°F) isotherm (Gibbs and Collette, 1959). Hochachka (1974) alludes to the common dolphin as a "tropical eurythermal species." *C. hippurus* is common in the Caribbean, the Gulf Stream, and the Gulf of Mexico. The occurrence of this species in large numbers off the Texas coast has been reported (Baughman, 1941).

This species comes close to shore where blue waters are found near the shore, notably southeastern Florida, Cape Hatteras, and Ocean City, Maryland (Gibbs and Collette, 1959). Schuck (1951) found that the best fishing for dolphin off North Carolina was by trolling in areas where bottom depths were between 21 and 100 fathoms. Gibbs and Collette (1959) cited by de Sylva (pers. comm.) as saying that in south Florida *C. hippurus* adults are caught both in the Gulf Stream and at its junction with coastal waters. This species occasionally enters inshore waters of somewhat high turbidity (Gibbs and Collette, 1959, citing de Sylva, pers. comm.).

5.1.7.2 General Behavior

The dolphin is well known for its propensity to station itself near nonmotile objects on the ocean surface. Kojima (1956, 1960a, 1960b, 1966) has published specifically on this subject. According to Kojima (1965), the high returns (27.2 percent average) resulting from his tagging study in Japan demonstrated the ecological significance and effects of floating objects on dolphins. There is a greater availability of food near floating objects, and dolphins leave them only when there is food nearby. In the Florida current and Gulf Stream, dolphin associate with Sargassum windrows and, according to Beardsley (1967) and Gibbs and Collette (1959), take much of their food from that community.

Young dolphin school, but older individuals are more solitary. Dolphin 300-500 mm long (fork length, probably) are referred to as "school" dolphin (Beardsley, 1967). Baughman (1941) considered the dolphin a highly gregarious species, but his observations are of young individuals. Although no specific description of the size of dolphin schools was found in the literature, it is the general impression that they do not contain the vast number of individuals found in schools of species such as the mackerel.

5.1.7.3 Other Data

More detailed biological data is contained in a Resource Document which is available through the Gulf

of Mexico Fishery Management Council. The material is not included in the FMP because no management measures are proposed at this time.

5.2 Abundance and Present Condition

The information for this section has been included in Section 5.4.1.2 for king mackerel, 5.4.2.2 for Spanish mackerel, 5.4.3.2 for cobia, 5.4.4 for cero mackerel, 5.4.5 for little tunny, 5.4.6 for bluefish, and 5.4.7 for dolphin. This was done because the information leading to the respective conclusions followed more coherently the presentation in Section 5.4.

5.3 Ecological Relationships

Prey-predator relationships, food chains, and competitive or mutualistic interactions are the most important factors to consider in developing an understanding of biological relationships of fishery species. A description will be given of the specific prey and predator organisms of each of the species of the management unit, followed by a general discussion of the food chains affecting these species, including larval food chains. Competitive and mutualistic interactions will be discussed where any information is available.

5.3.1 Prey-Predator Relationships of King Mackerel

a) Prey Species

The primary food of king mackerel in Florida waters are clupeid fishes, particularly *Opisthonema oglinum* (the Atlantic thread herring) and *Harengula jaguana* (scaled sardine), and invertebrates, including penaeid shrimps and squid. Fish of the families Carangidae (jacks), Lutjanidae (snapper), and Pomadasyidae (grunts) make up a small percent of the diet. The three groups account for 59 percent, 33 percent, and eight percent of stomach contents by number respectively (Beaumariage, 1973). Beaumariage examined 366 king mackerel stomachs, but only 70 held identifiable food; most (179) were empty.

In a Texas study, Knapp (1949) found that shrimp were the number one food item of king mackerel, accounting for 43.5 percent of food items in stomachs. Squid was also an important food item, making up 25.1 percent of food items. Fish of various types made up 50.6 percent of the food items in stomachs. Of this, 7.9 percent were menhaden. Other fish species were not separated.

Stomachs of 831 king mackerel were examined from fish caught offshore of Louisiana (C. Saloman and S. Naughton, pers. comm.). Fish were the dominant food, comprising over 99 percent by weight, and volume, and frequency of occurrence of the stomach contents. Primary species were in the families Clupeidae, Carangidae, Sciaenidae, and Trichiuridae.

In the stomachs of 355 king mackerel collected off Panama City, the volume of food was 85.4 percent fish and 14.1 percent squid. Minor amounts of various crustaceans made up the remainder of the volume of food items. Three fish species, *Decapterus punctatus* (round scad), *Sardinella anchovia* (Spanish sardine), and *Brevoortia patronus* (Gulf menhaden), were dominant (S. Naughton, pers. comm.).

b) Predator Species

The bottle-nose dolphin (*Tursiops truncatus*) and several shark species are thought to be the major predators of both king and Spanish mackerel due to their common occurrence around mackerel schools. Bottle-nose dolphins are a problem for both handline and gill-net mackerel fishermen on the Florida east coast (Cato and Prochaska, 1976), as they pull hooked fish off the line and tear them out of nets. Several shark species are mentioned by Bigelow and Schroeder (1948) as predators of the

mackerels. These are tiger sharks (Galeocerdo cuvier), bull sharks (Carcharhinus leucas), the smooth hammerhead (Sphyrna zygaena), and the short-fin mako (Isurus oxyrinchus).

Sharks often are found in areas where gill nets are being set around Spanish and king mackerel and damage to nets by sharks is a common occurrence. The speed and severity with which the sharks attacked the nets off Key West in 1978 suggested that the sharks were in the mackerel schools before the nets were set, rather than coming to the area to feed on trapped fish. The lemon shark (Negaprion brevirostris) is said to be one of the principal species interfering with the king mackerel fishing operations off Key West (S. Gruver, pers. comm.).

Two little tunny collected from the Florida current by Klawe (1961) had 20-30 mm Scomberomorus larvae in their stomachs. Unfortunately, the larvae could not be identified to species (Klawe, 1961), however, judging from habitat they very likely were king mackerel.

5.3.2 Prey-Predator Relationships of Spanish Mackerel

a) Prey Species

The following organisms are given by Klima (1959) as food items of Spanish mackerel in Florida based on analysis of 292 stomachs, 38 percent of which were empty. Listed in order of abundance in stomachs the organisms are: herrings (the Clupeidae) (69 percent); pilchards (Harengula pensacolae and related species) (nine percent); shrimp (Penaeus spp.) (six percent); mullet (Mugil sp.) (four percent); needlefish (Strongylura) and anchovy (Engraulidae) (less than one percent). Unidentified fish made up an additional eight percent of stomach contents.

A Texas study determined that 30 percent of stomachs containing food contained menhaden (Miles and Simmons, unpublished data). The stomachs of 3,428 Spanish mackerel were examined in this study. Thirty-four percent of the stomachs were empty. Klima (1959) reported on a subsidiary study using material collected by Miles and Simmons. In all 611 mackerel stomachs containing food were examined: 82 contained shrimp; 30 squid; 53 ribbonfish; six menhaden, and four, other species.

In another Texas study found that fish, excluding menhaden, made up 62.7 percent of the total number of stomach contents. Shrimp made up 23.4 percent, squid 10.9 percent, crabs 4.6 percent, and menhaden 3.7 percent.

No analysis has been made of the relative weights or volumes of types of food organisms in stomachs to help determine which food types provide the major part of the energy requirements of this species.

b) Predator Species

Sharks are a major predator of Spanish mackerel. The species has been listed among the stomach contents of the dusky shark (Carcharhinus obscurus) in Florida (Clark and von Schmidt, 1965). According to Bigelow and Schroeder (1948), the smooth hammerhead (Sphyrna zygaena) preys on Spanish mackerel. The mackerels in general are referred to as a component of the diet of bull sharks (Carcharhinus leucas), porbeagles (Lamna nasus), and tiger sharks (Galeocerdo cuvier) (Bigelow and Schroeder, 1948).

5.3.3 Prey-Predator Relationships of Cobia

a) Prey Species

The cobia feeds primarily on demersal organisms, especially crustaceans. In a Texas study (Knapp, 1951), mantis shrimp and eels were the organisms that occurred the greatest percent of the time

(58 percent and 50 percent respectively). Next in percent occurrence were shrimp (46 percent), crabs (42 percent), and squid (17 percent). Thirty-two percent of the stomachs contained fish, four percent of which were Spanish mackerel. A total of 29 stomachs were examined and 17 percent were empty.

b) Predator Species

None have been determined so far.

5.3.4 Prey-Predator Relationships of Cero Mackerel

The prey-predator relationships of cero mackerel are thought to be similar to those of king and Spanish mackerel.

5.3.5 Prey-Predator Relationships of Bluefish

a) Prey Species

According to Wilk (1977), bluefish feed throughout the water column on a large variety of fishes and invertebrates, both pelagic and demersal. Wilk (1977), observing populations in the northern part of their range, noted that they eat butterfish (Peprilus triacanthus), menhaden (Brevoortia spp.), round herring (Etrumeus teres), sand lance (Ammodytes americanus), silverside (Atherinidae), Atlantic mackerel (Scomber scombrus), anchovy (Engraulidae), and Spanish sardine (Sardinella anchovia). They also eat juvenile spotted seatrout (Cynoscion nebulosus), Atlantic croaker (Micropogon undulatus), and spot (Leiostomus xanthurus) (Wilk, 1977). Among the invertebrates fed on by bluefish are shrimps, lobsters, squids, crabs, mysids, and annelid worms (Wilk, 1977).

Richards (1976) examined the stomach contents of 66 bluefish in Long Island Sound from July to November. He found that 44 percent had empty stomachs. The most common prey organism was the adult bay anchovy (Anchoa mitchilli) (37 percent of total items). The squid (Loligo pealei) was next in abundance (18 percent). Menhaden (B. tyrannus) adults and juveniles and butterfish (P. triacanthus) juveniles were equally represented, each comprising 16 percent of food items.

Striped mullet (Mugil cephalus), Atlantic thread herring (Opisthonema oglinum), pinfish (Lagodon rhomboides), and shrimp (Penaeus spp.) are organisms common to Florida waters that were included in Wilk's (1977) list of food items of bluefish in the mid-Atlantic. Relative importance of these organisms was not given by Wilk (1977). Apparently measurements of relative weight or relative volume of food types have not been made.

b) Predator Species

Sharks are thought to be predators of bluefish. Shark species that are known to feed on bluefish are the sand tiger (Odontaspis taurus) and the thresher (Alopias vulpinus) (Bigelow and Schroeder, 1948). Wilk (1977) said that sharks, tunas, swordfish, and wahoo would be the only potential predators that would pose a threat to the fast-swimming bluefish.

5.3.6 Prey-Predator Relationships of Little Tunny

a) Prey Species

The round herring (Etrumeus teres) was the most important food species of Euthynnus alletteratus in specimens collected from the southern Atlantic coast of the U.S., making up 39 percent of stomach contents items (Carlson, 1952). Squid also was important, accounting for 28 percent of food items, and the Spanish sardine (Sardinella anchovia) made up 12 percent of food items. Other components of

the stomach contents were the round scad (Decapterus punctatus), Spanish mackerel and mud parrotfish (Sparisoma flavescens). Unidentified fish made up 11 percent of total food items (Carlson, 1952). In another study, both little tunnys collected contained Spanish mackerel. One little tunny contained larval little tunny indicating cannibalism (Klawe, 1961). Carangidae (jacks), and Exocoetidae (flyingfish) are some other groups fed upon by little tunny (Dragovich, 1969).

b) Predator Species

Little tunny was one food item identified in the stomach of a bull shark (Carcharhinus leucas) collected on the central Gulf coast of Florida (Clark and von Schmidt, 1965).

5.3.7 Prey-Predator Relationships of Dolphin

a) Prey Species

The dolphin is an opportunistic species, which will prey on most smaller fishes or squid which may be available. It is thought to be a day feeder (Erdman, 1958) and perhaps does not feed effectively in darkness (Gibbs and Collette, 1959), although they will feed at night on small fishes and squid attracted to light from ships.

The importance of the Sargassum community in providing food for common dolphin, particularly juvenile and younger mature individuals, has been noted by several authors. Rose and Hassler (1974) found significantly more empty stomachs in small female dolphin in a summer when tidelines off the North Carolina coast were relatively rare, which suggests that this community makes an important contribution to the food supply of this group. Kojima (1965), Rose and Hassler (1974), and Beardsley (1967) considered the Sargassum community to have great ecological importance to the dolphin because of the food supply it provides. Furthermore, the Sargassum community provides protection for younger individuals from predation by other species. Segregation of younger from older individuals through behavioral differences reduces cannibalism. An adaptive significance to the attraction of smaller individuals to the Sargassum community has been suggested (Rose and Hassler, 1974).
Apparently, emphasis on different types of food items changes throughout the life cycle of the dolphin. Shcherbachev (1973) noted that larvae and fingerlings of dolphin feed primarily on invertebrates, particularly copepods, while adult common dolphin eat flying fish of the genus Cypselurus. Kojima (1963) found juveniles of the families Engraulidae (anchovies), Mullidae (goatfish) and Oplegnathidae (a primitive perciform) in the stomachs of dolphin 500 to 1,500 mm in length in Japanese waters.

Erdman (1958) commented that the pelagic stages of young shore and reef fishes seemed to form the most abundant and frequent foods of the pelagic species he studied in Puerto Rico, which included the dolphin. He mentioned filefishes, triggerfishes, goatfishes, squirrelfishes, doctorfishes, and threadfins as young shore fishes which are important food items of pelagic fishes. He said that bottom fishes such as snapper and grouper and deep sea fishes were noticeably rare in stomachs compared with shore fishes.

b) Predator Species

Two known predators of the common dolphin in western Atlantic waters are the blue marlin (Makaira nigricans) Gibbs and Collette (1959) and the swordfish (Xiphias gladius) (D. de Sylva, pers. comm.). One 6.4 kg (14 pound) dolphin was found in the stomach of a whitetip shark (Carcharhinus longimanus) by Schuck and Clark (1951); although dolphin did not occur in any of 88 whitetip stomachs examined by Backus, et al. (1956). According to Backus, et al. (1956), the dolphin is a common associate of the whitetip shark.

5.3.8 Comparison of Food Habits of Species of the Management Unit

Clupeid fishes, penaeid shrimp, and squid are the principal prey organisms of five out of seven species in the coastal pelagic management unit: the three mackerels (if cero can be included), the bluefish, and the little tunny. The cobia feeds primarily on crabs and mantis shrimp, which it takes from the bottom. The diet of the dolphin consists mostly of flyingfish, jacks, triggerfish, and filefish.

The mackerels feed primarily on pelagic species, particularly herrings, although a fairly large percentage of the diet of king mackerel is made up of shrimp. The diets of the Spanish and king mackerel overlap. The one quantitative study that was done on the food of these mackerels in the same area (Knapp, 1949) suggests that the Spanish mackerel is more dependent on fish and less dependent on invertebrates than the king mackerel, which eats a large percentage of shrimp and squid.

The same herring species that was identified as the king mackerel's principal prey in Forida (Beaumariage, 1973) was given as the principal prey of the Spanish mackerel in Brazil (Menezes, 1970). This was the Atlantic thread herring.

The feeding spectrum of the bluefish appears to be wider than that of the mackerels. This species feeds throughout the water column. Small herring-like fishes and the juveniles of estuarine bottomfish such as spotted seatrout, Atlantic croaker, and spot serve as its prey. Mullet are included in the diet of bluefish as in the diet of Spanish mackerel.

An important prey of the little tunny is the round herring (Carlson, 1952). Squid also is important to this species as is the Spanish sardine. Little tunny also feed on flyingfish, which causes the diet of this species to overlap with that of the more oceanic dolphin. Scads (Decapterus spp.) also are thought to be important to this species based on volumetric stomach analysis of a related species in Hawaiian waters.

Mantid shrimp, crabs, eels, and squid are the main food organisms of cobia.

The diet of dolphin consists of flyingfish, jacks, triggerfish, and filefish.

5.3.9 Principal Prey Species of the Mangement Unit and Their Food Habits

Small schooling fishes in the family Clupeidae (herring and sardines) are the most important prey fishes of the coastal pelagic unit. Major species of this family are Opisthonema oglinum (Atlantic thread herring), Harengula jaguana (scaled sardine), Etrumeus teres (round herring), and Sardinella anchovia (Spanish sardine). Other prey organisms of apparently equal importance are penaeid shrimp and squid. The only species name mentioned for squid was Loligo pealei (Wilk, 1977). In subtropical waters this species is replaced by Loligo plei (Laroe, 1970).

Other neritic squid that occur in areas frequented by the coastal pelagics are the genera Sepioteuthis, Dortheuthis, and Lolliguncula (Voss, 1973). Other fish families that are major sources of food for one or more species of the management unit include the Engraulidae (anchovies), specifically Anchoa mitchilli, the Exocoetidae (flyingfishes and halfbeaks), the Carangidae (jacks, scads, and pompano) including Decapterus punctatus, and Peprilus triacanthus (butterfish).

Most of the clupeids, including Atlantic thread herring and Spanish sardine, feed on zooplankton, particularly copepods (Low, 1973; Hildebrand, 1963; and Bohlke and Chaplin, 1968). Atlantic thread herring eat anchovy larvae as well as copepods (Low, 1973). Preferential rather than nondiscriminant feeding is apparent in those species of clupeids for which food habits have been determined (Low, 1973). Clupeids are capable of feeding in either the picking or the filtering mode. They filter feed

when dense concentrations of food of a suitable size is available (O'Connell, 1972; and E. Houde, pers. comm.).

5.3.10 Larval Food Chains

Size of potential prey relative to the size of the predator is probably the single most important determinant of who eats who in marine food chains and prey species change as the predator grows (Detwyler and Houde, 1970). Prey-predator roles sometimes reverse with time, meaning that marine food chains are actually circles, larval fish being fed on by the prey of their parents. The influence of relative size on predation puts an evolutionary premium on the ability of a marine species to grow fast and attain a large size.

Coastal pelagic species are not exceptions to the generalities just stated. All are carnivores throughout their lives and are thought to eat copepods at early stages. Young cobia are known to require crustaceans in their diet and do poorly on a diet of pure fish (Hassler and Rainville, 1975a).

5.4 Estimate of MSY, Abundance and Present and Future Condition

Estimates of MSY for coastal pelagic species were developed especially for this management plan. These estimates were reviewed by the Scientific and Statistical Committee and accepted by it as the best available given the constraints imposed by the quality of available data. Additional detail on how some of the parameters were estimated and other technical discussion is contained in Powers and Eldridge (1983a and 1983b).

5.4.1 King Mackerel

5.4.1.1 King Mackerel: Assessment and Specification of MSY

A reassessment of the king mackerel stock was prepared for the Councils by the Southeast Fisheries Center (Powers and Eldridge, 1983b). In calculation of MSY, they used three methods: yield per recruit, average catch, and production model.

The 1983 estimate of MSY derived from using the yield per recruit method used in the original FMP was lower than that of the original FMP because the best estimate of YPR (1309 g) using the Johnson, et al., growth curve was only 64 percent of the previous estimate. The difference in MSY estimate was due to the difference in growth models (Powers and Eldridge, 1983b). The range in estimates was due to the different combinations of F and M that were used. The best estimate of MSY for sexes combined was approximately 14.5 million pounds with a range of 6.8 and 36.5.

Production model estimates utilize catch and effort statistics to estimate production model parameters; however, these statistics are not available in sufficient time series. In their stead very limited catch per unit effort data from northwest Florida were used. These data show declining trends over time and, if in error, would show more decline than may have actually occurred. Using several scenarios, the authors developed three estimates of 25.8, 26.0, and 35.2 million pounds.

Equilibrium catches from a relatively stable catch effort time period was the third method used to estimate MSY. Long term average yield were calculated using three scenarios of recreational catch trends. Six and seven year averages were used to encompass a complete cycle of the observed pattern of low years, high years, and normal years. Because landings in the 1970-1976 period appeared to be most representative of equilibrium conditions, the estimates obtained from using those years were considered to be the best using this method. The minimum MSY estimates for those years range from 21.9 to 24.6 million pounds.

MSY estimates in summary were:

Yield Per Recruit	6.8 to 36.5
Production Model	25.8 to 35.2
Average Catches	21.9 to 24.6

MSY probably occurs within the range of the production model and average catch estimates. It has, therefore, been estimated as the average of the estimates from the production model and the 1970 to 1976 average catches (average of 21.9, 23.7, 24.6, 25.8, 26.0 and 35.2). This figure is 26.2 million pounds which is very close to the best fitting production model. MSY is, therefore, set within the range of 21.9 and 35.2 million pounds with the best current point estimate at 26.2 million pounds for the overall king mackerel stock.

Because the resource is divided into two migratory groups, and because yield is maximized when fishing pressure is equal on both groups, TACs were chosen to reduce the catch of Gulf fish and allow an increased catch of Atlantic fish. This was done because evidence indicates that fishing pressure was too high on Gulf fish; whereas fishing pressure could be increased somewhat on Atlantic fish. The TACs will change from year to year as the population changes size in response to the new fishing mortality rate. The best estimate for TAC for the Atlantic migratory group is 11.8 million pounds and the best estimate for the Gulf migratory group is 14.225 million pounds. The use of the TAC will move landings to the MSY level.

5.4.1.2 King Mackerel: Assessment and Specification of Present and Probable Future Condition

The division of the king mackerel into two seasonal migratory groups allows a better analysis of the status of the stock (Section 5.1.1.1) (Powers and Eldridge, 1983b).

Gulf Migratory Group

Commercial size frequency and catch per unit of effort in Florida indicate a decline in recruitment since 1980. If present levels of fishing effort are maintained, recruitment could decline further. Also, if landings of large females in Louisiana increase substantially, recruitment could be adversely affected. Reduction of present catch by about 22 percent as proposed in the initial year of the amended plan will minimize the possibility of recruitment failure and should restore the population to near MSY level in several years.

Atlantic Migratory Group

Catch from this group is presently modest and appears well below the MSY. The total allowable catch to achieve MSY is above the capacity of the fisheries in the area; so it is doubtful that the TAC will be reached in initial years of the plan.

5.4.2 Spanish Mackerel

5.4.2.1 Spanish Mackerel: Assessment and Specification of MSY

Using the 1975 commercial landings and the adjusted estimate of recreational catch from the 1970 Saltwater Angling Survey, estimates of MSY varied from 13,464,000 pounds at $M = 0.5$ and $t_c = 1.0$ to 49,062,000 pounds at $M = 0.8$ and $t_c = 2.0$ (Exhibit 5-9). At the most likely combinations, $M = 0.7$ and $t_c = 1.5$, the best current estimate of MSY is 27 million pounds within a range of 13.5 to 49.1 million pounds. This compares with a total adjusted catch estimate of 20,158,000 pounds.

Exhibit 5-9 summarizes the range of MSY estimates for Spanish mackerel based on currently available data. The MSY estimates provided by this approach use as an input an estimate of total catch for some years. Because of uncertainty in the total recreational catch, estimates have been provided using data from the 1970 Saltwater Angling Survey (Deuel, 1973), which is believed to be an overestimate and using adjusted data to estimate the total recreational catch. In either case, the MSY estimates are in similar relative proportions to the estimate of the total catch. The likely upper and lower bounds represent a reasonable limit to the range of MSY estimates based on currently available data. The "best estimate" represents a reasonable estimate for the most likely value of MSY based on currently available data. Future research may provide revised data with which to revise the MSY estimate. The estimates of the critical parameters, M (instantaneous fishing mortality), and t_c (time at first capture) for the MSY model are also presented in Exhibit 5-9.

Exhibit 5-9

Spanish Mackerel MSY Estimate Summary
(million pounds)

	Estimate of Recreational Catch[1]	Based on Adjusted Estimates for 1975 Recreational Catch	Parameter Value Estimates	
			M	t_c
Likely Upper Bound	81.7	49.1	0.8	2.0
"Best Estimate"	45.0	27	0.7	1.5
Likely Lower Bound	22.4	13.5	0.5	1.0
Corresponding Estimate of Total Recreational and Commercial Catch	35.5[2]	20.1[3]		

[1] 1970 Saltwater Angling Survey

[2] Unadjusted estimate for 1970.

[3] Adjusted estimate for 1975.

5.4.2.2 Spanish Mackerel: Assessment and Specification of Present and Probable Future Condition

The present condition of the Spanish mackerel is not well defined. There is no documented information on changes in length frequency of the catch, changes in catch per unit effort, relative abundance, or distribution. The only available information which can be used to assess the present condition of the stock are the estimates of MSY presented in Section 5.4.2.1 and its relation to present catch.

If the estimates of Deuel (1973) for the recreational catch are accepted, then the total catch, recreational and commercial, in 1970 was 35,515,000 pounds. This is larger than the lower bound estimate of MSY, but below the "best estimate" of 44,963,000 pounds, and much less than the upper bound estimate of MSY. If our best estimate is correct, then the Spanish mackerel is not presently over-

fished; nor has it been in the past. However, this estimate of MSY is based on imprecise estimates of many parameters. It is advisable to be very conservative in inferring present condition from these estimates of MSY alone.

Predicting the future condition of the Spanish mackerel stock is dependent on the rate at which the catch and fishing effort are increasing and on the true values of MSY and present total catch.

Recreational fishing effort for most species of saltwater fish is increasing and will continue to increase in the foreseeable future. North (1976) estimated a rate of increase in saltwater recreational fishermen as 4.5 percent per year. Recreational boats of the size class used by most saltwater anglers (16-25 feet) have been increasing by approximately 9.5 percent in Florida. This is probably a reasonable proxy for an estimate of the rate of increase of recreational fishing effort. Recreational fishing effort for Spanish mackerel is probably increasing at a rate within this range.

Commercial fishing effort and fleet capacity have been increasing for Spanish mackerel, primarily because of the rapid increase in power roller gill-net vessels in south Florida. Most of these vessels are now equipped to fish for either Spanish or king mackerel. The total number is unknown, but approaches 80. The increase in number of vessels and effort is expected to continue.

The effect of these increases in effort depend on the true values of present catch and MSY. If either estimate of present catch is correct, and the corresponding lower bound estimate of MSY is correct, then the Spanish mackerel is already overfished and further increases in catch could result in severe reductions in the abundance of the stock, total yield, and catch per unit effort. If one of our "best estimates" is correct, then there is some room for expansion. However, if effort and catch increase as rapidly as seems possible, MSY will be reached in a few years.

5.4.3 Cobia

5.4.3.1 Cobia: Assessment and Specification of MSY

A crude estimate of MSY was obtained from the landing statistics. Deuel (1973) reported the 1970 recreational catch 775,000 pounds in the Atlantic and 125,000 pounds in the Gulf. These may be overestimates, but no data exist with which to correct them. For the period 1965-1977, maximum reported commercial landings on the Atlantic coast were 24,000 pounds in 1965 and 23,000 pounds in 1970. The maximum reported in the Gulf was 133,000 pounds in 1974. The maximum total catch was, therefore, 1,057,000 pounds.

This was accepted as the best available estimate of MSY. It is accepted with caution and considered an upper limit estimate. Using maximum reported catch for MSY in a stock which may be overfished could overestimate the real value. Additionally there is a high probability that the recreational catch is overestimated.

At present, there are not sufficient data available to calculate an accurate estimate of MSY for cobia. The only information available which could be used to make a crude estimate are commercial and recreational catch statistics and data from Richards (1977). These data indicate that there may be two stocks of cobia in U.S. waters; one in the Atlantic which may be overexploited, and one in the Gulf of Mexico which appears to be underexploited.

5.4.3.2 Cobia: Assessment and Specification of the Present and Probable Future Condition

The abundance of cobia is apparently much lower, even in unfished populations, than the abundance of other coastal pelagic species. It is a moderately long-lived species with a correspondingly low natural mortality rate and low rate of recruitment. This combination of characteristics makes

the cobia more susceptible to overfishing than other coastal pelagic species.

The cobia is subject to intense recreational fishing pressure during the summer in Chesapeake Bay, in spring and summer in the northern Gulf of Mexico and, to a lesser degree, during the winter in south Florida. If this fishing pressure increases, as seems very likely, the cobia could become severely overfished. This may be happening already in the Atlantic; however, until more data is available this conclusion is not definitive.

5.4.4 Assessment and Specification of MSY, the Present and Probable Future Condition of Cero Mackerel

There is no available information from which any estimate of MSY for cero mackerel can be produced. Neither recreational nor commercial catch statistics are available.

The size of the cero mackerel stock in U.S. waters is apparently much smaller than the king or Spanish mackerel. There is no commercial fishery and very little recreational fishing effort directed at the cero mackerel in U.S. waters. The current landings are primarily incidental catches. It is therefore unlikely that the cero mackerel is presently overfished or in any danger of becoming overfished if current trends continue.

5.4.5 Little Tunny: Assessment and Specification of MSY, Present and Probable Future Condition

There is no available information from which any estimate of MSY for little tunny can be produced. The little tunny stock in U.S. waters is apparently very large. It is the most abundant scombrid larvae out of eight species found in the eastern Gulf of Mexico (E. Houde, pers. comm.). There is very little commercial fishery and no comprehensive landing statistics available, either commercial or recreational. The recreational catch is probably quite large. Manooch and Laws (in prep.) reported 58,953 pounds of little tunny caught by the charter fishing fleet in North Carolina. Gentle (1977) reported the little tunny to be the second most abundant fish in the catch of the charter fishing fleet in Miami, Florida. In that study little tunny were often caught as bait for sharks and large billfish (E. Gentle, pers. comm.). Data in Carlson (1952) indicated that the abundance of little tunny along the Atlantic coast was very high. Wade (1977) estimated the Alabama recreational catch in 1975 at 388,444 pounds.

Although present catch is approximately one million pounds, it is very unlikely that the little tunny is being overfished or that it will become overfished in the forseeable future if present trends continue.

5.4.6 Bluefish: Assessment and Specification of MSY, Present and Probable Future Condition

The bluefish stock or stocks in the Gulf of Mexico appear to be small relative to those along the Atlantic coast. The available data are not sufficient to calculate a reasonable estimate of MSY. The present condition of the stock appears to be healthy; no significant trends in catches, either up or down are seen in either commercial or recreational catches. There is little directed fishery for bluefish in the Gulf and no reason to believe that the total catch is approaching MSY.

Without more accurate information on MSY and present catch, it is impossible to predict the future condition of the bluefish. Bluefish populations are known to undergo large fluctuations in abundance of unknown cause. Some data indicate that the bluefish may be in a period of stock expansion along the Atlantic coast. At present, it appears to be underexploited in the Gulf. How rapidly this could change as the total catch increases cannot be predicted with the available data.

5.4.7 Dolphin: Assessment and Specification of MSY, Present and Probable Future Condition

There are no available data from which to estimate MSY for dolphin; however, at the present time it is unlikely that the dolphin is being exploited at MSY. The dolphin is a species with a high growth rate, high mortality rate, low age at maturity, and high fecundity (see Section 5.1.7 on biological description). A species with this combination of biological characteristics is difficult to overfish, either in terms of recruitment overfishing or growth overfishing.

6.0 DESCRIPTION OF HABITAT

6.1 Condition of Habitat

6.1.1 Adult Habitat

The habitat of all adults of all the species in the coastal pelagic management unit, except dolphin, is the coastal waters out to the edge of the continental shelf in the Gulf of Mexico and Atlantic Ocean. Dolphin is an oceanic species that may be found on the shelf. Within that area, the occurrence of these species is governed by temperature and salinity. All species except bluefish are seldom found in water temperatures less than 20°C. Bluefish are commonly found in water temperatures down to 12°C. Salinity preference varies, but is generally for high salinity. Dolphin are seldom found in waters with salinity less than 36 ppt. The scombrids prefer high salinities, but less than 36 ppt. Salinity preference of little tunny and cobia is not well defined. Bluefish exhibit a wide preference and can be found in estuarine waters of relatively low salinity. Some populations of bluefish are estuarine dependent in the juvenile stage.

There appears to be little direct effect of man on the adult habitat which adversely affects adults of these species, nor does it appear likely that there will be significant effect in the foreseeable future. Habitat degradation is more likely to affect eggs and larvae or indirectly affect the adults through predator-prey relations.

6.1.2 Larval Habitat

The larval habitat of all species in the coastal pelagic management unit is the water column in the area of spawning. These areas are identified for each species in Section 5.1. Within the spawning area, eggs and larvae are concentrated in the surface waters.

There is, at present, no documented evidence that larval habitats have been degraded by natural or man-made impact to a degree sufficient to affect recruitment; however, man's impact on the habitat has greater potential to affect the larvae than the adults, and the magnitude of man's impact in the spawning area has been rapidly increasing.

Oil pollution from offshore oil spills or chronic leakage or discharge from operating oil wells is a potential danger to the spawning grounds of coastal pelagic species. The water soluble aromatic hydrocarbon component of crude oil is damaging to fish eggs and embryos. Fifty percent mortality was experienced in herring and anchovy larvae exposed to benzene in the range of 20 to 25 ppm in a laboratory experiment (Struhsaker, et al., 1974). Sublethal effects observed in laboratory experiments were abnormal development and altered respiration rates. Eggs and larvae were collected from San Francisco Bay and other locations. San Francisco Bay eggs showed a lower hatching rate (20-25 percent did not hatch) and San Francisco larvae showed a higher percent of abnormalities than eggs and larvae collected from other sites (Struhsaker, et al., 1974). San Francisco Bay is an area of chronic oil pollution.

Other pollutants such as pesticides may act synergistically with oil to produce the deleterious effects on the young stages of fish (Struhsaker, et al., 1974). Oil dispersants with water soluble aromatic hydrocarbon fractions also have been found to be damaging to eggs and larvae (Wilson, 1977), although the second generation dispersants are less toxic than those originally used after oil spills, due to the reduction in aromatic hydrocarbons (Wilson, 1977).

Although no adverse impacts have yet been documented, growing offshore drilling activity in the Gulf of Mexico is a potential threat to king mackerel in particular. A major spawning center is located off the coast of Texas. The possible impact of chronic oil leaks or oil bearing brine discharges on

the development of king mackerel larvae should be considered. The recent IXTOC oil spill demonstrates the potential for single accidents to impact a very large fraction of the total spawning area.

6.1.3 Habitat of Prey Species

Estuaries are critical habitats for most of the major prey species of coastal pelagics. For this reason, estuarine habitats and factors which affect them should be considered critical to the coastal pelagic management unit.

All the species of the coastal pelagic management unit, except the dolphin, have one thing in particular in common. They move from one area to another and harvest seasonal abundances of local resources. Many of the prey species of the coastal pelagics are estuarine dependent in that they spend all or a portion of their lives in estuaries. This means that the coastal pelagic species, by virtue of the ultimate source of their food, are to some degree dependent upon estuaries also. Therefore, coastal pelagic species can be expected to be detrimentally affected if the productive capabilities of estuaries are greatly degraded.

6.2 Habitat Areas of Particular Concern

The critical habitats of the species of the coastal pelagic management unit, generally speaking, are:

1) Offshore areas of peak spawning activities

2) All the estuaries on their migration routes.

Some general statements can be made as to actions that would serve to protect the areas of critical habitat:

1) Locate the centers for spawning activity for the coastal pelagic species, evaluate their current habitat quality, and protect them from further degradation.

2) Determine whether or not king mackerel hatching or larvae development in the western Gulf, a major spawning area, are significantly affected by proximity to operating oil wells (or brine discharges) and if this affects recruitment.

3) Recognize the importance of estuaries to the coastal pelagic species and act against damage to natural support capabilities of estuaries by dredging, filling, bulkheading, and change in freshwater runoff, etc.

6.3 Habitat Protection Programs

As discussed in the previous sections, the coastal pelagic fish do not inhabit any site specific habitat. Rather they are spawned in very large (generally) offshore, geographical areas, and as adults, migrate over great distances. There are comprehensive coastal zone management programs being developed that focus on protecting and enhancing estuarine environments along with other coastal areas. Indirectly these programs will affect in a positive manner the productivity of the management unit.

At the federal level no comprehensive habitat protection programs exist. A marine sanctuary program was established by the Marine Protection, Research and Sanctuaries Act. The Act permits the designation (by the Office of Ocean and Coastal Resource Management, NOAA) of specific marine sanctuaries. Existing or proposed sanctuaries will not significantly affect the habitat of coastal pelagic species.

7.0 FISHERY MANAGEMENT JURISDICTION, LAWS, AND POLICIES

Management institutions currently involved with the species in the coastal pelagic management unit include the Fishery Management Councils and various states within the range of the stocks. King mackerel, Spanish mackerel, cero mackerel, dolphin and cobia are caught almost entirely within the South Atlantic and Gulf of Mexico regions. Bluefish are caught in substantial amounts from Mississippi to Massachusetts, but are considered by this plan only in the Gulf of Mexico. Little tunny are caught by recreational fishermen in the South Atlantic and Gulf of Mexico regions, and there is a moderate commercial catch off New England.

Exhibit 7-1 shows the proportion of the U.S. commercial catch caught inside and outside of three miles from shore.

There may be some interaction between the stocks of king and Spanish mackerel caught in United States waters and those caught by Mexicans off Vera Cruz.

7.1 Management Institutions

The United States, acting through the fishery management councils and the U.S. Department of Commerce pursuant to the Fishery Conservation and Management Act of 1976 (16 U.S.C. 1801 et seq.), has authority to manage fisheries in the FCZ of the United States.

The states have authority to manage fish stocks within their boundaries (nine nautical miles for Texas and Florida's west coast and three elsewhere). The principal state conservation agencies are Texas Parks and Wildlife Department, Louisiana Department of Wildlife and Fisheries, Mississippi Department of Wildlife Conservation, Alabama Department of Conservation and Natural Resources, Florida Marine Fisheries Commission, Georgia Department of Natural Resources, South Carolina Department of Wildlife and Marine Resources, and North Carolina Department of Natural Resources and Community Development.

The Gulf States and the Atlantic States Marine Fisheries Commissions are interstate compacts which provide coordination among the member states.

7.2 Federal Laws, Regulations and Policies

Existing federal laws, other than the MFCMA, have no apparent significant impact on the coastal migratory pelagic resources; however, implementation of coastal zone management programs may have indirect beneficial impacts on the habitat of the fishery. Also, the Marine Mammal Protection Act is related to the Spanish and king mackerel and bluefish fishery. These conclusions were reached after a review of the following legislation:

- Coastal Zone Management Act (and current status of state coastal zone programs);
- Marine Mammal Protection Act;
- Endangered Species Act;
- Fish and Wildlife Act of 1956;
- Marine Protection, Research and Sanctuaries Act;
- Federal Water Pollution Control Act; and
- Outer Continental Shelf Lands Act.

Exhibit 7-1

Commercial Landings by Species and by Distance Caught off U.S. Shores[1]
(Thousand Pounds)

Species[2]	1980	1981	1982	3-Year Average	Percent
King mackerel					
0-3 miles	843	1,187	1,543	1,191	15.9
3-200 miles	6,192	6,036	6,643	6,290	84.1
Spanish mackerel					
0-3	6,533	2,298	3,832	4,221	48.0
3-200	5,435	3,869	4,428	4,577	52.0
Little tunny					
0-3	43	96	24	54	22.9
3-200	179	150	217	182	77.1
Bluefish[3]					
0-3	11,404	10,491	11,627	11,174	68.9
3-200	4,272	6,168	4,710	5,050	31.1

1 None of the fish in the Management Unit were reported caught beyond 200 miles.

2 Data on cobia and dolphin unavailable.

3 Includes fish from New England and Mid-Atlantic areas.

Source: U.S. Department of Commerce, National Marine Fisheries Service, Fisheries of the United States, annual reports for 1980, 1981 and 1982.

The Coastal Zone Management Act places responsibility for comprehensive land and water management of the coastal zone upon the coastal states. The Act also requires that federal actions directly affecting the coastal zone of a state be consistent (to maximum extent possible) with the approved state plans. Of the eight states in the management area, Georgia and Texas do not have approved coastal zone programs.

The final regulations of the Marine Mammal Protection Act make it a federal crime to kill, capture or harass any marine mammal. Amended regulations prohibit the intentional killing under any circumstances of the bottlenose dolphin, a species which preys on fish in the management unit. Occasionally these porpoises are a nuisance to the fishermen. They bite and tear fish from gill nets used to take Spanish and king mackerel or bluefish and sometimes damage fishing nets. They pull hooked king mackerel off handlines, sometimes damaging the handliner's gear and injuring the fishermen. There are no sections of the Act that restrict the provisions of the management plan.

The remaining legislation listed above has no impact on the management unit.

7.3 Treaties and International Agreements

No foreign or Indian treaties or international agreements exist that relate specifically to coastal pelagics in the management area.

Agreements exist regarding the interim maritime boundaries between the United States and Mexico and Cuba in the Gulf of Mexico and the Straits of Florida. Governing International Fisheries Agreements with both Mexico and Cuba have expired.

7.4 State Laws, Regulations and Policies

Coastal migratory pelagic resources are regulated, to a certain extent, by the states of the South Atlantic and Gulf of Mexico regions. States have jurisdiction extending three nautical miles from shore, but Texas and Florida's west coast have three marine leagues (nine nautical miles). Few states have extensive management restrictions (as compared to shellfish, for example) directed at king or Spanish mackerel or other coastal migratory pelagic resources. However, several states do regulate size limits and have restrictions on the use of fishing gear that affect this management unit.

Florida, the state where most fishing for mackerel occurs, has several laws which affect the management unit. In December of 1984, a Florida regulation became effective setting a two fish per person, per trip bag limit on Gulf group king mackerel. This applies to commercial and recreational fishermen in Florida waters. Minimum size limits have been placed on mackerel and bluefish. They are 12 inches and ten inches respectively, measured from the nose to the rear center edge of the tail, and apply to commercial and recreational fishermen alike. It is illegal to catch, buy, sell, or have in one's possession any fish not meeting the minimum size. Second, the use of purse seines is prohibited for taking any food fish. Third, there are several special acts passed by the legislature which have local applicability. The only special act directed specifically at fish in the mangement unit is for Monroe County. It prohibits the use of gill nets having stretched mesh of less than 3-1/4 inches for the taking of mackerel. Special acts also prohibit the use of seines and nets in designated waters of Broward and Palm Beach Counties. In Duval, St. Johns, Volusia, and Broward Counties, special acts place restrictions on mesh size of nets and seines for catching any fish in designated waters.

An agreement was recently signed between the State of Florida and the United States concerning the enforcement of MFCMA provisions with respect to foreign fishing in the Gulf of Mexico. There, the state's jurisdiction extends to three marine leagues (approximately nine nautical miles). According to the agreement, only federal fishery laws will be applied to foreign fishing between three and nine

miles off the coast of Florida. Also, state personnel are authorized to enforce federal laws within that geographical area.[1]

There is another Florida law concerning jurisdictional issues which is worthy of noting. Florida, in the absence of federal law, has claimed jurisdiction over the "operations of all fishermen and vessels of this state engaged in the taking of such fishery resources within or without the boundaries of state waters" [Florida State Code, Section 370.02 (1) (a)]. Such extended state jurisdiction has been upheld in the courts prior to the federal government's initiation of a management program under the MFCMA.[2] When a management plan is implemented, the MFCMA apparently supercedes the state code with all waters beyond the state jurisdiction to the 200-mile limit coming under federal jurisdiction.

A law passed in 1979 in the Florida legislature to regulate the depth of gill nets used for king mackerel. It was instituted to resolve a gear dispute between hook and line and gill-net king mackerel fishermen on the state's east coast. The new law restricts gill nets to 200 mesh (a hanging depth of approximately 57 feet) and a mesh size of 4-3/4 inches in any county on the Atlantic Ocean except Monroe. One effect of the Act is to separate the areas fished by the two groups of fishermen, thereby reducing gear conflicts by restricting the effective depth in which the nets may be used.

The only other states that have laws or regulations specific to the mangement unit are Texas and South Carolina. In both states, restrictions are placed on the minimum size of fish taken. In South Carolina, it is unlawful to buy, sell, or offer to sell any mackerel of length less than twelve inches, measured from the nose to the tip of the tail. Texas and Alabama have implemented the 12-inch minimum fork length for Spanish mackerel, and Texas has also added the 33-inch minimum fork length for cobia.

Several states on the Gulf coast have general gear restrictions which may affect the management unit. In Alabama, minimum net mesh may not be less than 1-1/2 inches from knot to knot with a 2-1/2 inch stretch for use in the Gulf of Mexico.[3] Purse seines may not be used within state waters to take species in the management unit. Mississippi prohibits harvest of most food fish species, including king and Spanish mackerel, by purse seine gear. Possession of these species aboard a purse seine vessel is also prohibited. Louisiana has minimum limits for various types of nets; for seines minimum mesh of 7/8 inches square or 1-3/4 inches stretched; for gill nets not less than 1-1/2 inches square or three inches stretched; for trammel nets not less than one-inch square or two-inches stretched. For species other than menhaden, purse seines may be used in state waters only by special permit. At present there are no permits for species in the management unit. No nets or seines in Louisiana may exceed 2,000 square feet in length. In Louisiana, recreational fishermen are restricted to taking game fish (including the species in the management unit) with a reel, artifical bait, spinner, spoon device, or spear, or from taking commercial fish with bows and arrows for sport. In Texas, gear restrictions include a maximum length of nets and seines of 1,800 feet; minimum mesh size of nets and seines of 1-1/2 inches square; minimum mesh of trammel nets of eight inches square on the outer walls and 1-1/2 inches square for the mesh of the center wall; and trot lines should have a maximum length of 600 feet. Purse seines may not be used in state waters except for menhaden.

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1 The same agreement was signed by the State of Texas, which also has a seaward boundary of three marine leagues.

2 In Skiriotes v. Florida the Supreme Court held that a state regulation prohibiting the use of specific gear for harvesting sponges outside the territorial limits of the state was a valid exercise of the police power by the state upon one of its citizens, permissible in the absence of any conflict with federal law.

3 In the Baldwin County area permissible net mesh is 1-1/2 inches from knot to knot.

The South Atlantic coastal states also have general gear restrictions for commercial fishing that may affect the mangement unit. In North Carolina, the use of purse seines is prohibited for taking foodfish, and no nets may be pulled by more than one boat except in long haul fishing operations. South

Carolina restricts the mesh size of seines to a minimum of 2-1/2 inches. In Georgia, gillnetting is prohibited, as is the use of power drawn nets. The latter restriction effectively prohibits purse seines. Gear restrictions in Florida include only those discussed earlier in this section. There are no gear restrictions on recreational fishermen in any of the south Atlantic states.

The general management programs of all states in both regions include some licensing requirements for commercial fishermen, wholesale dealers and retail dealers; however, none of the licensing requirements are species specific with respect to coastal migratory pelagic resources. Only Louisiana and Texas have licensing requirements for recreational fishermen. Recreational licenses obtained in either state can be used for both freshwater and saltwater sportfishing. Closed seasons for fishing or taxes on fish landed are not used in the management programs for coastal migratory pelagic resources by any of the states.

7.5 Local and Other Applicable Laws, Regulations and Policies

There are no laws passed by local jurisdictions that directly affect the management unit. State laws having local applicability are in effect in Florida.

8.0 DESCRIPTION OF FISHING ACTIVITIES AFFECTING THE STOCKS COMPRISING THE MANAGEMENT UNIT

8.1 History of Exploitation

The species in the management unit have traditionally been sought after by both commercial and recreational fishermen. King mackerel, Spanish mackerel, and bluefish have been historically important as target species of major commercial fisheries. The species in the management unit have been important in supporting recreational fishing from charter boats and private boats. King mackerel, in particular, have been traditionally important as a mainstay of the commercial charterboat fishery. Dolphin have been caught commercially as a seasonal supplement to other fisheries. Cobia have been primarily a recreational species and the commercial catch is incidental. Little tunny have been mainly a recreational species within the Gulf and South Atlantic regions. Cero mackerel are not particularly abundant in the United States and have been an incidental commercial and recreational catch. To date there has been little, if any, foreign participation in the coastal pelagic management unit fisheries in the waters of the United States fishery conservation zone.

King mackerel in recent years have been caught commercially primarily in south Florida and to some extent off North Carolina and Louisiana. Historically, there was a small amount of commercial fishing for king mackerel in Chesapeake Bay. Large scale commercial exploitation in Florida did not begin until the early 1900s. This coincides with the beginnings of the development of Florida fisheries in general. Total commercial catch appears to have averaged around four million pounds during the 1920s and 1930s. The trend in total commercial catch dropped to about two and one-half million pounds in the early 1950s, increasing to about an eight million pound catch in the mid-1970s. Catches declined to five million pounds in 1978 and 1979 then increased to exceed eight million in 1982.

Traditional commercial user groups include hook and line fishermen and gillnetters. King mackerel is a primary target species for these groups, although they catch several other species in the off season. The number of participants in both of these groups has increased dramatically in recent years. In 1969 there were an estimated 100 hook and line boats and 12 large gill-net vessels operating in this fishery in south Florida. This increased to an estimated 300 hook and line boats and 33 large gill-net vessels by 1977. A significant number of large gill-net boats which fished primarily for Spanish mackerel entered the king mackerel fishery. The number of gill-net vessels using power rollers was estimated at 121 in 1983 and there were 188 smaller gill-net boats and 246 commercial hook and line boats.

Over the past 20 years there have been several developments in gear and fishing techniques. Beginning approximately in the mid-1960s electronic fish finders came into widespread use. Boat construction changed from predominantly wood to predominantly fiberglass. Hook and line boats began to use power reels for hauling in lines. Gill-net boats increased in size and the depth of nets increased. A significant development beginning in approximately 1965 was the development and adoption of power rollers for hauling in gill nets. In about 1967, monofilament mesh began to be used for nets. Also, in the late 1950s several fishermen began to use spotter aircraft for spotting schools of fish. The use of spotter aircraft has gradually increased so that today nearly all of the gill-net vessels and some hook and line vessels use them.

Earll (1883) reports that Spanish mackerel were taken off Sandy Hook, New Jersey, beginning around 1850. Gill nets were introduced into Chesapeake Bay in 1887. Pound nets were also used during that period in New Jersey, and by the 1880s were the principle means of taking Spanish mackerel in that area (Earll, 1883).

Large-scale commercial exploitation of Spanish mackerel comparable to today's levels did not begin until the early 1920s, when commercial exploitation began on a large scale in Florida. Total U.S. commercial landings averaged about six to seven million pounds between 1920 and 1940. The 1948

commercial landings were reported to be 12 million pounds. Landings dropped to about eight million pounds between 1950 and 1965. Landings began to increase again in the late 1960s and reached 14 million pounds in 1976. They have since declined to an average commercial catch of about 7.9 million pounds from 1978 through 1982. This activity has been centered in south Florida.

As in the case of king mackerel, power rollers on the larger vessels and monofilament nets came into use in the 1960s. Spotter planes were first used in the 1950s, although widespread use by the larger gill-net vessels did not occur until the 1960s. The number and size of vessels in the fishery has increased over the last several years.

Saltwater sport fishing has been a major recreational activity in the southeastern portion of the nation for many years. Much of the activity was shore-based or took place from boats relatively close to shore until the 1950s. As transportation systems improved and as leisure time increased with affluence, demand for recreational opportunities grew dramatically. With the growth in demand for leisure activity came improvements in recreational equipment. Sales of boats and motors that could be used for offshore fishing climbed. Fishing tackle became more elaborate.

Fishing by private boat for the species in the mangement unit has taken place for many years. However, beginning in the late 1950s small boats capable of fishing for these species became available to large numbers of people. Beginning in the late 1960s specialized sportfishing boats in the 20-foot range were developed and became popular with recreational fishermen. This type of craft is capable of venturing offshore to areas where species such as king mackerel, dolphin, and little tunny can be caught. These boats met a growing demand from recreationists with growing incomes. These developments brought the opportunity to fish for species in the management unit to large numbers of people. Section 8.2.1.2 presents data on the growth of the number of private boats in the Gulf of Mexico and South Atlantic regions. Between 1967 and 1974 the number of private boats of 16-foot length and greater increased at an average annual rate of 10.3 percent.

8.2 Domestic Commercial and Recreational Fishing Activities

8.2.1 Participating User Groups

King mackerel and Spanish mackerel are major target species of an important commercial fishery in south Florida as well as a major target species for the private boat and charterboat recreational fishery along widespread areas within the Gulf and South Atlantic regions. King mackerel are particularly important to the charterboat and offshore private boat fleets. In addition, smaller amounts of king mackerel are caught as a commercial supplement to the North Carolina charterboat fleet. Small amounts of Spanish mackerel are caught as an incidental catch or supplemental commercial target species off Alabama, Mississippi, Louisiana, North Carolina, and to a smaller degree Georgia and South Carolina.

Bluefish are a commercial target species off the Florida east and west coasts. While the amounts caught in these fisheries are rather large, the nature of the catch is that of a supplement to fisheries whose primary target is other species. Minor amounts of bluefish are also caught commercially on a supplemental or incidental basis off Alabama, Mississippi, and Louisiana. Bluefish is also an important recreational species. In the Gulf of Mexico region it is caught predominantly from private boats.

There appears to be a small commercial catch of little tunny within the Gulf of Mexico and South Atlantic regions. However, little tunny is a major supplemental recreational species, particularly for private and charter boats, in various localities throughout these regions.

Small amounts of dolphin are caught commercially as a seasonal supplement to other fisheries in south Florida. They are caught recreationally in significant amounts by the small boat and charterboat fleets in this area.

Cobia are caught commercially as a minor supplement to other commercial fisheries in Florida and excess recreational catches are sold by charterboat operators. There is an incidental catch by shrimp trawlers off Florida, Alabama, Mississippi, and Louisiana. For the recreational fishermen, cobia is a prized game fish throughout the Gulf and South Atlantic regions and is particularly sought from Mississippi to Florida.

8.2.1.1 Primary Commercial User Groups

The primary commercial user groups for species in the mangement unit include:

- The Florida king mackerel hook and line fleet.
- The Florida king mackerel large boat gill-net fleet.
- The Florida small boat (20-28 feet) Spanish mackerel gill-net fleet.
- The Florida large boat (45-48 feet) Spanish mackerel gill-net fleet.
- A Louisiana hook and line fishery for king mackerel beginning in 1982-83.

Many gill-net vessels of all sizes are equipped to fish for both king and Spanish mackerel.

Significant secondary commercial user groups include:

- The southeast Florida small boat gill-net fleet which takes a supplemental catch of king mackerel.

- The North Carolina charter boat fleet which rigs up for commercial king mackerel fishing in the spring and fall.

- The Florida haul seine fleet which takes a moderate catch of Spanish mackerel.

- Purse seine fisheries for Spanish and king mackerel.

Florida King Mackerel Hook and Line Fleet

The Florida king mackerel hook and line fleet includes a group on the east coast centered around the Fort Pierce area. These have been a major traditional user group catching king mackerel along the coast from approximately Palm Beach north to Cape Canaveral. The size of these boats range from about 24 to 36 feet. Their numbers have greatly increased in recent years from about 50 in 1969 to 250 in 1976. These fishermen typically obtain about 70 percent of their value of landings from king mackerel (Morris, Prochaska, Cato, 1977).

The other major hook and line user group operates out of the Florida Keys. The boats are somewhat larger -- from 32 to 40 feet. Most of these vessels are primarily dependent upon other fisheries such as spiny lobster, stone crab, pompano, snapper or grouper. Their fishing effort for king mackerel varies greatly, dependent upon the availability of fish and success of the lobster season. The number of vessels from the Florida Keys actually fishing for king mackerel averages approximately 50 vessels per year.

King Mackerel Large Boat Gill-net Fleet

The Florida king mackerel large boat gill-net fleet had traditionally operated in the Florida Keys and along the Florida west coast around the Naples area. The Naples area has not been a major producer of king mackerel in recent years, and these vessels typically move around the coast in search of the king mackerel. These vessels typically range in size from 40 to 65 feet and are equipped with power

rollers. The number of such vessels increased from an estimated 12 in 1969 to 33 in 1977. The primary reason for investing in these vessels is the profitable king mackerel fishery (Prochaska and Williams, 1976); however, these vessels also fish for Spanish mackerel. In addition, they obtain support from other fisheries such as spiny lobster. The spiny lobster and king mackerel fisheries tend to complement each other during the year as they have different fishing seasons.

Small Boat Spanish Mackerel Gill-net Fleet

The Florida small boat Spanish mackerel gill-net fleet has traditionally operated along the east coast from about Salerno (in Martin County) to about Sebastian (in Indian River County). These boats are typically 20-22 feet in length and may obtain roughly 40 percent of their value of landings from Spanish mackerel (Cato, Morris, Prochaska, 1978). They are also the major Florida commercial user group for bluefish which provides them with about ten to 15 percent of their value of landings. Other revenues for this fleet include catches of king mackerel, pompano and mullet. King mackerel landings include some incidental catch along with Spanish mackerel, and a directed catch. Some of these fishermen use small gill nets of 4-3/4 inch mesh when king mackerel are present in shallow water.

Large Boat Spanish Mackerel Gill-net Fleet

The Florida large boat Spanish gill-net fleet has traditionally operated in three main areas of Florida: the Naples area on the west coast, the Keys, and the east coast between Palm Beach and Cape Canaveral. These vessels typically range in size from 30 to 60 feet and are equipped with power rollers. They obtain up to roughly 80 percent of their value of landings from Spanish mackerel. Some of the vessels also fish for king mackerel. Other revenues for their fleet include catches of bluefish (10 to 15 percent by value of landings) and spiny lobster for those operating in the Keys.

Louisiana Hook and Line Fishery

This fishery for king mackerel was developed commercially in the winter of 1982-83. A trolled handline fishery is similar to the Florida hook and line fleet and is centered in the Grand Isle area. Pole and line fishing is also common around the offshore platforms. During the height of the season, there may be as many as 60 vessels, some shrimp trawlers landings fish at Grand Isle. Boats land fish at Empire.

Secondary Commercial User Groups

Of the secondary commercial user groups there has traditionally been a small boat gill-net fleet taking king mackerel on the southeast Florida coast from Dade to St. Lucie County. These are typically 18 to 30 foot boats. This fleet is not particularly directed to any single species, although it does take substantial amounts of Spanish mackerel as well as king mackerel. The total number of gill-net boats on the Florida east coast is slightly over 300.

The North Carolina charterboat fleet numbers approximately 130. Of these, approximately 25 percent fish commercially for king mackerel in the off season (C. Manooch, NMFS, pers. comm.). The number of vessels and trolling effort expended has increased significantly in recent years resulting in increased catch.

In Mississippi and Florida, processors have initiated purse seine operations to test the feasibility of small scale purse seines. Target species vary with availability, at times including bait species and foodfish, thread herring, Spanish sardine, blue runner, crevalle jack, lady fish, redfish, mullet and king and Spanish mackerel. Spanish mackerel landings were expected to take place between May 1st and August 31st. An unknown amount of mackerel was caught before passage of a state law prohibiting harvest of most food fish species. Six to seven vessels, 48 feet in length each, are presently operating. Some of these vessels were once part of the power roller gill-net fleet and are typical of such vessels. Spotter aircraft are used to locate fish.

8.2.1.2 Recreational User Groups

Recreational users have increased in numbers over time. Many come from outside the management unit as well as areas within it. Increased income, leisure time, and a wide variety of supplies have increased participation. This participation has, in turn, generated significant amounts of economic value and also employment. These aspects of this user group are described below.

Estimated Number of Anglers

Exhibit 8-1 presents estimates of the number of fishermen who caught particular species in the coastal migratory pelagic resources management unit. In 1975 there were an estimated 6.4 million persons who participated in saltwater recreational fishing in the South Atlantic and Gulf of Mexico regions. These estimates are based on the state reports of the 1975 National Survey of Fishing and Hunting and Wildlife Recreation (U.S. Department of Interior, 1977) and historical data from the 1960, 1965, and 1970 Saltwater Angling Survey. The total number of anglers in 1975 was determined by aggregating the number of participants from the various states for the state reports. The estimate of fishermen who caught particular fish in the management unit was based on trend data from the Saltwater Angling Surveys. An analysis of data for 1960, 1965, and 1970 showed that the ratio of anglers in the management area who caught a particular fish in the mangement unit to total anglers in the South Atlantic and Gulf regions, did not vary greatly over the period of the surveys. In fact, bluefish showed the largest variation, and that variation was relatively small. In 1960, 13.3 percent of all anglers in the two regions caught bluefish. In 1965 that figure was 7.9 percent and in 1970 it was 8.4 percent, a maximum difference of less than six percent of the total number of anglers. Because these ratios were relatively stable, it was assumed that the 1975 ratios were the same as those for 1970. Ratios were calculated from the 1970 Saltwater Angling Survey and applied to the estimates of number of anglers obtained from the 1975 National Survey of Fishing and Hunting. While there may be accurate data from the 1970 Saltwater Angling Survey, it is relatively more accurate than data on participation (except for species which are caught with relative infrequency such as cobia). The figures presented here provide a general indication of the importance of the species in the mangement unit to total recreational fishing.

It is also recognized that the number of anglers actually catching king and Spanish mackerel may have declined in the last two to three years. These species have not recently been as readily available to recreational anglers in the eastern Gulf of Mexico and participation is affected. The figures presented above indicate participation interest by recreational anglers in these species in what may be considered a "baseline" year.

In 1979 (NMFS, 1980) the number of anglers had increased to 7.6 million in the Gulf and South Atlantic areas. This is an increase of 19 percent or almost five percent per year. Exhibit 8-1a presents information on anglers targeting certain migratory pelagic species and differs from Exhibit 8-1 which depicts anglers who caught certain species.

Type of Fishing

Exhibit 8-2 presents data from the 1970 Saltwater Angling Survey on the method of fishing for coastal pelagic species. The category reported as "Party or Charter Boat" relates mainly to charter boats because local studies show that the coastal pelagics are not a predominant portion of head or party boat catches, but they are of major significance to the charterboat catch. Charter boats refer to craft available for hire at a fixed price per day regardless of passenger or load, while head or party boats refer to craft which charge a per passenger fee and may have a regular schedule. It should be noted that there is a high standard error in this survey associated with dividing data into this many categories. Nevertheless, the data are probably indicative of general trends, and are generally consistent with perceptions of persons knowledgeable in the fishery and other local studies. General

Exhibit 8-1

Estimated Number of Anglers Who Caught Fish
In the Coastal Migratory Pelagic Species in 1975*

Species	Number of Anglers** South Atlantic	Gulf of Mexico	Percent of Total Anglers	Total
Bluefish	454,000	89,000	8.4	543,000
Cobia	14,000	10,000	0.4	24,000
Dolphin	184,000	212,000	6.2	396,000
King Mackerel	374,000	343,000	11.2	717,000
Spanish Mackerel	382,000	397,000	12.1	779,000
Little Tunny	-***	-***		-***
Total Saltwater Anglers in Region	2,820,000	3,608,000		6,428,000

* Estimates based on 1975 National Survey of Fishing and Hunting, State Reports and historical data from the 1960, 1965, 1970 Saltwater Angling Surveys.

** Number of anglers is not additive because an angler may catch several kinds of fish.

*** Data insufficient to estimate number of fishermen who caught little tunny.

Exhibit 8-1a

Estimated Number of Anglers Targeting
Coastal Migratory Species in 1979*

Species	South Atlantic	Gulf of Mexico	Percent of Total Anglers	Total Number
Bluefish	136,584	**	1.8	136,584
Dolphin	97,560	**	1.2	97,560
King Mackerel	149,592	183,606	4.4	333,198
Spanish Mackerel	**	130,145	1.7	130,145
Little Tunny				
Total Anglers	3,252,000	4,382,000		7,634,000

* NMFS, 1980

** Data not published, percentage targeting species less than one percent

conclusions include the fact that king mackerel is caught almost entirely from private boats or charter boats with a relatively even split between the two. Spanish mackerel are caught predominantly by private boats, although significant catches are obtained from charter boats, pier fishing, and beach fishing. The majority of dolphin being found further offshore is caught by private boats, although significant amounts are caught by charter boats. It is generally true that cobia are caught predominantly in pier and private boat fishing, although a number of them are caught from charter boats.

Commercial Charter Fishing Boat Fleet

The charterboat fleet is heavily involved in fishing for coastal pelagic species. King mackerel, in particular, has historically been one of the most important species in supporting charter-boat operations throughout the South Atlantic and Gulf of Mexico regions. This is in contrast to head or party boats which tend to target other species such as snapper and grouper.

In North Carolina, 92 percent of the total number of fish taken by anglers from charter boats in 1977 were coastal pelagic species. King mackerel accounted for 36.7 percent of the total number caught, followed by bluefish (28.2 percent), Spanish mackerel (14.8 percent), dolphin (9.3 percent) and little tunny (2.9 percent) (Manooch and Laws, 1979).

In southeastern Florida, these species are also important to the charter fleet. In a study of the Dade County, Florida, charterboat sport fishery, Gentle (1977), found dolphin, little tunny and king mackerel accounted for 55.9 percent of the total catch. Dolphin and king mackerel were the second and third most sought-after species.

In a study (conducted in early 1978) of the charterboat fleet along the Florida west coast from Escambia County (next to Alabama) to the Keys (Browder, et al., 1978), king mackerel was found to be a major target species of offshore charter boats. The percentage of total fishing effort directed to king mackerel by season and by Florida coastal area was found to be as follows:

Season	Keys	West Coast	Northwest Coast
Spring	3.9%	49.0%	31.4%
Summer	-	-	49.5
Fall	9.3	19.0	50.7
Winter	34.3	13.0	7.9

Charter boats fishing in the coastal waters adjacent to the St. Andrews Bay system (Bay County on the northwest Florida coast) are heavily dependent on coastal pelagic species and king mackerel in particular. There fish from the management unit accounted for 91 percent of the total charterboat catch in 1973. King mackerel was the most important species, accounting for 74 percent of the total catch in numbers (Sutherland, 1977).

In Alabama in 1975 the percentage of charterboat catch in weight was reported by Wade (1977). He found that king mackerel made up 21.9 percent of the total catch, followed by little tunny (13.6 percent) and Spanish mackerel (4.1 percent).

Exhibit 8-2

Percent of Fish Caught by Mode of Fishing[1]
by Species and by Area in 1970

	Private Rented Boat	Party or Charter Boat	Bridge, Pier or Jetty	Beach or Bank
South Atlantic				
Bluefish	50.4	-	23.1	26.2
Dolphin	97.0	2.4	-	*
Little Tunny	67.0	32.5	-	*
King Mackerel	82.4	13.5	-	*
Spanish Mackerel	97.2	*	-	*
Gulf of Mexico				
Bluefish	68.3	2.7	29.0	*
Dolphin	98.1	*	-	*
Little Tunny	30.1	-	64.4	*
King Mackerel	95.1	-	-	*
Spanish Mackerel	85.7	4.8	8.9	-
South Atlantic and Gulf of Mexico**				
Bluefish	59.4	1.3	26.0	13.1
Dolphin	97.5	1.2	-	*
Little Tunny	48.5	16.2	32.2	*
King Mackerel	88.7	6.7	-	*
Spanish Mackerel	91.4	2.4	4.4	-
		1980		
South Atlantic				
Bluefish	61.4	0.6	13.3	24.7
Dolphin	89.6	10.4	*	*
Little Tunny	83.6	16.3	*	*
King Mackerel	58.0	42.0	*	*
Spanish Mackerel	90.0	-	4.7	*
Gulf of Mexico				
Bluefish	83.0	4.8	11.2	-
Dolphin	44.5	55.5	*	*
Little Tunny	90.0	-	*	*
King Mackerel	72.9	7.7	18.8	-
Spanish Mackerel	82.8	2.8	14.2	-

* none reported

** average of Gulf and South Atlantic percentages

\- no data reported due to low participation in the category relative of sample size

[1] NMFS, 1980

Similar patterns hold true for charterboat fishing in Texas. In a study of marine recreational fishing in southern Texas[1] during the 1975-76 season (Trent, 1976), king mackerel, Spanish mackerel, cobia, dolphin, and little tunny were among the ten most abundantly caught species in fishing from inboard boats. This pattern is consistent with reports of the composition of catch from charter boats. King and Spanish mackerel and cobia were among the ten most abundantly caught species from outboard boats. King mackerel was clearly the most abundant species caught in all types of boat fishing.

The charterboat fleet in the South Atlantic and Gulf of Mexico consists of an estimated 966 boats. Exhibit 8-4 presents the estimated number of boats by state for each region in 1984.

Private Boats

A wide range of types of private boats are used by recreational fishermen to pursue coastal pelagic species. They range from open outboards 16 feet in length or even smaller in some cases up through sportfishing boats of 60 feet or larger. Typically, however, fishing for these species tends to be done by boats of about 18-20 feet or larger because the boats must be capable of venturing offshore. This is particularly true of fishing for king mackerel, dolphin, and little tunny.

No comprehensive data exist on the number of characteristics of private boats that are used specifically for species in the management unit. However, a study of the king mackerel fishery in Bay County, Florida (Brusher, et al., 1978), does indicate the size and relative use of private boats. In Bay County, Florida, private boats in a wide range of sizes are involved in the king mackerel fishery. The fishing effort for king mackerel increased with boat size. Boats greater than 20 feet in length tended to fish for king mackerel a considerably greater number of days. Approximately 50 percent of the catch and effort of king mackerel was accounted for by boats greater than 20 feet in length. Approximately 85 percent of the catch and effort was accounted for by boats greater than 15 feet in length.

Exhibit 8-4 presents data on the total number of registered boats greater than 16 feet in length in the states within the Gulf of Mexico and South Atlantic regions by year. Not all of these boats are used in salt water and not all of them fish for species in the management unit. However, the number of boat registrations has increased at a rate of 10.3 percent per year over the period 1967 through 1974.

In order to estimate the recreational catch for 1975, an adjusting procedure was used which is described in Section 5.4. This adjusted catch estimate is the amount on which the best estimate of MSY is based.

8.2.2 Landings/Catch

8.2.2.1 Commercial Landings

Exhibits 8-5a through 8-8 present statistics on commercial landings for king mackerel, Spanish mackerel, bluefish, and cobia. Cero mackerel is not broken out separately in available landing statistics but is aggregated with king mackerel.

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[1] The study area ranged from Port Aransas south to Port Isabel near Brownsville, Texas.

Exhibit 8-3

Number of Registered Boats in Southeastern Coastal States
Greater than 16 feet in Length (1983 and 1967-1974)

Year	North Carolina	South Carolina	Georgia	Florida	Alabama	Mississippi	Louisiana	Texas	Total
1983					61,772[3]		101,016[2]	354,346[1]	
1974	53,291	34,382	34,064	152,372	32,774	18,415	57,251	145,213	527,764
1973	48,235	31,627	24,912	132,862	31,192	16,112	49,051	125,756	460,517
1972	41,358	26,664	38,000	127,054	27,956	19,023	47,621	111,987	439,663
1971	35,935	23,391	37,596	116,205	25,724	14,665	47,301	102,035	402,852
1970	39,952	20,865	31,683	106,933	22,362	10,764	43,034	83,722	359,315
1969	37,184	20,326	30,349	96,227	20,319	10,760	40,714	80,096	335,979
1968	32,699	18,600	25,491	87,774	18,573	9,400	38,247	64,963	295,747
1967	29,334	16,643	24,313	79,249	16,768	7,244	33,917	58,697	266,165

[1] 15 percent used in Gulf

[2] 65 percent used in marine waters

[3] 20 percent used in marine waters

Source: U.S. Coast Guard and State Agencies.

Exhibit 8-4

Estimated Number of Charter Boats and Head Boats in the South Atlantic and Gulf of Mexico by State in 1984

State	Charter	Head
North Carolina	128	11
South Carolina	31	17
Georgia	36	2
Florida (East coast)	132	31
Florida Keys	86	24
Florida (West coast)	215	41
Alabama	19	6
Mississippi	15	4
Louisiana	26	10
Texas	102	30
TOTALS	790	176

Source: R. L. Schmied, NMFS, St. Petersburg, FL

The current total U.S. commercial landing of king mackerel is approximately seven million pounds (1983) see Exhibit 8-5a. Roughly two percent or less of the landings occurred outside of Florida waters until the 1980s. Record landings were 10.5 million pounds in 1974. Landings began to increase significantly after 1973 from levels of 4.5 to 6.7 million pounds between 1965 and 1973. Landings by migratory group in recent years are shown in Exhibit 8-5d.

The Louisiana commercial hook and line fishery began as a winter fishery November into January. It has developed into an annual fishery with 1983-1984 landings (in one thousands of pounds as follows):

1983:		1984:			
January	357	January	15	July	44
February	402	February	44	August	23
April-June*	94	March	84	September	11
July-September*	282	April	<1	October	30
October-December*	166	May	<1	November	40
		June	17	December	478
				1984	787

* Data listed quarterly to provide confidentiality of reporting dealers.
Source: NMFS Statistics and Bane, et al. (1984)

The 1983 total U.S. commercial Spanish mackerel landing was approximately eight million pounds. Almost all the catch comes from Florida waters. Record landings were 18.0 million pounds in 1976.

West coast Florida (including Monroe County) commercial catches exceeded east coast Florida catches from 1959 to 1976 when east coast landings became dominant (Exhibit 8-6b). In recent years, total commercial production exceeds recreational catch, and the commercial proportion of total catch is increasing although total catches are decreasing (P. Eldridge, 1984, pers. comm.) (see Exhibit 8-6c).

The current total U.S. commercial bluefish landings is approximately 13.3 million pounds (average 1978 to 1980). However, most of these landings occurred in the Mid-Atlantic region. Gulf of Mexico landings were stable from 1966 through 1976 at five to six hundred thousand pounds. Gulf landings have since increased to approximately one million pounds.

The current commercial landing of cobia is approximately 114,000 pounds (1975-1979 average), having ranged between 83 and 151 thousand pounds between 1968 and 1979. More than 95 percent of commercial cobia landings occurs within the Gulf of Mexico and South Atlantic regions. Commercial dolphin landings in the Gulf and South Atlantic regions have varied between 60 thousand and 189 thousand pounds over the period 1966 through 1977. Total reported U.S. commercial landings include about 60-80 thousand pounds landed in Hawaii.

8.2.2.2 Recreational Catch

Data on the recreational catch are much less comprehensive. Historical data on the catch of saltwater anglers are available from surveys for 1960, 1965, 1970 and 1979 for the entire South Atlantic and Gulf of Mexico regions. These are presented in Exhibit 8-9. Data are not available on the recreational catch of little tunny except for 1979. Cero mackerel is aggregated with Spanish mackerel in these surveys.

The data presented in Exhibit 8-9 should be viewed with caution. The National Surveys for 1960, 1965, and 1970 conducted to obtain the estimates used relatively small regional samples. There was also recall bias (those interviewed were asked to recall the number and weight by type of fish caught for up to a 12-month period). Substantial positive bias is believed to have been introduced into the estimates. The NMFS researchers who conducted the 1970 survey suggest that the survey may overstate

the recreational catch by perhaps a factor of two or more on the average for all species (Deuel, 1973, p. 34). In addition, there is a high standard error associated with data on the catch of individual species within a region. Thus, the data may contain an additional error beyond the recall bias associated with the statistical survey procedure. This latter error is more severe for species not caught frequently such as cobia.

The 1979 survey was designed to solve most of the problems associated with previous studies. It will be the basis for an ongoing series of surveys on an annual or semiannual basis. The resulting catch estimates are believed to be more accurate than earlier estimates. However, estimates from the first year should be used with caution. The initial distribution of sampling effort did not adequately cover all segments of the fishery. For example, charter boats were poorly sampled. In the case of king mackerel, this resulted in an unknown, but probably large, underestimate of the total catch. This type of error will be corrected in future surveys.

Notwithstanding the problems that have been encountered in conducting recreational fishing research, the results consistently show that anglers are catching substantial numbers of fish in the management unit. However, because of the high associated error, and differences in methodology between the three surveys, the data presented in Exhibit 8-9 are not considered reliable in drawing conclusions as to trends in the amount of catch over time.

In order to estimate the recreational catch for 1975, an adjusting procedure was used which is described in Section 5.4. This adjusted catch estimate is the amount on which the best estimate of MSY is based.

8.2.2.3 Fish Caught Recreationally and Sold Commercially

In addition to the expenditures associated with purchases of goods and services for recreational fishing, some fish caught by anglers are sold in commercial markets. Very little is known about the final disposition of the recreational catch. Existing evidence is too limited to approximate the value of fish sold; however, information from several local areas does, by way of example, provide some insight into the amount of recreational catch sold commercially.

Preliminary results from a study of Florida Gulf coast charter boats reveal that 53 percent of the operators responding to the survey sold recreationally caught fish to commercial markets. Seventy percent of the fish sold went to wholesale fish houses, 13 percent was sold directly to the public, twelve percent went to restaurants, and five percent went to other retail establishments (Browder, et al., 1978). The study also showed that 34 percent of responding offshore operators fish commercially during a portion of the year with ten percent of the fish sold being king mackerel. The percent income of commercial sale of all species of fish by region were N.W. Florida, 3.0 percent; W. Florida, 8.0 percent, and Florida Keys, 3.2 percent. Danville (1983a) provides estimates of king mackerel sales by charter boats (Exhibit 8-10a).

Bay County, Florida, is a major recreational fishing area for king mackerel, but there is virtually no commercial troll line fishery there for king mackerel. (As explained in Section 8.2.4.2, trolling is the dominant method of recreational angling for king mackerel.) In 1975 the estimated recreational catch of king mackerel from private and charter boats was 1.1 million pounds (Brusher, et al., 1977). In that same year the National Marine Fisheries Service commercial catch statistics show that 48,300 pounds of king mackerel sold in Bay County fish houses were caught using troll lines. Since there is virtually no commercial troll line fishery, most, if not all, of the reported troll line catch must come from recreational landings. Thus, 4.3 percent (.048 million pounds/1.1 million pounds) of the total recreational catch was sold through fish houses in one county alone. If king mackerel caught from private boats are disposed of in a manner similar to those caught from charter boats, then the 48,300 pounds represents about 70 percent of the king mackerel sold in the county. The total sold, then, would be 69,000 pounds, or 6.2 percent of the recreational catch.

Exhibit 8-5a

Commercial Landings of King Mackerel
In States with Significant Landings
(1000 pounds and 1000 dollars)

Year	By State											
	North Carolina		South Carolina		Georgia		Florida (East)		Florida (West)		Louisiana	
	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars
1983	843	608	178	144	2	2	3066	3070	1300	1222	1489	1354
1982	1207	1157	186	165	4	4	4383	4251	2166	1971	229	218
1981	736	649	135	125	11	9	4858	4198	3073	2516	-	-
1980	769	647	208	176	17	12	3073	2608	3002	1971	-	-
1979	382	274	80	60	16	12	3346	2712	1691	995	-	-
1978	172	108	13	10	35	24	3402	1968	1745	628	-	-
1977	245	126	7	3	4	2	3236	1783	4950	1732	-	-
1976	156	109	8	5	4	2	4921	2539	2801	891	-	-
1975	100	60	8	4	1	1	3697	1715	2622	640	-	-
1974	40	24	4	2	6	2	4267	1678	6133	1594	-	-
1973	26	7	11	5	-	-	3712	1537	2217	597	-	-
1972	9	3	1	*	-	-	3489	1051	1378	255	-	-
1971	9	2	6	1	1	*	2907	820	2738	472	-	-
1970	12	3	*	*	1	*	4338	1015	2372	320	-	-
1969	16	4	2	*	-	-	2943	599	3242	415	-	-
1968	8	2	*	*	-	-	2586	503	3604	464	-	-
1967	24	5	-	-	-	-	2988	497	3084	351	-	-
1966	95	19	4	*	-	-	1782	323	2633	320	-	-
1965	139	28	-	-	-	-	2549	374	1898	232	-	-

Source: NMFS Statistics and Bane, et al. (1984)

Exhibit 8-5b

Annual Commercial Landings of King Mackerel in Florida
by Major Gear Type from 1960-1983 in pounds

Year	Total	Hook/Line	Net	Percent Net
1960	3,592,000	3,556,500	35,500	0.99
1961	3,759,000	3,659,700	99,300	2.64
1962	4,097,000	2,764,800	1,332,200	32.52
1963	4,990,000	2,302,500	2,687,500	53.86
1964	3,334,000	1,812,800	1,515,200	45.63
1965	4,447,000	1,931,200	2,515,800	56.67
1966	4,415,000	1,292,200	3,122,800	70.73
1967	6,072,000	1,391,200	4,680,800	77.09
1968	6,190,000	1,399,000	4,791,000	77.40
1969	6,185,000	1,814,700	4,370,300	70.66
1970	6,709,600	2,443,300	4,266,300	63.59
1971	5,644,100	1,616,300	4,027,800	71.36
1972	4,867,300	2,552,500	2,314,800	47.56
1973	5,928,500	2,930,800	2,997,700	50.56
1974	10,400,900	3,665,200	6,735,700	64.76
1975	6,319,100	3,145,400	3,173,700	50.22
1976	7,622,200	3,156,900	4,465,300	58.58
1977	9,131,668	3,361,368	5,770,300	63.19
1978	5,307,193	3,046,449	2,260,744	42.59
1979	5,037,573	3,047,000	1,990,000	39.50
1980	6,074,763	4,262,000	2,310,000	38.03
1981	7,930,898	5,151,898	2,779,000	35.04
1982	6,549,000	4,522,000	2,027,000	30.95
1983	4,366,000	2,696,000	1,670,000	38.2

Source: Powers and Eldridge, 1983a; 1983 Data from NMFS Statistics

Exhibit 8-5c

Annual Reported Net Catches of King Mackerel
and Percent of Total Commercial Landings
from the East and West Coasts of Florida

	EAST COAST		WEST COAST	
	Net Catch (Pounds)	% Total	Net Catch (Pounds)	% Total
1960	13,700	0.76	21,800	0.71
1961	15,800	0.76	83,500	3.47
1962	120,000	5.81	1,212,200	57.61
1963	526,500	24.23	2,161,000	76.02
1964	433,500	21.46	1,087,700	76.02
1965	881,900	34.60	1,633,900	82.82
1966	770,200	43.23	2,352,600	87.38
1967	1,899,800	63.58	2,781,000	79.67
1968	1,483,100	57.35	3,307,900	80.39
1969	1,756,000	59.67	2,614,300	75.11
1970	2,354,000	54.27	1,912,300	76.53
1971	1,692,900	56.08	2,397,900	85.72
1972	1,290,500	36.98	1,024,300	70.97
1973	1,175,600	31.67	1,822,100	78.84
1974	1,593,200	37.33	5,142,500	83.30
1975	1,197,500	32.39	1,976,200	72.28
1976	2,068,700	42.91	2,396,600	84.07
1977	1,183,807	27.58	4,690,700	89.91
1978	1,244,700	33.58	1,118,500	64.09
1979	1,032,000	30.84	958,000	56.64
1980	167,000	5.43	1,646,000	54.84
1981	758,000	20.49	2,021,000	65.57
1982	583,000*	13.30	1,444,000	66.67
1983	833,000	19.0	837,000	19.10

* Preliminary

Source: Powers and Eldridge, 1983a; 1983 Data from NMFS Statistics

Exhibit 8-5d

King Mackerel Landings
by Migratory Group
1979-1983
(thousands of pounds)

Fishing Year	Gulf Group			Atlantic Group		
	Recreational[2]	Commercial[3]	Total	Recreational[2]	Commercial	Total
1978-79	12,781	3,444	16,228	3,924	1,603	5,524
1979-80	12,781	4,029	16,811	3,924	1,886	5,809
1980-81	12,781	5,991	18,774	3,924	2,634	6,556
1981-82	12,781	5,620	18,407	3,924	2,191	6,109
1982-83	12,781	4,802 *	17,593	3,924	3,394*	7,308
Average Landings	12,781	4,777	17,563	3,924	2,342	6,260

1. Fishing year - Gulf: July-June; Atlantic: April-March

2. Recreational catch is 1979-1980 average. East Florida divided as in stock assessment.

3. Gulf - Collier County, Florida through Texas: April - October
   Volusia County, Florida through Texas: November - March
   (This varies from stock assessment definition)

4. Atlantic - North Carolina through Monroe County, Florida: April - October
   North Carolina through Flagler County, Florida: November - March

* Handline fishery closed May 6 - June 30, 1983

Exhibit 8-6a
Commercial Landings of Spanish Mackerel
(1000 pounds and 1000 dollars)

By State

Year	North Carolina		South Carolina		Georgia		Florida (East)		Florida (West)		Texas, Alabama, Louisiana		Mississippi	
	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars
1979[1]	13	4	*	*	2	1	4709	989	1603	335	146	29	30	7
1978[1]	13	4	*	*	*	*	5511	1061	1725	438	47	7	58	14
1977	46	7	-	-	2	*	9708	2078	2000	428	92	12	151	30
1976	31	5	3	1	3	1	9559	1779	7783	1360	179	24	379	82
1975	49	7	10	2	6	1	5145	902	5621	962	292	40	224	39
1974	73	9	2	*	1	*	2346	459	8267	1444	246	30	41	6
1973	64	9	4	*	5	1	3203	538	6194	999	165	14	98	14
1972	96	13	5	1	5	1	3369	426	6532	816	205	20	485	57
1971	95	14	4	1	*	*	2582	308	7383	830	96	8	179	20
1970	63	9	2	*	*	*	3574	459	8100	939	155	28	43	9
1969	39	12	4	1	-	-	2359	253	8175	946	155	12	12	1
1968	69	8	8	1	1	*	4406	382	7066	797	52	14	114	11
1967	73	8	2	*	2	*	1802	153	5867	611	33	3	76	7
1966	78	10	1	*	1	*	2181	232	7004	813	57	6	9	*
1965	117	12	13	2	1	*	2901	290	4883	586	19	2	3	*

By Region

Year	New England		Middle Atlantic		Chesapeake		South Atlantic		Gulf of Mexico		United States	
	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars
1980[1]	**	**	**	**	**	**	**	**	**	**	11968	3137
1979[1]	-	-	*	*	2	*	4724	994	1779	371	6505	1365
1978[1]	-	-	*	*	*	*	5524	1065	1830	459	7354	1524
1977	-	-	-	-	22	4	9756	2085	2243	470	12021	2559
1976	-	-	2	*	80	13	9596	1786	8341	466	18019	3265
1975	1	*	4	1	62	12	5210	912	6137	1041	11415	1966
1974	-	-	2	*	24	4	2422	468	8554	1480	11002	1952
1973	-	-	*	*	50	9	3276	548	6457	1027	9783	1584
1972	-	-	*	*	23	4	3475	441	7222	893	10720	1338
1971	*	*	*	*	52	9	2681	323	7658	858	10391	1190
1970	*	*	*	*	201	31	3639	468	8298	972	12138	1471
1969	*	*	-	-	124	18	2452	266	8342	959	10918	1243
1968	-	-	*	*	60	10	4484	391	7232	812	11776	1213
1967	-	-	-	-	30	5	1879	161	5976	621	7885	787
1966	-	-	*	*	142	23	2261	242	7066	819	9469	1084
1965	*	*	-	-	74	11	3032	304	4905	588	8011	903

Note: * = <500 pounds or $500
** = Not Available
[1] Preliminary

Source: U.S. Department of Commerce. Fishery Statistics of the United States (Various Years). Washington, D.C.: Government Printing Office.

Exhibit 8-6b

Commercial Landings of Spanish Mackerel
for South Atlantic and Gulf of Mexico
1950-1983

(thousands of pounds)

Year	South Atlantic	Gulf of Mexico	Total Landings
1950	3,725	2,593	6,318
1951	2,183	6,511	8,694
1952	3,609	4,517	8,126
1953	3,775	3,015	6,790
1954	2,431	2,887	5,318
1955	3,403	1,627	5,030
1956	4,925	2,919	7,844
1957	4,469	3,649	8,118
1958	7,524	3,870	11,394
1959	2,508	4,691	7,199
1960	2,406	5,468	7,874
1961	3,296	4,014	7,310
1962	2,674	6,912	9,586
1963	2,267	5,447	7,714
1964	2,083	3,957	6,040
1965	3,032	4,905	7,937
1966	2,261	7,066	9,327
1967	1,879	5,976	7,855
1968	4,484	7,232	11,716
1969	2,402	8,342	10,744
1970	3,639	8,298	11,937
1971	2,681	7,658	10,339
1972	3,475	7,222	10,697
1973	3,276	6,457	9,733
1974	2,422	8,554	10,976
1975	5,210	6,137	11,347
1976	9,627	8,342	17,969
1977	11,035	2,636	13,671
1978	3,465	1,583	5,048
1979	4,901	2,122	7,023
1980	9,893	1,952	11,845
1981	4,227	3,700	7,927
1982	3,949	3,443	7,392
1983	5,989	2,260	8,249

Exhibit 8-6c

Comparison of Recreational vs Commercial Estimates
of Spanish Mackerel Landings 1975, 1979 and 1980

(Thousands of Pounds)

Location	1975		1979		1980	
	Recreational	Commercial	Recreational	Commercial	Recreational	Commercial
North Carolina	725	49	108	13	418	75
South Carolina	176	10	29	0	200	7
Georgia	*	6	6	2	65	1
Florida: East	732	5,145	2,000	4,886	1,011	9,810
South Atlantic	908	5,210	2,143	4,901	1,694	9,893
Florida: West	5,148	5,621	1,061	1,946	1,197	1,770
Alabama	942		508	113	1,024	51
Mississippi	555	224	55	30	421	76
Louisiana	384	292**	166	33	720	55
Texas	*		649	-	631	-
Gulf of Mexico	7,029	6,137	2,439	2,122	3,993	1,952
Total	7,937	11,347	4,582	7,023	5,686	11,845

Ratio of Commercial to Recreational Landings

	1975	1979	1980
Total	1.43	1.53	2.08
South Atlantic	5.74	2.29	5.84
Gulf of Mexico	0.87	0.87	0.49

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* Less than 30,000 pounds.

** Landings for Texas, Alabama, and Louisiana combined.

Source: Peter Eldridge, NMFS, Personal Communication.

Exhibit 8-7
Commercial Landings of Bluefish
(1000 pounds and 1000 dollars)

Year	Florida (West)		Alabama		Mississippi		Louisiana		Texas		Gulf of Mexico		United States	
	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars
1980[1]	**	**	**	**	**	**	**	**	**	**	**	**	**	**
1979[1]	900	120	15	1	32	7	*	*	-	-	947	128	12881	2151
1978[1]	850	109	9	1	11	2	*	*	-	-	870	111	11300	1570
1977	952	132	2	*	26	4	3	*	-	-	983	136	11320	1318
1976	490	78	2	*	66	8	1	*	-	-	559	86	10387	1091
1975	436	48	7	1	75	12	12	1	-	-	530	62	10841	1487
1974	501	55	9	1	16	2	11	1	-	-	537	59	10541	1143
1973	493	58	27	3	10	1	*	*	-	-	530	62	10597	1173
1972	511	54	22	1	14	2	*	*	-	-	547	57	7415	866
1971	410	49	13	1	9	1	-	-	-	-	532	51	6318	726
1970	650	62	22	2	22	2	*	*	-	-	694	66	7203	742
1969	529	51	32	2	26	3	*	*	-	-	587	56	5978	709
1968	556	59	4	*	84	8	-	-	-	-	644	67	5404	719
1967	513	54	4	*	79	8	-	-	-	-	596	62	4279	529
1966	584	61	9	1	102	10	-	-	-	-	695	72	5484	647
1965	859	88	5	1	72	8	-	-	-	-	936	97	5008	582

Note: * = <500 pounds or $500
** = Not Available
[1] Preliminary

Source: U.S. Department of Commerce. Fishery Statistics of the United States (Various Years). Washington, D.C.: Government Printing Office.

Exhibit 8-8
Commercial Landings of Cobia
(1000 pounds and 1000 dollars)

By State

Year	North Carolina		South Carolina		Georgia		Florida (East)		Florida (West)		Texas, Alabama, Louisiana, Mississippi	
	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars
1979[1]	4	1	*	*	*	*	6	3	78	24	6	[illegible]
1978[1]	2	*	*	*	-	-	9	5	87	26	3	[illegible]
1977	1	*	-	-	-	-	12	4	68	14	21	[illegible]
1976	2	*	-	-	1	*	13	4	104	21	6	[illegible]
1975	2	*	-	-	-	-	14	4	84	13	35	[illegible]
1974	1	*	-	-	-	-	12	2	89	10	44	[illegible]
1973	2	*	-	-	-	-	11	2	77	8	36	[illegible]
1972	3	*	-	-	-	-	14	2	74	6	44	[illegible]
1971	11	1	-	-	-	-	7	1	77	6	27	[illegible]
1970	7	*	-	-	-	-	14	2	60	5	46	[illegible]
1969	6	*	-	-	-	-	4	1	45	3	25	[illegible]
1968	7	*	-	-	-	-	9	1	41	3	41	[illegible]
1967	10	*	-	-	-	-	9	1	24	2	16	[illegible]
1966	10	*	-	-	-	-	5	*	28	2	10	[illegible]
1965	10	1	-	-	-	-	4	*	11	1	3	[illegible]

By Region

Year	New England		Middle Atlantic		Chesapeake		South Atlantic		Gulf of Mexico		United States	
	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars
1979[1]	-	-	-	-	*	*	10	4	84	25	94	[illegible]
1978[1]	-	-	-	-	*	*	11	5	90	27	101	[illegible]
1977	-	-	-	-	2	*	13	4	89	19	104	[illegible]
1976	-	-	-	-	3	*	16	6	110	22	129	[illegible]
1975	-	-	-	-	6	1	16	4	120	18	142	[illegible]
1974	-	-	-	-	5	1	13	2	133	15	151	[illegible]
1973	-	-	-	-	2	*	13	2	113	11	128	[illegible]
1972	-	-	-	-	4	*	17	2	118	10	139	[illegible]
1971	-	-	-	-	4	*	18	2	104	7	126	[illegible]
1970	-	-	-	-	2	*	21	2	106	9	129	[illegible]
1969	-	-	-	-	3	*	10	1	70	6	83	[illegible]
1968	-	-	-	-	4	*	16	1	82	7	102	[illegible]
1967	-	-	-	-	3	*	19	1	40	3	62	[illegible]
1966	-	-	-	-	2	*	15	*	38	2	55	[illegible]
1965	-	-	-	-	10	1	14	1	21	2	45	[illegible]

Note: * = <500 pounds or $500
[1] Preliminary

Source: U.S. Department of Commerce. Fishery Statistics of the United States (Various Years). Washington, D.C.: Government Printing Office.

Exhibit 8-9

Estimated Weight and Number of Coastal Migratory Pelagic Fish Caught by Anglers in 1960, 1965, 1970, and 1979 by Species and Region (weight is in 1000's of lbs., numbers are in 1000's)

	1960		1965		1970		1979**		
	No. of Fish	Estimated Weight	No. of Fish	Estimated Weight	No. of Fish	Estimated Weight	No. of Fish	Estimated Weight	Adjusted Estimate of Weight for 1975
South Atlantic									
Cobia	-	-	-	-	26	775	-	-	
Dolphin	152	1,000	166	1,118	2,166	27,806	2,762	14,126	
King Mackerel	*	*	6,639	74,132	4,165	34,942	373	4,033	
Spanish/Cero Mackerel	7,380	24,830	7,548	18,186	4,967	14,623	898	2,098	
Little tunny	-	-	-	-	-	-	136	593	
Total	14,713	39,470	22,423	104,728	24,175	97,417	4,169	20,850	
Gulf of Mexico									
Bluefish	54	80	685	2,700	563	1,659	1,057	1,481	
Cobia	-	-	216	2,029	93	125	-	-	
Dolphin	313	1,250	464	873	268	2,133	36	363	
King Mackerel	*	*	1,675	16,299	3,072	27,459	598	5,931	
Spanish/Cero Mackerel	5,149	11,330	1,708	4,283	2,793	7,808	1,196	2,257	
Little tunny	-	-	-	-	-	-	147	288	
Total	5,516	12,660	4,748	26,184	6,789	39,184	3,034	10,320	
South Atlantic and Gulf of Mexico									
Cobia	-	-	216	2,029	119	900	-	-	
Dolphin	465	2,250	630	1,991	2,434	29,939	2,805	14,872	
King Mackerel	*	*	8,314	90,431	7,237	62,401	975	9,931	23,700
Spanish/Cero Mackerel	12,529	36,160	9,256	22,469	7,760	22,451	2,107	4,574	8,500
Little tunny	-	-	-	-	-	-	303	995	
Total	20,229	52,130	27,171	130,912	30,964	136,621	6,190	30,372	

* 1960 survey included king mackerel with Spanish and cero mackerel.

** 1979 catch includes fish landed whole and fish gutted or filleted at sea. Released fish are not included.

Sources: Saltwater Angling Surveys for 1960, 1965, and 1970; Marine Recreational Fishery Statistics Survey, 1979. See Section 5.4 for adjusted weight for 1975.

Exhibit 8-10a

Regional Estimates of Pounds and Values of King Mackerel
Catch Sold Annually by Charter Boats (from Danville 1983a)

	North Carolina	Florida E.	Florida Keys	Florida W.	Texas
Per Vessel					
Pounds	69	399	1,154	93	74
Value ($)	86	499	1,443	116	93
Regional Total					
Pounds	7,910	43,927	203,159	26,573	8,982
Value ($)	9,888	54,904	253,948	33,216	11,227

In 1984 Florida initiated a trip ticket reporting system for vessels selling marine products in Florida. This should enhance data on commercial catch.

In another area of Florida, Dade County, an estimated 12.5 percent of all fish caught from charter boats in 1976 were sold. Other fish caught were used for bait (24.8 percent), consumed by customers (19.6 percent), mounted (14.8 percent), and released (1.5 percent). The disposition of the remaining 26.8 percent of the catch was unknown. The researcher also found that king and cero mackerel were generally consumed by customers or used for bait (Gentle, 1977).

8.2.3 Fishing and Landing Areas

8.2.3.1 Commercial

Commercial landings of king and Spanish mackerel took place almost entirely within Florida, until recent years when the king mackerel fishery expanded in Louisiana and North Carolina (Table 8-5a). The king and Spanish mackerel fisheries are local fisheries in the sense that the catch is generally landed at ports within a few hours run of where the fish are caught. Typical one-way trip lengths between fishing and landing areas average about 20 miles on the Florida east coast. In the Florida Keys these distances may be about 40 miles. However during the winter, king and Spanish mackerel season boats may travel around the coast of Florida and temporarily operate out of ports closest to where the fish are currently available.

The three main traditional Florida landing areas for king and Spanish mackerel have been:

- Collier and Lee Counties on the west coast of south Florida
- Monroe County in the Florida Keys
- Indian River, St. Lucie, Martin, and Palm Beach Counties on the east coast of south Florida.

In Collier and Lee Counties major ports at which fish are landed include Naples and Fort Myers. In the Florida Keys major landing ports include Key West and Marathon. On the Florida east coast major landing ports include Boynton Beach, Palm Beach, Jupiter, Port Salerno, Fort Pierce and Sebastian.

The major fishing areas have included an area known as "No Man's Land" located approximately 40 miles west of Key West between the Marquesas and the Dry Tortugas. Another major area on the Florida west coast is located southwest of Cape Romano near Naples. Spanish mackerel are frequently caught in Florida Bay. On the Florida east coast major fishing areas are located along the narrow continental shelf just inside the Gulf Stream from about Palm Beach north to Sebastian. During the winter season, schools of Spanish and king mackerel will migrate and congregate in certain areas, such as over reef outcroppings, for a period of time. The boats will converge to the areas where the fish are located. Specific areas and times at which fish are available will vary from year to year due to ocean and weather conditions.

There has historically been considerable season-to-season variation in the proportion of the king mackerel catch landed in areas of the state. While Collier and Lee Counties have been major landing areas in many past seasons, in some seasons they account for only a small percentage of the catch. This has been the case for the last couple of seasons. In the 1976-77 season, Monroe and Dade Counties accounted for the majority of the landings as they did in 1959 through 1961. Most of these landings were believed to be from fish caught in "No Man's Land", west of Key West.

A commercial hook and line fishery for king mackerel was developed off Grand Isle, Louisiana, in the winter of 1982-83. What began as a winter fishery has developed into a year round fishery reaching almost 1.5 million pounds in 1983 and 800 thousand pounds in 1984.

There appears to be somewhat greater consistency in the areas in which Spanish mackerel are landed. The Dade/Monroe County area and the southeast coast area account for about 80 percent of the catch.

In northwest Florida there is a small catch of king and Spanish mackerel, taken primarily by haul seines. This generally occurs in the summer season. Bluefish are taken at many locations around the Florida east and west coasts. In North Carolina king mackerel, and Spanish mackerel are caught off various points along the coast such as Wanchese, Oregon Inlet, and Beaufort. In addition, there is a small commercial catch of king and Spanish mackerel off South Carolina and Georgia. In addition, Spanish mackerel are caught commercially off Alabama, Mississippi, and Louisiana. Small amounts of bluefish are taken commercially off Alabama, Mississippi, and Louisiana. Dolphin are taken commercially primarily in the Florida Keys, although significant amounts are also taken off St. Lucie County on the Florida east coast, and in northwestern Florida. Cobia are taken commercially in Florida (particularly off St. Lucie, Monroe, Pinellas, and Bay Counties) and in Texas. In Texas cobia are frequently caught in the vicinity of shrimp trawlers.

8.2.3.2 Recreational

Unlike the commercial harvesting of fish in the management unit, the recreational fishing activity is widely distributed throughout both the South Atlantic and Gulf of Mexico regions. Fishing occurs out of virtually all marinas and boat docks that have access to coastal waters. Similarly, anglers can be found on most accessible beaches and shore-based locations such as bridges, piers or jetties. The following discussion mentions those locations that are generally thought to be heavily frequented by anglers catching species included in the management unit.

In the South Atlantic during typical years, recreational fishing for king mackerel and Spanish mackerel occurs heavily in North Carolina and along the eastern coast of Florida. While dolphin, and little tunny are among the fish caught by anglers, they are landed much less frequently in the northern part of the region than in southern Florida. Cobia is a prized sportfish, but is the least frequently landed of the species in the management unit. In North Carolina areas such as Morehead City, Oregon Inlet, Harker's Island, or Hatteras are often frequented by anglers. Along the Florida east coast there is considerable recreational fishing activity out of the Jacksonville, Palm Beach, Fort Lauderdale, and Miami areas. In South Carolina considerable fishing occurs out of Charleston and Murrel's Inlet, and in Georgia the St. Simons Island area is a popular offshore angling site.

In the Gulf of Mexico, recreational activity is most heavy in Florida, Texas and Alabama; significant recreational effort also occurs off Mississippi and Louisiana as well. For recreational fishing, king and Spanish mackerel are the most important species of the management unit in the Gulf of Mexico. Cobia, dolphin and little tunny are landed by anglers throughout the Gulf coast, but as in the South Atlantic they are caught much less frequently. There is very little fishing from shore-based locations for species in the mangement unit. Most fishing occurs offshore from privately owned boats and charter boats.

On the west coast of Florida major fishing areas include the Keys, the Fort Myers-Naples area, the Clearwater-St. Petersburg area and the Panama City-Destin area. These areas are popular for charter-boat fishing as well as fishing from private boats, although charter fishing is most concentrated in the Keys and Panama City-Destin (Bay county) locations. Angling for king mackerel is normally particularly heavy in the Bay County area. In Alabama, the Mobile Bay area, Dauphin Island, and Gulf Shores are heavily frequented fishing areas. Biloxi and Ocean Springs are major areas for coastal recreational fishing in Mississippi, and in Louisiana anglers seeking to fish offshore often depart from areas such as Eades or South Pass. The long Texas coast has many fishing locations. Among the more important recreational fishing ports for the coastal migratory pelagic species are areas such as Freeport, Port O'Connor, Rockport, Port Aransas, South Padre and Port Isabel. In short, recreational activity is highly dispersed, but in the aggregate it accounts for a large amount of fishing effort.

8.2.4 Vessels and Gear

8.2.4.1 Commercial

a) King Mackerel

King mackerel are caught commercially with a variety of gears which include gill nets, trolled lines, hand lines, haul seines and trammel nets. Currently, trolling and gillnetting are the most widespread fishing methods in use. Exhibit 8-10 presents catch by gear type for the Florida east and west coasts. From 1971 through 1975, of the total Florida king mackerel catch, 58 percent was by gill net, 40 percent was by hook and line (either troll line or hand line), and less than one percent each by haul seine and trammel net. During the years up through 1975, the reported east coast gill-net catch was by boats in the smaller (20 to 30 feet) size ranges. The reported west coast catch was predominantly by larger boats (up to 40 to 65 feet) operating in the Keys and Naples area. Traditionally, nearly all of the catch in other states (which is small compared to the Florida catch) has been by troll line.

Hook and line boats operating on the Florida southwest coast typically range from about 24 to 36 feet. Of a survey of ten such boats in February, 1977 (Morris, Prochaska, Cato, 1977), the average boat had a length of 29.9 feet and a fish carrying capacity of 4,000 pounds. Eighty percent were built of fiberglass and 20 percent wood. These boats are usually operated by one man, although some may have one crew member. Hook and line boats operating out of the Florida Keys are somewhat larger typically ranging in size from 32 to 40 feet. These boats may operate with crews of two or three men. Most hook and line boats are now equipped with electronic or hydraulic reels for retrieving lines. Many boats have loran for navigation and marking good fishing spots. Fish are caught on lines with artifical spoons or feathered jigs. Strips of mullet, squid, or dead ballyhoo may also be used for bait. North Carolina fishermen usually use 300-pound monofilament line trolled on the surface or at various depths using planers or weights. Florida hook and line boats usually use No. 9 trolling wire. It has been reported that in the past, hook and liners could land 2,000 to 4,000 pounds of king mackerel per boat per day on a good day in the Florida fishery. Off North Carolina catches of 1,000 to 2,000 pounds per day are not unusual. Much of the North Carolina king mackerel fleet consists of charter boats which rig up for commercial fishing during the spring and fall.

Exhibit 8-10

King Mackerel
Commercial Catch By Gear

Florida East Coast
(pounds)

Year	Haul Seine	Otter Trawl (shrimp)	Runaround Gillnet	Hand Line	Troll Line
1977[1]	-	-	1,183,807	63,688	2,653,399
1976[1]	-	-	2,068,700	109,700	2,642,500
1975	-	-	1,197,500	63,400	2,435,900
1974	-	-	1,593,200	109,200	2,565,000
1973	-	-	1,175,600	89,500	2,446,600
1972	-	-	1,290,500	15,200	2,183,700
1971	-	-	1,629,900	52,200	1,224,500
1970	-	-	2,354,000	13,400	1,970,500
1969	-	-	1,756,000	17,000	1,169,700
1968	-	-	1,483,100	22,000	1,081,100
1967	-	-	1,899,800	32,200	1,056,200

Florida West Coast
(pounds)

Year	Purse Seine	Haul Seine	Runaround Gillnet	Trammel Net	Hand Line	Troll Line	Drift Gillnet
1977[1]	-	*	4,668,397	*	16,099	479,082	*
1976[1]	-	*	2,396,600	*	104,300	300,400	*
1975		80,800	1,895,400	-	239,900	406,200	
1974		33,400	5,109,100	-	445,400	545,600	
1973		74,400	1,747,300	400	106,900	287,800	
1972		46,400	977,900	-	213,100	140,500	
1971		51,200	2,293,900	800	135,900	203,700	52,000
1970		97,300	1,796,000	-	68,900	390,500	19,000
1969	116,400	63,200	2,389,400	600	88,300	539,500	44,700
1968	332,700	78,200	2,880,900	1,100	68,900	226,700	15,000
1967	283,300	41,800	2,398,900	13,000	55,900	247,100	45,000

[1] Preliminary
* Not Available

Source: U.S. Department of Commerce. Fishery Statistics of the United States (Various Years). Washington, D.C.: Government Printing Office.

Troll line boats generally fish by seeking out spots where mackerel congregate, such as reefs. Electronic fishfinders aid in locating the fish, and many fishermen know and mark specific spots where king mackerel are expected to congregate. As fish are found, the boats will begin operating in concentric circles over the schools.

In recent years, fishermen using live bait fished with rod and reel have developed a commercial fishery for king mackerel between Jupiter and Miami, Florida. The fishery is seasonal from mid April to September when schools of bait are present. A commercial pole and line fishery has also developed in conjunction with the Louisiana handline fishery.

The other major component in the king mackerel fishery is the large gill-net fleet. These are vessels typically ranging in size from 40 to 65 feet with an average size which is probably between 45 and 55 feet. These vessels have typical carrying capacities of 25,000 to 35,000 pounds. The typical set of the net yields about 8,000 to 10,000 pounds although sets as high as 50,000 pounds have been reported. Most of these vessels are constructed of fiberglass and have diesel engines. Vessels are operated by a captain and crew of three to five.

Fishing gear consists of gill nets of nylon mesh with a center band of monofilament mesh. The common mesh size is 4-3/4 inches stretched. Typical nets are 400 to 700 yards long with an average of about 500 to 550 yards. Typical stretched mesh depths are about 80 feet. This allows fishing in waters of up to 57 feet.

These vessels use power rollers mounted near the stern for retrieving nets. These are usually hydraulically powered. Aircraft are generally used as spotters. The spotter pilot will locate schools of king mackerel and will direct vessels to their location. The vessels will then proceed to "set" the net around the school or portions of it. The net will then be closed driving the fish into the net. The process of setting, retrieving, and unloading a net takes several hours.

There has been a small boat gill-net fleet operating on the southeast Florida coast for a number of years. Historically this catch was made from 18- to 30-foot boats. Some fishermen in this group have small monofilament king mackerel nets. These boats are not usually equipped with power rollers. The main fishing area was from Dade County to St. Lucie County. Many of these boats fish primarily for Spanish mackerel. King mackerel has not been their primary target although significant quantities are landed.

Landings by haul seine or trammel net are not a significant part of total king mackerel landings. Most of this catch takes place on the northwestern Florida coast. King mackerel are not the primary target species for craft using this gear. Bycatch of king mackerel in otter trawls appears to be insignificant.

b) Spanish mackerel

Spanish mackerel are caught commercially primarily with run-around gill nets. Small amounts are taken by haul seine, trammel net and hook and line. Minor amounts are taken as a bycatch in shrimp otter trawls. Exhibit 8-11 presents catch by gear type for the Florida east and west coasts. Florida accounts for about 90 to 95 percent of the U.S. Spanish mackerel catch. In Florida from 1971 through 1975, 85 percent of the Spanish mackerel catch was caught by gill nets. This includes both small boats (18 to 20 feet) as well as larger boats (up to 60 feet). During those same years approximately nine percent of the catch was caught with haul seines and six percent was caught by hook and line. Less than one percent was caught in trammel and shrimp otter trawls in Florida. In North Carolina less than one percent of the total U.S. catch is taken through a combination of haul seine, anchor nets, and long seines. One or two percent of total U.S. catch is typically taken in shrimp otter trawls off the Gulf states. The rest of the Gulf states catch is primarily by gill net.

There is both a small boat and large boat gill-net fishery for Spanish mackerel off the Florida southeast coast. The small boats are typically open skiffs, 20 to 22 feet in length with a fish carrying capacity of 2,500 to 6,000 pounds. The average capacity was approximately 4,900 pounds of fish in 1977 (Cato, et al., 1978). Of the boats in the survey, 14.5 percent used a spotter plane.

These boats are frequently operated by one man although they may have one or two crewmen on board for some trips during the year. Both strike or run-around gill nets and drift nets are used.

The large Spanish mackerel gill-net boats typically range in size from 30 to 60 feet in length and have a fish carrying capacity of 15,000 to 50,000 pounds. According to the survey of Cato, Morris, Prochaska (1978), the average capacity was approximately 29,000 pounds of fish. Of the boats in the survey, 83 percent used a spotter plane. These boats operate with a captain and from one to five crewmen with an average of three crewmen in addition to the captain. Nets with a typical mesh size of 3-3/8 to 3-3/4 inches are used when fishing for Spanish mackerel.

Exhibit 8-11

Spanish Mackerel
Commercial Catch By Gear

Florida East Coast
(pounds)

Year	Haul Seine	Otter Trawl(shrimp)	Runaround Gillnet	Hand Line	Troll Line
1977[1]	*	*	10,202,253	14,067	769,766
1976[1]	*	*	8,731,400	195,400	627,000
1975	16,400	600	4,753,900	161,200	212,700
1974	6,900	7,000	2,164,400	79,200	88,600
1973	7,000	20,900	3,020,300	78,600	76,200
1972	40,000	3,400	3,221,200	38,200	66,200
1971	25,000	5,500	2,416,400	32,300	102,600
1970	6,000	7,000	3,457,300	60,900	43,200
1969	15,000	4,700	2,239,900	36,300	62,900
1968	22,000	13,600	4,219,000	56,100	95,800
1967	unclassified	3,300	1,667,400	57,000	73,800

Florida West Coast
(pounds)

Year	Purse Seine	Haul Seine	Runaround Gillnet	Trammel Net	Hand Line	Troll Line	Drift Gillnet
1977[1]	*	*	6,619,600	*	117,100	613,800	*
1976[1]	*	*	1,709,969	*	61,187	482,929	*
1975		265,600	4,527,900	88,000	184,000	555,800	
1974		486,400	6,972,000	162,100	298,100	348,600	
1973		602,400	5,370,100	101,800	61,600	58,400	
1972		1,541,000	4,524,700	130,900	105,300	230,100	
1971		1,319,400	5,651,300	126,800	130,000	88,900	66,900
1970		1,224,000	6,476,500	119,500	103,000	78,700	98,200
1969		882,200	6,903,500	96,100	108,100	71,300	113,400
1968	198,800	822,100	5,646,900	113,700	130,600	83,600	70,000
1967	194,600	648,600	4,604,500	88,000	103,700	129,300	70,000

[1] Preliminary
* Not Available

Source: U.S. Department of Commerce. Fishery Statistics of the United States (Various Years). Washington, D.C.: Government Printing Office.

c) Cobia

Cobia is not a primary commercial target species. It is caught on a supplemental basis in the Florida hook and line and gill-net fisheries. In Texas it is caught by hook and line as a commercial supplement to the charterboat fleet. It is also caught by shrimp trawler crews.

d) Cero Mackerel

Cero mackerel is an incidental catch to the king mackerel fishery. No separate landing statistics are available. They are aggregated with king mackerel. Cero mackerel is not thought to be particularly abundant in United States waters.

e) Bluefish

Bluefish are caught commercially in the Gulf of Mexico region primarily with haul seines, gill nets, and hook and line. Small amounts are landed in shrimp otter trawls, and trammel nets. Exhibit 8-12 presents bluefish catch within the Gulf region for 1973, a typical year. Of the total catch of 531,000 pounds, 39.4 percent was landed by haul seine, primarily in Florida. Gill nets landed 43.7 percent, the bulk of which was in Florida. The hook and line catch was 8.5 percent of the total and this was all in Florida.

In Florida bluefish provide a supplement to fishermen targeting other fisheries. Bluefish are caught here in small gill-net boats (18 to 22 feet), of the same type used for Spanish mackerel using stretched mesh nets. In their survey of small Spanish mackerel net fishermen (Cato, et al., 1978) reported that 13 percent of the value of catch and 19 percent of the weight of catch was bluefish.

Florida haul seiners use small open boats in the 20 foot size class. These boats are typically operated by two persons.

Exhibit 8-12

Bluefish Commercial Catch by Gear 1973
(thousand pounds)

	Haul Seine	Shrimp Otter Trawl	Trammel Net	Gillnet	Hook and Line
Florida (West)	209	-	32	206	45
Alabama	-	9	3	15	-
Mississippi	-	-	-	11	-
Louisiana	-	(1)	-	-	-
Texas	-	-	-	-	-
Total	209	10	35	232	45
Percent of Total Landings in Gulf and South Atlantic Regions	39.4	1.9	6.6	43.7	8.5

(1) Less than 500 lbs.

Source: U.S. Department of Commerce. N.M.F.S. Fishery Statistics of the United States, (Various Years). Washington, D.C.; U.S. Government Printing Office.

f) Little Tunny

There appears to be a small commercial catch of little tunny within the Gulf and South Atlantic regions. Purse seines are the main gear used for catching little tunny. It is used primarily for bait.

g) Dolphin

Dolphin is caught commercially exclusively by hook and line. It is not a primary commercial target species. It serves as a seasonal supplement to the Florida mackerel troll line fishery. It is caught commercially mostly in April through July, primarily in Monroe County and the southeastern Florida coast.

8.2.4.2 Recreational

Recreational fishermen use rod and reel when they angle for fish in the management unit. Both natural and artificial baits are used, and three different fishing methods are employed. Trolling is the most commonly used technique by charter and private boat fishermen. Charter boats often use four lines, two unweighted lines for fishing at the surface and two weighted lines at some depth below. Private boats generally troll with fewer lines and remain closer to shore. Boats troll in a straight line or in a random pattern until fish are hooked, and then trolling continues in circles until fish are no longer being caught. Trolling often is used when circling surface structures or underwater reefs. Both natural and artificial baits are used. A second technique, jigging, involves casting a lure or bait into the water and retrieving it with a jerking motion. This method is often used from fixed platforms such as bridges or piers. Jigging is also employed from boats when the boat is near a surface or underwater structure. The third method is float fishing and is usually done from a drifting or anchored boat, although it can be employed from a fixed platform. Hooks are baited and suspended below the surface in the water column with a float. Frequently chum is used to attract the fish (Manooch, 1978; Brusher, et al., 1977).

Section 8.2.1.2 presents a discussion of the types of private boats used by recreational fishermen for species in the management unit. Studies of charter boats from North Carolina, Florida and Texas provide a somewhat more detailed description of these commercial boats than is available for private boats. The length of charter boats in North Carolina range from 29 to 55 feet and have an average length of 42 feet. Charter boats there range in age from new to 44 years old and on average are 16 years old. Sixty percent of the boats have single diesel engines, and approximately 25 percent have twin diesel engines. The remaining boats have gasoline engines. Nearly all boats were equipped with CB and VHF radios and a fathometer. Just over one-half of the charter boats are equipped with long range navigational devices (loran C or loran A) (Abbas, to be published).

In Texas the average length of boats is about 31 feet. More boats are gasoline powered than diesel powered. Gasoline powered boats accounted for 76 percent of those sampled. Nearly all boats were equipped with VHF and CB radios and fathometers. Only 28 percent were equipped with loran (Ditton, et al., 1977).

On the west coast of Florida the average boat length is 37 feet. Seventy-eight percent of the boats are diesel driven, the remaining boats having gasoline engines (Browder, et al., 1978).

8.2.5 Employment

8.2.5.1 Associated with Commercial Harvest

This section describes the estimated employment associated with the commercial harvest of king and Spanish mackerel. Data on employment associated with the fisheries for other coastal migratory pelagic

species are not available. Most of these other species are harvested commercially incidentally to fishing activities targeting other species. Employment information discussed in this section is for 1980 (Centaur Associates, 1984).

Total employment associated with the mackerel fisheries was equivalent to 1,561 person-years. This employment level represents that for the harvesting and processing sectors, wholesale and retail dealers and restaurants, as well as indirect employment associated with firms providing service or products to the industry (Exhibit 8-13a).

Employment associated with the harvesting sector is estimated at 593 person-years for the 560 vessels (Danville Associates, 1983). Approximately 2,000 fishermen are involved in the fishery, but the fishery is seasonal and most boats engage in other fisheries during part of the year. These fishermen represented 475 person-years of employment. Persons providing fuel, supplies, maintenance, and services contributed an additional 118 person-years to the harvesting sector.

Employment associated with the mackerel processing sector totaled an estimated 96 person-years for direct and indirect employment. Employment for primary (fish houses) and secondary mackerel wholesalers totaled 249 person-years and employment for retailing mackerel, 249 person years. Employment associated with mackerel in restaurants which includes institutional establishments totaled 476 person-years.

Exhibit 8-13a

Total Economic Impact of Mackerel[1]
(from Danville Associates, 1983)

	Indirect Sales (millions of dollars)	Indirect Value Added (millions of dollars)	Indirect Income (millions of dollars)	Indirect Employment (person-years)
Fuel and Oil	2.03	0.84	0.54	24
Bait	0.07	0.04	0.02	2
Ice	0.49	0.20	0.14	7
Groceries	0	0	0	0
Misc. Supplies	0.20	0.09	0.08	4
Gear Purchases and Repair	1.33	0.61	0.49	24
Maintenance and Repair (Hull and Engine)	1.15	0.53	0.43	20
Insurance	0.33	0.16	0.13	6
Boat, Engine, Electronics	1.37	0.63	0.51	25
Unloading, "Other"	0.47	0.18	0.13	6
Total Indirect	7.44	3.28	2.47	118
+ Direct Impact	8.49	5.73	4.99	475
Total Economic Impact of Fish Harvesting	15.93	9.01	7.46	593

1 Domestic landings only.

Exhibit 8-13a (Contd.)

Total Economic Impact of Mackerel[1] (Contd.)

Processor Impact:	Direct	X	Multiplier	= Total Economic Impact
Sales:	$4.2 million	x	2.17	= $ 9.1 million
Value Added:	$0.9 million	x	3.11	= $ 2.8 million
Income:	$0.3 million	x	3.48	= $ 1.1 million
Employment:	34	x	2.83	= 96 person years

Wholesale Impact:	Direct	X	Multiplier	= Total Economic Impact
Sales[2]:	$6.6 million	x	1.52	= $10.0 million
Value Added:	$4.3 million	x	1.31	= $ 5.6 million
Income:	$2.5 million	x	1.37	= $ 3.4 million
Employment:	182	x	1.37	= 249 person years

Retail Impact:	Direct	X	Multiplier	= Total Economic Impact
Sales[2]:	$2.9 million	x	1.43	= $ 4.1 million
Value Added:	$2.4 million	x	1.26	= $ 3.0 million
Income:	$1.3 million	x	1.33	= $ 1.7 million
Employment:	130	x	1.13	= 147 person years

Restaurant Impact:	Direct	X	Multiplier	= Total Economic Impact
Sales:	$11.8 million	x	1.54	= $18.2 million
Value Added:	$4.6 million	x	1.59	= $ 7.3 million
Income:	$3.0 million	x	1.70	= $ 5.1 million
Employment:	410	x	1.16	= 476 person years

Total Economic Impact:		
	Sales[2]	$57.3 million
	Value Added	$27.7 million
	Income	$18.8 million
	Employment	1,561 person-years

1 Domestic landings only.

2 Sales refers to the markup for the wholesale and retail sectors.

8.2.5.2 Associated with Recreational Angling

Employment in manufacturing, wholesale trade and retail trade related to recreational fishing activity for the coastal migratory pelagic fish of the mangement unit in the South Atlantic and Gulf of Mexico is estimated to have been 2,990 person-years in 1977. Employment related to the king and Spanish mackerel fisheries is estimated to have been 1,170 person-years and 900 person-years, respectively, in 1977 for the two regions. These estimates include employment related to purchases of equipment such as boats, motors, trailers or fishing gear; nondurable goods such as boat fuel or live bait; and services such as charterboat fees, use of marine facilities, or food, lodging and travel.

The estimates represent employment benefits which accrue to the nation and not just to the two regions. For example fishing equipment purchased in Florida for use in mackerel fishing may be manufactured in New England and distributed through a mid-Atlantic state. This nonlocal manufacturing and wholesale distribution employment related to equipment used in Florida is included in the employment estimates presented above. The method for determining these estimates is presented in Section 9.1.2.

As discussed in Section 8.2.1.2, the coastal migratory pelagic resources management unit is particularly important to the charterboat fleet. Charterboat fishing is often not a full-time occupation for the boat operators. For some it provides seasonal employment. Other operators may charter these boats only on weekends. For example only 34 percent of Texas operators surveyed in 1975 said that charter fishing was their only occupation. Nearly 60 percent of the operators earned less than 50 percent of their income from charter fishing (Ditton, et al., 1977). In North Carolina very few captains rely on charter boating as a sole source of income (Abbas, to be published). Because of the seasonal and intermittent characteristics of charterboating activity, it is not possible to provide an estimate of related employment in terms of person-years; however, the estimated number of persons involved in providing charterboating services is presented below.

In Section 8.2.1.2 the number of charter boats that operated in 1977 was estimated to be 982. Each boat requires a captain, and many boats also used a mate. In Texas 60 percent of the boats used mates (Ditton, et al., 1977). On the west coast of Florida just over 90 percent of the boats used mates (Davis, et al., unpub. ms.). Assuming then that 75 percent of all charter operators employed a mate for their trips in 1977, the total number of persons involved in providing charter fishing services was 1,719; 982 captains and 737 mates. Regionally 727 persons are estimated to have been involved in charter fishing in the South Atlantic and 992 provided services in the Gulf of Mexico.

A significant portion of those employed in charter boating in both regions are affected by the mackerel and other pelagic species fisheries. As described in Section 8.2.1.2, 92 percent of the catch of boats operating from North Carolina ports were fish in the management unit, 37 percent of which were king mackerel. In southeastern Florida, 41 percent were from the management unit, and from portions of northwest Florida over 90 percent (74 percent were king mackerel) of the fish caught were from the mangement unit. Potential employment in charter boats is related to the management unit in similar proportions.

8.2.6 Conflicts Among Domestic Fishermen

In recent years there has been a significant degree of controversy among the various user groups participating in the Florida king mackerel fishery. Although it is difficult to document these conflicts through scientific studies, they are substantiated through public testimony, advisory panel meetings, and personal observations. Because king mackerel is a species which is very important to both the commercial and recreational fishermen, there has been significant competition for the resource which has heightened in recent years. In addition, the hook and line and gill-net commercial fishermen (two of the main commercial user groups) have been involved in a continuing conflict which escalated during the 1977-78 season.

Traditionally the southern Florida peninsula has been the center of the king mackerel commercial fishery during the winter season. Northwestern Florida has recreational fishing during the summer season. Since 1975 king mackerel became less and less available to the recreational fishermen along the Florida Gulf coast from Naples north and west. The 1975 season was reported to be the last good year for recreational fishing in that section of Florida. The recreational catch dropped in 1976 and has remained low through 1983. A somewhat similar pattern has existed with respect to the northern Gulf of Mexico in recent years. During this period the number of large king mackerel roller rig gill-net vessels showed a significant increase. This has led to a widespread perception among recreational fishermen that the large gill-net vessels are depleting the resources. This is denied by the gill-net fishermen. This climate has led to a series of initiatives by recreational fishing interests to curtail or prohibit the large-scale gillnetting of king mackerel. See Section 7.4 for a description of a recently enacted Florida state law placing certain limitations on king mackerel gillnetting. On the southeast Florida coast there have recently been occasional reports of vessel conflicts for fishing grounds between recreational and commercial fishermen.

Significant gear conflicts have occurred between large king mackerel gill-net vessels and the king mackerel hook and line boats on the southeast Florida coast between Sebastian, and Fort Pierce. The conflicts occurred because the two types of craft would disrupt each other's fishing operations. The large net vessels must move in circles of roughly 200 yards diameter while setting their nets on a school of fish. Hook and line boats must troll above and around such schools. This causes physical gear conflicts when both types of craft are attempting to fish in the same area. It is widely believed that the two types of gear are basically incompatible when fishing in localized areas. It is also believed that gill nets scatter the fish, decreasing the catch rates for hook and line boats for some time afterwards.

This gear conflict issue errupted to a significant extent in February, 1978, over ridge areas between Sebastian and Fort Pierce in southeast Florida. This became an important public issue and resulted in the Florida legislature enacting a law limiting gill-net depth to an effective fishing depth of approximately 57 feet or less along the Florida Atlantic coast. It was felt that the conditions are such that the potential for the above type of gear conflict may exist along the eastern Florida coast covering Brevard, Indian River, St. Lucie, Martin and Palm Beach Counties.

The primary fishing area of hook and line boats in that area are relatively narrow, rocky ridges. These ridges run parallel to shore and are more productive in approximately 60 to 90 feet of water. These ridges tend to attract the mackerel into a relatively small, well defined area where they can be consistently located and fished on a daily basis.

The primary fishing area of gill-net vessels is in the expanses of relatively flat sandy bottom between the ridges. The majority of the favorable bottom lies between 40 and 60 feet of water. Because of the strong currents often present in that area, setting the net on rocky bottom often results in damage to the net, loss of the catch and occasionally loss of the entire net. However, given conditions of no current and calm seas, nets can be effectively set on a rocky bottom.

Until recent years the conflict between the two groups was minimal both because the best fishing areas were on different types of bottom and because the nets were not deep enough to effectively fish water as deep as the best area for hook and line fishermen. The severity of the conflict increased with the increase in depth of the nets (before the Florida law was passed) and the number of net vessels in the area.

8.2.7 Assessment of U.S. Harvesting Capacity

Harvesting capacity has been growing rapidly in the U.S. king mackerel fishery in recent years. The number of king mackerel hook and line boats operating in Florida has increased from an estimated 50 to 300 in the last eight years. The number of power roller gill-net boats has increased from an estimated

12 in 1969 to 121 in 1982 (Danville Research Associates, 1983). The recreational fishing pressure and corresponding capacity has been increasing at approximately ten percent per year or more (see Section 8.2.1.1.).

Exhibit 8-13b presents a lower bound estimate of current U.S. harvesting capacity for king mackerel. It is based on taking the highest catch per unit of gear for the various user types of experienced over the last ten years. The estimate for the Florida east coast hook and line is based on the catch per boat experienced in 1970 using the current estimate of the number of boats in the fleet. The estimate for the large roller rig gill-net fleet is the estimated catch per boat experienced in 1974 using the current estimate of vessels capable of fishing for king mackerel. For the other user groups nominal capacity is expressed as the greatest amount of landings experienced by that user group over the last ten years. The recreational capacity is expressed as the estimated 1975 catch increased to 1978 by the estimated 10.3 percent annual increase in fishing effort.

Current capacity is considerably above current catch levels. Using the estimates in Exhibit 8-13b, current capacity is estimated at 67 million pounds (using adjusted recreational catch data) (see Section 5.4.1) versus an estimated adjusted total catch for 1975 of 30.1 million pounds. Similar relationships hold if the unadjusted recreational catch data is used.

Exhibit 8-14 presents a lower bound estimate of harvesting capacity for Spanish mackerel. The capacity for the large and small Florida gill-net fleets is based on an estimate of the number of boats in each fleet times the average harvest during the 1976 season of a sample of each vessel type. While the sample may represent those vessels that target Spanish mackerel more heavily than others in the fleet, it does provide an indication of the capacity of each vessel in the fleet.

Current Spanish mackerel harvesting capacity is considerably above current catch estimates. From Exhibit 8-14 it is estimated at 80.8 million pounds versus an adjusted total catch estimate for 1975 of 20.1 million pounds.

While these estimates of capacity for both king and Spanish mackerel would seem to indicate overcapitalization, the fact that these boats and vessels participate in two or more other fisheries precludes such an obvious conclusion. There have been no direct studies of this issue for this fishery, and methodology until very recently has been lacking to deal with capacity for multispecies craft. In addition the catch rates used to compute commercial capacity were for years of near perfect weather conditions and very high availability. The effective capacity is less under average conditions.

8.2.8 Assessment and Specification of the Extent to Which U.S. Vessels Will Harvest Optimum Yield

It has been determined that U.S. fishing vessels will harvest the entire optimum yield specified by the Councils both for king mackerel and Spanish mackerel. There is, therefore, no total allowable level of foreign fishing (TALFF).

8.2.8.1 King Mackerel

The Councils have specified total allowable catch to be 14.225 million pounds for the Gulf group. The TAC for the Atlantic group is 11.8 million pounds for a total of about 26 million pounds.

Commercial users have the intent and capacity to take their allocation. The commercial fishery has exceeded ten million pounds in the past (1974).

The recreational fishery harvested an estimated 23.7 million pounds in 1975 (based on the adjusted catch estimates for 1975. Both commercial and recreational users are to be limited to a TAC of no more than 26 million pounds by management measures though their capacity is higher (Exhibit 8-13b).

Exhibit 8-13

King Mackerel Harvesting Capacity
(pounds)

Florida East Coast Hook and Line Fleet	250 boats @ 36,071	9,018,000
Large Roller Rig Gill-net Fleet	121 boats @ 204,364	24.728,044
Florida West Coast Haul Seine Fleet	1970 landings	97,000
Florida West Coast Trammel Net Fleet	1972 landings	131,000
Florida West Coast Hook and Line Fleet	1974 landings	991,000
North Carolina Commercial Capacity	1977 landings	245,000
South Carolina Commercial Capacity	1973 landings	11,000
Georgia Commercial Capacity	1974 landings	6,000
Recreational Fishing Capacity (Total)	1975 catch estimate by 10.3 percent annual increase in fishing pressure to 1978	31,785,000[1]
Total		67,012,044

[1]Based on the adjusted recreational catch data. Using angling survey data from Deuel (1973) directly the corresponding recreational fishing capacity is estimated at 84,046,000 pounds and the corresponding total capacity is 108,850,000 pounds.

Exhibit 8-14

Spanish Mackerel Harvesting Capacity
(pounds)

Large Florida Gill-net Fleet	121 boats @ 425,000	51,425,000
Small Florida Gill-net Fleet	250 boats @ 58,360	14,590,000
Florida Haul Seine Fleet	1972 landings	1,581,000
Florida Hook and Line Fleet	1975 landings	1,114,000
Commercial Fleet in Other States in Gulf and South Atlantic Regions	1972 landings	796,000
Recreational Fishing Capacity (Total)	1975 catch estimate by 10.3 percent annual increase in fishing pressure to 1978	11,300,000[1]
Total		80,806,000

[1] Based on the adjusted recreational catch data.

8.2.8.2 Spanish Mackerel

The Councils have specified optimum yield at MSY and to be 27 million pounds.

In order to estimate commercial harvest in 1982, the increase in commercial landings between 1965 and 1977 was assumed to be a linear function. The following linear regression was calculated:

$$\text{Annual landings} = -8.003 \times 10^5 + 411.65\ (\text{year}) \qquad r^2 = .41$$

From this formula, commercial landings for 1982 were estimated to be 15.6 million pounds. The actual landings may vary widely from this estimate due to weather or availability of fish. The recreational fishery harvested an estimated 8.4 million pounds in 1975. If the catch increased at the same rate as the estimated 10.3 percent compounded annual increase in fishing pressure, the 1982 recreational catch would be 15.1 million pounds. However, catch per unit effort declines as effort increases. The actual recreational catch cannot be accurately predicted, but is expected to be between 8.4 and 15.1 million pounds. For the purpose of determining expected domestic harvest, the expected recreational catch for 1981 was estimated at 12 million pounds.

Expected domestic annual harvest by all users in 1982 was estimated at 27 million pounds, equal to OY.

8.2.8.3 Cobia

The Councils have determined that optimum yield for cobia is the available amount of cobia equal to or greater than 33 inches fork length. This amount is estimated to be equal to 1,004,000 pounds per year under present conditions and is expected to increase under the proposed management regime.

Expected domestic harvest in 1982 is estimated as 1,004,000 pounds. This is the best estimate of present catch. The U.S. fishermen have the intent and capacity to harvest all available cobia larger than 33 inches. Most of the present catch is larger than 33 inches. Although commercial landings have decreased in the Atlantic and increased in the Gulf, total landings have remained relatively stable since 1970. Recreational catch since 1970 has increased in some areas and decreased in others according to participants in the fishery. No clear trend in the amount of the total catch is discernible from the limited data available. Data on growth, mortality, and catch, indicated that the most recent estimate of total catch is approximately equal to MSY (see Section 5.1.6.4 and 5.4.6.1).

8.2.9 Assessment and Specification of the Portion of the Optimum Yield Which U.S. Harvesters Propose to Deliver to Foreign Vessels

U.S. harvesters do not propose to deliver any fish in the management unit to foreign vessels.

8.3 Foreign Fishing Activities

There are no foreign fishing participants believed to be operating in the coastal pelagic management unit fisheries within the fishery conservation zone (FCZ). The only known foreign fishermen who have been operating within the FCZ of the South Atlantic and Gulf of Mexico are the Japanese seeking bluefin tunas. The National Marine Fisheries Service Foreign Fisheries Observer Program reports that only a negligible amount of foreign bycatch for the species in the management unit. There is no history of foreign fishing for the species in the management unit as target species within the United States FCZ.

There are extensive Mexican fisheries for king mackerel and Spanish mackerel. These are centered off the State of Veracruz. From 1971 through 1980 reported landings on the Mexican Gulf coast varied between 11 and 21.9 million pounds for Spanish mackerel and 1.9 and 4.8 million pounds for king mackerel (Bane and Bane, 1984). See Exhibit 8-15. There may be some interaction between these and the U.S. stocks.

Exhibit 8-15

Mexican Gulf Commercial Landings of King and Spanish Mackerels

1971 - 1980 in lbs x 1,000 (from Bane and Bane, 1984)

YEAR	KING MACKEREL	SPANISH MACKEREL
1971	2,487	7,293
1972	3,316	11,762
1973	4,819	14,453
1974	3,274	11,517
1975	3,122	10,423
1976	3,298	7,394
1977	1,985	9,636
1978	3,384	11,327
1979	6,024	12,679
1980	7,007	11,096
1981	9,458	13,025
1982	9,744	17,193
1983	9,894	18,801

8.4 Interactions Between Foreign and Domestic Participants

8.4.1 Harvesting Interactions

There are currently no interactions between domestic and foreign participants in the fishery (see Section 8.3) except for an insignificant bycatch. The extent to which stocks fished in Mexican and U.S. waters are related is unknown.

8.4.2 Transfers at Sea to Foreign Vessels

There are no known transfers of fish in the management unit from U.S. harvesters to foreign vessels. None have been proposed or are anticipated.

8.5 Domestic Processing Capacity

There is currently sufficient domestic processing capacity to process the commercial harvest of king and Spanish mackerel. The domestic processing industry has in recent years handled the expected commercial harvest necessary to take optimum yield (see Section 8.2.8).

Capacity is to be measured in terms of adequate capacity and the intent to utilize that capacity on fish caught by U.S. fishermen. Intent to utilize capacity is essentially an economic decision by firm owners. In this regard capacity is defined as the maximum sustainable level of output the industry can attain within a very short time if demand were not a constraining factor, and when the industry is operating its existing stock of capital at its customary level of intensity (Klein and Summers, 1966).

Processors appear to have the ability and intent to utilize their capacity. Fish houses in St. Lucie, Martin, Palm Beach and Monroe Counties, Florida, have from 29 to 59 percent of their fish species represented by Spanish mackerel. King mackerel represents from 47 to 53 percent of the fish volume of fish houses in Indian River, St. Lucie and Palm Beach Counties. Bluefish represent from two to nine percent of the fish volume of these three counties and Martin County. This level of dependence on these species indicates a high level of economic dependence and thus the desire to continue the utilization of these species.

The harvest areas lie in fairly close proximity to processing areas of these fish. Since the major commercial production is in Florida, the fish houses and processors have organized an efficient system to accommodate the migratory patterns of these fish. The organizational systems follow three basic patterns. First, some fish houses have established themselves in the most highly productive areas and are highly dependent on locally caught fish. Other fish houses around Florida may also own vessels which "follow" the fish. Trucks are then sent to the seasonal landing locations and the fish are transported to the fish house or point of handling or sale by the trucks. The third method has seen some processors set up satellite freezers or handling locations along the coast to handle the fish as they are harvested near these locations. These techniques have insured adequate refrigeration and freezing capability near harvest areas.

King mackerel are predominately marketed fresh or frozen whole. Much smaller amounts are processed into the steak or smoked form. About 65 percent of Florida's east coast production has in recent years gone to the New York market iced in boxes in whole form. About 75 percent of king mackerel production from the Florida Keys and the Florida west coast has gone to Puerto Rico. This "lack" of processing has been the result of market preference rather than being due to the inability to "process" the fish.

Spanish mackerel production is usually sold as fillets in either fresh or frozen form with frozen the predominant market form. During 1974 slightly over one-half of all landings were marketed in that form. Some sources suggest this market form may account for as high as 90 percent of total landings. In recent years harvest levels were not fully absorbed by the market and some freezer companies had freezer stocks one year old. The overall market for Spanish mackerel has declined.

Availability and capacity of labor force, processing machinery, freezers, etc. appear adequate. Secondary handlers presently use machines for gutting and removing backbones of Spanish mackerel; therefore, there is no constraint by available labor supply in this segment of the total industry.

Capacity in the king mackerel processing sector is a function of available labor supply since the product is mainly handled fresh whole and iced or frozen whole; however, since this requires relatively unskilled labor the supply can be expanded rapidly. The chief capacity restraint in the king mackerel sector is the market distribution system; however, the market is expected to handle increased supplies

since prices have been increasing along with increased landings and because of the expanding market in Puerto Rico.

Seasonal schedules are variable due to the variability in seasonal landings for king and Spanish mackerel. During peak production months in the king mackerel fishery, much of the landings move into adequate freezing facilities and thus fill markets needs during peak demand periods. During the record production year for Spanish mackerel, fishermen were placed on a 15,000-pound per day limit. This gives an indication of the capacity which is approximately 18.0 million pounds. This is considerably above the average or expected commercial harvest.

9.0 DESCRIPTION OF ECONOMIC CHARACTERISTICS OF THE FISHERY

9.1 Domestic Harvesting Sector

9.1.1 Commercial

Value of Landings

Exhibit 8-5 in Section 8.2.2 presents data on the value and amount of the total U.S. commercial landings of king mackerel. It should be noted that a predominant portion of the commercial exvessel landings of king mackerel is sold rather than passed through nonmarket transactions. This is true for the other species in the management unit as well. About 95 percent of total value landed had come from Florida prior to development of fisheries off North Carolina and Louisiana.

About 95 percent of the U.S. Spanish mackerel commercial landings occur in Florida, although at least some landings occur in all of the states in the Gulf and south Atlantic regions except Texas.

The value of Spanish mackerel landings in North Carolina, South Carolina, Georgia, and Alabama has averaged less than $10,000 per year over the last ten years. Complete data on the value and amount of total U.S. landings for Spanish mackerel is presented in Exhibit 8-6 in Section 8.2.2. Spanish mackerel prices have not risen as fast as have king mackerel prices. In the late 1950s, Spanish mackerel prices were about seven to nine cents per pound which was only about three cents per pound below prices of king mackerel. Spanish mackerel prices began to rise in 1973 and reached 21 cents per pound in 1977 which was about half the price per pound of king mackerel. This may help explain the recent trend for boats formerly exclusively in the Spanish mackerel fishery to become involved in the king mackerel fishery as well.

Florida is the only state in the Gulf of Mexico to have significant commercial landings of bluefish. The value of commercial landings of bluefish has generally been less than two thousand dollars per year in each of the other states in the Gulf. Bluefish prices are relatively low compared to other fish, and landings easily glut the market. They are not a primary target species but are sought when other more valuable species are not available.

Cobia and dolphin are not major target species for commercial fishermen, but are caught on a supplemental basis. They are both landed commercially, predominantly in Florida. Total annual commercial value of landings in the Gulf and South Atlantic regions have typically been less than $30,000 for dolphin and $20,000 for cobia.

Economic Characteristics of the Fleet

Cost and return data was obtained from surveys of boats in the king mackerel hook and line fleet, and the Spanish mackerel small and large boat gill-net fleets, (Morris, et al., 1977, 1978). Of the boats in the survey, the average hook and line boat had total revenue of $24,500, $17,500 of which was from king mackerel. The average small Spanish mackerel net boat in the survey had total revenue of $26,700, $10,500 of which was due to Spanish mackerel. The average Spanish mackerel large boat in the survey had total revenue of $96,400, $76,000 of which was due to Spanish mackerel. The net returns to the captain/owner were $14,900 - king mackerel hook and line boat; $15,900 - small Spanish mackerel net boat; and $21,800 - large Spanish mackerel net boat.

Overall yearly profit for vessels and boats in the coastal migratory pelagic fishery is the remainder of total revenue after fixed and variable costs are paid. Variable costs, which include fuel, crew shares, gear repair, and maintenance, must be paid to continue fishing during one season. Fixed costs, which include boat payments, insurance, and depreciation, could be postponed temporarily either

totally or in part if total income is inadequate. Vessels and boats such as these that do participate in several fisheries have their fixed costs spread over several activities. Therefore, analysis of the financial performance of a boat or vessel in only one fishery is incomplete or would be biased if it included all fixed costs.

Data from these surveys were used to calculate economic ratios of investment, costs, and personal income to value of the catch for these fleets. These ratios were then applied to estimate the economic characteristics for the respective commercial fisheries as a whole. Catch was estimated as the 1976-77 average. Then the current (1977) price was applied to determine the value of landings. To estimate personal income, the ratio of personal income/value of catch from the surveys was applied to the value of landings. A similar procedure was used to estimate investment in the fishery. The total personal income in the commercial fishery derived from the king mackerel in the Gulf and South Atlantic regions was estimated to be $2,111,000, from the Spanish mackerel fishery $1,888,000, and from the bluefish fishery $326,000.

9.1.2 Recreational Fishing

The following sections present a description of the direct economic contribution to the nation associated with recreational fishing for the coastal pelagic species. The estimates are presented in the context of impacts associated with all marine recreational fishing in the southeast to illustrate the relative importance of the fisheries. Presented first are estimates of total expenditures by recreational fishermen and the associated employment, wages and salaries generated by their purchases.

It is conceptually difficult to identify economic effects associated with a particular species of fish. Often fishermen seek multiple species. Similarly, those fishermen who do direct their effort at particular fish often catch other fish incidentally. These confounding characteristics of recreational fishing activity make it difficult to clearly delineate activity attributable to a particular species. Fully recognizing these conceptual difficulties, species specific estimates were determined by prorating total economic activity using an indicator of participation such as catch or effort. The indicators chosen were largely dictated by the limits of available data. In all instances where prorating procedures were used, the method has been described.

Thus, while the estimates presented may not fully represent the economic impacts within the desired accuracy range, they do provide a reasonable perspective of the relative magnitude of the coastal pelagic fishery vis a vis other saltwater sportfishing.

Total Direct Economic Impacts

Participation in marine recreational fishing results in substantial purchases of goods and services. It has been estimated that in 1975 the expenditures associated with saltwater angling activity in the South Atlantic and Gulf of Mexico regions were $289 million and $644 million, respectively (Centaur Management Consultants, 1977, pp. 39-42). Exhibit 9-1 presents estimates of direct economic impacts associated with coastal pelagic species in 1977.

As can be seen from the exhibit, anglers' expenditures related to the coastal pelagic species amounted to nearly ten percent of expenditures for all saltwater fishing in the two regions. Regionally, angler expenditures in the South Atlantic and Gulf of Mexico related to coastal pelagic species amounted to an estimated 15 percent and eight percent of total angler expenditures in the respective regions. In dollar terms, however, expenditures related to these species were greater in the Gulf than in the South Atlantic.

With respect to individual species, total expenditures attributable to king mackerel were estimated to be $40 million, and for Spanish mackerel about $36 million. These figures each represent about four

Exhibit 9-1
Estimated Economic Impacts Associated
with Marine Recreational Fishing in 1977

	Value of Sales ($1,000	Employment (Person-Years)	Wages and Salaries ($1,000)
South Atlantic[1]	330,980	7,780	60,750
Management Unit[2]	51,070	1,290	10,450
King Mackerel	14,430	380	3,170
Spanish Mackerel	13,850	360	2,840
Gulf of Mexico[1]	749,910	17,420	148,310
Management Unit[2]	57,940	1,700	12,860
King Mackerel	25,750	790	6,040
Spanish Mackerel	21,710	560	4,320
Total[1]	1,080,890	25,200	209,060
Management Unit[2]	109,010	2,990	23,310
King Mackerel	40,180	1,170	9,210
Spanish Mackerel	35,560	920	7,160

[1]Represents total impacts associated with marine recreational fishing for all species.

[2]Represents impacts prorated to species in the Management Unit except little tunny, based on relative participation by recreational anglers. Data on participation specific to little tunny are not available.

Source: See Text.

to five percent of the total of both regions. Regionally, expenditures associated with king and Spanish mackerel in the South Atlantic were about $14 million for each, while in the Gulf expenditures amounted to an estimated $26 million for king mackerel and $22 million for Spanish mackerel.

Angler purchases create and sustain employment and personal income in the production, distribution, and retail sale of the goods and services bought. These employment and wage and salary impacts are also presented in Exhibit 9-1. Of the estimated 25,200 person-years of employment generated by expenditures of all anglers in the Gulf and South Atlantic regions in 1977, approximately 2,990 person-years can be attributed to all coastal pelagic species. Wages and salaries generated were just over $23 million. Approximately $9.2 million can be associated with king mackerel and $7.2 million with Spanish mackerel. Regionally, employment and income impacts were greater for fishing that occurred in the Gulf of Mexico than occurred in the South Atlantic.

It should be noted that these direct economic impact estimates represent benefits that accrue to the entire nation and not just to the two regions. Included in the estimates are impacts associated with purchases of durable goods such as boats, motors, boat trailers, and fishing tackle; nondurable goods such as boat fuel, car fuel, or live bait; and services such as charter and head boat fees, use of marine facilities, equipment rental, or food, travel, and lodging.

The above estimates were determined by allocating the estimated regional direct economic impacts associated with all saltwater sportfishing in the southeast to coastal pelagic species using a methodology employed in a recent report prepared for the National Marine Fisheries Service (Centaur Management Consultants, 1977). Economic impacts are prorated based on the number of anglers who caught fish in the management unit. This procedure was modified to adjust for the significant role that the charter fleet plays in the fishery. The methodology provides a reasonable estimate of the national impacts associated with a particular fishery.

The procedure employed takes into account the fact that many purchases by anglers are not made for the singular purpose of fishing. This is particularly true of durable goods. For example, a boat may be purchased for fishing as well as for cruising or water skiing. Moreover, a boat used solely for fishing is rarely (if ever) used for seeking only one species of fish. On the other hand, it would be inappropriate to completely discount purchases that are not wholly attributable to a particular activity (e.g., angling for king mackerel). Here it is assumed that the expenditures for the purchase of equipment are attributable to a particular activity in proportion to the amount of time that the equipment is used for that activity.

Impact estimates for 1977 are based on the 1975 estimates presented in the report prepared for the NMFS (Centaur, 1977). To obtain the 1977 estimates, real growth in angler expenditures and associated employment was assumed to increase at 3.6 percent annually (North, 1976, p. 42).[1]

The effects of inflation were accounted for by using the Bureau of Labor Statistics consumer price index for expenditures and labor cost index for wages and salaries.

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[1] It has been reported that sales of fishing equipment for king mackerel fishing in northwestern Florida have recently declined because fish have declined in abundance there over the past two to three years. However, the data presented in this section are designed to represent the impacts as if 1977 were a typical or average year.

Charter Boats

Of the estimated $1.1 billion in total expenditures associated with all marine recreational fishing in the South Atlantic and Gulf of Mexico regions in 1977, an estimated $23.9 million were for charter-boat fees. Estimates of charter revenues and personal income illustrating the relative importance of the coastal pelagic fish are presented in Exhibit 9-2. Charter fees associated with coastal pelagic species were estimated to be $11.5 million. Similarly, estimated charter fees associated with fishing for king and Spanish mackerel were $6.2 million and $1.8 million, respectively.

Personal income of the charter operators is estimated to be $8.3 million in 1977. Personal income attributable to coastal pelagic species was an estimated $4.0 million. Estimated income associated with king and Spanish mackerel was $2.2 million and $0.6 million, respectively.

The revenue estimates were determined by using recent studies of charter operations in North Carolina (Abbas, to be published), Georgia (Brown and Holemo, 1975), southeastern Florida (Gentle, 1977), the Gulf coast of Florida (Browder, et al., 1978), and Texas (Ditton, et al., 1977).

The above research provided estimates of the average annual gross revenues for a boat operating in the area studied. These estimates were assumed to be typical of the proximal geographic region. Data on North Carolina boats were also assumed to represent boats from South Carolina. Data from studies of charter boats in Georgia and Dade County, Florida were used to represent the remaining portion of the South Atlantic coast. Northwestern Florida charter boats were assumed to be representative of Alabama charter activities and Louisiana and Mississippi boats were assumed to be similar to those in Texas.

While revenues may vary from year to year because of weather conditions, availability of fish or other reasons, the studies (which were conducted in different years) were assumed to represent typical fishing years. Revenue estimates were normalized only for inflation. To obtain the total revenue estimates, the number of boats in each area (see Section 8.2.1.2) was multiplied by the respective average annual revenue per boat.

Personal income earned by the operators was estimated through an analysis of cost and revenue data of charter boats presented in studies of North Carolina, Georgia and Texas boats. Operators' income as a percent of gross revenues was 32 percent in North Carolina, 33 percent in Georgia, and 39 percent in Texas. Personal income here includes all profit remaining after fixed expenses (excluding depreciation) and variable expenses have been paid, but before payment of interest and taxes. Based on the relatively small range of personal income observed in the three studies, it was assumed that operators' income is 35 percent of all charter operations. This percentage was applied to gross revenue estimates for the two regions.

The allocation of gross revenue and personal income to coastal pelagic species and separately to king and Spanish mackerel is based on catch statistics for all areas except the Florida Gulf coast and Alabama. There the allocation was determined using effort data. Statistics on the number of fish caught from North Carolina boats (Manooch and Laws, unpub. ms.) and southeastern Florida (Gentle, 1977) were used in prorating gross revenue and income for the eastern Gulf. In the absence of catch or effort data specific to charter boats in the western Gulf, statistics on the catch from inboard boats fishing in the Gulf off the Texas coast were used to determine the allocation factors (Trent, 1976).

Tourism

Tourism is a significant aspect of the marine recreational fisheries of the southeast. Recent regional surveys conducted by the National Marine Fisheries Service show that a substantial number of anglers in the eastern United States do at least some of their fishing in the coastal states of the South Atlantic and Gulf of Mexico, most of them traveling to Florida (Ridgely and Deuel, 1975).

Exhibit 9-2

Estimated Gross Revenue
and Operator's Income for Charter Boats
in the South Atlantic and Gulf of Mexico, 1977

	South Atlantic	Gulf of Mexico	Total
Total	9,899,000	14,081,000	23,980,000
All Coastal Pelagic Species	5,445,000	6,230,000	11,675,000
King Mackerel	2,324,000	4,064,000	6,388,000
Spanish Mackerel	1,485,000	365,000	1,850,000

Charter Operators' Income

	South Atlantic	Gulf of Mexico	Total
Total	3,465,000	4,928,000	8,393,000
All Coastal Pelagic Species	1,906,000	2,181,000	4,087,000
King Mackerel	814,000	1,422,000	2,236,000
Spanish Mackerel	520,000	138,000	648,000

Source: See Text.

Comprehensive tourism data specific to the coastal pelagic fisheries are not available, but studies of charter boat operations (the importance of the management unit to the charter fleet is discussed in Section 8.2.1.2) show that tourism is very important to the charter fishery.

A recent study of charter boat fishermen in Mississippi revealed that only 17 percent of the participants live in the coastal counties of that state, and that 57 percent of the participants were from outside Mississippi (Etzold, et al., 1977, p. 10). A study of Texas charter boat fishing in 1976 shows that only two percent of the participants were from Texas coastal counties, while 92 percent were from inland areas of the state (Ditton, et al., 1977, pp. 41-42). In Dade County, Florida, 81 percent of the participants in charter fishing surveyed were nonresidents of the county, and 77 percent were from outside of Florida (Gentle, 1977, p. 101). Also, charter boat operators in Bay County, Florida, have estimated that 98 percent of their customers are nonresidents of the county (Brusher, et al., 1977). Clearly, the charter boat fleet is heavily dependent on tourism for its business.

In addition to the business tourists bring to the charter boat operators, they spend considerable sums of money in the local economy for other items such as food, lodging, and travel. It is estimated that approximately 456,000 tourists participated in charter fishing in 1977 in the South Atlantic and Gulf of Mexico. In addition to the $23.9 million they spent for charter fees (see previous section), an estimated $17.9 million was spent on food, lodging, transportation and miscellaneous items for the days they fished. Approximately $8.2 million of that total was spent in southern Florida.

Tourist expenditures attributable to king mackerel and Spanish mackerel were estimated using a prorating procedure similar to that applied in the analysis of charter boat revenues and income (i.e., based on the proportion of coastal pelagic species that were caught while charter fishing to total

fish caught). Accordingly, expenditures by tourists for food, lodging and travel attributable to coastal pelagic species were an estimated $10.0 million in 1977. Tourist expenditures associated with king mackerel charter fishing were an estimated $5.6 million. Approximately $0.85 million were associated with Spanish mackerel.

It should be noted that while tourists who engage in charter fishing likely comprise the majority of nonlocal participants, there are other tourists who also fish for recreation. Many persons trailer their boats to the southeast for long winter vacations. There are also nonlocal anglers who catch coastal pelagic species from shore-based locations such as beaches, piers or jetties. These tourists are not included in the estimates presented above. Therefore, the above expenditure estimates should be viewed as a lower bound of total tourist expenditures associated with coastal pelagic resources.

9.2 Domestic Processing Sector

King mackerel is sold in fresh whole (eviscerated), frozen whole, frozen steak, and smoked product forms. The great majority is sold in either fresh or frozen form. Although data are incomplete, a review of NMFS processed product statistics indicates that less than ten percent is steaked. It is reported that the amount of smoked product is very minor. A survey conducted by Prochaska and Cato in 1975 (Prochaska and Cato, 1977) indicated that 65 percent of total U.S. king mackerel landed on the Florida east coast was shipped to New York Fulton Fish Market. Fish from this area is roughly half of total U.S. king mackerel production. Fish are landed at primary wholesalers and boxed and iced by them. The fish are then trucked to New York by independent truckers. These king mackerel do not change form until they are sold through the New York market.

In 1980, prices at the New York Fulton Fish Market (these are prices for fish sold by New York wholesalers) was $1.42 per pound, while southeast exvessel prices averaged 76 cents (Centaur Associates, 1984). In 1980, landings of king mackerel in the Gulf and South Atlantic totaled 7,029,000 pounds valued at $5,356,000 exvessel. The wholesale value was estimated at $8,992,000, an increase of $3,636,000 over the exvessel value, or a 67 percent increase (Centaur Associates, 1984).

In addition to the New York market there is a similar product flow for a significant amount of king mackerel sold fresh in the local Florida market (e.g., in Miami).

A large volume of king mackerel is frozen and shipped to Puerto Rico. An estimated 75 percent of landings in the Florida Keys and Florida west coast is reported to be shipped to Puerto Rico. This market began to greatly expand in the late 1960s, when widespread use of refrigeration became available in the Caribbean areas (Austin, et al., 1978).

King mackerel is primarily sold in fresh and frozen form, and there is no real processing involved, except for handling and freezing. Capacity in handling at fish houses is mainly a matter of labor, which can be increased on a relatively short-term basis. Capacity in freezing involves interaction with all other frozen fish products. King mackerel is only a moderate portion of total Florida freezings. The chief capacity constraint on processors is dictated by the market. The frozen market in Puerto Rico is continuing to expand. Evidence of the continually expanding market for king mackerel is the fact that while landings have increased in recent years, prices have continued upward (see Section 9.1.1). Processors indicate that there is considerable room left for expansion of king mackerel production and marketing.

Major product forms for Spanish mackerel include frozen fillets and fresh whole. During 1980, 77 percent of Spanish mackerel was sold as frozen fillets. In 1980, 3.041 million pounds of Spanish mackerel fillets were processed, valued at $4.166 million. Most of this was processed in Florida (Centaur Associates, 1984). In 1980, 11.968 million pounds were landed, valued at $4.17 million exvessel and $5.5 million wholesale.

Amounts of Spanish mackerel also go to the local Florida fresh fish market. Spanish mackerel is also sold as marine mammal food to aquarium-type attractions. A certain amount is also sold for bait.

Processing capacity for Spanish mackerel appeared to be reached in the 1975-76 winter season, when boats were placed on 15,000-pound limits. The landings during that season were approximately 18 million pounds, which represents an approximation of market/processing capacity at that time based on the earlier definition. Processors indicate that the market is continuing to expand.

The total direct and indirect economic impact of the king and Spanish mackerel fisheries are presented in Exhibit 8-13. The total sales value generated by these fisheries was $57.3 million, including all sales in support industries. Of this amount, the value added on was $27.7 million and income was $18.8 million.

Bluefish is sold in fresh, frozen and fillet product form. Historical data are not available on amounts. Bluefish is a rather low priced fish. The market for bluefish is unorderly. There is not a consistent marketing channel for bluefish. When they are available in the fishery and other more attractive species are not, fishermen will catch them. However, they glut the market rather easily.

Cobia and dolphin are primarily sold in fresh form. There is not a well developed marketing channel for them. They are generally sold in local areas to a small group of consumers who are familiar with them.

9.3 Other Sectors of the U.S. Fishing Industry

The dependence of other sectors of the fishing industry follows the relationships presented in Section 11.3.

9.4 International Trade

International trade of king and Spanish mackerel appears to occur on a relatively small scale in comparison to domestic trade for these fish. (Trade with Puerto Rico, a major market for king and Spanish mackerel is not included in the analysis of international trade.) Imports originate from Latin America, chiefly Mexico, Venezuela, and Ecuador (E. Berry, NMFS, pers. comm.). Foreign markets are reported to include Canada and Venezuela (Austin, et al., 1978). Records of international trade in king and Spanish mackerel are generally aggregated with all mackerel, making international activity somewhat difficult to trace.

United States imports of mackerels are relatively small, and most is other species than those in the management unit. Mexico is a major source of king and Spanish mackerel imports, but in 1977 the total imported to the United States was less than 55,000 pounds. The fish is generally sold frozen, although small amounts of fresh Mexican fish do make their way into Brownsville, Texas, markets. Other Latin American countries which exported mackerel to the U.S. include Venezuela, Columbia, Ecuador, Nicaragua and Honduras. Combined, these countries exported less than 50,000 pounds of frozen mackerel to the U.S. in 1977. Nearly 150,000 pounds of canned mackerel from Peru entered southeastern markets through Mobile and New Orleans in 1977, but these are believed to be Pacific varieties.

Historically, the largest importer of canned mackerel from southeast ports was Japan, but its imports dropped dramatically (from a high of nearly 5.8 million pounds in 1973) to just over 100,000 pounds in 1977. The substantial amounts of canned mackerel are in all likelihood Atlantic and/or Pacific mackerel. Because these fish sell at a lower price than king and Spanish mackerel and are sold canned, they probably have little effect on king and Spanish mackerel markets which generally are sold in fresh and frozen forms. Moreover, Japanese imports should have little impact now because they have been so drastically reduced.

European countries intermittently export mackerel products to the southeast U.S. The nations include Holland, Poland, Germany, the United Kingdom, Denmark, Norway, Spain, and Portugal. Like the imports to Japan, these are believed to be other than king and Spanish mackerel. Also, they appear in small quantities and should not affect U.S. king and Spanish mackerel markets.

As in the case of imports, records on exports of king and Spanish mackerel are also highly aggregated. Canned products are included with all other mackerel and frozen products are aggregated with many non-mackerel species. Data on canned products suggest that exports of king and Spanish mackerel are quite small. In total only 1.2 million pounds of all types of canned mackerel were reported to have been exported from U.S. ports; however, the majority of this is believed to be Atlantic mackerel.

According to U.S. census statistics Venezuela received no canned mackerel from the U.S. in 1977 and the only shipments to Canada were from Pacific coast ports. Shipments from Florida ports went to Guatemala, the Bahamas, and the Dominican Republic.

Except for Venezuela, tariffs on mackerel products do not appear to be restrictive to international trade. Tariffs for selected nations for frozen and canned mackerel products are presented below. As can be seen from the exhibit Venezuela has strong protective tariffs, 300 percent on the value of canned products. Canada, the other export market, has no tariff on frozen products and a 15 percent tariff on canned products. This is comparable to the U.S. tariff of 12.5 percent on the value of shipments.

Tariff Rates for Selected Nations

	Frozen	Canned
Canada	0	15%
Japan	10%	15%
Mexico	35%	20%
United States	0.35¢/lb.[1]	12.5%
Venezuela	15%	300%

1 The U.S. tariff is being phased out and will be zero by 1985

10.0 DESCRIPTION OF THE BUSINESS, MARKETS, AND ORGANIZATIONS ASSOCIATED WITH THE FISHERY

10.1 Relationship Among Harvesting, Brokering, and Processing Sectors

Historically, king and Spanish mackerel have been sold by fishermen to local fish dealers. These primary wholesalers in turn sell to fresh fish markets and restaurants, freezer companies, and secondary wholesalers. The relatively recent organization of several fishermen's cooperatives and corporations has modified the market structure for king mackerel by eliminating the primary wholesale level in some instances. The industry structure and markets for king and Spanish mackerel are separately described below.

10.1.1 King Mackerel Industry Structure and Markets

Commercial fishermen have traditionally had a rather close relationship with the fish houses. The fish houses and fishermen generally have operated under unwritten agreements in which the wholesaler provides a guaranteed market for the catch and boat services such as free docking facilities and ice, fuel, and fishing equipment for a fee. In exchange, the fishermen agree to sell their catch to particular fish houses. There is some evidence that these relationships are decreasing in importance.

There are approximately 30 fish houses in Florida that purchase king mackerel from commercial fishermen (Exhibit 10-1). Three are located in Collier County (Florida west coast), and the remaining fish houses are divided about equally between the Keys and the east coast of Florida. While fishermen are guaranteed a market for their catch, the price they receive is not guaranteed. Fish houses pack the fish in ice, find a buyer and generally arrange and pay for shipping. The fish are transported by truck, usually by independent firms.

Because of concern for the low prices received for their catches, several groups of fishermen have organized cooperatives in order to bypass the fish house and sell directly to the secondary wholesaler. The fishermen organizations have had a significant effect on dockside prices. These organizations are discussed in Section 10.2.

In past years almost all gillnet-caught king mackerel sold has been passed through five secondary wholesalers. Firms in Miami, Palm Beach, St. Petersburg, and Jacksonville handle most of the secondary distribution. Several new firms reportedly have entered the market.

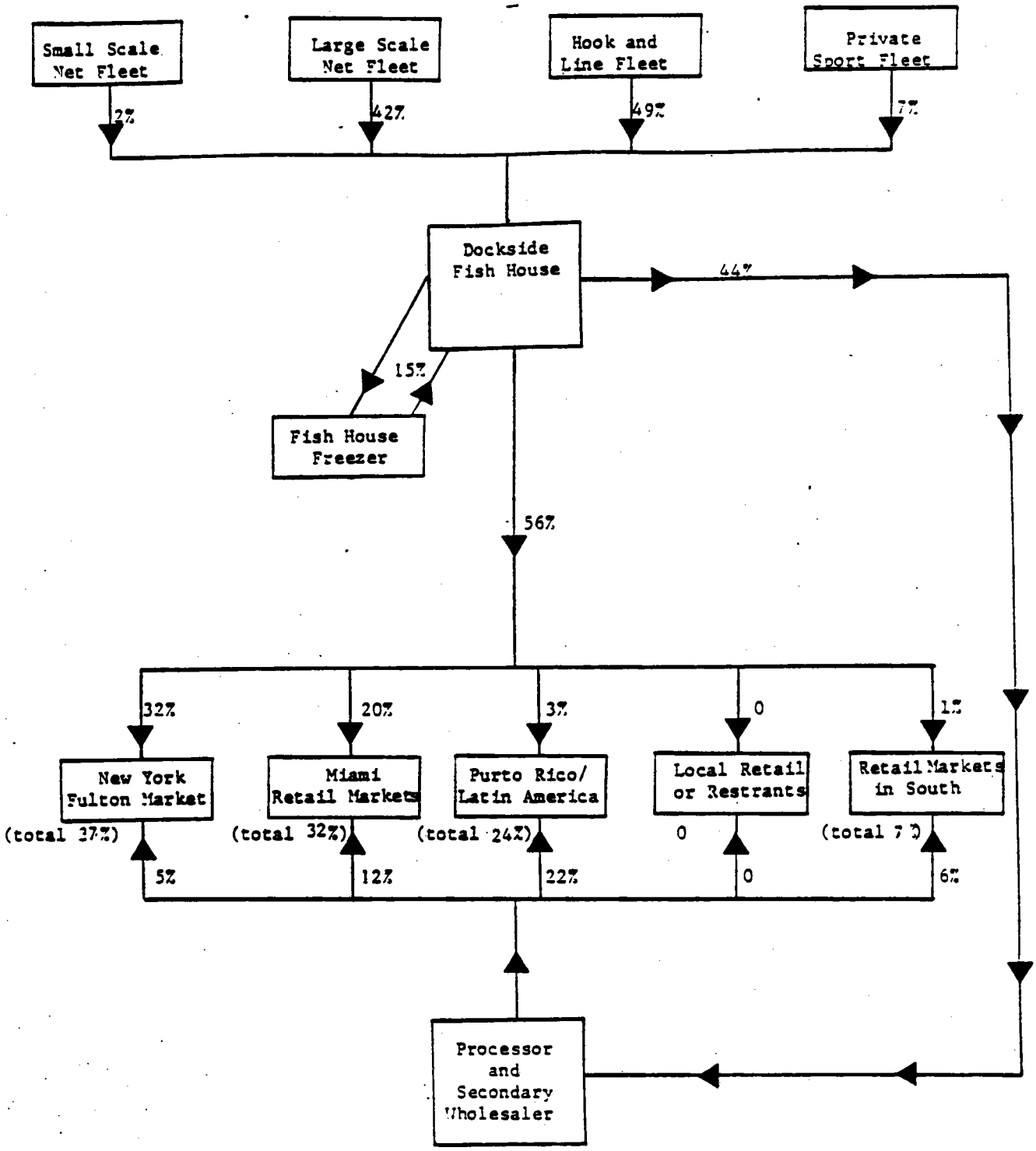
In instances where fish houses cannot process any more fish either because the facility is temporarily overloaded or the market is saturated, fishermen are informed in advance which species of fish will not be accepted. In some instances catch limits will be set for each fisherman. In the Florida Keys where truck loads are limited to 15,000 pounds of iced fish, the availability of trucking facilities may also limit the catches that fish houses will handle.

The major markets for king mackerel are Puerto Rico, New York, Florida, Canada and Venezuela. King mackerel is marketed in several product forms including gutted and iced fresh fish, frozen whole or in steaks, smoked, and as a canned smoked paste. In 1980, 24 percent of the catch was exported to Puerto Rico and Latin America (Centaur Associates, 1984).

An estimated 75 percent of the catch from the Florida's southwest coast and Keys are marketed frozen to Puerto Rico. This is primarily the gill-net catch. The remaining portion of the catch is sold fresh primarily through Fulton's Fish Market in New York. On the east coast of Florida, approximately 65 percent is marketed fresh. The local Florida market is attributed largely to the Miami Cuban population (Austin, et al., 1978). This is primarily the hook and line catch.

Exhibit 10-1

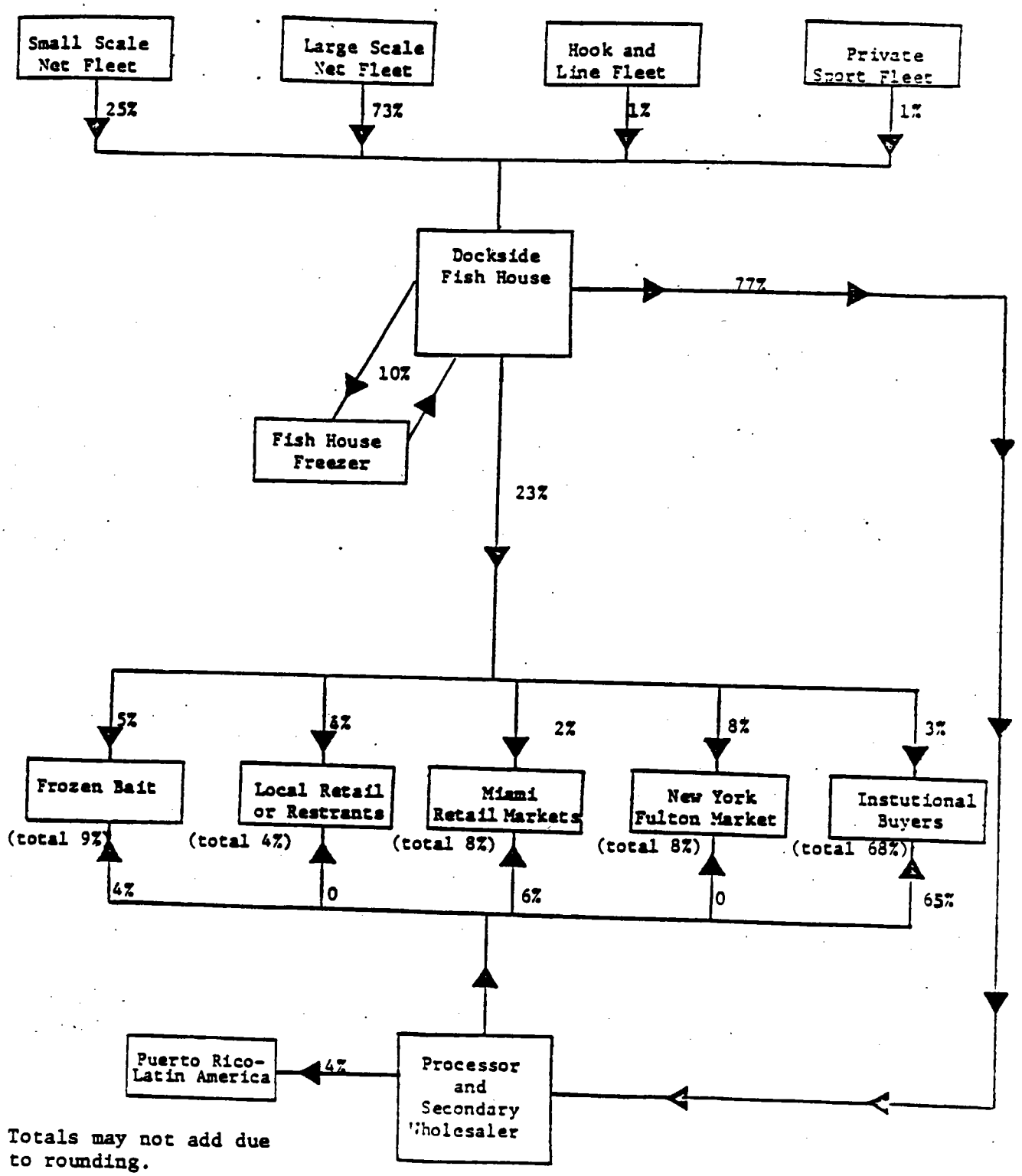
King Mackerel Product Flows



Source: Centaur Associates, Inc., "Socio-Economic Study of the Mackerel Purse Seine Fishery, Task I Report." Prepared for the National Marine Fisheries Service, Miami, Florida, Contract No. FSE-43-12-119, 1980.

Exhibit 10-2

Spanish Mackerel Product Flows



Totals may not add due to rounding.

Source: Centaur Associates, Inc., "Socio-Economic Study of the Mackerel Purse Seine Fishery, Task I Report." Prepared for the National Marine Fisheries Service, Miami, Florida, Contract No. FSE-43-12-119, 1980.

10.1.2 Spanish Mackerel Industry Structure and Markets

The arrangement between Spanish mackerel fishermen and fish houses is similar to that for the king mackerel fishery (see Section 10.1.1). The major primary and secondary wholesalers are the same as those dealing in king mackerel (Exhibit 10-2).

There are sizable markets for both fresh and frozen Spanish mackerel. Traditionally it has been an important product in the fresh fish market. Geographically the major market for fresh Spanish mackerel is the southeast, including Florida.

The market for frozen Spanish mackerel fillets has seen recent expansion. Approximately 77 percent were sold as frozen fillets, most going to institutions (Centaur Associates, 1984). One large cafeteria chain is purchasing as much as five million pounds of frozen Spanish mackerel yearly or nearly 50 percent of total annual landings.

Product forms are determined in part by the size of the fish. Fish over one and one-fourth pounds are preferable for fillets. Some companies ship whole frozen fish three pounds or greater to Puerto Rico.

Although the demand is increasing, the record production of Spanish mackerel recently has sometimes exceeded expected demand. For example, record high harvest in the 1975-76 winter-spring season was not fully absorbed by the market. At the end of 1977, some freezer companies and a cafeteria chain still had stocks of 1976 landings.

There are three major markets for Spanish mackerel. By far the most important market outlet is to approximately 15-20 cafeteria chains in the southeast that purchase frozen Spanish mackerel fillets. It is estimated that about 75 percent of Spanish mackerel landings are sold to cafeteria chains. The second largest outlet is to retailers who service home consumers. Products sold to retailers consist primarily of fresh and frozen fillets and whole drawn, the latter being both fresh and frozen.

The third market outlet consists of two major user groups, i.e., for animal feeding in zoos, aquariums, etc., and for bait by both commercial and recreational fishermen.

The Spanish mackerel sold to these outlets consists primarily of the smaller sized fish that have limited acceptance in the restaurant and retail outlets.

10.2 Fishery Cooperatives or Associations

Two fishermen's cooperatives have been identified in the coastal migratory pelagic fishery. Their offices and facilities are located in (1) the Port Salerno-Sebastian area, and (2) Key West.

The formation of cooperatives results from two or more firms desiring to increase competition and/or to take advantage of consolidated purchasing of supplies. Increased competition takes place through the addition of one or more buyers in the market bidding on supplies or through the cooperative returning part of the marketing spread to its members. The advantage of consolidated purchase enables a cooperative to benefit from quantity discounts offered by sellers for materials. Through these means, cooperatives can operate both as buyers and sellers for their members.

King mackerel fishermen are the predominant members in both cooperatives. The Florida Fishermen's Association in Port Salerno-Sebastian is made up of hook and line king mackerel fishermen.

In Key West another cooperative was recently formed by five king mackerel net fishermen. The new corporation sells directly to a secondary wholesaler in Miami. It provides docking facilities, boat

equipment, ice, and covers some overhead expenditures for the fishermen involved. The fishermen's catches are packed in ice and loaded directly onto trucks from the boats. The trucks are provided by the wholesaler specifically for the day's catch (Austin, et al., 1978).

There are three other groups of fishermen associations important to the fishery. Several organizations promote commercial fishing interests. These associations tend to represent different fishermen constituencies such as small hook and line or net boats, large net operations, and processors. From a statewide area all are involved in lobbying for legislation supporting commercial fishing and developing markets for their products. They have also been involved in resolving disputes among fishermen such as the recent conflict between hook and line and net mackerel fishermen on the Florida east coast.

Charter boat operators have also formed associations, but membership is generally limited to a local area. Associations have been organized in communities throughout the South Atlantic and Gulf regions. Among their activities are the promotion of charter fishing services through advertising as well as involvement in supporting sport fishing interests in their state legislatures and local governments. In northwest Florida several charter associations have expressed their concern over the recent decline in king mackerel in that area of the Gulf of Mexico which they attribute to the growth of commercial net fishing in southern Florida.

Recreational fishermen also are involved in organizations and associations that serve sport fishing interests. In addition to the organizations that have a national or international membership, there are a large number of local angler clubs established for social reasons and concern about the decline of king mackerel caught in northwest Florida. Several sportfishing associations have also expressed their organizational purposes. There are an estimated 184 sport fishing clubs in the South Atlantic and Gulf of Mexico coastal states. They are distributed by states as follows: North Carolina, 23; South Carolina, 2; Georgia, 13; Florida, 40; Alabama, 39; Mississippi, 20; Louisiana, 25; and Texas, 22. Not all of the members of these clubs are salt water anglers. Based on the preliminary results of a recent survey of sport fishing organizations, the estimated total club membership in the two regions is 14,720. Of these an estimated 10,300 are salt water recreational fishermen (Stroud, pers. comm.).

10.3 Labor Organizations

There are no known labor organizations in the harvesting or processing sectors that are involved in the fishery.

10.4 Foreign Investment

There is no significant foreign investment in the domestic sectors of the fishery.

11.0 SOCIAL AND CULTURAL FRAMEWORK OF DOMESTIC FISHERMEN

11.1 Ethnic Character, Family Structure, and Community Organization

Commercial fishermen who fish for coastal pelagic species, in general, have an ethnic and social character similar to the cross section of people in the states and counties in which they reside. The major exception to this is the hook and line fishery for king mackerel operating out of the Florida Keys (Monroe County), which contains a concentration of fishermen of Cuban-American heritage, although specific numbers are not available at this time.

The boat captains in the fisheries for the species in the management unit are predominantly owner/operator entrepreneurs although there are a few cases of company-owned boats or vessels or a captain owning more than one boat or vessel, in which case captains may work on an employee basis.

The hook and line king mackerel fishery and small scale Spanish mackerel net fishery typically consist of an owner/operator who may fish alone or who may have one or possibly more crew members for at least part of the year. In these cases the crew member frequently is a relative such as a son. The larger net boats operating in the king and Spanish mackerel net fisheries usually consist of an owner/captain and three to five paid crew members. Many of the captains try to work with the same crew year after year. In other cases boats may be operated with one or more itinerant crew members.

There is a considerable number of instances where fishermen in this fishery have come from families where the father was a fisherman operating in the same or other local fisheries. Currently, a number of father/son combinations are commercially fishing for species in the management unit. Many of these fishermen appear to express a desire that their sons may be able to continue with a family tradition of commercial fishing.

The predominant portion of the fishermen reside in those coastal communities surrounding the ports from which they operate. Certain of the communities in which the commercial fishermen live such as Monroe County (Florida Keys), Salerno, Fort Pierce, Sebastian, (Florida east coast), and Naples (Florida west coast) have a large proportion of the total population involved in the fishing community.

11.2 Age, Education, and Experience of Commercial Fishermen

Specific data on age and years of fishing experience for king and Spanish mackerel fishermen are available only from surveys conducted of Florida Atlantic coast king mackerel hook and line fishermen (Morris, Prochaska, Cato, 1977) and Florida east coast large and small boat Spanish mackerel fishermen (Cato, Morris, Prochaska, 1978).

The king and Spanish mackerel fishermen in the surveys are about the same age as Florida fishermen as a whole, but they have considerably more years of fishing experience than Florida fishermen. In 1974, the average age of Florida commercial fishermen was 48 years with a range of 16 to 85 years. Florida Atlantic coast hook and line king mackerel fishermen had an average age of 49 years in 1976 (Morris, Prochaska, Cato, 1977). Similarly, Spanish mackerel fishermen on the Atlantic coast averaged 45.6 years of age for small boats and 45.6 years of age for large fishing boats.

With respect to years of experience in commercial fishing, Florida fishermen as a whole, averaged 16.5 years in 1974. In contrast, hook and line king mackerel fishermen in the survey had 20.9 years of experience, small boat Spanish mackerel fishermen had 27.3 years of experience and large boat Spanish mackerel fishermen had 33.7 years.

It should be noted that the fishermen in the survey were boat captains and may be skewed toward the more experienced persons in the fishery. However, contact with people in the fishery indicates that Florida king and Spanish mackerel fishermen have demographic characteristics similar to those of Florida fishermen as a whole. The majority (52 percent) of all Florida fishermen were between 41 and 60 years of age with only eleven percent less than 31 years old and 19 percent over 61 years of age, (Prochaska and Cato, 1977). The average Florida fisherman has fished for approximately 16 years and most have fished between seven and 30 years. Educational attainment averaged 11.3 years for Florida fishermen surveyed in 1974. Years of schooling declined with the age of the fishermen. Data on educational attainment specific to mackerel fishermen are not available.

11.3 Employment Opportunities and Unemployment Rates

Unemployment has risen sharply in the Florida counties (Martin, Indian River, St. Lucie, Palm Beach, Monroe, and Collier) where most commercial fishing of king and Spanish mackerel occurs.[1] Despite relatively high rates of unemployment in the local economies, overall employment opportunities in commercial fishing appear to have remained favorable as have opportunities in the mackerel fisheries.

In all six counties the 1977 unemployment rate was more than double the 1973 rate. With the exception of Martin County, all areas had rates well above the 7.7 percent rate for all of Florida in 1977. In Martin and Monroe Counties the unemployment rate dropped between 1975 and 1977 while in Indian River and St. Lucie Counties the rate continued to climb during that period. Thus opportunities for employment in the local economies have generally declined since the early part of the decade.

No directly comparable unemployment data are available specifically for fishermen, but estimates of the number of fishermen in all types of fishing activity by county between 1970 and 1975 do provide an indication of the employment opportunities in fishing.[2] The total number of fishermen in the six counties increased from nearly 3,150 in 1970 to just over 3,900 in 1975, indicating that employment opportunities in fishing increased during the time when unemployment rates for the local economies also increased. Not all counties gained in fishing employment, however. The number of fishermen in Monroe County increased by more than 50 percent from 1970 to 1975. During that period the county unemployment rate tripled. On the east coast of Florida a similar pattern occurred in St. Lucie and Indian River Counties although the percent increase in the number of fishermen was not as large. In contrast the total number of fishermen in Martin, Palm Beach and Collier Counties decreased between 1970 and 1975. There is no clear reason for the declining trend there. The statistics on number of fishermen are gathered at the location where fish are landed. The temporary migration of fishermen to other fishing areas (e.g., Monroe County) may partly explain the decline.

Employment opportunities in the mackerel fisheries have increased as demonstrated by the increase in number of boats participating in the fishery. For example, the estimated number of hook and line boats on the east coast of Florida involved in the king mackerel fishery increased from approximately 50 in 1970 to over 200 in 1975. During that period the number of fishermen in the area remained relatively constant. In 1970 the total number of fishermen in St. Lucie, Martin, and Indian River was 384, and in 1975 the total was 391. It is likely that much of the increase in boats is due to fishermen temporarily entering the fishery when fish were readily available, or are drawn in by rising prices for king mackerel relative to other fish (see Section 9.1).

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1 Source of all unemployment estimates: Florida Department of Commerce; Division of Employment Security.

2 Source of number of fishermen employed: National Marine Fisheries Service, unpublished data.

Like hook and line boats, the number of net boats in the fishery has also increased. In 1970 there were an estimated 15 boats. By 1975 the number of boats had nearly doubled and in 1977, 33 gill-net boats participated in the king mackerel fishery. At present, the total is near 80. Overall then, opportunities for employment in fishing and in the fishery have been favorable despite the rather poor overall employment situation in the local areas of concern.

On the southern Florida Atlantic coast (i.e., Indian River, St. Lucie, Martin and Palm Beach Counties) employment in the king mackerel fishery is a very major component of total fishery employment. An estimated 70 to 80 percent of fishermen in that area are major participants in the king mackerel fishery. These are predominantly the hook and line fishermen. The Spanish mackerel fishery is also of great importance to total fishing in the area. While total employment in that area is high because of the large population, the amount of total unemployment is several times higher than the total employment in the fishery.

In Monroe County fishing is an extremely important industry to the local economy. The number of fishermen reported for the county is nearly 15 percent of total county employment. Major participants in both the king and Spanish mackerel fisheries comprise about eight percent of total fishermen. Unemployment is high in the area being nearly ten times the number of major participants in either the king or Spanish mackerel fisheries.

On the southern Florida west coast (Collier and Lee Counties), employment in the king mackerel fishery is relatively small. However, major participants in the Spanish mackerel fishery are about 15 percent of total fishermen. Again, the total county unemployment rate is several times the employment in the fishery.

Still many fishermen are not employed full time in fishing (see Section 11.5). A recent survey of Florida fishermen showed that those with income from nonfishing activities had widely varied employment. Based on those who specifically reported type of employment, 28 percent were in residential or commercial construction. Seventeen percent were employed in marine related jobs such as tug boat cpatains, marina operators and boat builders. Ten percent were involved in agriculture, nine percent were employed in security type jobs, and seven percent held jobs as mechanics and repairmen. Twenty-two percent held other occupations such as teachers, chemists, optometrists, broadcasters and flight inspectors. Only 21 percent of the respondents said that their nonfishing employment was seasonal (Prochaska and Cato, 1977, pp. 20-21).

King and Spanish mackerel fishing in the major commercial areas in south Florida takes place primarily in the months of December through February. However, the king mackerel hook and line fleet in the Atlantic coast and the large boat gill-net fleet depends heavily on the king mackerel season to justify its investment. In Monroe County participants in the king and Spanish mackerel fishery gain additional income from the spiny lobster fishery. Spiny lobster fishing takes place predominantly from August through November; thus the two fisheries are seasonal complements to one another. Mackerel fishermen also fish for other species such as snapper, grouper, stone crab, mullet, spiny lobster, and pompano.

11.4 Recreational Fishing

The motivations and cultural characteristics of anglers seeking species in the management unit are diverse. Many seek the excitement of the sport, the chance to relax and socialize with their friends, or the opportunity to be in a natural environment. A discussion of the demographic characteristics of marine recreational fishermen and their values in participation is presented below.

11.4.1 Demographic Characteristics of Recreational Fishermen

Basic demographic characteristics of marine recreational fishermen in the South Atlantic and Gulf of Mexico were determined by the U.S. Department of Interior (1972, 1977a, 1977b). Over 51 percent of participants were between the ages of 25 and 54 in 1975. Anglers under 25 accounted for 32.4 percent of the participants, and anglers 55 years old or older accounted for 16.3 percent of the fishermen. Salt water anglers are predominantly male. Nearly one-third of the participants were female in 1975. Forty-three percent of the recreational fishermen had incomes between $10,000 and $25,000 (U.S. Department of Interior, 1977b). A 1971 study of southeastern wildlife recreation suggests that of the anglers surveyed, there was no heavy concentration of participation from any particular occupational group, although professionals, management, and skilled crafts persons tend to participate more often than members of other occupational groups (Horvath, 1974).

These characteristics apply to anglers in general from the southeast. Data specific to anglers that seek or catch the coastal pelagic species are not available. With the exception of bluefish, these species are caught predominantly by private or charter boats (see Section 8.2). Because of the widespread and growing popularity of smaller boats in the 18-22 foot category capable of fishing for king mackerel as well as other species in the management unit, these species tend to be highly sought by middle income fishermen as well as fishermen owning the larger sportfishing craft.

Recent research on charter boat fishing in the Gulf of Mexico, the other important component of the coastal pelagic recreational fishery, suggests that charter fishermen are of higher socioeconomic status than anglers as an entire group. Mississippi charter fishermen tend to have higher incomes than anglers overall. Eighty percent of the charter fishermen had incomes over $15,000 and 36 percent had incomes over $25,000. Occupationally, charter fishermen in Mississippi were much more often employed in professional and managerial positions than the general population of southeastern anglers (Etzold, et al., 1977). A study of Texas charter fishermen yielded similar results. There, 78 percent of charter fishermen surveyed had incomes over $20,000 and 34 percent had incomes over $40,000 (Ditton, et al., 1977).

11.4.2 Social Benefits of Recreational Fishing

Recreational fishing yields significant benefits over and above those measured by the value of expenditures presented in Section 9.0. Researchers have found that participants pursue angling opportunities for multiple reasons. Among the benefits are the fulfillment of a desire for solitude; to be outdoors in a natural environment; to have companionship; to explore and have an adventurous experience; for the scenery; to get away from it all and reduce tension; to experience achievement in catching fish or obtaining a trophy; or for the opportunity to "think things through." These, of course, are in addition to the satisfaction gained from the feeling of sporting accomplishment in successfully catching fish (Bryan, 1976, p. 85). For example, a study of sport fishermen in Rhode Island showed that "catching the fish" ranked second behind "experiencing tension and/or relaxation" among the six categories of values of recreational fishing expressed (Spaulding, 1970). There is general agreement that the great majority of persons go fishing with at least the expectation that fish will be caught.

In efforts to estimate how fishermen value these benefits of recreational fishing, researchers have devised methodologies for expressing them in monetary terms. For example, a 1971 study of the southeast indicated that saltwater fishermen received benefits valued at $59.80 for each day of fishing (Horvath, 1974, p. F-48). In contrast, a 1970 national study showed that saltwater anglers spent an average of only $10.77 per day (U.S. Department of Interior, 1972, p. 10). Although the valuation procedure used by Horvath is not necessarily precise because of its subjective nature, the results of such a methodology provide a benchmark of the value of the social benefits associated with recreational fishing.

11.5 Economic Dependence on Commercial or Marine Recreational Fishing and Related Activities

In many instances persons employed in both commercial and recreational fishing activities are not wholly dependent on fishing for their entire income. Often the seasonality of fishing activity makes it necessary to find other employment. For example, in North Carolina the charter fishing season generally begins in April and runs through part of November, but the heavy season includes only the summer months. Most charter boat operators there must find alternate sources of income to support themselves during the off-season. There are also a significant number of "casual" fishermen, persons who fish to supplement the income of their essentially full-time jobs. A survey of Florida commercial fishermen found that a number of respondents were employed in occupations such as chemistry, optometry, education, or broadcasting (Prochaska and Cato, 1977). Recent research on commercial fishermen in Florida and charter fishermen in Texas and Florida provides a picture of the importance of fishing as a source of income.

In 1974, 48 percent of Florida commercial fishermen surveyed fished full time. Fifty-two percent of the fishermen reported that some of their income was earned from employment outside of fishing. Approximately 30 percent of the fishermen earn over 50 percent of their income from nonfishing employment. On average, all fishermen (excluding shrimping operations) earned about 38 percent of their income from outside sources (Prochaska and Cato, 1977).

Spanish and king mackerel fishermen are more dependent than the average Florida commercial fishermen on fishing for a livelihood. A 1976 study of hook and line king mackerel fishermen revealed that 67.7 percent of their income was earned from fishing (Morris, et al., 1977). Similarly, small boat Spanish mackerel gill-net fishermen earned 71.2 percent of their income in 1976 from fishing. Large boat Spanish mackerel gill-net fishermen differed somewhat, earning 91.7 percent of their income from fishing (Cato, et al., 1978). The latter statistic is probably typical of the proportion of income earned from fishing of large boat king mackerel fishermen.

Two studies of charter fishing, one in Texas (Ditton, 1976) and one in Florida (Browder, et al., 1978) also include information on the operator's dependence on the commercial sport fishing business as a source of income. Of those operators surveyed in Texas, 66 percent responded that charter fishing was not their only source of income. On average 61.5 percent of an operator's working time was devoted to charter fishing. When asked what percent of their income comes from charter fishing, 59 percent said that less than 50 percent of their earnings came from charter fishing (Ditton, 1976). In Florida the situation differs somewhat. Preliminary results of a study of charter fishermen on Florida's west coast reveal that 60 percent of the operators surveyed had other income, but less than 28 percent of the operators had a second job; i.e., retirement income. Additionally, 90.4 percent of the operators fished full time in season.

In short, while fishing is often not a full-time occupation, it is a substantial source of income for those who are directly employed in commercial harvesting and commercial sportfishing.

Very little is known about the economic dependence of those employed in the processing, distribution, and retail sale of fishery products and of those involved in producing and selling recreational fishing goods and services. It is reasonable to assume though that where fishing activity is seasonal (e.g., in North Carolina), some employment is also affected. For example, this would likely be true for employment in processing commercially harvested fish, and for recreational fishing, those employed in activities such as selling bait would also be affected. It is unclear though to what extent these persons are dependent on king and Spanish mackerel or other coastal pelagic fish in the management unit. With respect to the production of recreational fishing gear (e.g. tackle, boats, etc.) most gear is not made specifically for use in one fishery. Boats and boat related items are used for activities other than fishing, and most fishing tackle can be used to catch many kinds of fish. However, there are approximately four or five small firms that manufacture fishing tackle produced

specifically for catching king mackerel. According to a southeastern distributor of fishing tackle products, these firms are more dependent on the king mackerel sport fishery than most other manufacturers. Sales of these products have reportedly declined in the last two seasons, possibly because of the decline of king mackerel fishing in the eastern Gulf of Mexico (G. Foti, pers. comm.). The precise extent of economic dependence on the king mackerel fishery of these firms is unknown presently.

11.6 Distribution of Income Within Fishing Communities

Specific data on income distribution from this fishery are not available.

On Florida's east coast in St. Lucie, Indian River, Martin and Palm Beach Counties, the private industry sectors that contribute the most to total personal income are wholesale-retail trade, services, contract construction and manufacturing. Palm Beach County has the largest population of these counties, 460,100 in 1975, and the highest per capita income, $6,940 in 1975. St. Lucie County is the next most populous area, but it is much smaller, only 66,300 persons. Its per capita income was the lowest of four counties in 1975, $4,814. Fisheries, forestry, and agriculture account for about two percent of the personal income in each of the counties except Palm Beach, where less than one percent is derived from those sources. It is not possible to subdivide the available data into fishery derived personal income.

Monroe County, the southernmost county of Florida, has a somewhat different economic base. Personal income derived from government is significant in all six counties, but in Monroe County it is the leading income source. This is largely because of the federal government installations in Key West, which can be quite cyclical. Retail and wholesale trade and services are the next largest sectors contributing to personal income. In 1975 Monroe County had a population of 51,400 and the per capita income was $5,478. The county has virtually no agriculture or forestry, so that the personal income estimates for "other industries" represents the contribution of fisheries to local personal income. It amounts to about five percent, or $5 million, of the income derived from private industry. Note that this does not include income related to processing and retail sale of fishery products which are included in the wholesale and retail trade sector.[1]

In the southwestern portion of Florida, Collier County is important to the king and Spanish mackerel commercial fishery. In 1975 the population there was 62,400 and the per capita income was relatively high, $6,647. As with the counties on the east coast, services, wholesale and retail trade, and construction were the private industries contributing the most to personal income in 1975. "Other industries" (including fisheries) accounted for just over three percent of the total.

Thus the fisheries (harvesting) sector constitutes a significant element of the local economies where king and Spanish mackerel are landed. While contributions of two or three percent of total personal income may not seem large at first glance, in terms of dollars of income each percentage point represents a substantial amount of money earned. Unfortunately available data do not show all fishery-related (processing, retail sale) personal income. Such data would illustrate more clearly the even larger contribution that fisheries make to the local economies.

Recreational fishing also makes an important contribution to the local economies of communities throughout the South Atlantic and Gulf of Mexico. There are numerous communities in both regions from which anglers embark to catch coastal pelagic species, and the available data is too limited to show precisely the variations in income contribution that sport fishing makes. But several studies of

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1 Data source: U.S. Department of Commerce, Bureau of Economic Analysis.

economic impacts of marine recreational fishing show that salt water angling adds substantially to the local economies. A 1971 study of Morehead City (Carteret County), North Carolina, estimated that marine recreational fishing there by nonresidents yielded $1,046 million in direct net income to the local area. Charterboat fishing activity which is heavily dependent on king and Spanish mackerel and bluefish yielded over $310,000 in direct net income (Coastal Zone Resources Corporation, 1972). In a study of Texas charter fishing, it was estimated that charter fishermen spent over $4.2 million in five Texas coastal communities in 1976 for charter fees, food, lodging, travel and miscellaneous expenses (Ditton, et al., 1977). And in Dade County, Florida, charter fishermen spent an estimated $4.1 million (Gentle, 1977). While the last two studies did not estimate personal income derived from fishermen expenditures, it is easily seen that the income portion of these services is quite sizeable. Furthermore, as Ditton notes, because charter fishing is so much a tourist activity, the income derived is a nonlocal addition to the coastal economies. Thus recreational fishing in general and charter fishing in particular (because it is so important to the coastal migratory pelagic resources management unit) also are important contributors to local economies where the activity occurs.

12.0 MANAGEMENT PROGRAM

A. No Action Alternative

A no action alternative is the maintenance of status quo. Analysis of this alternative shows that a revised management regime is needed if the overfished condition of king mackerel Gulf migratory group is to be corrected. The current regime has three significant flaws:

First, the existing FMP's primary regulatory mechanism is to prevent overfishing by utilizing fixed quotas based on an overestimated MSY (=OY). Regardless of the stock's condition, these quotas allow harvesting to take place up to a level much greater than the revised MSY. Allowing fishing harvest (fishing mortality rate) to continue at current levels under such a quota system would result in a long-term reduction of abundance of the Gulf migratory group to 68 percent (or possibly as low as 31 percent) of MSY (Exhibit 12-1a). This also assumes that fishing harvest and mortality rate would not increase over time, which is unlikely. Continued increases in harvest may result in severe recruitment overfishing.

EXHIBIT 12-1a
The Effect of Four Management Strategies on Gulf Group King Mackerel

Management Strategy	Expected No. Years Until Recovery to 5-10% of PMSY	Expected Long-Term Abundance as a % of PMSY (Range)
1) Status Quo	Recovery not expected	68(31 to 100)
2) F in all years = PMSY	2 to 3	100(78 to 118)
3) $F_1 = 0$; F_{2+} = PMSY	1	100(78 to 118)
4) Declining F	3 to 5	100(75 to 118)

PMSY = population level to produce MSY
F = fishing mortality
F_1 = fishing mortality in year 1

Second, the existing management regime is based on a single king mackerel stock; whereas, the new scientific information shows that there are at least two distinct low mixing migratory groups (Section 5.1.1.1). The Gulf migratory group is overfished, while the Atlantic migratory group is underexploited. Therefore, the existing management regime could not correct for those conditions.

Third, the existing plan provides for no mechanism for timely adjustment of regulations to respond to conditions of the stock.

B. **Proposed Action***

A 1983 reassessment of the king mackerel stock by fishery scientists developed a maximum sustainable yield for this species at 26.2 million pounds, well below the 37 million pounds set in the original plan. The researchers also established the existence of two migratory groups, one of

* Throughout Section 12, selected management options are indicated by **bold-type** headings.

which was being overfished to the level where stock was declining. The plan was, therefore, failing to prevent overfishing and to achieve optimum yield in accord with the first National Standard set forth in the Magnuson Act. The Councils, therefore, determined that it is urgent to amend the plan accordingly, to restore the stock and achieve a more valid level of optimum yield based on the recent findings. Because stock recovery will be gradual and because changes in fishing effort and fishing patterns cannot be anticipated, a flexible plan is proposed. The amended plan would provide for annual stock assessments for king and Spanish mackerels and provide needed control to restore and maintain the fish populations near MSY.

12.1 Definition of the Fishery

The coastal migratory pelagic resources (mackerels) are those species in the coastal waters and fishery conservation zone (FCZ) of the Gulf of Mexico and off the South Atlantic coast as specified below.

12.2 Management Unit and Fishing Year

Area for Management: Federal regulation pursuant to this plan will apply to the FCZ within the jurisdiction of the Gulf and South Atlantic Councils. However, maximum sustainable yield, optimum yield, and total allowable catch are based on the stocks in the FCZ, the territorial sea, and internal waters of the various states. Consequently, allocations include catches both from the FCZ and waters landward thereof. The states bordering the areas of jurisdiction of the Gulf of Mexico and South Atlantic Fishery Management Councils are urged to adopt regulations which are compatible with those applying in the FCZ. Regulations are not applied in the area of jurisdiction of the Mid-Atlantic Council because the catches there and the quantities of regulated species occurring there are so small that regulation would not be cost effective and is not necessary to accomplish the objectives of the plan. Similarly, catches there are not included in OY or in catch allocations. Should a fishery develop which significantly affects the stocks and is in the FCZ beyond the area for management, the management area may be extended by plan amendment.

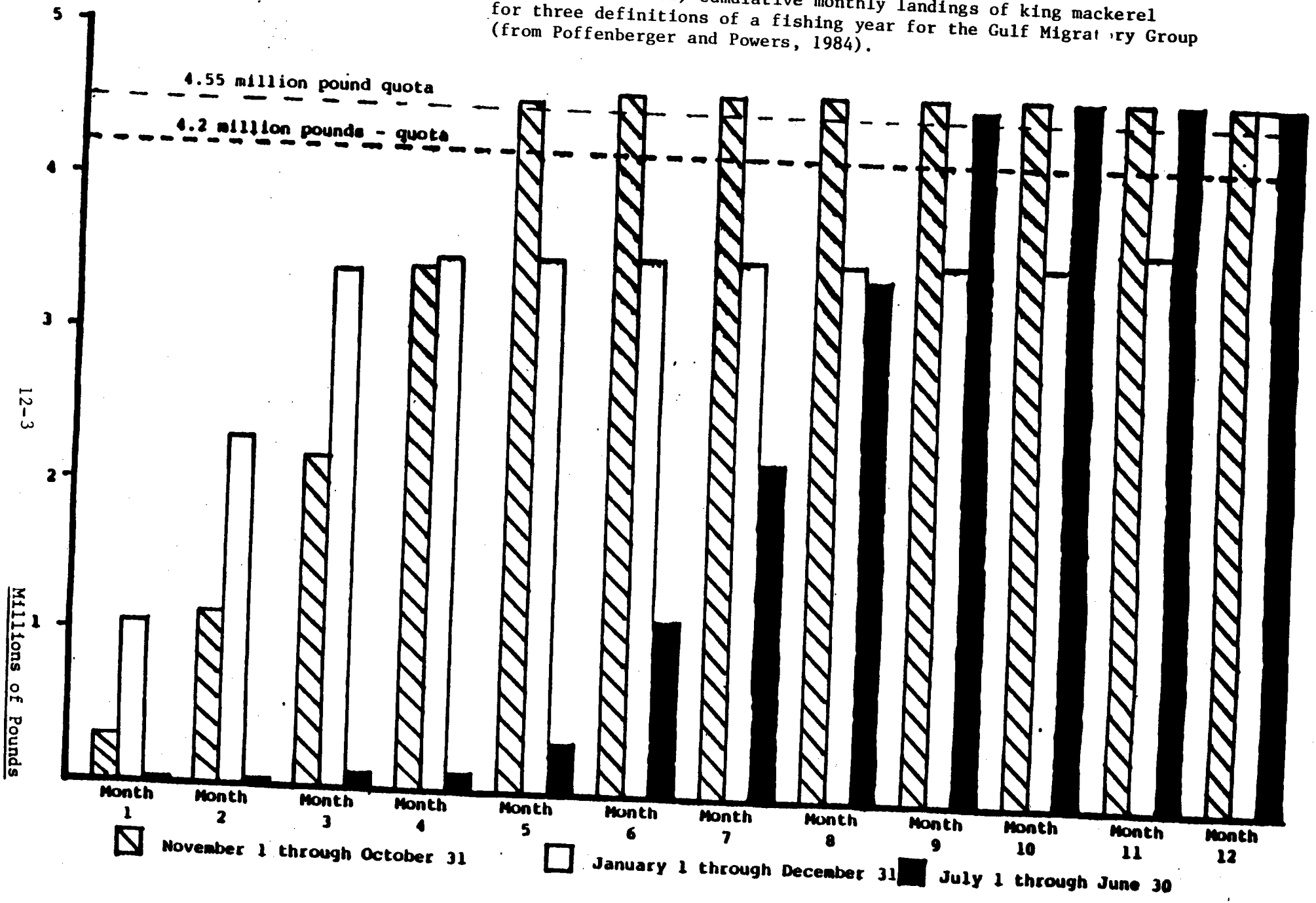
Management Unit: king mackerel, Spanish mackerel, and cobia.

Other Species in the Fishery: dolphin, little tunny, cero mackerel and other species caught incidental to the directed fishing effort are minor species in the fishery. In the Gulf of Mexico, bluefish is included as a minor species in the fishery. No management measures other than data collection are proposed for those species at present. Bluefish in the South Atlantic region are not included because a separate Bluefish Management Plan for the entire Atlantic coast is being prepared.

The scientific names of the above species are as follows:

King mackerel	(*Scomberomorus cavalla*)
Spanish mackerel	(*Scomberomorus maculatus*)
Cero mackerel	(*Scomberomorus regalis*)
Little tunny	(*Euthynnus alletteratus*)
Bluefish	(*Pomatomus saltatrix*)
Cobia	(*Rachycentron canadum*)
Dolphin	(*Coryphanena hippurus*)

Exhibit 12-1b. Average (1978-1982) cumulative monthly landings of king mackerel for three definitions of a fishing year for the Gulf Migratory Group (from Poffenberger and Powers, 1984).



Fishing Year: For the Gulf king mackerel group the fishing year is July 1st through June 30th. April 1st through March 31st is to be the fishing year for the Atlantic group. For other species in the fishery the fishing year is January 1st through December 31st.

Rationale: The fishing year for Gulf group king mackerel set to begin July 1st gives all fishermen in all geographic areas access to the resource during the first half of the fishing year. It is likely that the commercial fishery for this group will be closed at some time during the fishing year when the quota is filled. Based on the average catch 1978 through 1982 a quota of four million pounds or more would be filled in March with a fishing year beginning on July 1st or November 1st (Exhibit 12-1b). A July 1st date, however, would have provided access to the fish for northern and western Gulf fishermen in the summer and fall and for Florida east coast fishermen during the winter and spring until the quota is filled. Florida east coast fishermen may begin fishing Atlantic stock fish on April 1st. The July 1st starting date could have resulted in an earlier closing date when the commercial quota is reached depending on the magnitude of the historically low catches in the Gulf between July and November. The Councils, therefore, divided the commercial Gulf group allocation into eastern and western zones to provide fishing opportunity in each area regardless of starting date (see Section 12.6.3.1).

The fishing year for the Atlantic group is set to coincide with occurrence of that stock through its full range through south Florida.

The fishing year for other species in the management unit is set for the calendar year to facilitate collection and tabulation of statistical data.

12.3 Problems in the Fishery

1. Fishing effort is jeopardizing the biological integrity of the king mackerel fishery. That portion of the stock which inhabits the Gulf of Mexico during the summer and supports the winter fishery in southeast Florida has been severely overfished and fishing mortality on this group needs to be reduced. That portion of the stock which inhabits the Atlantic coast has been exploited to a lesser degree and fishing mortality rate on that group is below the level which will produce maximum yield.

2. Adequate management has been hindered by lack of current and accurate biological, statistical and economic information. The present system does not provide a mechanism which insures rapid incorporation of new data into stock assessments. Further, there is no coordinated plan to generate stock assessment data.

3. Intense conflicts and competition exist between recreational and commercial users of the mackerel stocks; and between commercial users employing different gears.

4. The existence of separate state and federal jurisdiction and lack of coordination between the two make biological management difficult; since in some instances, the resource may be fished beyond the allocation in state waters.

5. Cobia are presently harvested at a size below that necessary for maximum yield and may be overfished in some areas beyond the management area. Most southeastern states have not yet adopted the recommended minimum size limit. Also, no management action has been taken by states which have jurisdiction over cobia populations in Chesapeake Bay, which appear to have been overfished. Federal enforcement capability is limited and not believed to be very effective in this case.

6. Development of a fishery targeting large, mature king mackerel in the wintertime off Louisiana may eventually reduce recruitment to the resource. Total catch of large, mature king mackerel has greatly increased due to development of a commercial fishery in Louisiana during the winter months. Reported commercial catch increased from zero during 1981-82 to 1.2 million pounds during the 1982-83 winter season. Given the already excessive fishing effort on smaller fish in the Gulf of Mexico, increasing fishing effort on the spawning population could result in recruitment declines.

12.4 Specific Management Objectives

In consideration of the relevant biological, economic, social and ecological factors, the following Specific Management Objectives have been specified for the coastal migratory pelagic resources management unit.

Objective 1

The primary objective of this FMP is to stabilize yield at MSY, allow recovery of overfished populations and maintain population levels sufficient to ensure adequate recruitment.

Rationale: This objective addresses problems 1, 5 and 6. Stock assessments will consider the consequences of separate or combined management for various possible stocks or groups within each stock. Management measures will be considered in relation to their impact on abundance of various possible stocks and on spawning biomass. Expansion of the fishery into new areas which could adversely affect spawning stock abundance will be discouraged.

Objective 2

To provide a flexible management system for the resource which minimizes regulatory delay while retaining substantial Council and public input into management decisions and which can rapidly adapt to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups or by area.

Rationale: This objective addresses problems 1, 3 and 6. The FMP must address fluctuating stock abundance and allow regulatory flexibility to reduce the harvest if needed to compensate for excessive harvest in the past or to maintain adequate stock abundance during periods of poor recruitment. This flexibility may also be applied in allowing catches in excess of maximum sustainable yield during periods of exceptionally good recruitment, so long as adequate stock abundance is maintained.

The FMP must provide a mechanism to incorporate the most current and valid biological information into stock assessments for species in the management unit, and allow rapid regulatory changes based on that information. It is possible that improving biological data will demonstrate the existence of more, separate stocks, or of additional groups within each stock, which should be managed separately in order to improve biological yield. It is also possible that estimates of MSY and ABC will change as biological analyses are updated.

Objective 3

To provide necessary information for effective management and establish a mandatory reporting system for monitoring catch.

Rationale: This addresses problems 1, 2 and 6. The Councils intend that the FMP focus attention on areas of poor information, encourage research into those areas and provide a mechanism which will insure that all available information can be incorporated into the stock assessment as quickly as possible. The FMP will improve the data base directly by providing for a mandatory statistical reporting system which will generate necessary data on catch and other parameters necessary for management.

Objective 4

To minimize gear and user group conflicts.

Rationale: This addresses problem 3. Intense user group conflicts and competition for the resource is the rule in the king mackerel fishery and is present to a lesser degree in the case of Spanish mackerel. The FMP will minimize these conflicts through allocation of the resource and measures which physically divide the users of different gears and by setting the fishing year for each migratory group to allow equal access opportunity for all user groups. A high degree of flexibility is required to adjust to changing conditions.

12.5 Assessment of Optimum Yield

Optimum yield (OY) from a fishery is defined in MFCMA as the amount of fish which will provide the greatest overall benefit to the nation with particular reference to food production and recreational opportunities, and which is prescribed as such on the basis of the maximum sustainable yield from that fishery as modified by any relevant economic, social, or ecological factor.

12.5.1 Specification of OY and TAC

12.5.1.1 Mackerels

The long-term goal of optimum yield from mackerels is maximum sustainable yield. The amount of optimum yield which may be harvested annually for each species, defined as total allowable catch (TAC) may vary due to fluctuating recruitment, fluctuating abundance by area or unit of stock, intensity of fishing effort by area or unit of stock, social, economic, or ecological factors, and improving estimates of MSY.

The best available estimates are:

	MSY* (1,000 lbs.)	TAC** (1,000 lbs.)	ABC*** (1,000 lbs.)	
			Best Estimate	Possible Range
King mackerel	26,200			
Gulf group		14,225	14,225	14,997 - 10,713
Atlantic group		11,812	11,812	15,418 - 6,871
Spanish mackerel	27,000	27,000	27,000	

* MSY is assessed and specified in Section 5.4. MSY is the level of maximum surplus production of the population. It may be a target or goal which is to be achieved. In order to reach that goal, fishing mortality rate and, thus, the catch must be altered. The annual catch levels specified as a particular strategy for achieving the goal are the total allowable catches (TACs). Therefore, MSY is a biologically determined level which may be the target of management. Whereas, the TAC is the catch level specified solely by management to realize a particular management strategy and goal (J. Powers, 1983, pers. comm.).

** Note: The sum of the Atlantic and Gulf ABCs does not necessarily add up to MSY. If one group is overfished its ABC will be lower than the long-term average; the reverse is true if a group is underfished. Only if both groups are producing exactly at MSY will the sum of the ABCs from both areas equal MSY. When that occurs TAC for the Gulf group will be larger than at present, while ABC for the Atlantic group will probably be smaller.

*** Acceptable biological catch (ABC) is a biological determination on which TAC is based.

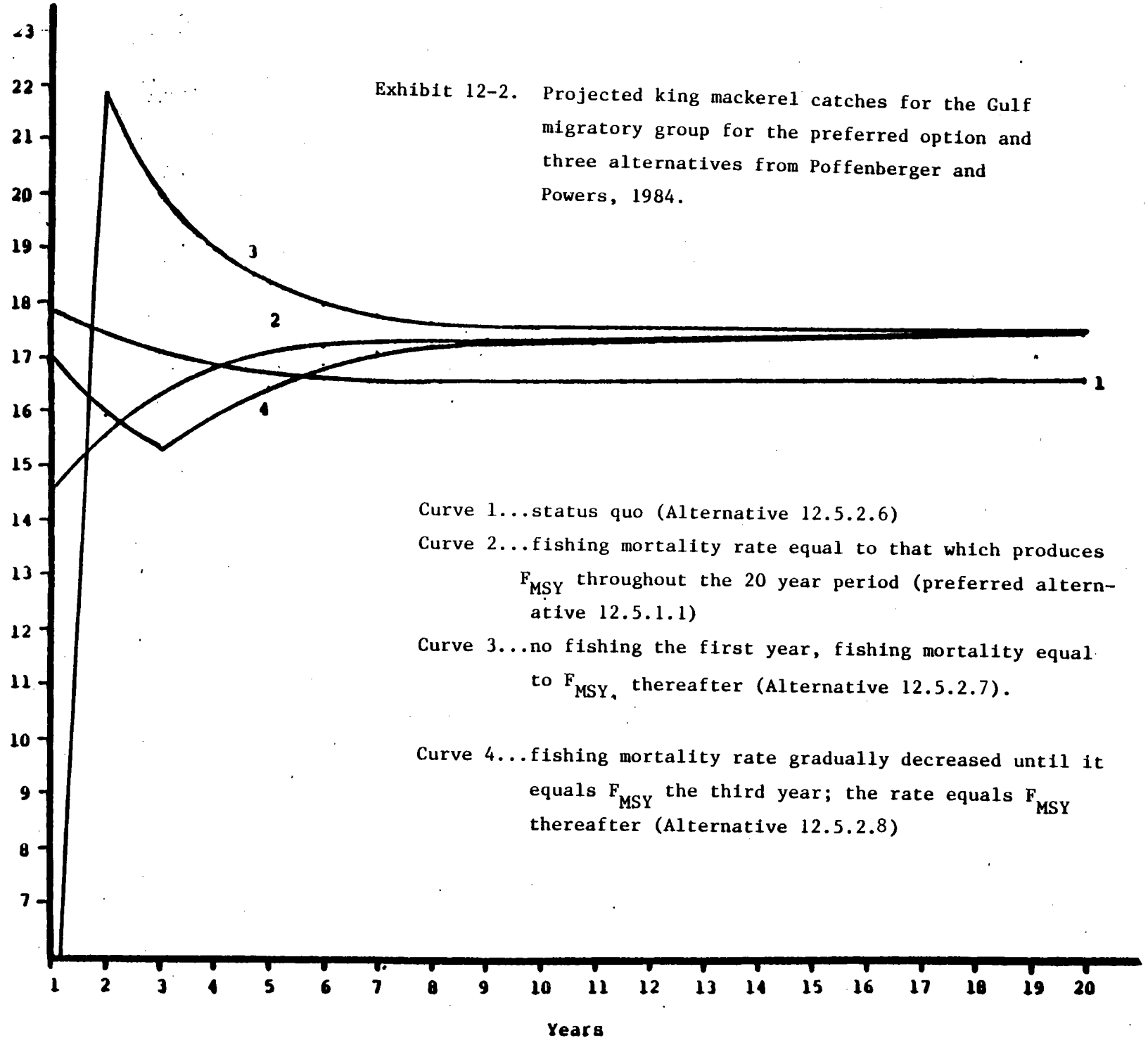


Exhibit 12-2. Projected king mackerel catches for the Gulf migratory group for the preferred option and three alternatives from Poffenberger and Powers, 1984.

Curve 1...status quo (Alternative 12.5.2.6)

Curve 2...fishing mortality rate equal to that which produces F_{MSY} throughout the 20 year period (preferred alternative 12.5.1.1)

Curve 3...no fishing the first year, fishing mortality equal to F_{MSY}, thereafter (Alternative 12.5.2.7).

Curve 4...fishing mortality rate gradually decreased until it equals F_{MSY} the third year; the rate equals F_{MSY} thereafter (Alternative 12.5.2.8)

Rationale: This option sets the biological base for OY and uses maximum yield as a goal, not a fixed number. It establishes the base for flexible management which can address both mackerel species and multiple stocks within each species. The annual amount of OY (TAC) is limited within a range, and it is possible to set it extremely low to protect an overfished stock or set it very high to take advantage of exceptionally good recruitment.

It can protect a stock from overfishing or restore depleted stocks while maintaining a goal of obtaining MSY.

Powers and Eldridge (1983b) offered in part the following advice on catch levels allocated to migratory groups :

1) The best estimate ot total allowable catches which are produced by equal fishing mortality rates are:

   Atlantic Migratory Group = 11,812,000 pounds
   Gulf Migratory Group = 14,225,000 pounds

2) Due to some uncertainty in the estimate of MSY, F_{msy} and the present F's and catch levels, we cannot be absolutely sure of the above estimates. Therefore, it is our conclusion that the estimates in (1) above could be between 5.4 and 13.6 million pounds for the Atlantic migratory group and between 10.0 and 18.3 million pounds for the Gulf migratory group.

3) The above implies a reduction in catch from the Gulf migratory group and an increase in catch from the Atlantic migratory group.

The management strategy for the Gulf group of king mackerel is to reduce the TAC by about 22 percent from the average catch for the 1974 to 1979 period. That average was 5.536 million pounds for commercial, 12.781 million pounds for recreational, and 18.317 million pounds total catch. These figures are also very similar to the 1982 catch (see Exhibit 8-5d). The 22 percent reduction in TAC would allow the overfished stocks to rebuild to a level of MSY production in about three years (Exhibit 12-2). TAC is set at the best estimate of ABC. This will require a sacrifice in yield for the first few years with a gain after the MSY level is achieved (Powers and Eldridge, 1983b).

The TAC specified is for the initial years of the amended plan. Estimates will be reviewed annually and modified as needed to achieve the long-term goal of MSY.

For the Atlantic group of king mackerel the TAC is set high to allow catches to increase from the 1982 level of 7.4 million pounds so that MSY may eventually be achieved.

For Spanish mackerel TAC is set at MSY.

Should conditions change, better information become available, or hardship develop for fishing groups, the annual assessment provides the opportunity to adjust the TAC as may be needed to achieve the goals and objectives as set forth in this plan.

12.5.1.2 Cobia

Optimum yield for cobia was determined to be the available amount of cobia at a size equal to or greater than 33 inches fork length, as measured from the tip of the head to the center of the tail. This amount is estimated as 1,000,000 and is expected to increase if the proposed management measures are implemented.

Rationale: This optimum yield will greatly reduce the possibility of recruitment overfishing, stabilize catch at or near MSY, and increase present yield, average size, and availability of large, trophy-size fish.

The proposed limit protects the cobia until the age at first maturity. This greatly reduces the possibility of recruitment overfishing. Under the estimated levels of fishing mortality in the early 1960s (the latest available data) this measure would increase yield between 25 percent and 58 percent. If the cobia stock in the Atlantic is presently overfished, this OY will restore the stock and prevent overfishing in the future.

12.5.1.3 Other Species in the Fishery

Optimum yield was not specified for the other species because of lack of data to estimate MSY. When sufficient data become available to estimate MSY and/or OY for other species in the fishery, and the need arises for management measures, the Councils will develop such estimates. At that time, these species will be added to the management unit by plan amendment.

12.5.2 Alternatives for OY and TAC Considered and Rejected

12.5.2.1 Rejected Alternative 1

Set TAC for Gulf group king mackerel for the lower range estimate of 10.7 million pounds.

Rationale: The Florida Marine Fisheries Commission requested that the FMP/DEIS include for public discussion an alternative TAC at the lower range estimate of ABC of 10.7 million pounds. The Commission proposes a 2.9 million pound commercial quota and a two fish per angler, per trip limit for Florida waters and requested that it be considered for the FCZ to limit Gulf group TAC to this level. This lower level of harvest is based largely on recent declines in the commercial landings. It would provide a greater margin of safety to prevent overfishing and would restore stock to MSY level in a shorter period of time but with greater sacrifice by recreational and commercial fishermen. In December of 1984, the Florida Cabinet adopted a two king mackerel per person, per trip for the Gulf group king mackerel in Florida waters. This also applies to commercial fishing.

12.5.2.2 Rejected Alternative 2

Set TAC for Gulf group king mackerel for a medium range estimate of 13 million pounds.

Rationale: This reduction of 1.2 million pounds from the 14.2 million pounds proposed for public review would have partially accommodated the request of the Florida Marine Fisheries Commission for a reduced TAC. The Councils determined that this reduction would be too severe for both recreational and commercial fishermen.

12.5.2.3 Rejected Alternative 3

The long-term optimum yield goal for mackerels is ___ percent (less than) maximum sustainable yield. The amount of OY which may be harvested annually for each species defined as total allowable catch (TAC) may vary due to variations in recruitment, fluctuations in abundance by area or unit stock, intensity of fishing effort by area or unit stock, and improving estimates of MSY.

Rationale: Compared to the specified option, setting the OY below MSY results in higher stock abundance, higher catch per unit effort, greater protection against overfishing, but lower total catch and requires much more stringent management to enforce.

12.5.2.4 Rejected Alternative 4

A. OY for king mackerel is determined to be maximum sustainable yield, estimated to be within the range of (example: 25.8 - 32 million pounds) for all stocks of management area. Within that range, TAC will be determined annually for each stock based on the best scientific information available.

B. OY for Spanish mackerel is determined to be maximum sustainable yield, estimated to be within the range of (example: 20 to 30 million pounds) for all stocks of management area. Within that range Total Allowable Catch will be determined annually for each stock based on the best scientific information available.

Rationale: This would reduce management flexibility relative to options which do not specify a fixed range for OY. If new information shows that the MSY estimate is too high and that the real value is below the specified range, the only way to protect the resource would be to amend the FMP. This could also occur if one or more stocks were overfished. (Both have occurred in the case of king mackerel.)

12.5.2.5 Rejected Alternative 5

Optimum yield for king and Spanish mackerel is that amount of fish harvested by U.S. fishermen subject to the management regime established by this FMP.

It is the intent of the Councils to stabilize the level of harvest of mackerels at their maximum sustainable yield accommodating, as needed, biological, economic and/or social factors necessary to achieve maximum yield over the long-term.

Rationale: This alternative is similar to the one specified, but does not address protection from possible overfishing of the stock.

12.5.2.6 Rejected Alternative 6

Continue present fishing effort on Gulf king mackerel.

Rationale: Present levels of fishing are expected to further reduce the abundance to levels to 65 to 70 percent of that necessary to produce MSY. There would be no recovery of stocks and catches would continue to decline.

12.5.2.7 Rejected Alternative 7

Close fishing on Gulf group of king mackerel for one year; then resume fishing at MSY.

Rationale: This action is expected to restore the stock to MSY level quickly. It would result in great economic hardship on those economically dependent on the commercial and recreational fisheries for this group.

12.5.2.8 Rejected Alternative 8

Reduce present catch rate gradually to achieve MSY i.e., reduce excess catch by 25 percent of excess over a four-year period.

Rationale: This gradual reduction would have less immediate impact on fishermen than the preferred option but would require a longer period (four to five years) to restore the stock. Declines in yield are not so great at first but would last longer than the preferred option.

12.5.2.9 Rejected Alternative 9

Optimum yield for cobia equal to the best estimate of MSY, 1,057,000 pounds.

Rationale: This alternative was rejected. The estimate of MSY is extremely crude, due to incomplete and inaccurate estimates of catch and lack of any estimates of fishing effort or recruitment. Harvest at any numerical estimate based on such poor data may significantly overfish or underfish the stocks(s). Neither possibility is in the best interest of the nation. Enforcement and data collection costs required to limit the harvest to a fixed amount would be prohibitive.

12.5.2.10 Rejected Alternative 10

Effective TAC for Gulf group king mackerel to be 13.7 million pounds with fixed recreational/commercial ratio of allocation to be 70/30. Recreational bag limits to be two fish per person on private vessels, and on charter boats four fish per angler in western zone, and three per angler eastern zone - both excluding captain and crew. Commercial allocation to be 4.0 million (0.284 million pounds for purse seine, 1.2 million pounds for western zone and 2.7 million pounds for eastern zone).

Rationale: This option would have provided a 24 percent reduction in recreational and 27 percent reduction in commercial catches, more than required for the target 22 percent reduction. Additionally, the stock assessment workshop found no basis for separation of management for substocks within the Gulf group. This option was rejected by the South Atlantic Council.

12.6 Management Measures

12.6.1 Mechanism for Annual Determination of MSY, ABC, TAC and Non-Quota Restrictions

12.6.1.1 Preferred Alternative

A. An assessment group appointed by the Councils will reassess the condition of each stock of king and Spanish mackerel in the management unit on an annual basis. The group shall be composed of NMFS scientists, Council staff, Scientific and Statistical Committee members and other state, university and private scientists as deemed appropriate by the Councils. The group will address the following items for each stock:

1. Stock identity and distribution. This should include situations where there are groups of fish within a stock which are sufficiently different that they should be managed as separate units. If several possible stock divisions exist, the assessment group should describe the likely alternatives.

2. MSY for each identified stock. If more than one possible stock division exists, MSY for each possible combination should be estimated.

3. Condition of the stock(s) or groups of fish within each stock which could be managed separately For each stock, this should include but not be limited to:

   a. Fishing mortality rate relative to F_{msy} or $F_{0.1}$
   b. Abundance relative to an adequate spawning biomass
   c. Trends in recruitment
   d. Acceptable Biological Catch (ABC) which will result in long-term yield as near MSY as possible.
   e. Calculation of catch ratios based on catch statistics using procedures defined in the FMP.

4. Overfishing. A stock of fish shall be considered overfished if the fishing mortality rate exceeds F_{msy} or $F_{0.1}$, or spawning biomass is low enough to affect recruitment. The $F_{0.1}$ fishing rate is the level of fishing mortality at which an increase in effort produces ten percent of the increase in yield that would occur in a lightly fished fishery for a comparable increase in effort. An $F_{0.1}$ yield per recruit management strategy better protects against growth overfishing and maintains a larger spawning population than does a F_{max} management strategy. If any stock or subgroup is overfished, the assessment group will estimate levels of ABC which would allow that stock to recover in one year, three years, five years, or other period as requested by the Councils.

5. Management Options. If recreational or commercial fishermen have achieved or are expected to achieve their allocations, the assessment group will delineate possible options for nonquota restrictions on harvest, including effective levels for such actions as:

   a. Bag limits
   b. Size limits
   c. Gear restrictions, and
   d. Other options as requested by the Councils

6. Other biological questions as appropriate.

B. The assessment group will prepare a written report with its recommendations for submission to the Councils each year, by such date as may be specified by the Councils. The report will contain the scientific basis for their recommendations and indicate the degree of reliability which the Councils should place on the recommended stock divisions, levels of catch and options for nonquota controls of the catch.

C. The Councils will consider the report and recommendations of the assessment group and such public comments as are relevant to the assessment group's submission. A public hearing will be held at a time and place where the Councils consider the group's report. The Councils will convene the Joint Advisory Panel and may convene the Scientific and Statistical Committee to provide advice prior to taking final action. After receiving public input, Councils will make findings on the need for changes.

D. If changes are needed in MSYs, TACs, quotas, bag limits, or permits, the Councils will advise the Regional Director of the Southeast Region of the National Marine Fisheries Service (RD) in writing of their recommendations, accompanied by the assessment group's report, relevant background material and public comment. This report shall be submitted each year by such date as may be specified by the Councils.

E. The RD will review the Councils' recommendations, supporting rationale, public comments and other relevant information, and if he concurs with the recommendation, will draft regulations in accordance with the recommendations. He may also reject the recommendation, providing written reasons for rejection. In the event the RD rejects the recommendations existing regulations shall remain in effect until resolved.

F. If the RD concurs that the Councils' recommendations are consistent with the goals and objectives of the plan, the National Standards and other applicable law he shall implement the regulations by notice in the Federal Register each year prior to the appropriate fishing year or such dates as may be agreed upon with the Councils. A reasonable period for public comment shall be afforded, consistent with the urgency, if any, of the need to implement the management measure.

Appropriate regulatory changes which may be implemented by the Regional Director by notice in the Federal Register include:

1. Adjustment of the point estimates of MSY for mackerels within the ranges specified in Sections 5.4.1.1 and 5.4.2.1.

2. Setting total allowable catches (TACs) for each stock or group of fish which should be managed separately, as identified in the FMP. The TAC may be increased not to exceed 30 percent annually when warranted by new information. Any number of increases may be made so long as they do not exceed 30 percent in any year and provided that no TAC shall exceed the best point estimate of MSY by more than ten percent. Downward adjustments of any percentage are allowed in order to protect the stock and prevent overfishing. Reductions or increases in allocations as a result of changes in the TAC are to be as equitable as may be practical utilizing similar percentage changes to all participants in a fishery. (Changes in bag limit cannot always accommodate the exact desired level of change.)

3. Adjusting user group allocations in response to changes in TACs according to the formula specified in the FMP.

4. Implementing or modifying quotas, bag limits, or permits, as necessary to limit the catch of each user group to its allocation.

Rationale: This mechanism is intended to adjust TAC and assure a fair allocation of TAC among user groups. The percentage of TAC which is allocated to each user group is specified by a formula which is specified in Section 12.6.3. This approach allows timely management by notice in the Federal Register while retaining substantial Council control. It also allows TAC to be set above or below the long term OY to allow a stock to recover from overfishing, take advantage of exceptionally good recruitment, or react to pressing social and economic issues.

It will promptly identify overfishing before damage to the stocks occurs. If a stock has been overfished, the system allows the Councils to balance the severity of regulation against time needed for stock recovery (i.e., extreme restriction of catch will bring a quick recovery but economic disruption) and base the decision on solid scientific advice. The system provides the Councils with a solid scientific basis for recommending bag limits, size limits, or other restrictions as appropriate. It provides a mechanism which strongly encourages scientific research on mackerel and which allows rapid incorportation of new biological data into stock assessments.

12.6.1.2 Rejected Alternative 1

Prior to the beginning of each year, the Regional Director will prepare a written report based on the latest available stock assessment report prepared by the National Marine Fisheries Service, data reported by harvesters and processors, and other relevant data. The report will include consideration of:

1. the best estimate of the number of stocks, or groups of fish, which require management as separate units and appropriate levels of allowable biological catch for each;

2. exploitable biomass and spawning biomass relative to optimum yield;

3. fishing mortality rates relative to optimum yield;

4. magnitude of incoming recruitment, and

5. projected effort and corresponding catches.

Based on the information presented in the report, and in consultation with the Councils, the Secretary will propose annual quotas for king and Spanish mackerel for each identified group of fish which requires separate management, and divide these quotas into allocations by user groups by a formula specified in the FMP. The Regional Director will publish these allocations in the Federal Register. Comments on the proposed annual allocations may be submitted to the Regional Director within 30 days after publication. The Secretary will consider all comments, determine appropriate annual allocations and publish them in the Federal Register.

Rationale: This alternative places most of the responsibility for annual review on NMFS and the Regional Director. It removes the Councils from control of the fishery without plan amendment. There is little opportunity for technical review of the stock assessment by other than NMFS scientists.

12.6.1.3 Rejected Alternative 2

Prior to the beginning of each year, the Regional Director will prepare a written report based on the latest available stock assessment report prepared by the National Marine Fisheries Service, data reported by harvesters and processors, and other relevant data. The report will include consideration of:

1. the best estimate of the number of stocks, or groups of fish, which require management as separate units and appropriate levels of allowable biological catch for each;

2. exploitable biomass and spawning biomass relative to optimum yield;

3. fishing mortality rates relative to optimum yield;

4. magnitude of incoming recruitment, and

5. projected effort and corresponding catches.

Based on the information presented in the report, and with concurrence of the Councils, the Secretary will propose total allowable catch levels for king and Spanish mackerel for each identified group of fish which requires separate management, and divide these TACs into allocations by user groups by a formula specified in the FMP. The Regional Director will publish these allocations in the Federal Register. Comments on the proposed annual allocations may be submitted to the Regional Director within 30 days after publication. The Secretary will consider all comments, determine appropriate annual allocations and publish them in the Federal Register.

Rationale: This alternative requires concurrence of the two Councils, thus providing more public input and Council control. It offers less opportunity for technical review than does the preferred alternative. Regulatory response time is less than the preferred alternative but more than the rejected alternative 1.

12.6.2 Separation of Migratory Groups of King Mackerel

12.6.2.1 Preferred Delineation of King Mackerel Groups

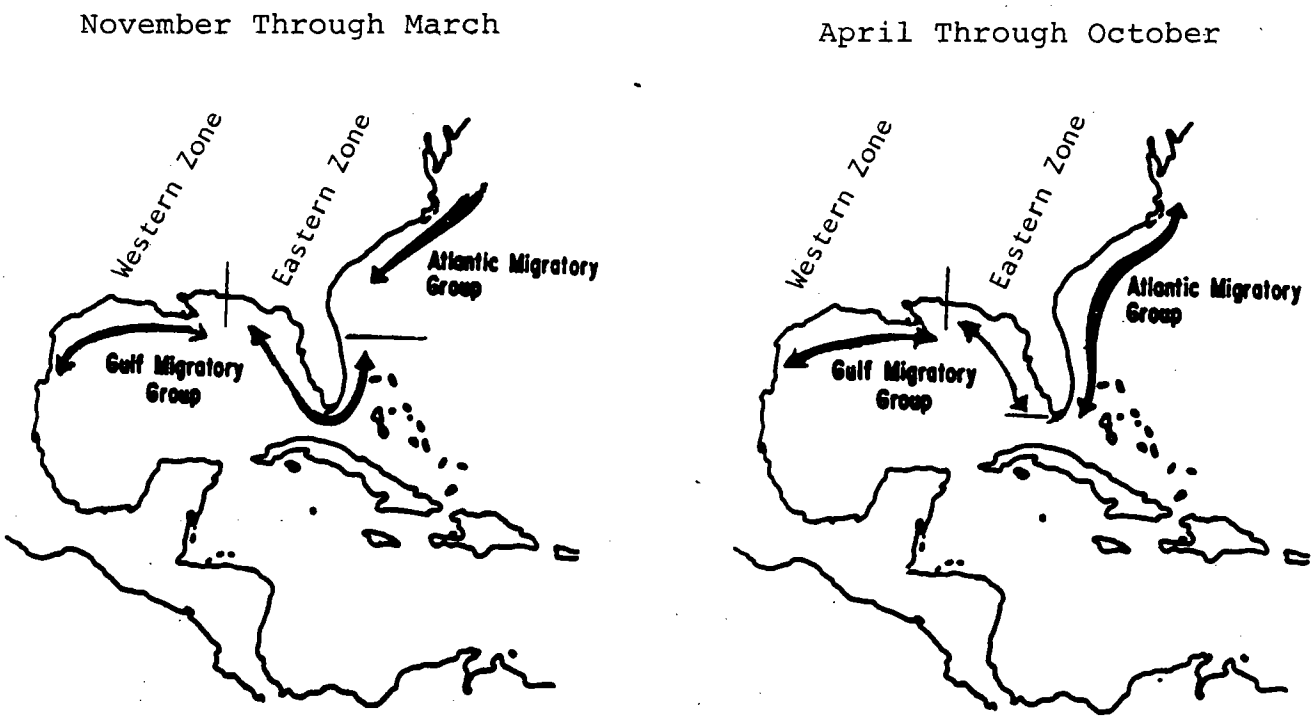
The Councils have set seasonal and areal boundaries to delineate the two migratory groups for management purposes. From April 1st through October 31st the Monroe/Collier County (Florida) line separates the two groups. From November 1st through March 31st the Flagler/Volusia County line, Florida is the boundary (Exhibit 12-3).

Rationale: There is some disagreement among scientists on how many stocks of king mackerel are present in the southeast; one, two, or more. However, all agree that at the minimum, mixing rates for fish at the extremes of the range of king mackerel are so low that for practical management purposes the population should be divided into two groups (Section 5.1.1.1). Tagging data show at least two movement patterns, although there may be more. The stock assessment concludes that fishing mortality on the Gulf group of fish has been excessive and needs to be reduced. Further, it indicates that fishing mortality on the Atlantic group could increase.

The boundaries set for management purposes are within guidelines recommended by the Scientific and Statistical Committee. The preferred option of dates and location of boundaries to define the migratory groups would increase potential king mackerel catch by 525,000 pounds over the May 1st to September 30th option by allowing Florida east coast fishermen to fish the underutilized Atlantic group during April and October. There would be no adverse impact on the Gulf migratory group of fish.

Exhibit 12-3

Seasonal Distribution of Gulf and Atlantic Migratory Groups of King Mackerel with Eastern and Western Zones for Commercial Allocation of the Gulf Migratory Group



12.6.2.2 Rejected Alternative 1

Set summer boundary at Dade/Monroe County (Florida) line.

Rationale: The Scientific and Statistical Committee recommended a summer boundary in extreme south Florida. The Dade/Monroe line is in a high population area making data collection and enforcement more difficult than the more remote boundary selected.

12.6.2.3 Rejected Alternative 2

Set winter boundary at Georgia/Florida line.

Rationale: The SSC recommended a division north of Cape Canaveral to the Florida/Georgia line. The state line area has a low population density providing for ease of enforcement and monitoring of catch. The commercial catch of the three northernmost east coast Florida Counties comprises only 1.37 percent of the east Florida catch. There is a substantial recreational fishery, however, which would be subject to the Gulf group bag limit.

12.6.2.4 Alternative 3

Further divide the Gulf migratory group of king mackerel into eastern and western Gulf groups for management purposes.

Rationale: Louisiana fishermen have stated that they believe the larger fish found off Louisiana in the winter and Texas in the summer do not migrate east of the Mississippi River and thus could be managed as a separate group. The TAC for the Gulf migratory group could, therefore, be subdivided to provide appropriate quotas and bag limits for the separate management units. However, studies have shown king mackerel tagged off Texas in the summer have been recovered off southeast Florida in the winter and Florida tagged fish have been recovered in the western Gulf in the summer indicating mixing of smaller fish. The commercial allocation has been divided, and this meets the desire of Louisiana fishermen to have a fishing opportunity on an open quota.

12.6.2.5 Rejected Alternative 4

Set the seasonal change for May 1st.

Rationale: The SSC recommended a change some time in April which is the month when Gulf king mackerel leave southeast Florida and the Atlantic group appears in northeast Florida. Landings of the Atlantic group are more substantial than are those of the Gulf group in Monroe County. The benefits of allowing additional harvest of the Atlantic group far outweighed the relatively insignificant take of the Gulf group in the Keys. More than likely, the Gulf quota will have been taken prior to the last month of the season. This alternative would have reduced potential king mackerel commercial harvest by 525,000 pounds.

12.6.2.6 Rejected Alternative 5

Set the seasonal change for April 15th

Rationale: Statistics are maintained on a monthly basis, and it would be impractical to split the data into semimonthly periods since the SSC indicated either April 1st or May 1st would be equally appropriate.

12.6.3 Allocations

The allocations for the initial years of the plan as amended are as stipulated in this section.

12.6.3.1 King Mackerel Allocation

1. The TAC for king mackerel is to be divided between recreational and commercial fishermen based on recent catch ratios.

2. The TAC for king mackerel in the Gulf group is to be allocated with 68 percent for the recreational fishermen and 32 percent for the commercial fishermen for the initial year of the plan amendment. This amounts to 9.67 million pounds for recreational and 4.55 million pounds for commercial fishermen.

3. The TAC for king mackerel in the Gulf group after the initial year of this amendment will be allocated between recreational and commercial (permit) fishermen based on the ratio of the average catch over the most number of years beginning in 1979 for which concurrent recreational and commercial catch data are available. Following calculation of the R/C catch ratio, two percent is to be transferred from recreational to commercial allocation to compensate for sale by recreational fishermen provided the bag limit does not change as a result of the transfer. This calculation is to be made by the stock assessment group.

4. The commercial allocation for the Gulf migratory group is to be divided between eastern and western zones with the separation to be the Florida-Alabama border and extending south (Exhibit 12-3a) The allocation is to be divided as follows:

   After a deduction of 6 percent but no more than 400,000 pounds for the purse seine fishery; 69 percent of the remainder is allocated for the eastern zone and 31 percent is allocated to the western zone. For the initial amendment year, this is to be:

   Purse Seines = 284,000 pounds
   Eastern Zone = 2.94 million pounds
   Western Zone = 1.328 million pounds

5. For the Atlantic group of king mackerel the TAC will be allocated between recreational and commercial fishermen based on the ratio of the average catch over the most number of years beginning in 1979 for which concurrent recreational and commercial catch data are available. For the initial year of the FMP this allocation is 62.9 percent for recreational and 37.1 percent for commercial fishermen. In the initial year of the plan, this amounts to 7.43 million pounds for recreational and 4.38 million pounds for commercial fishermen. The stock assessment group will calculate the ratio annually.

Rationale: The Gulf migratory group has been overfished and TAC is a 22 percent overall reduction to rebuild the stock to MSY levels. In order to reduce the catch of various user groups equitably, allocations based on a measure of historic catch patterns are to be used. In recent years, the recreational fishery has taken approximately 70 percent of the catch with the commercial fishery taking about 30 percent. An allocation ratio of 68 to 32 was selected to allow for recreational catch that is sold and counted against the commercial allocation. In future years when the TAC changes, the allocations may be adjusted accordingly.

The rationale for the suballocation of the Gulf commercial quota into eastern and western zones is to provide fishing opportunity for fishermen throughout the migratory route. Without some means of distribution of the catch, fishermen in one area could take a disproportionate share of the quota

while the fish were present only in that area. The formula specified would provide sufficient fish for the purse seine study and divide the remainder between the historic Florida fishery and the developing fishery off Louisiana.

Base figures used in the calculations for the Gulf group were the average catches for the period 1975-1979, which incidentally are comparable to the 1982 catch:

1975-1979 average total = 18.3 M
1975-1979 average commercial catch = 5.536 M
1975-1979 average recreational catch = 12.781 M

Allocations:

TAC = 14.225 M (22 percent reduction from base)
Recreational Allocation = 9.673 M (68 percent of TAC)
Commercial Allocation = 4.552 M (32 percent of TAC)
Eastern Zone (Florida) = 2.94 M
Western Zone (AL, MS, LA, TX) = 1.328 M
Purse Seine (Gulf Group) = 0.284 M

Exhibit 12-3a

Comparison of Commercial Allocations and
King Mackerel Commercial Landings by Calendar Year
by Migratory Group and Zone (1979 - 1983)

Year	Atlantic Group[1]	Gulf Group[2]		
		E. Zone (FL)[3]	W. Zone[4]	Total Gulf Group
1979	1,921,643	3,593,517	175	3,593,692
1980	2,774,124	4,293,981	0	4,293,981
1981	2,343,367	6,469,133	0	6,469,133
1982	3,834,611	4,178,277	229,186	4,407,463
1983	2,331,662	3,139,542	1,491,947	4,631,489
Allocation	4,380,000[5]	2,940,000	1,328,000	4,552,000[5]

1 Atlantic Group = North Carolina through Monroe County, Florida: April - October
North Carolina through Flagler County, Florida: November - March

2 Gulf Group = Collier County, Florida through Texas: April - October
= Volusia County, Florida through Texas: November - March

3 Eastern Zone of Gulf Group = That portion of Gulf Group off Florida

4 Western Zone of Gulf Group = Alabama through Texas

5 Includes purse seine allocations

The Atlantic group is presently underfished, but the catch can be expected to increase in future years as both recreational and commercial fisheries are expanded. The ratio for allocation therefore is flexible so that it may be adjusted as the fishery develops. Catch data from both user groups, as they become available, will be used in the recalculation of the allocation ratio. The imposition of the quotas would not measureably change exvessel prices (Poffenberger and Powers, 1984).

12.6.3.2 Alternative Allocations for King Mackerel Considered and Rejected

Rejected Alternative 1

No separate allocation for recreational and commercial fishermen.

Rationale: Under present data collection programs this strategy would render management ineffective and may result in overfishing. Recreational catch data are not collected on a real time basis, and there would be no way to reduce fishing the following seasons if excessive harvest occurred.

Rejected Alternative 2

Provide separate commercial allocations for hook and line and net fishermen.

Rationale: A sub-allocation could (and did in the first year of plan implementation) result in a closure to one group while the quota of the other was not filled. This was caused by changing patterns in gear use which were not predicted when the sub-quotas were set in the original FMP.

Rejected Alternative 3

Divide all fishermen into two groups: hook and line and net fishermen.

Rationale: This allocation would require an effective measure of recreational catch in a timely basis not presently available. An annual survey would be required in order to close the fishery when a quota is reached. Without this mechanism overfishing could occur through the portion of hook and line catch not sold and reported through current commercial statistics.

Rejected Alternative 4

Maintain the fixed allocation of 68:32 for the recreational:commercial allocation of the Gulf migratory group.

Rationale: If catch patterns should change in future years, appropriate allocations could be achieved only through FMP amendment.

Rejected Alternative 5

Allocate 30 percent of the Gulf group TAC to commercial and 70 percent to recreational users.

Rationale: The division approximates the average catch of the two groups from 1975 to 1979. Commercial landings decreased somewhat in more recent years, and current recreational data are not yet available.

Rejected Alternative 6

Establish a fixed ratio for allocation of the Atlantic group of king mackerel.

Rationale: This group is presently underfished and both recreational and commercial fisheries are increasing. The ratio of catch can be expected to change as the fisheries develop.

Rejected Alternative 7

Provide a single commercial allocation for the Gulf migratory group.

Rationale: With a single commercial allocation, the selection of the fishing year becomes critical to assure fishermen throughout the migratory route an opportunity to fish before the quota is filled. It is difficult to select a fishing year which would provide equal access to fishermen throughout the area.

Rejected Alternative 8

Divide the Gulf group commercial allocation into eastern and western zones at boundaries other than the Florida-Alabama border.

Rationale: The Mississippi River Outlet would have allowed crossover reporting by the Louisiana fleet. A boundary at Cedar Key, Florida, would have provided for facilitation of enforcement but would have placed the Florida Panhandle's large charter fleet in the western zone allocation encouraging fishing under the permit quota if charterboats are allowed to cross over to fish under commercial permits. It would also have made management more difficult for the State of Florida.

12.6.3.3 Spanish Mackerel Allocation

For Spanish mackerel in the initial years the season will close for the remainder of the year when the TAC of 27 million pounds is reached. The only allocation within the TAC is for purse seines (see Section D below).

Rationale: While this measure could result in a short-term closure of the fishery, it provides a safeguard to prevent overfishing the stock. The associated short-term economic and social costs of a closure are considered to be small in comparison to protection of the stock and long term biological, economic and social yields. There are insufficient data at this time to divide the stock into migratory groups. At the time that the assessment group and Councils determine that divisions or reduced TAC should be implemented, the regulations may be amended as provided for in Section 12.6.1.

12.6.3.4 Rejected Alternative 1

Establish a formula for development of an allocation ratio for Spanish mackerel should one be needed to reduce TAC in the future.

Rationale: The assessment group will review the stock annually to determine its condition. A formula reflecting present catch patterns could be implemented in the event that reductions are needed. At this time the magnitude of any needed reduction is unknown. It will need to be evaluated carefully with respect to the potential impacts on users. This action could be addressed more thoroughly through an amendment to the regulations when the full extent of the needed change is known and can be evaluated.

12.6.3.5 Cobia

There are no allocations or quotas for the catch of cobia.

Rationale: The imperfection of the MSY figure due to a dearth of data for this species would not provide adequate basis for quotas or allocations. The safeguard to prevent overfishing is provided

through a minimum size limit. The commercial fishery is small and is usually not directed specifically at cobia. Similarly, the recreational fishery is opportunistic rather than directed.

12.6.3.6 Purse Seine Allocations

1. An allocation of king mackerel for purse seine purposes is to come from the commercial quota. It is not to exceed 284,000 pounds in the initial amendment year from the Gulf migratory group or more than 400,000 pounds from the South Atlantic Council area of jurisdiction. In subsequent years, the Gulf group purse seine allocation is to be six percent of the Gulf group commercial allocation, but may not exceed 400,000 pounds as provided for in Section 12.6.3.1.

2. Within the TAC for Spanish mackerel a purse seine allocation for research purposes is allowed annually but is not to exceed 300,000 pounds from the Gulf and 300,000 pounds from the South Atlantic Council area of jurisdiction.

3. Observers under the direction of National Marine Fisheries Service are required on all purse seine vessels fishing for king or Spanish mackerel during the first three fishing years after this plan is in effect.

4. A bycatch of no more than one percent of king mackerel or ten percent of Spanish mackerel by weight or number, whichever is less, is allowed in purse seines. This bycatch is to be counted in the purse seine quota, and when the quota is filled, no more of that species may be landed for sale.

Rationale: Regulation of the use of purse seines to harvest mackerels is needed. Implementation of the FMP had removed legal barriers imposed by state laws and may result in almost unlimited purse seining if no action is taken. Both Councils and virtually all users of the resource, including purse seine operators, believe that unrestricted purse seining will result in overfishing and serious socioeconomic impacts on all users of the mackerel stocks. A recent study (Centaur, 1981), research by Florida DNR (Moe, 1967; Ingle, 1967) and experience of purse seine operators, are all consistent with the conclusion that control of this gear is necessary if its potential economic benefits are to be realized without overfishing the stock or adverse economic impacts on other user groups. At the same time, the Councils are in a poor position to specify a long-term management strategy for purse seines because there is no history or experience in purse seining for these species. For this reason, the proposed purse seine regulations are considered temporary and will be modified as soon as sufficient information is available.

The purse seine allocations chosen by the Councils are large enough to allow several vessels to operate. This will allow the Councils to observe mackerel purse seining under normal conditions and develop a long-term management approach to this gear. At the same time the amounts are small enough to have little adverse effect on other user groups. If any unexpected adverse impacts develop, the allocation will limit them to a minimum until appropriate amendments in the FMP can be made.

The allocation for Gulf stock king mackerel is reduced to correspond with the overall reduction in the TAC for this overfished stock. During the first partial fishing year of plan implementation the 16 purse seine boats giving notice of intent to fish king mackerel landed only a small amount due to the short season. In the 1983-84 season, the 14 boats giving notice are expected to land in excess of 130,000 pounds. All catch is from the Gulf migratory group and from Florida's east coast.

12.6.3.7 Purse Seine Allocations Considered and Rejected

Rejected Alternative 1

Prohibit purse seine fishing on Gulf group king mackerel.

Rationale: There is a limited historic purse seine fishery for king mackerel, and this group is presently overfished and reduction of catch is necessary to restore the stock. Purse seines can be used efficiently and can take large catches in a short time. Catches made in 1983-84 season were on the Gulf stock.

The amount to be taken by this gear can be restricted to stay within a reduced TAC, and prohibition of gear without sufficient justification can be construed to be in violation of the National Standards.

Rejected Alternative 2

Provide a purse seine allocation for Atlantic group king mackerel.

Rationale: The purse seine fishery for king mackerel thus far has been limited to winter months in southeast Florida. The catch has been from Gulf group fish. Theoretically, an additional allocation on Atlantic group fish could be made in the same area during the summer season. The Councils did not wish to direct fishing for an entire 800,000-pound allocation to one geographic area which already has substantial conflict among various gear use groups.

Rejected Alternative 3

Provide purse seine allocation to each Council area of jurisdiction.

Rationale: The most likely group of king mackerel to be fished by purse seine is the Gulf group during winter months. It is very possible that the total allocation for both Councils' areas of jurisdiction could be taken from the stressed Gulf group.

12.6.4 Permits

12.6.4.1 Annual permits are required for boats fishing under the commercial quota on the Gulf king mackerel group. These vessels are exempt from the recreational bag limit. In initial plan amendment years, permits are not required of boats fishing Atlantic group king mackerel. They may be established under procedures prescribed in Section 12.6.1.1.

All fishermen who apply for permits (except charter and headboat operators who are ineligible) must be able to show they derive more than ten percent of their earned income from commercial fishing.

Boats fishing a group for which commercial permits are issued and which do not possess a permit are presumed to be recreational boats and are subject to recreational bag limits.

Permits are valid for a fishing year and are available only in the two months preceeding the season. Owners of newly registered or documented boats, however are allowed a 60-day period after registration or documentation to obtain a permit.

Permits are transferable on sale of vessel with new owner being responsible for changing name and address. Persons may appeal to the Regional Director on basis of hardship for issuance of permits at other times. The Regional Director may issue permits for cause.

Boats with permits must cease fishing for that group or zone of king mackerel when its commercial quota is reached and the season closed.

A fee may be charged for the permit, but shall not exceed administrative costs incurred in issuing the permits. Fees are expected to be less than ten dollars.

Rationale: It is the Councils' intent that the reductions in allocations made from within the TAC be

fair and equitable. This is to be accomplished by restricting the users to one or the other allocation. This will also provide further assurance that the TAC is not exceeded.

The Councils believe that requiring permits only of boats fishing a commercial quota that is likely to be reached during a fishing season is the procedure which imposes the least regulation and imposition on fishermen while still maintaining the catch within TAC. As proposed in the initial years of the FMP, there are an estimated 600 commercial boats fishing the Gulf group.

The limitation of permits to commercial fishing vessels is not intended as economic distribution; rather it is to be a means of achieving an equitable reduction in catch by both recreational and commercial fishermen. The allocations are based on recent catch ratios. In order to prevent large numbers of recreational fishermen from fishing under the commercial permit system, not selling their catches, and causing TAC to be exceeded through this uncounted catch, the permit limitation to commercial fishermen has been added. The ten percent of earned income from commercial fishing was judged by the Councils to be sufficient to include those who may be partially dependent on social security, retirement benefits, or investments. New entrants in the king mackerel fishery may establish eligibility with a record of income from other commercial fisheries and bag limit sales.

Charterboats and headboats are excluded from permit eligibility because of the probability that many would elect to cross over to permit fishing, thus, either utilizing the commercial quota or exceeding the TAC with unreported (unsold) catches. The sale of king mackerel by charterboats is discussed in Section 8.2.2.3. There would be an impact on those vessels which may seasonally fish commercially for king mackerel. These vessels could continue to sell their catch but would be restricted to the recreational bag limit and could not sell their catch after the commercial quota is filled. The two percent transfer in allocation provides for bag limit sale.

The Magnuson Act provides that a permit fee may be charged but that it not exceed administrative costs of issuing the permit. It is expected that this will be less than ten dollars per permit.

The closure of the permit fishery when the quota is reached will require coordinated closure by adjacent states in order for this measure to be effective. States will be requested to adopt similar measures so that the fishery may be closed in the territorial sea as well as in the FCZ when the quota is filled for a season.

12.6.4.2 Alternative Permit Requirements Considered and Rejected

Rejected Alternative 1

Require permits for all vessels fishing for king mackerel.

Rationale: Requiring that all vessels fishing for king mackerel have permits would provide a universe for data gathering and would, if separate permits are required, identify recreational and commercial boats. The public cost of operation and analysis of the system would be large and not cost effective for a single species. It would duplicate some state licensing programs.

Rejected Alternative 2

Require no permits.

Rationale: Permits are an imposition and some vessel owners may forget to obtain them during the available period. Others may wish to enter after a season proves to be particularly attractive. The use of a permit system is, however, intended to allocate the resource fairly and to prevent exceeding quotas and the TAC. It would be difficult to enforce a recreational bag limit when the commercial season is open.

Rejected Alternative 3

Require all fishermen who sell king mackerel to have a permit and be exclusively under the season quota. Prohibit sale when the quota is reached.

Rationale: This would prevent bag limit fishermen from selling their catch during open or closed season but would require action by the states to require a permit for sale of fish taken in state waters.

Rejected Alternative 4

Require permits of any vessels desiring to exceed the bag limit and require that permit vessels cease fishing for king mackerel when the quota is filled.

Rationale: This would allow recreational and charterboats to obtain commercial permits at the risk of ceasing to fish for king mackerel when the quota is filled. Any catch sold would count toward filling the commercial quota, but unsold catch in excess of the bag limit would cause the total allowable catch estimates to be exceeded. Logbooks could be required for permit vessels, but this system would be slow and expensive. Logbooks could be required only of charterboats, but these vessels are not readily identifiable. Some states have no commercial or charterboat licenses to facilitate identification.

Rejected Alternative 5

Prohibit possession of rod and reel aboard permit vessels.

Rationale: This would discourage anglers from obtaining the commercial permit and limit permits to handline and net boats. There are commercial rod and reel fishermen in southeast Florida and Louisiana who fish primarily for king mackerel. The Florida fishermen fish predominantly for the Atlantic migratory group; however, the Louisiana fishermen are dependent on the Gulf group.

12.6.5 Seasonal Closures

12.6.5.1 King Mackerel, Gulf Group

Boats with commercial permits must cease fishing for Gulf group king mackerel in the FCZ of a zone for the remainder of the fishing year when the commercial quota is reached for that zone. King mackerel caught in a zone after the quota is reached for that zone may not be sold. For the initial years, the Gulf group quota is 32 percent of the TAC or 4.552 million pounds. The suballocation into zones is provided for in Section 12.6.3.1. The allocation for purse seines and seasonal closure is separate.

12.6.5.2 King Mackerel, Atlantic Group

Commercial fishing for Atlantic group king mackerel must cease in the management area for the remainder of the fishing year when the commercial quota is reached for that group. King mackerel caught in the management area after the quota is reached for that group may not be sold. For the initial years this quota is 37.1 percent of the TAC or 4.382 million pounds. The allocation for purse seines and season closure is separate.

12.6.5.3 Spanish Mackerel

Fishing for Spanish mackerel will cease for the remainder of the fishing year when the TAC is reached. For the initial years the TAC is 27 million pounds.

Rationale: In order to maintain fishing within the TAC, the commercial fishery for king mackerel will be regulated by a season which will close when the commercial quota is attained. Commercial catch data can be obtained on a real time basis to monitor the landings and promptly close the fishing season at the appropriate time.

The prohibition of sale of king mackerel from the zone or migratory group whose season has been closed will further separate the allocation to user groups, deter crossover of fishermen to supply a market void, and facilitate enforcement of the closure. The purse seine allocation and seasonal closure is separate.

12.6.5.4 Seasonal Alternatives Considered and Rejected

Rejected Alternative 1

No closed season.

Rationale: Closed seasons are not presently likely for other than Gulf group king mackerel for which a reduction from present catch is required. This reduction could be achieved through commercial trip limits or bag limits. Both would reduce harvest efficiency and increase production costs.

Rejected Alternative 2

Close season for king mackerel on all fishermen when TAC is reached.

Rationale: This would require capability of monitoring catch of all fishermen who fish under the TAC on a real time basis. This ability does not presently exist for the recreational fishery.

Rejected Alternative 3

Close the fishery in the territorial sea of the states as well as the FCZ when the permit quota is reached and prohilt sale of the species.

Rationale: While this procedure would promptly close the fishery, it would usurp the authority of the states without due process. The action may be beyond the authority of enabling legislation.

12.6.6 Bag Limits

12.6.6.1 King Mackerel

The recreational allocation will be controlled by bag limits for anglers per boat trip. Different bag limits may be set for anglers on charter or private recreational vessels. The catch limit for private boats without commercial permits is two fish, per person, per trip, for only Gulf group king mackerel in initial years. The bag limit for charter boats is two fish, per person, per trip, for all persons on the boat, or three fish per angler, per trip, excluding captain and crew, whichever is greater.

Rationale: Statistical catch data on the recreational fishery cannot be obtained in sufficient time to regulate the fishery through quotas within a season. A bag limit, however, may be used to limit future catch to a predefined level, as in this case, within the TAC. Studies have shown that the catch rate of charter boats is higher than that of private boats. The catch rates also vary geographically. The same trip bag limit for all recreational boats provides a larger percent reduction for charter boats (34 percent) than for private boats (22 percent) and for all boats in high yield areas than in low yield areas. Similarly, expert fishermen will experience a greater reduction in catch than lesser skilled fishermen.

Exhibit 12-3b

Expected percent reduction in annual recreational catch of king mackerel from the Gulf Migratory Group resulting from proposed bag limits on number of fish per trip. Range of uncertainty in the estimate is also given. (From Eldridge and Powers, 1983c).

Bag Limit in #/trip	Private Vessels			Charter Vessels			Private & Charter Combined[1]		
	Best estimate of catch reduction (%)	Range		Best estimate of catch reduction (%)	Range		Best estimate of catch reduction (%)	Range	
		Low	High		Low	High		Low	High
3	45	34	56	75	69	82	53	44	63
4	35	24	47	69	61	77	44	34	55
5	28	17	38	63	54	72	37	27	47
6	22	12	32	57	47	67	31	21	41
7	17	8	26	52	42	63	27	17	36
8	14	6	22	48	37	59	23	14	32
9	11	4	18	44	33	55	20	12	28
10	9	3	15	40	29	51	17	10	25
11	7	2	12	37	25	48	15	8	22
12	6	1	10	34	22	45	13	7	19
13	5	1	8	31	20	42	12	6	17
14	4	1	7	28	17	39	10	5	16
15	3	0	6	26	15	37	9	5	14
16	3	0	5	24	14	34	8	4	13
17	2	0	4	22	12	32	7	3	12
18	2	0	3	20	11	30	7	3	10
19	1	0	3	19	9	28	6	3	10
20	1	0	2	17	8	26	6	2	9
21	1	0	2	16	7	25	5	2	8
22	1	0	1	15	6	23	5	2	7
23	1	0	1	14	6	22	4	2	7
24	1	0	1	13	5	20	4	1	6
25	0	0	1	12	4	19	3	1	6

1/ Assumes 72.97% of the recreational catch comes from private vessels and the rest from charter vessels. See Table 2.

Exhibit 12-3c

Expected percent reduction in annual recreational catch of king mackerel from the Gulf Migratory Group resulting from proposed bag limits on number of fish per person per trip[1]. Range of uncertainty in the estimate is also given. (From Eldridge and Powers, 1983c).

Bag Limit in #/person/trip	Private Vessels			Charter Vessels			Private & Charter Combined[2]		
	Best estimate of catch reduction (%)	Range		Best estimate of catch reduction (%)	Range		Best estimate of catch reduction (%)	Range	
		Low	High		Low	High		Low	High
1	45	34	56	69	61	77	52	41	62
2	22	12	32	48	37	59	29	19	39
3	11	4	18	34	22	45	17	9	25
4	6	1	10	24	14	34	11	5	17
5	3	0	6	17	8	26	7	3	11
6	2	0	3	13	5	20	5	1	8
7	1	0	2	9	3	15	3	1	5
8	1	0	1	7	2	12	2	1	4

[1]Assumes 3 people per private vessel trip and 4 people per charter vessel trip (charter vessels exclusive of captain and crew).

[2]Assumes 72.97% of the recreational catch comes from private vessels and the rest from charter vessels. See Table 2.

Exhibits 12-3a and 12-3c were compiled from boat surveys in Texas, northwest Florida and North Carolina. Some assumptions must be made, when one uses the tables, on the average rate of catch and number of fishermen on boats.

An average vessel limit of six fish per trip produces a 22 percent reduction for private vessels while a vessel limit of 17 fish per trip produces a 22 percent reduction for charter boats (see Exhibit 12-3b). This is because charter vessels have a higher catch rate than private vessels.

Similarly, a bag limit may be set as a limit per person per trip by using the average number of fishermen: two on private vessels and four on charter vessels exclusive of captain and crew. The reduction in catch can be projected using Exhibit 12-3c.

A bag limit of two fish, per person, per trip would reduce the private vessel catch by 22 percent, the charter vessel catch (including captain and crew) by 34 percent. A three fish limit for charterboats, excluding captain and crew, would also provide a 34 percent reduction for this group based on the average number of four anglers and two crewmen. (3 x 4 = 2 x 6 = 12). An overall weighted reduction for all recreational vessels is 25 percent.

The Councils opted for the two fish, per person, per trip on private and a two fish - three fish option for charter vessels as being equitable to the anglers and providing sufficient fish for a worthwhile recreational fishing experience while achieving the goal of catch reduction. This achieves the needed reduction of 24 percent. Charterboat operators testified that though the average catch would be the same with the two fish for all or three fish excluding captain and crew, the higher limit would be more acceptable psychologically on prospective clients. The Councils, therefore, provided this option.

The measure will necessarily result in some temporary sacrifice of catch in order to restore the stock to MSY levels in a reasonable period of time.

12.6.6.2 Alternative Bag Limits Considered and Rejected

Rejected Alternative 1

No bag limit, restrict the recreational catch by closure.

Rationale: The MSY level could be restored in one year with total closure of the fishery. This would have a severe economic impact on all users (see Exhibit 12-2).

Rejected Alternative 2

Establish a different limit of two, three, or four king mackerel per angler, per trip. Exclude captain and crew from allowable boat catch.

Rationale: To accommodate a TAC of 10.9 million pounds, the Florida Marine Fisheries Commission requested a bag limit of two fish per angler, per trip, exclusive of captain and crew on charterboats. A two fish per angler, per trip limit would provide an overall 29 percent reduction, more than is required to restore the stock in the goal of three years. The limit is particularly restrictive on charter vessels which would experience a 48 percent reduction in catch. Furthermore, it would be difficult to justify the exclusion of individuals from participation in the fishery.

Following is the expected time until recovery of the Gulf migratory group assuming that Florida adopts a 2.94 million pound commercial quota (for territorial waters and the FCZ) and assuming the following recreation bag limit strategies. (Note that recovery time is defined here as the time until the stock reaches 90 percent of its level at maximum productivity.)

	Expected Number of Years to Recovery
0) Proposed regulations; 4.55 million pounds commercial quota and two fish per per limit.	3.0 years
1) 2.94 million pounds commercial quota; 2 fish bag limit in Florida territorial waters; 3 fish elsewhere.	2.3 years
2) 2.94 million pounds commercial quota; 2 fish bag limit in Florida territorial waters and Florida FCZ; 3 fish elsewhere.	2.2 years
3) 2.94 million pounds commercial quota; 2 fish bag limit for all areas of the Gulf migratory group.	1.6 years

There is a great deal of uncertainty in estimating future abundance. There is a significant chance that the stock will not recover under any of the strategies; likewise, there is a smaller chance that the stock will recover in a shorter time than is estimated above. However, the above recovery times are best estimates for the alternative management strategies.

These projection analyses are primarily based upon data from 1980 and previous. Commercial catches have declined somewhat since 1980. We do not presently have estimates of the recreational catch available for 1981-1983. But if they, too, have declined, then the projected recovery times above are underestimated. However, the relative change in recovery time between the alternative strategies would remain approximately the same (Powers, 1984).

A four fish limit would provide only 11 percent or half of the intended goal of a 22 percent reduction. Unfortunately, a half fish cannot be included as part of the limit.

Rejected Alternative 3

Provide higher king mackerel bag limits for fishermen on charter vessels.

Rationale: Because average charter vessels have higher catch rates than average private vessels an equal bag limit constitutes a greater percentage of reduction for charter vessels. A lower bag limit for fishermen who cannot afford to charter could be considered as unfair. Presumably, charter captains are more skilled and thus more successful than the average private vessel fisherman. However, there are also skilled private vessel fishermen who fall in the category of having a greater reduction. Any bag limit will affect some fishermen more than others.

Rejected Alternative 4

Provide for different bag limits by geographical area.

Rationale: Fish in the western Gulf may be larger than those taken in the eastern Gulf; therefore, the average bag limit may constitute a greater catch in weight. Fish may be more abundant in some areas and may contain a mixture of fish from another migratory group. The Councils are, however, regulating each migratory group as determined by the best available technical data, as a unit throughout its range in accord with the Magnuson Act.

The bag limit is intended to reduce the number of fish caught as a percentage of the present catch. It is not derived from the weight or size of fish.

Rejected Alternative 5

Provide for a three fish per angler, per trip bag limit for all recreational boats and exclude captain and crew on charterboats.

Rationale: This was the option selected by the Councils for presentation at the first round of public hearings. It achieved an overall recreational reduction of only 17 percent instead of the needed 24 percent (see Section 12.6.3.1). It was discriminating toward the captain and crew of charterboats.

Rejected Alternative 6

Allow retention of one king mackerel over 50 inches in length in the FCZ only off Louisiana.

Rationale: The recent development of a commercial winter fishery for large, female king mackerel occurred off Louisiana where these fish tend to school seasonally. Although larger fish do occur in other areas throughout the range of this migratory group, they apparently are most available in the area off Louisiana where in excess of one million pounds was landed during the 1982-83 winter season.

Rejected Alternative 7

A bag limit of one cobia per person per day be implemented in the South Atlantic Council area where data support the need for the measure.

Rationale: This measure would have reduced recreational enjoyment of the fishery on those occasions when more than one per day is caught. It would have also had a significant impact on cobia tournaments which are held throughout parts of the regions. The potential benefits in reducing harvest were felt to be unnecessary at this time.

Rejected Alternative 8

Prohibit the sale of cobia.

Rationale: The commercial fishery for cobia is not a major directed fishery and the total commercial catch is small compared to the recreational catch. Thus, this measure would have little beneficial biological impact. It would, however, interfere with the operations of a certain number of fishermen.

Rejected Alternative 9

No more than one king mackerel more than 50 inches fork length or 53 inches total length per person, per trip, may be retained from the Gulf of Mexico FCZ in boats fishing either under the recreational bag limit or commercial quota.

Rationale: A new winter commercial fishery for large king mackerel was developed off Grand Isle, Louisiana, in the 1982-83 season. Approximately 1.2 million pounds of mostly large females were landed. Tagging studies conducted by NMFS at the time showed the fish ranged up to about 70 pounds (1,516 mm fork length). The mode was between ten and 25 pounds, however, with less than one percent over 40 pounds. The impact of the increased catch from these schools of large females is not known. The Councils' Scientific and Statistical Committee advised a conservative approach in exploiting this group until better data become available. The SSC did, however, recommend against this measure as being ineffective. Returns from fish tagged from this group through 1984 are from off Louisiana, Texas and Mexico.

12.6.7 Size Limits

12.6.7.1 Spanish Mackerel

Minimum size limit is 12 inches fork length or 14 inches total length. An undersized catch of up to five percent by weight of the boat catch of Spanish mackerel is allowed.

Rationale: The 12-inch minimum size for Spanish mackerel would prevent the harvest of fish below the size required for optimum biological yield. A 12-inch Spanish mackerel is 0.5 years old and weighs approximately 0.5 pounds. Maximum yield per recruit is obtained with an average age at recruitment of 1.0 years, when fishing at $F_{0.1}$. Because age at recruitment is an average and not all fish in a year class become vulnerable at exactly the same age or size, fishing mortality must begin at a slightly younger and smaller size to obtain the required average.

Under the present conditions in the fishery, both the beneficial and negative impacts of this measure are relatively minor because the catch is small. The major benefit of this measure is to prevent the development of a large fishery for small fish. Such a development would have a negative impact on the total yield of the fishery and on the availability of the more desirable, larger fish. The State of Florida already imposes a 12-inch minimum size limit. Ninety-eight percent of the commercial catch and a large proportion of the recreational catch is currently caught in Florida. South Carolina also imposes a 12-inch minimum size. Texas has a commercial size limit of 14 inches total length which is comparable.

There appears to be little or no negative economic or social impact of these management measures. The desirability of fish smaller than 12 inches is much less. Sport fishermen generally prefer a larger fish. Such small fish are too small to fillet or cut into steaks, limiting their marketability. The meat yield is low limiting its food value to sport fishermen and other consumers. Fish this small are currently not caught to a significant extent in the commercial fishery. The five percent allowance of undersize fish prevents waste through the variance allowed since gill nets are not perfectly selective. Fish that are caught and which would not survive release may be retained within the five percent variance.

Alternative percentages for Measure B(2) were rejected because five percent was considered large enough to provide for any incidental harvest and small enough to discourage marketing of small fish.

There will be a slight negative impact on some recreational fishermen who will be prevented from catching smaller fish. This catch is not thought to be large; most occurs within state waters. Release mortality is not expected to be high since it is fairly easy to release Spanish mackerel in the recreational fishery. These fish would soon enter the fishery at legal size.

12.6.7.2 Cobia

Minimum size is 33 inches fork length or 37 inches total length.

Rationale: The 33-inch size limit for cobia supports and implements the chosen OY alternative. It protects the stock from recruitment overfishing, should stabilize the fishery at or near MSY and will increase the present total yield, average size and availability of large, trophy-class fish.

Although the majority of the stock(s) and total catch occur in the management area, there is some evidence that the extension of this measure into the waters off the mid-Atlantic states may have a beneficial effect on some populations of cobia. The Gulf and South Atlantic Fishery Management Councils will provide the Mid-Atlantic Council and the Secretary with the available data in order that the Mid-Atlantic Council can determine the suitability of this measure for their area of jurisdiction.

This measure would interfere with the current fishing activity of those now taking fish smaller than 33 inches. Because the cobia is primarily a sport fish and most sport fishermen desire a large fish when seeking cobia, the negative impacts on user groups of this measure are small. It appears that much of the small cobia are caught incidentally while seeking other species.

There will be some short-term loss of production to the commercial fishery, but potential yield will increase in the long term. This long-term increase in yield is estimated at between 13,000 and 41,600 pounds worth $8,150 over the next five (present value with ten percent discount factors).

This fishery is of the nature of a supplemental catch. The total value of commercial cobia landings has been less than $60,000 per year in the United States and most are believed to be larger than 33 inches. The landings are widely distributed between Texas and Virginia.

12.6.7.3 Size Limit Alternatives Considered and Rejected

Rejected Alternative 1

Provide a four (4) pound size limit for king mackerel for all fishermen both commercial and recreational.

Rationale: The four pound size limit corresponds to a 25-inch limit. This measure would prevent harvest of king mackerel below the size of a maximum economic yield. It was rejected because survival rate of released king mackerel by the average recreationalist would be low and because most recreational fishermen are nonselective in the size of fish they catch. In addition, the measure would have had a severe economic and social impact on the recreational sector in some areas since in some years in specific locations as much as 79.5 percent of the catch is less than 25 inches in fork length (northwest Florida in 1978, based on data supplied to Council by NMFS, Panama City Laboratory) this measure would be to virtually eliminate a very valuable fishery in that and other areas. The potential gain in total yield was not considered of great enough value at this time to offset the adverse impact on the recreational fishery.

Rejected Alternative 2

Prohibit purchase, sale, or processing for commercial use king mackerel under 25-inch fork length.

Rationale: This measure would have slightly increased the abundance of larger fish, slightly decreased commercial catch, and slightly increased the average price per pound. When proposed, this measure did not appear to have any significant negative impacts. Its major benefit was to prevent development of a large commercial effort directed at small fish.

Objections to this measure were raised at public hearings and during a National Marine Fisheries Service review of the plan. Public comment indicated that a bycatch of small king mackerel occurred in gill-net catches of Spanish mackerel and that this measure would cause unavoidable and at times substantial waste. This measure was rejected by NMFS because it discriminates against commercial fishermen when no similar restriction is placed on recreational fishermen who also have a large catch of small king mackerel.

The Councils rejected the measure for the above reasons. Further, they reasoned that if the catch of small fish needed to be reduced in the future, it could be accomplished through measure 12.6.1.1.

Rejected Alternative 3

No more than one king mackerel more than 50 inches fork length or 53 inches total length per person, per trip, may be retained in the Gulf of Mexico FCZ.

Rationale: This measure would limit the catch of large female fish found schooling off Louisiana in the winter. Less than one percent of the catch off Louisiana is larger than this size, however.

12.6.8 Gear Restrictions

12.6.8.1 King Mackerel Gill Nets

Minimum mesh size may not be less than 4-3/4 inches stretched measure. A bycatch of no more than ten percent king mackerel as compared by number with Spanish mackerel is allowed in smaller mesh net catches.

Rationale: This measure will slightly increase biological and economic yields of king mackerel, prevent recurrence of wasteful fishing practices, help reduce user group conflicts and increase the effectiveness of regulation by the State of Florida.

This measure will eliminate the recurrence of a wasteful fishing practice, the use of small mesh gill nets to take king mackerel. At times, particularly along the southeast Florida coast, gill-net fishermen have used small mesh gill nets designed to catch Spanish mackerel, in trying to catch king mackerel. During 1978 and 1979, an extremely intense conflict developed along the southeast coast between gill-net fishermen and hook and line fishermen. Much of this conflict concerned alleged loss or "drop-out" of king mackerel from gill nets. Subsequent testimony at several public hearings and research into the drop-out problem indicated that dropout from 4-3/4 inch stretch mesh nets was probably minimal but that significant waste had occurred when small mesh nets were used. To the degree that waste occurs with use of small mesh nets, this measure will increase the potential yield from the fishery.

Use of large mesh nets results in harvest of larger, more valuable fish. Freezer processors are the major market for gill-net catches. These processors report that smaller fish are less desirable and that large catches of small fish would result in lower exvessel prices. The size distribution of catches made with 4-3/4 inch stretch mesh results in the optimal marketable product.

Trial and error experimentation by commercial fishermen indicates that the 4-3/4 inch mesh size is the optimal mesh size for maximum average catches out of the average size distribution in fish schools on which the nets are normally set. Only when set on schools of fish which are primarily smaller than 25 inches fork length will this mesh size be inefficient. During the normal fishery, schools of such small fish are uncommon.

This measure will aid the State of Florida's enforcement of its identical regulation, reducing enforcement costs to the state and improving effectiveness of that enforcement.

12.6.8.2 Purse Seines for King and Spanish Mackerel

Owners or operators must:

1. Notify the Regional Director in writing of intent to fish for king or Spanish mackerel 30 days in advance of fishing year and include number of vessels and area to be fished, and

2. Notify Center Director 48 hours in advance of trip, and

3. Report catch to Center Director, and

4. Accommodate observers for scientific and statistical purposes for the first three years of plan operation, and

5. Possess a commercial quota permit, if required, to fish on that migratory group.

See Section 12.6.3.6 for allocation and rationale for purse seines.

The Councils have provided an allocation with observers required for the first three years of the plan in order to evaluate the effect of the use of purse seines in this fishery. The procedures outlined assure availability of observers for purse seine vessels as needed.

12.6.8.3 Alternatives for Gear Regulation Considered and Rejected

Rejected Alternative 1

Other minimum mesh sizes for king mackerel gill nets.

Rationale: Alternative mesh sizes were considered and rejected because (1) there was no reason to believe that any mesh sizes, either slightly larger or slightly smaller than 4-3/4 inches would be more beneficial than the proposed mesh; (2) a mesh size smaller than 4-3/4 inches would conflict with Florida law causing difficulties in enforcement for both state and federal agencies; (3) the proposed mesh size is consistent with advice of the Advisory Panel, review by the Scientific and Statistical Committee, and present fishing practices in the industry; and (4) an increase in the minimum mesh size would adversely affect the industry by forcing many operators to purchase new nets.

Rejected Alternative 2

No minimum mesh size for king mackerel gill nets.

Rationale: It may be argued that no regulation is needed, that the fishery will police itself. This argument is patently false in open access fisheries such as this one. Competition and economic pressure often force fishermen into inefficient fishing practices or practices which are detrimental to the stock even though many fishermen may realize the long-term negative aspects of their activities. The use of small mesh nets to catch king mackerel on the east coast of Florida is a prime example. It has been well established by trial and error of other fishermen since the early 1960s that large mesh nets (approximately 4-3/4 inches) result in the best and most efficient harvest of king mackerel. On the southeast coast of Florida small mesh nets were used by fishermen who did not yet have large mesh nets, many fishermen knowing that small mesh nets were less efficient. Less than optimum catches and waste through drop-out were the result.

Rejected Alternative 3

Restrict the use of spotter aircraft in the king mackerel fishery.

Rationale: This measure would reduce the efficiency of fishing effort of a particular user group. Spotter aircraft are used predominantly by large boat gillnetters and by a small percentage of hook and line boats. These actions may make more fish available for other user groups.

This measure was rejected because it would reduce economic efficiency, and increase the variability of the catch. This would adversely affect the economic returns of the user groups being restricted, and cause interruptions in the supplies of fish to consumers. Since catch limits are provided to prevent exceeding MSY, the use of spotter planes will not lead to overfishing.

Rejected Alternative 4

Restrict the number of lines and hooks used in the king mackerel fishery.

Rationale: This measure would also reduce the efficiency of fishing effort for a particular group. It was rejected because of the adverse economic effect on the user group being restricted and possibly reduced supply to traditional consumers. It was not considered to be necessary because of catch limitations to prevent exceeding MSY.

Rejected Alternative 5

Use of purse seines to harvest king or Spanish mackerel in the area of jurisdiction of the South Atlantic Council shall be prohibited except for specified research.

Rationale: The South Atlantic Council proposed this measure because of its belief that use of purse seines would be detrimental to the fishery and that its use should be prohibited until research showed that it could be used safely.

The measure was disapproved by the Secretary of Commerce for the following reasons. There was not enough information in the plan to demonstrate that purse seines would be harmful to the fishery and that total prohibition was necessary and appropriate. The measure appears to violate National Standard 2, which specifies that regulations be based on the best scientific information available. The measure restricts purse seines more severely in the South Atlantic than in the Gulf, without developing a reason for the difference. This violates National Standard 3. The total prohibition of purse seines was considered an allocation of fishing privilege to users of other gear. With no conservation or other rationale given, this violates National Standard 4. Finally, a total prohibition without clear reasons violates National Standard 5 which requires efficient utilization where practicable.

The South Atlantic Council was unable to develop sufficient reasons to answer the objections of the Secretary of Commerce, and rejected the measure in favor of measures allowing limited use.

12.6.9 Measures to Resolve User Conflict

12.6.9.1 Procedure for Regulatory Amendment

To resolve user or gear conflicts for king and Spanish mackerel the Secretary of Commerce, after consultation with the affected Councils and states, may by regulatory amendment:

1. When conflict arises from expansion of a historical fishery in a traditional fishing area, the Secretary may separate users or gear by area or time, assign local quotas based on historic catch, or limit use of gear.

2. When conflict arises from introduction of gear into nontraditional fishing areas, the Secretary may prohibit use of the gear, allow limited use for evaluation, limit number of units in conflict area, or allow unrestricted use of gear.

3. When conflict arises as a result of circumstances in the fishery other than as described in (1) or (2) above, the Secretary may implement the measures described above or take other appropriate action to resolve the conflict in a manner consistent with the goals and objectives of the plan, National Standards, MFCMA, and other applicable law.

Rationale: In the mackerel fishery there is a long history of conflict between users of net gear and of hook and line gear. Because of the seasonal nature of the fishery, direct conflicts are usually of short duration, one to eight weeks per year, and may reoccur in the same area each year. Because of the mobility of the gill-net fleet and the migratory habits of the fish, these conflicts may arise suddenly, with little warning. As effort by all groups increases and commercial gear technology continues to improve, expanding the fishable area available to net gears, the potential for conflicts

increases. It is expected that such conflicts will further intensify in the future and spread to areas where no direct conflict exists today.

These measures are designed to enable the Council to address gear and user group conflicts as quickly as possible through the use of the regulatory amendment process. They delegate authority from the Council to the Secretary of Commerce to address such conflicts. The delegation of authority is limited by certain fixed guidelines. In practice, the Regional Director of the Southeast Region of the National Marine Fisheries Service acts as designee for the Secretary in implementing this measure.

It is intended that any action taken by the Regional Director will be based on consultation with and recommendation by the Councils. Should the action (or nonaction) of the Regional Director be unacceptable to the Council, the plan amendment process can be started.

If action is needed, the Regional Director, after consultation with the Councils, will issue proposed regulations. If significant, an Environmental Impact Statement and Regulatory Analysis will be prepared. Public hearings will be held to allow full public review before final regulations are issued. The entire process requires a minimum of 90 days but is expected to require more time under normal circumstances. Because mackerel fisheries are highly seasonal, it is likely that a regulatory amendment could not be implemented until the fishing season one year after a conflict develops. In some cases, where conflicts are particularly intense, regulations will be needed very quickly. At such times the Councils expect that emergency implementation of a regulatory amendment will be necessary. This will reduce the required implementation time to less than 30 days.

12.6.9.2 Procedure for Regulation By Notice in the Federal Register

To resolve user or gear conflicts for king mackerel in the area off southeast Florida between 27°0.6'N latitude in the vicinity of Fort Pierce the Secretary, after consultation with Council Chairmen and State officials, may by notice in the Federal Register establish fishing windows to separate gillnet and hook and line fishermen by area or time. He may close the area to fishing for king mackerel to all fishermen if the conflict results in death, serious bodily injury, or significant gear loss.

Procedures for evaluating the existence of a conflict:

1. The following procedures must be employed by the Regional Director in his decision process regarding the existence of a conflict for which a notice is appropriate and prior to the implementation of such a notice.

   (a) At such time as the Regional Director is advised by any party that a conflict exists, he must confirm the existence of such a conflict through information supplied him by NMFS, U.S. Coast Guard or other appropriate law enforcement agencies.

   (b) In the event that such information is not ascertainable from those law enforcement personnel as provided in (a) above, such confirmation may be made through information supplied by personnel of the state agency with marine fishery management responsibility.

   (c) Confer with the Chairmen of the affected Councils, the office of the state agency(s) with the marine fishery management responsibility, and such other persons as the Regional Director deems appropriate, if any.

2. When the Regional Director, Southeast Region, NMFS, determines, based on reliable information, that a conflict, as described in FMP Section 8.2.6, exists or is about to exist, he will take one of the following actions by notice. The time period during which such restrictions shall be enforced will be determined by length of time a direct conflict exists or is expected to exist.

(1) Establish a fishing window within the following points: (see Exhibit 12-4)

(a) Bethel Shoal light (27° 44.3'N, 80° 10.4'W).

(b) A wreck 15 miles southeast of Fort Pierce inlet (27° 23.5'N, 80° 3.7'W).

(c) Marker WR 16, five miles northeast of Jupiter inlet (27° 0.6'N, 80° 2.0'W).

(d) 100 fm depth due east of point c (27° 0.6'N, 79° 55.0'W).

(e) 100 fm depth due east of point b (27° 23.5'N, 79° 54.0'W).

(f) 100 fm depth due east of point a (27° 44.3'N, 79° 53.5'W).

The Regional Director may prohibit use of gill-net gear to take king mackerel within the area a-b-e-f, b-c-d-e or a-c-d-f. If additional action is needed, prohibit use of hook and line gear to take king mackerel within a window landward of a line between the points a-b, b-c or a-c.

(2) Establish two fishing zones seaward (east) of state jurisdiction. These zones shall be the waters of the FCZ between 27° 10' north latitude and 27° 50' north latitude divided into two areas along the line of 27° 30' north latitude.

(a) In the first year in which a conflict arises, the use of gill nets for taking of king mackerel shall be prohibited in the area south of 27° 30' north latitude and use of hook and line gear for taking of king mackerel shall be prohibited in the area north of 27° 30' north latitude. In any succeeding year when a conflict develops, the area in which each gear is prohibited may be changed.

(b) When a conflict arises, use of each gear within the zone between 27° 10'N and 27° 50'N may be alternated daily.

(i) On even days of the month, use of gill-net gear to take king mackerel may be prohibited.

(ii) On odd days of the month, use of hook and line gear to take king mackerel may be prohibited.

(c) Close the fishery for king mackerel to all users within the zone between 27° 10'N and 27° 50'N. This measure shall only be imposed if the conflict results in:

(i) Death or serious bodily injury.

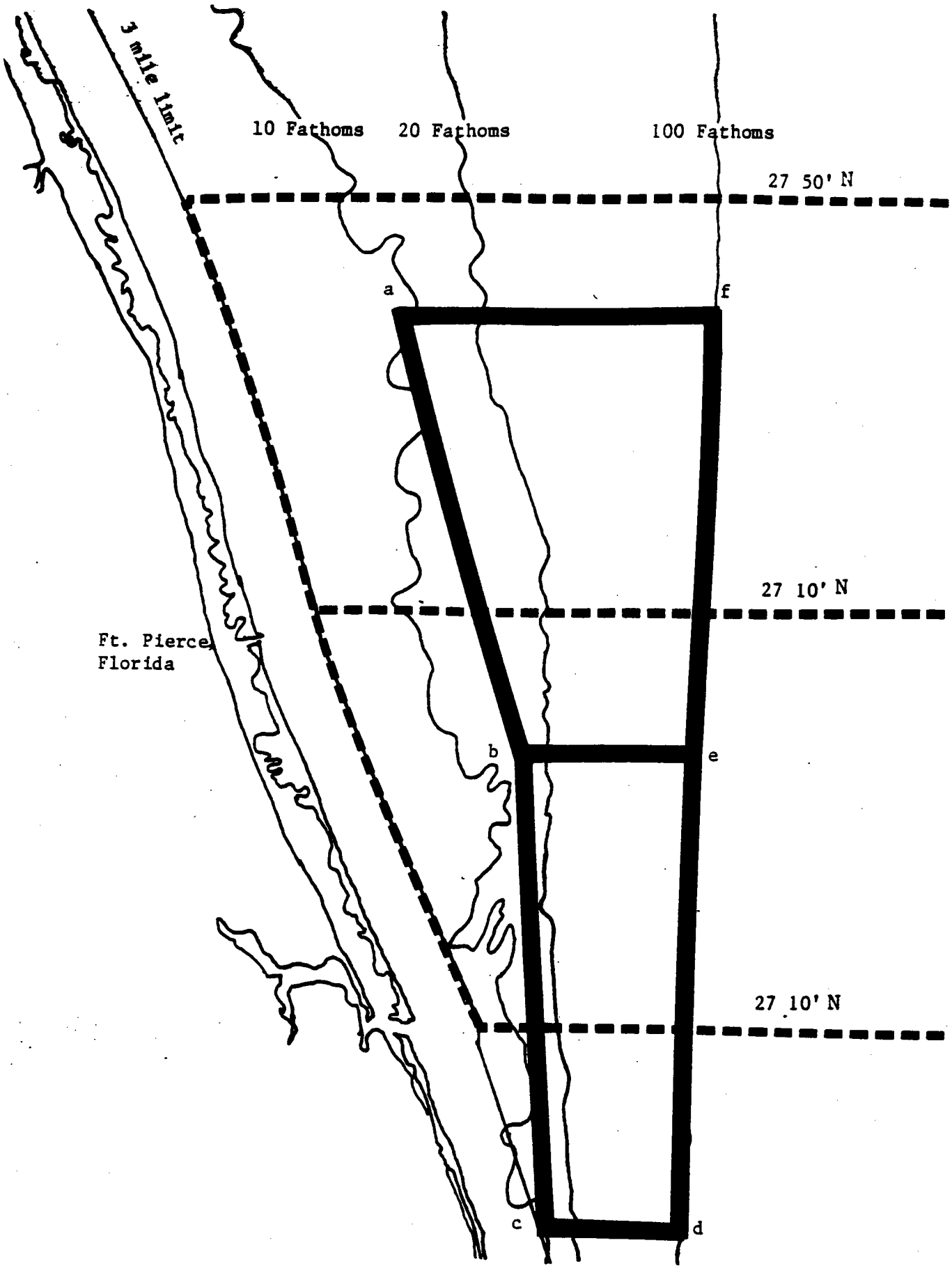
(ii) Significant gear loss.

3. <u>Restrictions on Regulation By Notice in the Federal Register</u>

(a) No regulation by <u>Federal Register</u> notice may be implemented which results in the exclusive access of any user group or gear type to the fishery during the time the field order is in existence.

(b) A regulation by <u>Federal Register</u> notice may be rescinded by the Regional Director if he finds through application of the same procedures set forth in (1) above that the conflict no longer exists.

Exhibit 12-4 - Area divisions possible under king mackerel Measure B.



(c) No regulation by Federal Register notice may be implemented for a time period greater than five (5) days except under the conditions set forth in Section (e) below.

(d) At such time as the Regional Director submits to the Federal Register a regulation for implementation under these provisions, he shall immediately arrange for a fact-finding meeting in the area of the conflict to be convened no later than 72 hours from the time of implementation of the field order. The following shall be advised of such fact-finding meeting:

(1) The Chairmen of the affected Councils;

(2) The office of the state agency with fishery management responsibility;

(3) Local media;

(4) Such user group representatives or organizations as may be appropriate and practicable;

(5) Others as deemed appropriate by the Regional Director or as requested by Chairmen of the affected Councils or the state agency.

This fact-finding meeting shall be for the purpose of evaluating the following:

(1) The existence of a conflict needing resolution by the field order;

(2) The appropriate term of the field order, i.e., either greater or less than five (5) days;

(3) Other possible solutions to the conflict other than federal intervention;

(4) Other relevant matters.

(e) In the event it is determined as a result of the fact-finding meeting that the term of the regulation should exceed five (5) days, the Regional Director may, after consultation with the Chairmen of the affected Councils and the involved state agency, extend such field order for a period not to exceed 30 days from the date of initial implementation. In the event the Regional Director determines that it is necessary or appropriate for the term of such regulation to extend beyond 30 days, such extension may be made after consultation with the Chairmen of the affected Councils and for such period of time as necessary and appropriate to resolve the conflict.

Rationale: This measure addresses an existing conflict (see Section 8.2.6) by separating groups of fishermen who use different gears. This will reduce the severe social and economic conflicts which have occurred in this fishery in recent years.

The measure offers considerable flexibility in response to this gear conflict. If, after the plan is implemented, little or no active conflict exists, no action need be taken. If an active conflict again develops, several options are available. The most appropriate can be implemented by notice in the Federal Register within a very short time period. The procedures for evaluating the existence of a conflict ensure that no unnecessary action will be taken. Rapid public review, through the required fact-finding meeting, will ensure that the most appropriate action had been taken. This is particularly important if the fishery is totally closed. In that case the fact-finding meeting can then be used as the basis to choose a less restrictive solution to the conflict.

Option (1) would establish an inshore, offshore division of the users. Several alternatives for closed areas are provided to ensure that a viable solution is available which affects the least possible area. The division corresponds to a natural and traditional separation of fishing grounds.

Hook and line fishermen normally fish over rocky reef areas, most of which are enclosed within points a-c-d-f. Net fishermen more often fish over smooth bottom, most of which is located inshore of a line between points a-b-c. Nets can only be used over rocky areas when wind and currents are unusually calm.

Options (2)(a) and (2)(b) would establish a north/south division of fishing grounds. Within a designated zone, fish schooling at any depth or over any type of bottom would be available to the designated gear. This measure is equally restrictive to both user groups. Neither group is permanently restricted from any area. The average availability and catch of each user group is not expected to be affected, although short-term fluctuations may be intensified. King mackerel are present in both areas every year, but the area of greatest concentration and best catch per unit effort may shift from year to year. Shifting availability may be advantageous or disadvantageous to either group in the short term, but each group shares an equal risk.

Option (2)(c) provides for total closure of the fishery in cases of extreme conflict. This measure can be used as a cooling-off period. Rapid public review through the required fact-finding meeting can result in a less restrictive field order within a very short period of time.

The area affected is a major fishing zone. It lies off the coast of two counties, St. Lucie and Indian River. For the period 1972-1977, an average of 17 percent of the total annual U.S. commercial harvest was landed in those counties during the affected time period.

Approximately 200 of the estimated 300 hook and line vessels in the fishery are based in these two counties and fish primarily in the affected area. A significant, but unknown number of vessels from other areas also fish in the area. The number of commercial hook and line fishermen affected is estimated at 320 or more.

The number of large power roller gill-net vessels based in the area is unknown. Because of the high mobility of the gill-net fleet, all of the vessels in Florida could be expected to fish this area at some time. In most years, approximately 30 vessels or less are present. The number of fishermen affected is estimated at 120.

The number of private recreational or charterboat fishermen who might be affected by this measure is unknown.

Efficiency of both gears will be increased by separation. At present the setting of gill nets is sometimes delayed or prevented by the presence of hook and line fishermen over schools of king mackerel. Conversely, many fishermen allege that the setting of gill nets on a school of fish which have congregated over a given spot disperses that school and makes the fish less available to hook and line fishermen.

12.6.9.3 Alternatives to Resolve User Conflicts Considered and Rejected

Rejected Alternative 1

When a conflict results in repeated acts of violence, the Secretary shall aid in the prosecution of the perpetrators of the violence, and shall implement as a temporary emergency measure one or more of the options under Section 12.6.9. Said temporary emergency measure shall remain in effect no more than 45 days (or 90 days).

Rationale: This measure was orginally part of the recommended measures for resolving gear and user group conflicts. It was felt to be unnecessary.

Rejected Alternative 2

In the areas of Brevard, Indian River, St. Lucie, Martin and Palm Beach Counties of Florida, dense concentrations of incompatible gears, particularly commercial hook and line gear and gill-net gear, cause inefficiency in the use of both of these gears. Therefore, optimum use of the resource is not achieved. In order to achieve optimum use, the following gear restrictions are proposed. The following is to be in effect from April 1st to April 15th, in the FCZ off of Brevard, Indian River, St. Lucie, Martin and Palm Beach Counties of Florida:

> That commercial net boats be prohibited from fishing for king mackerel in a water depth of more than 60 feet, but less than 110 feet.
>
> That commercial hook and line boats be prohibited from fishing for king mackerel in a water depth of less than 50 feet. Charter and recreational fishermen are specifically excluded from this restriction.
>
> That in the overlapping zone where both groups are allowed equal fishing rights, commercial hook and line, charter or recreational boats are required to maintain a reasonable and proper distance from gill-net boats in the process of fishing and that gill-net boats maintain a reasonable and proper distance from commercial hook and line, charter or recreational boats engaged in trolling over a body of king mackerel so as not to disrupt the fishing activities of the hook and line boats by setting nets in the area where troll boats are engaged in fishing.

Rationale: This measure would separate two groups of commercial mackerel fishermen to avoid gear conflicts. The separation is by depth and time. This measure was not proposed because (1) there are overlapping zones in which fishing can take place by both gear types; and (2) the length of the separation in time, although at the peak of the season, is not long enough to allow for different availabilities of mackerel year to year. Because of these factors enforcement would be difficult, conflicts may still occur, and efficient use of both gear may be inhibited. Measure B was adopted as a more flexible alternative. The positive aspects of this measure were incorporated into Section 1 of Measure B.

Rejected Alternative 3

Establish seasonal net free zones in the FCZ off the east coast of Florida in coordination with a closure of portions of Florida's territorial waters. The closures proposed by the Florida Marine Fisheries Commission (FMFC) would be located near Key West and Fort Pierce from January 1st through March 31st. This measure was included for public discussion at the request of FMFC.

Rationale: FMFC had requested consideration of a net free zone in the FCZ three miles seaward of a line drawn between Satan Shoal and Coalbin Rock (Exhibit 12-5). According to FMFC this area was traditionally used only by hook and line fishermen prior to 1978, and there are other areas nearby favored by net fishermen which would remain open including No Man's Land, Smith Shoal, and Boca Grande Channel.

The area proposed for closure by FMFC off Fort Pierce is between Loran Coordinate lines 43450 and 43220 and would extend offshore into the FCZ to the 100 fathom isobath (Exhibit 12-6). The area is presently fished by both hook and line and net fishermen. Net fishermen, however, did not fish the offshore portion prior to 1978.

FMFC proposed to resolve gear conflict and by conducting studies in the areas determine whether net fishing can affect availability of fish locally by reducing abundance, disrupting schools, or changing habits of the fish. In addition, the stock assessment indicates overfishing of the Gulf group, to be

possibly severe. If king mackerel segregate into local populations, FMFC suggested some additional restriction on netting to protect some of the local population is justified as a biologically conservative approach to a stressed resource.

FMFC believes that these netting restrictions are prudent to maintain a balance between hook and line and net fishermen within its proposed quota of 2.9 million pounds for the commercial harvest of the Gulf group.

The Councils rejected the proposal because the commercial fishery is to be limited to an annual quota and because the plan already provides measures to resolve gear conflict off Ft. Pierce.

12.6.10 Statistical Reporting Measures

A. The Councils conceptually accept a landings survey system and creel census data system that would provide sufficient information for fishery management. Sample frequency, rates and mechanics of the system are to be developed by National Marine Fisheries Service for approval by the Councils.

B. Require a reporting system for all user groups and processors based on statistical sampling whereby it would be mandatory for a selected respondent to provide answers to the sampling questionnaire on a recurring basis that is not of great frequency.

One of the major problems in this fishery is lack of data needed to estimate MSY and monitor the proposed user group allocations. This greatly increases the risk of overfishing. The present data collection system is inadequate to provide the information required for this FMP. The above measures have been carefully considered in order to minimize costs and burdens on respondents, while obtaining the necessary information. This is achieved using a statistical sampling, rather than a complete census approach. Also, the statistical reporting system specified in this plan will be integrated with those for all plans in the respective Council areas in order to achieve efficiency and standardization.

Reporting Measure A provides a method of obtaining both commercial and recreational catch and effort. Statistical surveys by mail and/or telephone will delineate the statistical universe of users and gather data on participation rate and economic characteristics. Creel census samples will be used to obtain data on recreational catch rate combined with data obtained from commercial producers to estimate total catch and effort.

This measure is required to provide the data needed to implement the proposed allocation system for the recreational sector and to develop catch and effort data needed for MSY determination. This system is considered to be the most cost effective way to provide that data with the least imposition and cost to the users of the resource. Impacts on the users would be limited to the amount of time required to answer the required questions and would be imposed on only a small sample of the users.

The system is still in the process of development and there is little information available on required sample sizes or survey costs. Costs to the government cannot be accurately estimated at this time, although they are expected to be substantial. Costs are tentatively estimated at approximately $80,825 to $81,859 for all coastal pelagic species. Because this system is used for all plans in the Gulf and South Atlantic, the costs per management plan are expected to be small in relation to the value of the fishery.

The proposed measure has cost advantages over other systems. Relying entirely on a creel census system would be accurate but would be prohibitively expensive. Statistical surveys by phone or mail of the entire population of the southeast is expensive and has proven to be highly inaccurate.

Combining statistical surveys with a creel census will reduce the required creel census sample. Therefore, the costs of obtaining catch per unit effort and total catch data will be greatly reduced.

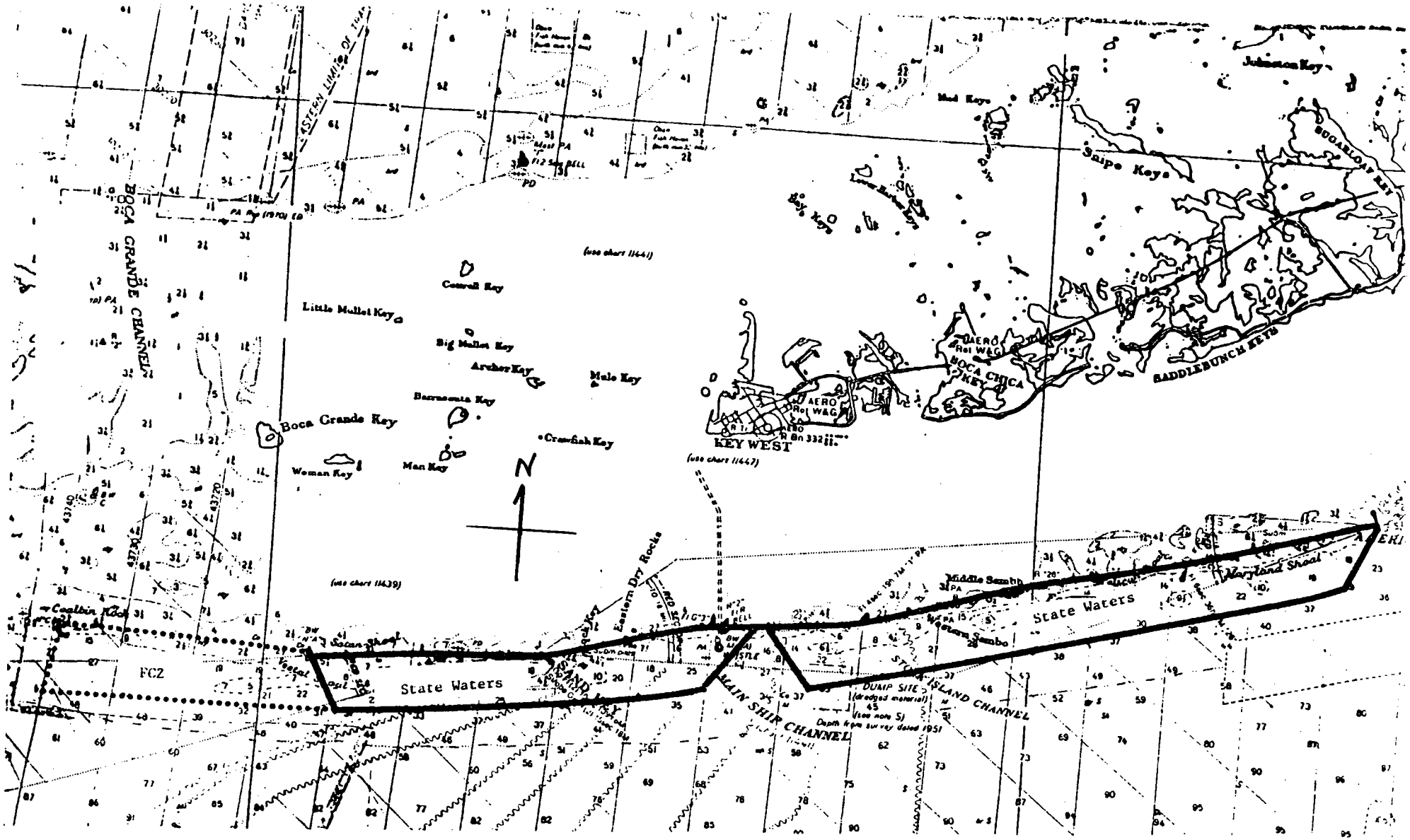


Exhibit 12-5

Net Free Zones Proposed by
Florida Marine Fisheries Commission

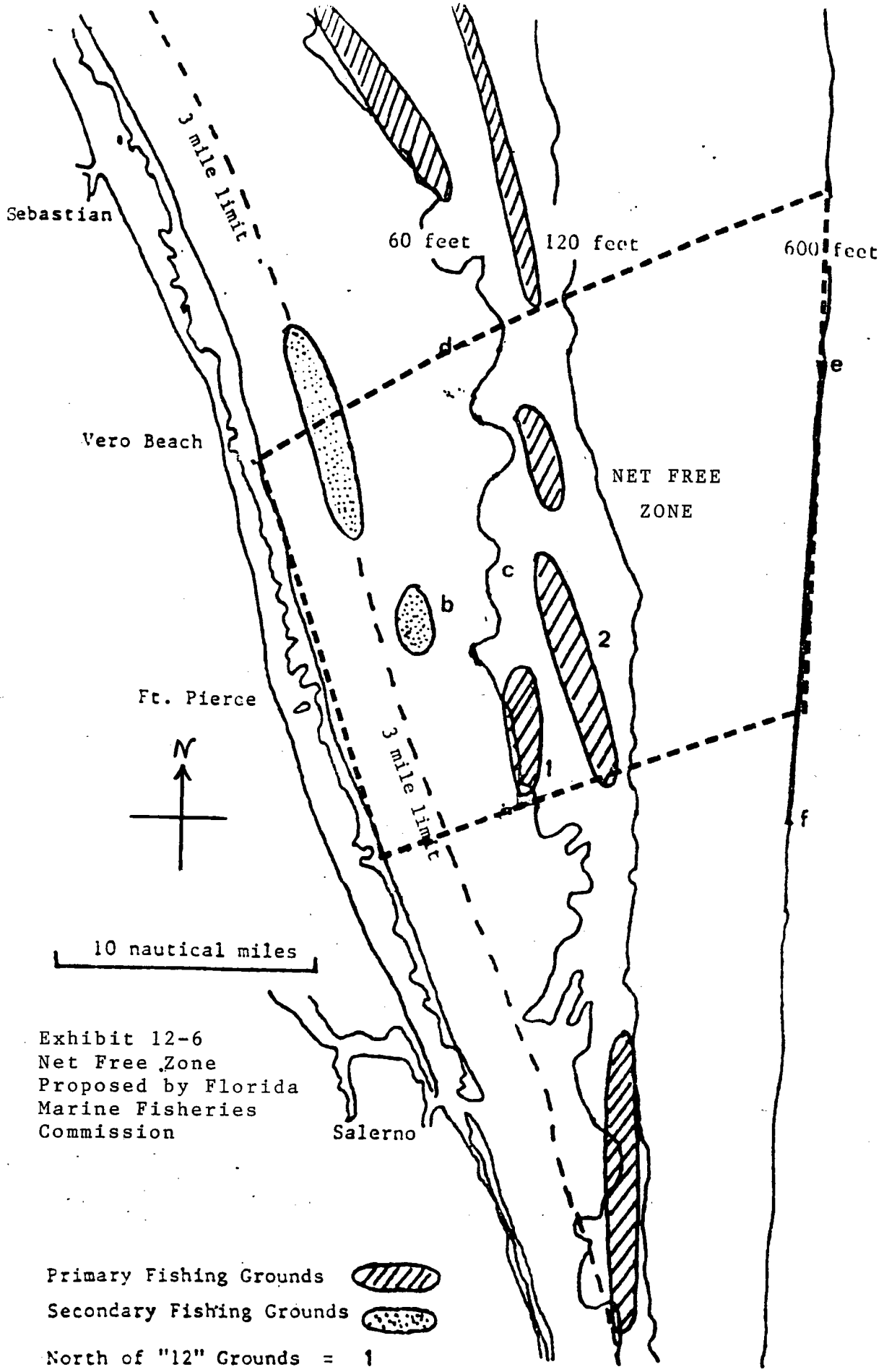


Exhibit 12-6
Net Free Zone
Proposed by Florida
Marine Fisheries
Commission

Reporting Measure B supports Measure A by requiring a reply from those persons selected for the survey. It also includes processors in the mandatory reporting requirement for that information deemed necessary by NMFS. This information is already being collected on a voluntary basis, but some processors do not report at present. Costs of this measure are included in Measure A.

12.6.11 Rejected Statistical Reporting Measures

C. Permits for all users for statistical purposes only.

This measure was considered and rejected because it was unnecessarily burdensome on vessel owners.

D. For Spanish mackerel - A mandatory trip ticket system for all charter and headboat operators.

This measure was considered and rejected as not cost effective. Sufficient information can be obtained from a sample of operators.

E. Require commercial fishermen to report catch and effort using trip tickets.

Rationale: This measure would greatly improve measures of total catch and fishing effort needed to monitor the fishery. It was rejected because funding required to implement the system is not available. The National Marine Fisheries Service is developing a unified approach to data collection in the Southeast Region which will attempt to collect the required data at a lower cost. Approved Measures A and B are consistent with this approach.

F. (1) Require logbook reporting of king mackerel for all charter and headboat operators.

(2) Require logbook reporting of Spanish mackerel for a statistical sample of charter and headboat operators. The sample shall be limited to the minimum necessary for management needs.

Rationale: This measure would provide precise measure of catch and effort and catch per unit effort for a significant portion of the recreational fishery. It was rejected because (1) funding may not be available and (2) it is discriminatory to one user group.

12.7 Trade-offs Between the Beneficial and Adverse Impacts of the Preferred or Optimal Management Options

Optimum yield was selected by trading off unlimited access to the resource to protect against overfishing. The selected management regime is intended to restore depleted stocks and achieve MSY levels. The preferred management options represent the trade-offs involved in minimizing the adverse impacts on any one user group.

The 22 percent reduction in catch from the Gulf king mackerel migratory group is proposed as a short-term trade off to provide long term stability and higher yields.

13.0 REVENUES FROM THE FISHERY AND MANAGEMENT COSTS

13.1 Revenues

The major impact of proposed management in this plan are benefits to be derived from restoration of the king mackerel Gulf migratory group to produce MSY. Various alternatives were considered in Section 12 and are evaluated by Poffenberger and Powers (1984).

The proposed action of reducing catch by 22 percent to restore the king mackerel stock in about three years would over a ten-year period produce 127.8 million pounds valued at no less than $124 million. This presumes a discount rate of five percent and places equal value ($0.97 per pound) on both recreational and commercial catch. This is a very conservative value for the recreational catch of 89.1 million pounds over the period.

Following discussions at the Councils' Scientific and Statistical Committee meeting, further discount calculations were performed using three percent. Rates of five and ten percent were used in Poffenberger and Powers (1984) and because of the physical nature of landings, it was argued that a rate closer to the real rate of return (i.e. a rate that does not include compensation for inflation) should be used. A discount rate of three percent was used in the South Atlantic Snapper-Grouper FMP. The results from a three percent discount rate show that the Councils' management option of 22 percent reduction in catch would be anticipated to have a larger present value than the other alternatives considered in the FMP. The relative PVs for three percent for the four alternatives are listed below.

Sensitivity analysis of present values for king mackerel catches (millions of pounds) resulting from management strategies as calculated by Poffenberger (personal communication) using 20-year time span at 3 percent discount rate with a 32-68 percent catch allocation between commercial and recreational fishermen:

Council Choice	One-year Moratorium	Phased Reduction	Status Quo
342.5 M	342.0 M	340.6 M	248.6 M

The relative values of the numbers are close in all options. These will shift with different time horizons, however.

Without remedial action, the Gulf king mackerel stock can be expected to decline further to 65 to 70 percent of MSY for an annual yield of something less than 12 million pounds.

Annual permits issued to fish for Gulf group king mackerel under commercial quota are expected to be about 600 in number. Cost not to exceed administrative costs would be under $10 each.

Poffenberger and Powers (1984) summarize the effects of the proposed regulations as follows:

Commercial Fishery (Gulf Group)

- exvessel prices would increase on the average approximately $0.02 per pound due to the decrease in landings resulting from a 4.2 million pound quota; no measurable price increase would be anticipated from a 4.5 million pound quota.

- the geographical boundaries, Monroe/Collier (Florida) county line for the winter fishery and the Florida/Georgia state line for the summer fishery, would reduce the potential catch of king mackerel in the Gulf group (which ranges from Texas to the respective summer or winter boundary), by approximately 240 pounds in relation to other alternatives for these boundaries.

- the seasonal boundaries, April 1st through October 31st for the summer fishery and November 1st through March 31st for the winter fishery, would increase the potential king mackerel catch an average of 525,000 pounds annually in relation to other alternatives for the seasonal boundaries.

- the twelve-month fishing (or quota) year begins July 1st and ends June 30th, which places most of the effects of the quota on hook and line fishermen on the east coast of Florida during March.

Recreational Fishery (two fish per angler, per trip - charters have option of three excluding captain and crew)

- available data are inadequate to estimate the effects on the demand for recreational fishing.

- permit system forces fishermen to choose between the commercial quota and a bag limit; charter boat operators who fish in the Gulf of Mexico are anticipated to be the most severely affected by this system.

13.2 Costs Likely to be Incurred in Management

13.2.1 Plan Development

The cost of development of this amendment includes expenses and salaries of Councils and staffs, and costs for meetings of Advisory Panels and Scientific and Statistical Committees for review. Also included are printing costs and expenses for public hearings. Total cost is approximately $95,000. NMFS costs would add $30,000 for a total of $125,000.

13.2.2 Data Collection and Monitoring

NMFS estimates its data collection and monitoring costs for this management unit to be $76,750 per year and costs for the states to be about $52,000.

13.2.3 Enforcement Costs

Enforcement costs for the original FMP were estimated to be $294,000. Additional costs for enforcing the amended FMP are estimated to be $40,000 per year if states adopt compatible regulations. If they do not, costs are estimated to be about $64,000.

14.0 SPECIFICATION AND SOURCE OF PERTINENT FISHERY DATA

14.1 General

Certain key data are vital to effective fishery management. Better statistics on catch and effort are needed to provide more precise management information for the coastal pelagic fishery. The type of data specified in this plan to be required from the public has been carefully considered to minimize the burden on respondents while obtaining the necessary information. This will be achieved by using statistical sampling where practical, rather than a complete census approach. Also, the statistical reporting system specified in this plan will be integrated with those for all plans in the respective Council areas in order to achieve efficiency and standardization. The required data elements have been carefully considered so as to require only those for which there is a critical need. In addition to statistical data collection, areas of needed research have been specified in order to encourage appropriate groups to undertake efforts to improve the information base for effectively managing the fishery.

14.2 Domestic and Foreign Harvesters

Reporting requirements for domestic fishermen are discussed in Section 12.6.10.

In addition to the above data reporting provisions, the Councils have recommended that the National Marine Fisheries Service provide the Councils with a draft logbook for distribution to the coastal migratory pelagic recreational fishermen that could be filed on a voluntary basis.

There are currently no foreign fishermen participating in the fishery except for an inconsequential incidental catch. No TALFF (total allowable level of foreign fishing) will be available under this plan. However, foreign fishermen taking species in the managment unit as a bycatch must cooperate in reporting the amount of such catch.

14.3 Processors

Processors are required to report under the provisions in Section 12.6.10. Such reporting will include the duty to cooperate in gathering commercial catch and trip ticket data for those who purchase directly from fishermen.

14.4 Areas of Research Needed to Improve the Management Information Base

Effective management of the coastal migratory pelagic resources will be fostered as improved research information becomes available. The Councils have recommended:

A. That the research needs as they apply to king mackerel be instituted according to the following priority order:

   1. Provide better estimates of recruitment, natural mortality, fishing mortality and standing stock for king mackerel. Information is needed on mortality resulting from the bycatch of king mackerel in the Spanish mackerel fishery. Specific information should include an estimate of total amount caught and distribution of catch by area, season and type of gear. Determining the catch in gill-net gear should be given first priority.

   2. Determine the number of separate stocks of king mackerel, their seasonal distribution and migration patterns and the distribution of fishing effort between stocks.

3. Determine size distribution of the catch by area.

4. Determine the effect of purse seine use on king mackerel stocks. Research should include size distribution of the catch, bycatch of other species, catch per unit effort, ability of fishermen to determine the size and species composition of the catch prior to pursing the net, and ability to release a school unharmed.

5. Conduct migration studies to determine normal king mackerel migration routes, variations in these routes, and the climatic or other factors responsible for these variations.

6. Determine the relation between migration of prey species (i.e., herring), and the migrations of king mackerel.

7. Assess the extent and effect of gill-net fallout.

B. That the research needs as they apply to the Spanish mackerel stock be instituted according to the following priority order:

1. Provide better estimates of recruitment, natural mortality rates, fishing mortality rates, and standing stock.

2. Determine the number of separate stocks, their seasonal distribution, migration patterns and the distribution of fishing effort between stocks.

3. Determine the effect of purse seine use on Spanish mackerel stocks. Research should include size distribution of the catch, bycatch of other species, catch per unit effort, ability of fishermen to determine the size and species composition of the catch prior to pursing the net, and ability to release a school unharmed.

4. Conduct migration studies to determine normal and changes in coastal migratory pelagic migration routes and the climatic or other factors responsible for changes in the environmental and habitat conditions which may affect the habitat and availability of stocks.

5. Assess the extent and effect of gill-net fallout.

6. Determine the relation between migration of prey species (i.e., herring), and the migration pattern of the stock.

Better estimates of recruitment, natural mortality, fishing mortality, and size of standing stocks are important to provide more precise esimates of MSY. Knowledge of king mackerel bycatch in the Spanish mackerel fishery is needed because of the possibility that this bycatch may be large enough to adversely affect the directed king mackerel fishery. Determining the number and characteristics of separate stocks (if any) of king and Spanish mackerel is important because of the possibility that separate stocks exist and that some stocks may be fished more heavily than others. Size distribution of the catch and any differences by area will be very important if the Councils consider size limits on king mackerel as a method to limit total harvest. This may require a long-term, on-going sampling program. Migration studies are needed because questions have arisen as to the reasons for king and Spanish mackerel not being as abundant in certain areas during certain years. In particular, fishermen have pointed out that king mackerel became less and less abundant during 1976, 1977, and 1978 in areas of the northern Gulf of Mexico. A better understanding of the cyclic nature of king and Spanish mackerel migrations and the possible relationship to migration of prey species would greatly contribute to their effective management. Research on the extent and effect of gill-net fallout is needed to resolve questions which have been raised as to the number of fish killed but not harvested during

gillnetting operations and the effect that this has on the status of the stocks. A research project on this topic has been initiated for king mackerel.

14.5 Specific Research Requirements for the Amendment to Coastal Migratory Pelagic FMP

Amendment of the plan has provided the flexibility for annual assessments of stock size and condition and for annual implementation of the management measures needed to assure that the stocks are maintained near a MSY level. In order to manage the fishery under this provision of the plan, specific scientific information will be required. This section delineates these data collection and research requirements. Initially, emphasis on research and data collection should be directed toward providing information for management of king and Spanish mackerel stocks, but eventually similar information will be required for other species managed under the plan.

14.5.1 Stock Assessment Requirements

14.5.1.1 Catch and Effort Information

In order to improve upon or modify MSY estimates and other stock assessment parameters, a time series of catch and effort statistics is required on a timely and continuous basis. Most of these data are currently being collected, but the timeliness of data availability must be improved and more specific analyses of the data collected will be required. Other required data elements will necessitate changes in data collection programs or new programs. The data requirements are as follows:

A. Total Commercial Catch and Landings Statistics by Area and by Month

Landings data are currently collected by NMFS and state port agents and are available by county, by month. This program should continue and be broadened to include those commercial sales not currently monitored. Catch data by statistical grid is collected through general canvas surveys. The interview frequency for king mackerel vessels should be increased in these surveys. Data entry format should allow disaggregation of catch information by month or season.

B. Commercial Effort and CPUE Data by Gear Type, by Area and by Season

Port agents in conducting general canvas surveys should collect individual vessel CPUE data. Effort data for the commercial harvest of mackerel are generally not available and are needed for stock assessment.

C. Timely, Total Recreational Catch and Landings by State (or area) and by Season (or Bimonthly Interval)

The annual national recreational surveys conducted by NMFS collect catch and landings information and should be continued. The timeliness of data availability should be improved. Specific consideration should be given to producing more rapid preliminary estimates of mackerel catch by state and by season or bimonthly sampling interval.

D. Recreational Effort and CPUE by Area and by Season (or Bimonthly Interval)

Data currently collected by intercept creel clerks for the national recreational survey should be anlayzed to provide CPUE for mackerel caught by persons fishing from private recreational and charter boats. The regional charterboat survey should be expanded to adequately sample each area for CPUE on both a man-hour and vessel-hour basis.

14.5.1.2 Mortality, Age and Growth Information

The estimates of mortality are critical to setting ABC and TAC for the stocks, and age and growth parameters are used in establishing mortality estimates. Mortality estimates are required on a continuous, annual basis and should be available for various geographical areas throughout the range of the stocks. Data needed for these estimates are as follows:

A. Size Frequency and Sex Information for Fish Harvested by Gear Type, by Area and by Season

These data are particulary needed for mackerel harvested in areas outside of Florida and should be collected on an annual basis. Port agents or other technicians should periodically measure length frequencies of commercial catches by subsampling. Recreational catch should be periodically monitored by NMFS intercept survey creel clerks or state biological personnel, possibly under the cooperative statistical program with NMFS. Particular emphasis should be placed on monitoring the catches of large king mackerel from off Louisiana.

B. Size/Age Information

Agreement between studies on aging king mackerel is not good. Federal and state personnel measuring length frequency of king mackerel should collect otoliths for aging studies by NMFS laboratory personnel.

14.5.2 Stock Definition Requirements

Information is needed to determine whether additional migratory management groups exist and to more clearly define the separation between groups and their migratory patterns. Data needed are as follows:

A. Tag and Recapture Information

In further defining the migratory groups of mackerel and their migration patterns, tagging studies should be conducted with particular emphasis on king mackerel populations off Louisiana and in the south Texas/Mexico area. Additional tagging should be carried out off southeast Florida during April to more clearly determine which migratory group is dominant in that area during April.

B. Genetic Difference Evaluations

Electrophoretic studies of king and Spanish mackerel tissue should be continued.

C. Movement Information

The regional charterboat survey should be utilized to determine movement patterns by geographically stratifying participating reporters and analyzing information on dates for first, last and peak catches each year.

14.5.3 Year Class Strength Prediction Requirements

The management strategy for king mackerel, at least in the Gulf, is to maintain the stock at near MSY levels adjusting the management measures to compensate for smaller (more restrictive measures) or larger (less restrictive measures) year classes entering the fishery. Methodology for predicting year class strength should be developed. The relationship between larval abundance and subsequent year class strength should be examined. Spawning areas and sampling times and areas for larval abundance

should be delineated so that this relationship can be studied. Such sampling areas should be included MARMAP or other annual surveys. Length/frequency and bycatch information should be examined for usefulness in predictions, etc.

15.0 RELATIONSHIP OF THE RECOMMENDED MEASURES TO EXISTING APPLICABLE LAWS AND POLICIES

15.1 Fishery Management Plans

Other existing or anticipated fishery management plans have little effect on the Coastal Pelagic Fishery Management Plan. Implemented plans which affect the management area are the Shrimp and Stone Crab FMPs in the Gulf and the Surf Clam FMP on the Atlantic Coast. Fishing for, or regulation of stone crabs have no significant impact on coastal pelagics. The Shrimp FMP may affect coastal pelagics through predator-prey relations. The Shrimp FMP will promote long-term reduction in bycatch of groundfish, a significant food source for mackerels. This may have some beneficial effect on mackerel populations. Gulf Reef Fish and Coral FMPs have also been implemented. None of these plans is expected to have significant impact on coastal pelagic resources.

Implementation of this FMP will have little impact on other management plans. Harvest of coastal pelagics has little if any impact on species regulated by other FMPs. There is substantial overlap of fishermen and vessels between coastal pelagics and spiny lobster, stone crab, and reef fish. However, this FMP is not expected to result in any displacement of user groups or major changes in abundance of coastal pelagics. Therefore, it is not likely that the FMP will substantially affect fishing activity for other species.

The statistical reporting system proposed in this plan will be incorporated into the total data collection effort for all plans in the Gulf and South Atlantic regions. This will achieve coordination, minimize costs and keep to a minimum the burden on respondents.

15.2 Treaties or International Agreements

There is no significant foreign participation in the Gulf and South Atlantic coastal pelagic fishery. There are no specific treaties or international agreements applicable to this management unit other than the general governing international fishery agreements. These are general bilateral agreements in which the participating nations agree to abide by the fishing regulations of the other nation when fishing in their waters. Currently there have been no applications for foreign fishing permits for any species in the mangement unit in the Gulf and South Atlantic regions. There is reportedly an occasional but insignificant incidental catch of king mackerel by Japanese longline vessels.

15.3 Federal Laws and Policies

Many federal laws and policies relate to this management unit in a peripheral way. However, there are no applicable federal laws or policies which will significantly constrain any of the measures of this plan. The intent of all data collection efforts under this plan is to maintain the confidentiality of individual responses as specified by the Privacy Act. Porpoises which are protected under the Marine Mammal Protection Act occasionally interfere with catching species in the management unit, and cause certain problems for fishermen; however, the provisions for this plan do not threaten the existence of the porpoise. Section 7 consultations have been conducted to determine if measures in this plan have adverse impacts on any threatened or endangered species as listed under the Endangered Species Act. A Section 7 consultation with the National Marine Fisheries Service concerning sea turtles and marine mammals resulted in a biological opinion that the plan was not likely to jeopardize these species. Consultation with the U.S. Fish and Wildlife Service resulted in a conclusion that the FMP will have no affect on the brown pelican or the West Indian manatee. The plan is in keeping with the Coastal Zone Management Act in that it is consistent with state coastal zone plans to the extent practicable. Other federal laws such as the Marine Protection, Research and Sanctuaries Act may constrain fishing for the species in the management unit to a limited extent; however, there are no adverse affects to management under this plan.

15.4 State and Local Laws and Policies

Florida, and some other states in the absence of federal law, have claimed jurisdiction over the "operations of all fishermen and vessels of this state engaged in the taking of such fishery resources within or without the boundaries of state waters." [Florida State Code, Section 370.02 (1) (a)]. Such extended state jurisdiction has been upheld in the courts prior to the federal government's initiation of a management program under the FCMA. The FCMA is assumed to supercede the state code in conflict in all waters beyond the state jurisdiction to the 200 mile limit coming under federal jurisdiction. In most cases, those state laws and policies not in agreement with this FMP will not adversely impact proposed management measures for the FCZ, nor will they impact overall management of the fishery.

The State of Florida prohibits possession of foodfish (except tuna) taken with a purse seine both inside and outside state waters. This law will conflict with activity legal under the plan. Florida also prohibits possession of gill nets used for taking of king mackerel which have a hanging depth of more than 200 meshes, 4-3/4 inch stretch mesh in any county along the Atlantic coast, with the exception of Monroe County. This may interfere with gill-net operators fishing in the FCZ. If tested in court, it is likely that the portions of these laws which apply to fishing in the FCZ will be struck down. If this happens, it will become more difficult for the state to enforce these regulations as they apply to state waters.

When federal regulations which provide for bag limits and seasonal closures on the filling of quotas are implemented, it becomes crucial that adjacent states promulgate similar measures. (Florida adopted the two fish bag limit for Gulf group king mackerel in December of 1984.) Because regulatory flexibility is proposed to adjust the federal management measures to the states of the stocks, state regulatory authority should be similarly responsive under ideal circumstances. Without compatible measures in state waters, enforcement of federal regulations would be difficult, and their effectiveness would be weakened.

In the future, effective and equitable management may require a workable means of differentiating true commercial from true recreational fishermen. This could be particularly important in implementing allocations to user groups. Therefore, the Councils have recommended that each state give consideration to requiring all persons who sell fish to have a commercial license, that the commercial license be of significant dollar value and that severe penalties be levied against any commercial operator purchasing fish from an individual not possessing a commercial license.

16.0 COUNCIL REVIEW AND MONITORING OF THE PLAN

16.1 General Approach

The Gulf of Mexico and South Atlantic Fishery Management Councils will, after approval and implementation of this plan by the Secretary, maintain a continuing review of the fishery managed under this plan by the following methods:

A. Assess the stock and modify the regulations and plan as provided for in Section 12.6.1.1.

B. Maintain close liaison with the fishery resource research, planning, management, and enforcement agencies involved to assess the condition of the stocks and the effectiveness of the management measures and regulations and compliance by the fishermen with the regulations. The state resource agencies, National Marine Fisheries Service (NMFS), and the U.S. Coast Guard are the primary agencies with which especially close liaison will be established for plan monitoring.

C. Maintain close liaison with the members of the Coastal Migratory Pelagic Subpanel of the Councils' Fishery Advisory Panel to assess the effectiveness of the management measures (and regulations) and the need for implementation of other measures or revisions of existing measures.

D. Promote research to increase the knowledge of the fishery and resources by the following methods:

   a. Identify the research required for better management of the fishery and resource.

   b. Request the National Marine Fisheries Service (NMFS) to consider these research needs and identify those which they can immediately address and those which will require efforts by other agencies or groups.

   c. Request state and university participation in research under their own programs to fill these data needs.

   d. Provide Council funding for research that cannot be addressed by NMFS, state and university entities.

   e. Assess the effectiveness of the statistical reporting system and recommend changes to NMFS or fund specific one-time surveys for data collection where data gaps exist.

E. Conduct public hearings at appropriate times and locations in the areas where the fishing effort is concentrated to hear testimony on the effectiveness of all aspects of the plan and the changes needed in the plan.

F. Consider by Council and its advisory groups all information gained from the first four activities listed above, and if necessary, prepare amendments to the plan. Hold public hearings on the amendments prior to sending them to the Secretary.

16.2 Specific Monitoring Considerations

A. Status or condition of the stocks.

Maximum sustainable yield will be determined based on best available data. The condition of the stocks will be periodically reviewed to determine if overfishing is occurring. As the statistical reporting system is improved and other research is completed, these additional data will be carefully reviewed to determine if changes in management measures are needed.

B. Catch Limits.

If the catch appears as if it will exceed or has exceeded any of the catch allocations in the plan, the Councils will review the data as of that time to determine whether the excess catch is a result of high abundance of fish, increased local availability, increased effort, or inaccuracies in the historical landings data. If appropriate, recommendations for bag limits or size limits will be forwarded to the Regional Director, NMFS.

If the updated MSY so indicates, the allocations will be changed accordingly by appropriate amendment.

C. Gear or User Group Conflicts.

If gear or user group conflicts arise, the appropriate Council will investigate the causes and extent of the conflict, potential solutions to the conflict, the economic and social impacts of any proposed limitations on any user group, and other factors as appropriate. Recommendations for appropriate action will be made to the Regional Director, NMFS. Public hearings will be held as appropriate to hear testimony concerning significant conflicts.

D. Harvesting Practices.

Harvesting practices proposed under the plan will be evaluated for their effectiveness and for the additions, deletions or modifications needed. In particular, the results of limited commercial purse seining and the proposed research programs to determine the effects of purse seining of king and Spanish mackerel will be carefully reviewed.

E. Standardization of Management Measures.

The Council will continue to work with the affected states to attempt to standardize regulations for the fishery in the FCZ and state territorial waters, where such standardization will serve a useful purpose.

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18.0 COMMENTS AND RESPONSE

1. No need for management of king mackerel in western Gulf where there is no commercial fishery.

   Response: According to best available scientific data, there is one migratory group in the Gulf, and it is overfished. Available data are insufficient at this time to divide the group for management purposes.

2. The limit of one king mackerel over 40 pounds will prevent trophy fishing.

   Response: This proposal has been deleted.

3. A recreational bag limit of two king mackerel will cause a hardship on charterboat operations because of its psychological effect on potential clients. It is unnecessary in the western Gulf where stocks are plentiful.

   Response: See 1. above. The bag limit is intended to reduce the recreational catch by 24 percent, and, therefore, must apply to all sectors. It is true that the percent reduction may be greater on some charterboats just as it may be greater on expert fishermen, or in areas of higher abundance. A three fish limit excluding charter captain and crew yields the same average catch as a two fish limit including captain and crew. Charterboats have an option of the greater of the two limits. There is no evidence that the bag limit will reduce an angler's desire to fish for king mackerel.

4. There is no need to reduce recreational catch as the commercial net fishery is the cause of the decline of king mackerel.

   Response: The recreational catch is approximately 70 percent of the catch of king mackerel with the commercial fishery landings about 30 percent. Of the commercial landings, net fishing has produced less than 40 percent in recent years.

5. Net fishing should not be prohibited in zones proposed in state and federal waters as proposed by the Florida Marine Fisheries Commission.

   Response: The Councils propose to restrict commercial fishing by quotas. Specific zones may be allocated to net and hook and line fishing off Ft. Pierce if conflict develops among fishermen.

6. Recommendations were made for Gulf group king mackerel fishing years to begin July and November in order to provide maximum opportunity to particular geographic areas.

   Response: Because of the migratory patterns and seasonal availability of king mackerel, the Councils divided the commercial allocation into eastern and western zones; thus, making the scheduling of the fishing year less important.

7. Concern was expressed for overfishing of Spanish mackerel stocks.

   Response: The Councils have requested a reassessment of the Spanish mackerel stock, and the amendment provides for annual review and some flexibility in regulation.

8. Commercial landings in 1982 are comparable to 1970 indicating that the commercial catch is static.

   Response: Commercial and recreational landings are cyclic, depending on recruitment strength from various year classes. The trend in the Gulf migratory group is downward, and that is the group for which a reduced catch is proposed.

9. A gradual reduction in TAC would have less impact on the fishery users even though recovery may take longer.

Response: The Councils considered this option but felt that a recovery period of three years was about the maximum which should be considered due to the poor condition of the Gulf migratory group.

10. The winter boundary between the Atlantic and Gulf migratory groups of king mackerel should be moved farther south than the Flagler-Volusia County line.

Response: The stock assessment group and the Councils' SSC recommended a division at any point between the northern boundary of Volusia County and the Georgia border.

11. No severe restrictions should be placed on king mackerel until the 1981-82 recreational catch data are verified and reviewed.

Response: Because of the long delay in obtaining these data, the Councils must proceed with the best data available. The amendment provides for annual review, and when these data become available they will be used in updating the stock assessment.

12. Because TAC is based on pounds, the bag limit should consider weight of fish. Fish vary in size geographically.

Response: The bag limit is based on percentage reduction of number of fish. It is true that the weight of the bag limit may vary due to prevailing size of the fish.

13. Allow charterboats a greater bag limit than private boats because their average catch is greater, and they will have a greater percentage of reduction.

Response: See 3. (preceding page).

14. The variable boundary between migratory groups is biased in favor of the Atlantic group.

Response: The boundary follows the recommendation of the stock assessment group and SSC, and is based on tagging studies conducted by state and federal fishing agencies.

15. Fix the migratory group boundary at Key West.

Response: See 10. above.

16. Close "No Man's Land" off the Florida Keys to net fishing.

Response: See 5. (preceding page).

17. In order to obtain good catch information, recreational fishermen should be required to obtain permits.

Response: The logistics of issuing permits would be costly. Catch information may be obtained more easily through sampling and with much less inconvenience to the fishermen.

18. The concept of annual review and more flexible management was endorsed.

Response: The Councils agree.

19. The commercial allocation should be subdivided between net and hook and line fishermen.

Response: The present FMP contains this provision, and it has not worked well. The first year of the plan, the hook and line quota was filled and fishing terminated, while the net quota remained unfilled. Changing catch patterns in the fishery makes this division impractical.

20. Fishing tournaments should be exempted from bag limits.

Response: There would be a difficulty in defining a bonafide fishing tournament. The Councils propose to restore the stock with a fair reduction in catch which is as equitable as possible and practical.

21. The bag limit will be self-defeating because king mackerel are difficult to release alive.

Response: King mackerel tagging programs utilize fish caught by hook and line. Fish can be released in good condition by fishermen who try to do so.

22. Some fishermen like to filet their fish at sea.

Response: Fish with size and bag limits would be required to be landed whole, or in an identifiable condition.

23. Seasonal closures would be preferred to a bag limit.

Response: Seasons would be more difficult because of the seasonal movement of the fish.

24. Close the Louisiana fishery because it takes larger fish.

Response: The size of fish taken off Louisiana varies with the price break on fish size. Larger fish often bring lower price per pound. The Louisiana commercial fishery is restricted in the western zone quota.

25. Restrict the use of purse seines and spotter planes.

Response: The purse seine fishery has been allocated a quota for study purposes, and a decision will be made on the use of the gear when the study is completed after the three-year program. The Councils do not propose to restrict efficiency of gear at this time. Total catch is limited by quota.

26. Close the king mackerel fishery for two years to allow stocks to recover.

Response: A one-year closure would be adequate and was considered. It was rejected because of its severe impact on various users.

27. The proposed quota for the western zone is based on only a few years' data and is using an excessive share of the Gulf group quota.

Response: The Louisiana fishery is new, and the allocation for the western group was based on recent catches.

28. Charterboats should be allowed to fish with a permit under the commercial quota.

Response: Vessels catching fish in excess of the bag limit but not selling their catches would cause the TAC to be exceeded. The Councils considered many options to restrict or to count this catch.

29. The requirement that a commercial permit seeker be required to share his income tax forms with Council members or staff is an invasion of privacy.

Response: Councils will not be involved in issuance of permits. NMFS will limit issuance to individuals who certify that at least ten percent of their earned income is derived from commercial fishing. Some may be required to substantiate this certification.

30. If future allocations are to be based on average catch in years for which both commercial and recreational catches are available, the commercial catch can only decline. It is limited by a quota, while total number of recreational participants can continue to increase.

Response: Because the ratio is to be based on an average of several years, any change will be dampened or small. It is possible that for economic or other reasons the recreational catch could decline. The change could work either way.

31. Allow a larger bag limit for king mackerel in the western Gulf.

Response: Present data indicate one migratory group of fish in the Gulf. There is, therefore, no justification for differential bag limits.

32. Adopt the lower TAC and management regime proposed by the Florida Marine Fisheries Commission.

Response: The Councils considered those measures to be too severe. The Councils' stock assessment group recommended a reduction of 22 percent for a recovery of the stock in three years. This is the intent of the amendment.

33. The Louisiana fishery is not given proper consideration in the amendment.

Response: The Louisiana fishery and landings are described in Section 8, and an allocation is provided based on landings.

34. Fishermen and other groups have inadequate notice and inability to participate in development of the FMP and amendment.

Response: Each Council has an advisory panel and has held public hearings during plan development. News releases, meetings, and notices of changes have been distributed. All public comments are reviewed and considered before the final draft is submitted for Secretarial review.

35. Question whether the restriction against a captain or crew member of a charterboat being included in the bag limit is constitutional.

Response: This restriction has been changed, and the captain and crew are now to be allowed a bag limit option.

36. The allocation reduction from the FMP to the amended FMP is greater for recreational fishermen than for commercial fishermen.

Response: In the original FMP, the TAC was equal to MSY. The commercial allocation was based on historic landings (1971-1975) with the remainder of TAC being allocated to the recreational fishery. The problem is that the MSY was overestimated. In the amendment, allocations are based on a ratio of the catch of the two user groups.

37. If one divides the recreational allocation (9.6M pounds) by average weight of fish (6.6 pounds), this shows only 1.5M fish are available. If this is divided by an estimated number of angler days, there are only 0.13 fish available per angler day.

Response: The two fish bag limit is estimated to reduce the total recreational catch by about 25 percent, based upon average catch rates. The 9.6M pound allocation is not a ceiling, but is the reduced estimated level of catch which may be attained with a two fish bag limit.

38. As a recreational fisherman, I support the two fish bag limit; however, I feel that stringent regulations should apply to the commercial sector as well.

Response: The commercial fishery is to be restricted to a quota and commercial fishing will cease in a zone for king mackerel when the quota is reached. The commercial allocation is also reduced similar to the recreational allocation.

39. The Councils should hold a public meeting before changes are made.

Response: The Councils held 25 public hearings on the proposed amendment.

40. Consideration should be given to placing key members of professional groups such as the associations who have technical expertise from a user's perspective on the stock assessment team for identification of TAC.

Response: Such individuals constitute the advisory panel which is to review the findings of the technical stock assessment group.

41. Rejected alternative to require permits for all mackerel fishermen appears to be in conflict with the recommendation that state's should license recreational and commercial fishermen.

Response: Permits for a single species would not be cost effective or practical. The Council would prefer that all states issue licenses for recreational and commercial fishermen as some have already done.

42. Council review and monitoring of the FMP (Section 16) should include coordination of effort with other professional resource agencies.

Response: This is the intent, and wording has been revised to clarify.

43. Charter boat operators are dependent upon selling portions of their catch and should be allowed to do so.

Response: Charter boats are to be defined as recreational boats for the purpose of reducing the catch fairly. Anyone may sell his catch so long as the commercial quota is not filled; however, only boats with commercial permits may exceed the recreational bag limits. Permit vessels must cease to fish for king mackerel when the quota is filled. Recreational boats may continue to fish.

U.S. Department of Transportation
United States Coast Guard

Commandant
United States Coast Guard

Washington, DC 20593
Staff Symbol: G-OLE/31
Phone: (202)755-1155

16207.2

JUL 13 1984

Mr. William P. Jensen Jr.
Chief, Fishery Management Operations
Division
United States Department of Commerce
NOAA, NMFS
Washington, DC 20235

Dear Mr. Jensen:

This in in reply to your letter of June 27, 1984 regarding Amendment 1 to the Fishery Management Plan for the Coastal Migratory Pelagic Resources I have no comments concerning the enforcement aspect of this plan.

Thank you for allowing me the opportunity to review and provide comments on these proposed changes.

Sincerely,

R. E. GRONBERG
Commander, U. S. Coast Guard
Chief, Fisheries Law Enforcement
Division
By direction of the Commandant

DEPARTMENT OF THE AIR FORCE
REGIONAL CIVIL ENGINEER, EASTERN REGION (HQ AFESC)
526 TITLE BUILDING, 30 PRYOR STREET, S.W.
ATLANTA, GEORGIA 30303

REPLY TO ATTN OF: ROV2

20 July 1984

SUBJECT: Draft Environmental Impact Statement (DEIS) for Amendment No. 1 to the Fishery Management Plan for the Coastal Migratory Pelagic Resources (Mackerels) (Your Ltr, 22 June 84)

TO:

National Marine Fisheries Service
Attn: Mr. Jack T. Brawner
Director, Southeast Region
9450 Koger Street
North Duval Building
St. Petersburg, FL 33702

1. We have reviewed the subject DEIS. Execution of the proposed amendment to the management plan will not adversely impact Air Force operations in the Eastern Region.

2. Thank you for the opportunity to review this DEIS. Our point of contact is Mr. Winfred G. Dodson, telephone (404) 221-6821/6776.

FOR THE COMMANDER

Monnie L. Gore Jr.
MONNIE L. GORE, JR.
Captain, USAF, Deputy Chief
Environmental Planning Division

cc: HQ USAF/LEEV

B

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1201 ELM STREET
DALLAS, TEXAS 75270

JUL 18 1984

Ms. Joyce M. T. Wood
Chief, Ecology and Conservation Division
U.S. Department of Commerce
National Oceanic and Atmospheric Administration
Room 6111
Washington, D.C. 20230

Dear Ms. Wood:

We have completed our review of your Draft Environmental Impact Statement (EIS) for the Fishery Management Plan on the Coastal Migratory Pelagic Resources. The proposed action will amend an existing fishery management plan in response to new scientific findings particularly with respect to the King Mackeral stock. This stock is to be divided into migratory groups for management purposes. This plan will provide more flexibility to address changes in the fish populations.

We classify your Draft Environmental Impact Statement as LO-1. Specifically, we have no objections to the project as it relates to Environmental Protection Agency's (EPA) legislative mandates. The statement contained sufficient information to adequately evaluate the possible environmental impact which could result from project implementation. Our classification will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions, under Section 309 of the Clean Air Act.

Definitions of the categories are provided on the enclosure. Our procedure is to categorize the EIS on both the environmental consequences of the proposed action and on the adequacy of the EIS, at the draft stage, whenever possible.

We appreciate the opportunity to review the Draft EIS. Please send our office five (5) copies of the Final EIS at the same time it is sent to the Office of Federal Activities, U.S. Environmental Protection Agency, Washington, D.C.

Sincerely yours,

/s/ Frances E. Phillips for

Dick Whittington, P.E.
Regional Administrator

Enclosure

cc: Mr. Jack T. Brawner

ENVIRONMENTAL IMPACT OF THE ACTION

LO - Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER - Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to re-assess these aspects.

EU - Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

ADEQUACY OF THE IMPACT STATEMENT

Category 1 - Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 - Insufficient Information

EPA believes the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3 - Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement. If a draft statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make a determination.

TO: F/SER 2, 21

Copy: Tech. Staff
Mackerel File

United States Department of State

Washington, D.C. 20520

August 17, 1984

AUG 30 1984
FISHERY MANAGEMENT COUNCIL

Mr. Jack T. Brawner
National Marine Fisheries Service
F/SER 2
9450 Koger Boulevard
St. Petersburg, Florida 33702

Dear Mr. Brawner:

Officers within the Department of State have reviewed the Draft Environmental Impact Statement (DEIS) For Amendment 1 for the Fishery Management Plan for the Coastal Migratory Pelagic Resources (Mackerals).

The statement made on page 7-1 of the document that "there may be some interaction between the stocks of king and Spanish mackeral caught in United States waters and those caught by Mexicans off Vera Cruz" was noted with interest. We appreciate the fact that research to determine the extent of this relationship is planned.

Since the very purpose of this fishery management plan is to maintain a viable stock of mackeral, the plan should give no problems to the Government of Mexico even if a relationship between the two stocks is further established. However, due to the importance of our fishery relationship with Mexico, we will be sending a copy of the DEIS to the Regional Fisheries Attache, Mr. Charles Finan, at the U.S. Embassy in Mexico City for his information.

I thank you for the opportunity to review this environmental impact statement.

Sincerely,

Thomas F. Wilson
Acting Director
Office of Environment
and Health

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW

Southeast Region / Suite 1360
Richard B. Russell Federal Building
75 Spring Street, S.W. / Atlanta, Ga. 30303

Telephone 404/221-4524 - FTS: 242-4524

AUG 10 1984

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ER-84/861

Mr. William P. Jensen, Jr., Chief
Fishery Management Operations Division
National Oceanic and Atmospheric
Administration
National Marine Fisheries Service
Washington, D.C. 20235

Dear Mr. Jensen:

The Department of the Interior does not have comments on Amendment 1/Fishery Management Plan/Regulatory Impact Review (combined) for the Coastal Migratory Pelagic Resources (Mackerels).

We appreciate the opportunity to review this document.

Sincerely yours,

James H. Lee

James H. Lee
Regional Environmental Officer

TO: F/SER 21

DEPARTMENT OF THE ARMY

SOUTH ATLANTIC DIVISION, CORPS OF ENGINEERS
510 TITLE BUILDING, 30 PRYOR STREET, S.W.
ATLANTA, GEORGIA 30335-6801

August 9, 1984

REPLY TO
ATTENTION OF:

Planning Division

Mr. Jack T. Brawner
Director, Southeast Region
National Marine Fisheries Service
9450 Koger Street, North, Duval Building
St. Petersburg, Florida 33702

Dear Mr. Brawner:

The attached comments are provided in review of the draft environmental impact statement for Amendment number one to the Fishery Management Plan for the Coastal Migratory Pelagic Resources (Mackerels).

We appreciate the opportunity for reviewing this document. If there are any questions on the attached, please contact Dr. M. A. Cooper at (404) 221-4619.

Sincerely,

Dan M. Mauldin
Chief, Planning Division

Attachment

SOUTH ATLANTIC DIVISION CORPS OF ENGINEERS
COMMENTS ON
DRAFT AMENDMENT ONE, FISHERY MANAGEMENT PLAN EIS
FOR THE COASTAL MIGRATORY PELAGIC RESOURCES

1. Page 2-1, paragraph 2.0. It would be helpful if the first National Standard set forth in the Magnuson Act were described.

2. Page 2-2, paragraph 2.4. Footnote explanations of the abbreviations used in the Table headings should be provided for clarification.

3. Page 2-6, paragraph 2.73. It would be helpful to include a brief description of the composition, roles and functions of the Councils, including any provisions for coordination with related resource agencies and user groups (reference page 10-4, paragraph 10-2).

4. Page 2-7, paragraph 2.8.2(B). Identify the territorial jurisdiction of the states adjoining the Federal Coastal Zone (FCZ) relative to the fishery resources problems and proposed solutions presented in the Fishery Management Plan (FMP) (reference Exhibits 7-1, 8-2, 10-2). Provide some insight into the significance of the states' jurisdiction and management of these resources in relation to the goals of the FMP (see also pages 7-3 and 7-4).

6. Page 12-9, paragraph 12.6.1.1(A). Consideration should be given to placing key members of professional groups, such as the Associations who have technical expertise from a user's perspective, on the assessment team for identification of the total allowable catch (TAC).

7. Page 12-19, paragraph 12.6.4.2. Rejected Alternative No. 3 appears to be in conflict with recommendations on page 2-7 (top) paragraph 2.8.2. This should be clarified also in relation to recommendations of the FMP given on page 15-2, paragraph 15.4 (bottom).

8. Page 12-40, paragraph 12.6.11 (E and F). Reconsideration of this alternative should be made based on the stated value of the information and need for it (page 14-1, paragraph 14.4 et al). Alternate means for implementation should be pursued. Statistical sampling methods should continue to be included.

9. Page 16-1, Section 16. Measures identified should include coordination of efforts with other professional resource agencies and groups having professional concerns and potential inputs to planning actions.